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1973

Volume III

AREA REPORTS: INTERNATIONAL

Prepared by staff of the

BUREAU OF MINES

UNITED STATES DEPARTMENT OF THE INTERIOR • Thomas S. Kleppe, Secretary

BUREAU OF MINES • Thomas V. Falkie, Director

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities to protect and conserve our land and water, energy and minerals, fish and wildlife, and park and recreation areas, and for the wise use of all those resources. The Department also has a major responsibility for American Indian reservation communities and for the people who live in Island Territories under U.S. administration.

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Foreword

The Federal Government, through the medium of the Minerals Yearbook or its predecessor volumes, has for 91 years reported annually on mineral industry activities. This edition of the Minerals Yearbook presents the record on worldwide mineral industry performance during 1973. In addition to statistics, the volumes provide background information to help in interpreting the year's developments. The content of the individual volumes is as follows:

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

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

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

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

THOMAS V. FALKIE, *Director.*

Acknowledgments

In preparing this volume, the Bureau of Mines gratefully acknowledges the statistics 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. Statistical and informational material was also obtained from airgrams of the U.S. Department of State, from publications of the United Nations, and from the domestic and foreign technical and trade press. Of particular assistance in preparing this volume were the routine and special reports submitted by the mineral, petroleum, economic, and commercial officers and other members of the embassy and consular service of the Department of State. Their contributions are sincerely appreciated.

The chapters of this volume were prepared by the staffs of the Divisions of Ferrous Metals, Nonferrous Metals, and Nonmetallic Minerals, of the assistant directorate—metals, minerals, and materials; and of the Divisions of Coal and Petroleum and Natural Gas of the assistant directorate—fuels. 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 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 [1]

In 1973, the world's mineral industry again registered gains in almost all measurable aspects of its activities despite the slump in the waning months of the year occasioned by the early stages of the developing, nearly worldwide energy crisis. Following years of relative complacency regarding mineral raw material supplies, the Governments of many nations decisively were made aware of the critical nature of their dependence upon other countries for the mineral energy materials that provide the basis for their industrial economic viability. Their awareness was occasioned by the sharply rising oil prices and/or the embargo of crude oil and products from the oil producing areas of North Africa and the Arabian Peninsula. Despite the severity of the problems that surfaced with the Yom Kippur War, the world's continually expanding population continued to pursue the goal of a higher standard of living. This goal led to higher levels of industrial activity, and hence to increased production, trade, and consumption of mineral commodities for the world as a whole, despite declines in some nations.

The United Nations index of overall world industrial production for 1973 was 9.6% higher than that for 1972, reflecting both increases in output and inflationary price rises. The following tabulation compares on a percentage change basis, the differences in indexes for various sectors of the mineral industry between 1971 and 1972 and between 1972 and 1973 with the changes in the index for overall industrial production:

Industry sector	Percentage change in United Nations world industrial production indexes	
	1971 to 1972	1972 to 1973
Extractive industries:		
Metals	+0.7	+5.3
Coal	−1.9	+2.0
Crude petroleum and natural gas	+6.7	+6.3
Total extractive	+4.7	+5.7
Processing industries:		
Base metals	+7.8	+10.3
Nonmetallic mineral products	+6.6	+8.5
Chemicals, petroleum, coal products	+9.2	+11.6
Overall industrial production	+7.2	+9.6

The figures for 1971 to 1972 in the foregoing tabulation differ from those published in the previous edition of this chapter as a result of improvements in the data base following publication of the previous edition. It is perhaps most significant to note that with the exception of the crude petroleum and natural gas sector of the extractive industries, all sectors listed registered a greater gain between 1972 and 1973 than between 1971 and 1972, this despite the energy problems of 1973. It is also noteworthy that within the processing industries, the base metals sector and the chemicals, petroleum, and coal products sector both registered greater percentage increases than did overall industrial production. In contrast, each of

[1] Physical scientist, Office of Technical Data Services—Mineral Supply.

the listed extractive industry sectors failed to show increases that were as substantial as that registered for overall industrial production.

Available partial and preliminary data on world trade in mineral commodities in 1973—data on the trade of developed market economy nations only—suggest that the total value of world mineral trade in 1973 was of the order of $147,000 million, up by almost 44% from the $102,331 million world total recorded for 1972. A part of the increase was the result of virtual worldwide inflation and devaluation of the U.S. dollar relative to some foreign currencies, but substantial gains in the quantity of materials moved also played a significant role. In the case of crude oil, the most significant single commodity traded (on both the tonnage and value basis), figures available to the Bureau of Mines indicate that 1973 exports totaled about 11,571 million barrels, an increase of 11.2% over the 1972 level. Exports of petroleum refinery products increased by 5.8% between 1972 and 1973, totaling 3,313 million barrels in the latter year.

From the viewpoint of consumption of mineral materials, 1973 saw increases in use of all major metals and fuels relative to 1972 levels, but the rate of increase varied from commodity to commodity compared with the growth rate registered between 1971 and 1972. Considering energy materials first, preliminary data suggests that despite the energy crisis, worldwide energy consumption increased by more than 5.7% in 1973, reaching a level of more than 7,835 million metric tons of standard coal equivalent, compared with the recorded 1972 level of 7,410 million metric tons. This increase was substantially higher than the 4.6% growth recorded between 1971 and 1972. In the case of the iron and steel industry, world total consumption of both iron ore and scrap reached new record highs, increasing by 7.7% and 6.8%, respectively, to levels of 680 million tons and 296 million tons, respectively, in 1973. Among the major nonferrous metals, aluminum registered a more modest growth rate between 1972 and 1973 than between 1971 and 1972, but copper, lead, zinc, and tin all recorded higher rates of increase between 1972 and 1973 than in the preceding period.

Reviewing mineral commodity prices, the most newsworthy event of 1973 undoubtedly was the sharp rise in most crude oil prices. In mid-October, the nations of Organization of Petroleum Exporting Countries (OPEC) indicated that crude oil prices would no longer be subject to negotiation and within a short timespan, prices were increased by about 70%. Refinery product prices likewise advanced by substantial amounts by yearend in most countries that were dependent to any extent upon OPEC oil. Among the nonferrous metals, only aluminum registered price declines in 1973 in major market economy nations, while copper, lead, tin, and zinc recorded notable increases.

Examining the influence of international confrontations on the mineral industry, nothing approached the economic impact of oil supply reductions and oil price rises that occurred following the flareup of fighting between Israel and its neighbors during the fall. This military action also adversely affected mineral production within the area as reservists left their jobs to fight and as some processing facilities (chiefly oil refineries) were damaged. However, these results, as well as an increase in regional liquid fuel consumption resulting from military activities, were almost inconsequential from the overall international viewpoint.

Similarly, in Southeast Asia, with the continued reduction in U.S. direct participation in the Vietnam war, requirements for mineral commodity supplies to sustain the war (chiefly fuels and construction materials) again fell off, despite occasional flareups in fighting. The Indochina area's only petroleum refinery, the Phnom Penh facility in the Khmer Republic, badly damaged previously during the war, apparently remained inoperative throughout 1973.

The gradual improvement in relations between the People's Republic of China (PRC) and the major market economy nations of the world was reflected in increased trade in mineral commodities and in mineral industry-related equipment between these areas during 1973.

The general pattern continued of shifting control of mineral industry operations in the developing nations from private corporations owned by foreign interests to public corporations owned wholly or partly by the producing countries. Some of the more noteworthy developments in this regard were in Libya, where the Government

increased its holdings in all oil company operations (except the Esso Standard Libya Inc. liquefaction plant) to the 51% level; in Iraq, where U.S. and Dutch interests in Basrah Petroleum Company, Ltd. were nationalized; and in Peru, where plans for nationalization within the copper industry advanced. It is perhaps significant to note also that despite the change in government in Chile, where the Marxist Allende regime was deposed in September, there were no plans to shift that nation's copper industry back into the direct control of foreign corporations.

PRODUCTION

In 1973, the estimated value of world crude mineral production was $112,400 million. This is 5.7% or $6,100 million above the previous year's total, as indicated in the following tabulation:

Year	Million dollars	
	Value of 53 major crude mineral commodities [1]	Value of all crude mineral commodities [2]
1950	37,224	42,100
1963	67,042	75,800
1968	77,908	88,000
1969	81,504	92,100
1970	86,897	98,200
1971	89,894	101,600
1972	94,089	106,300
1973	99,483	112,400

[1] For details on commodities included, see 1970 edition of this chapter, table 5. Figures for 1950–68 are those reported in Annales des Mines, No. 1, January 1971, p. 14; figures for subsequent years are extrapolated from the United Nations index of world extractive industry output (see table 1 of this chapter).

[2] Data are extrapolated from those in first column to compensate for commodities not included in original source study. For details on the basis of extrapolation, see the 1970 edition of this chapter, under "Value of World Mineral Production."

The 1972–73 growth rate exceeded that registered for 1970–71 and 1971–72 but fell short of the 6.6% increase registered for 1969–70.

The value added by processing of crude mineral commodities in mineral industry plants of various nations was estimated very roughly at about $250,000 million for 1973, a figure that is considered a low estimate because of the lack of complete data for all crude mineral commodities processed.

PRODUCTION INDEX PATTERNS

The United Nations indexes for mineral industry production of the world (excluding centrally planned economy countries of Asia) are given in table 1, together with index figures for major sectors of the industry and selected major geographic areas.

The index for output of the extractive industries and the processing industries again increased in 1973, exceeding the 1972 levels by 5.7% and 11.6%, respectively. The growth rate again exceeded that of the past few years. Production was up for every sector of the industry, but the major portion of the advance was again due to output of the processing industries, particularly chemicals, petroleum, and coal products.

On the basis of industry sectors, the major growth areas were chemicals, petroleum, and coal products, up 11.6%, and base metal processing industries, up 10.3%. Nonmetallic mineral products advanced 8.5%, exceeding the 6.6% growth rate between 1971 and 1972, while metals showed considerable improvement over the previous year with a 5.3% increase in production. In the area of fuel materials, coal extraction advanced 2 index points to 104 (1963=100), considerably below the overall industrial growth rate but reversing the downward trend shown by that sector in 1972. Crude petroleum and natural gas extraction registered a 6.3% increase in 1973, but this was slightly below the growth rate registered between 1971 and 1972.

The overall industrial production in-

dex for 1973 by quarters indicates a moderate increase between the last quarter of 1972 and the first quarter of 1973, a minor increase in the second quarter, with a decline in the third quarter to the first quarter level, and then ending the year up 8 index points. The extractive industries as a whole climbed 8 index points from the last quarter of 1972 to the first quarter of 1973 and remained at that level throughout the year, moving up only 1 index point in the last quarter. The subdivisions metal mining and coal did not vary more than 5 index points between any quarter of 1973, and although crude petroleum and natural gas production also remained fairly stable in 1973, that sector showed a jump of 12 index points between the last quarter of 1972 and the first quarter of 1973. Among the processing industries, base metal processing climbed 10 index points between the last quarter of 1972 and the first quarter of 1973, moved up slightly in the second quarter, declined to the year's low in the third quarter, then closed the year at a new high. The index of nonmetallic mineral products climbed steadily through the first half of 1973, then declined 5 index points before closing up in the final quarter. Chemicals, petroleum, and coal products jumped 13 points between the final quarter of 1972 and the first quarter of 1973 and continued to increase before falling off slightly in the third quarter, ending the year up 8 index points in the final quarter.

The United Nations indexes of world mineral industry production also indicate increased output for nearly all the regions listed except for the European Economic Community (EEC), which showed metal production down 7.2%, and total non-Communist industrialized countries, which had a slight decline in coal production. Production of coal also remained at the 1972 level for the United States, Canada, and the EEC. Also significant was the continuation of 1972 production levels of crude petroleum and natural gas in the non-Communist industrialized countries in 1973, particularly the United States and Canada, while Communist Europe increased production in that sector by 7.1% in 1973. The less industrialized countries increased crude petroleum and natural gas output by 9.7%, with the subdivision Asia up 15.8% over 1972. In the processing industries, the areas having the greatest increases in the base metals sector were the United States and Canada, the EEC, and Australia and New Zealand, up by 12.8%, 9.2%, and 12.4%, respectively, in 1973.

It should be remembered that growth rates alone, as shown in the production indexes, do not give an accurate indication of the contribution to total production by a given area or country. Communist areas in particular have generally shown consistently higher growth rates than non-Communist regions, but such output levels are from a lower base level in terms of quantitative output of most commodities. In other cases, the growth rate may be due mainly to industry expansion that is confined to one or several industries, as in the case of iron ore and bauxite in Australia.

QUANTITATIVE COMMODITY OUTPUT

Total world output of 71 mineral commodities for the years 1971–73 is given in table 2. Regional distribution of output for these same commodities for 1973 is given in table 3. In addition to these two tables, the statistical summary at the end of this chapter includes world output of seleced major commodities by principal producing countries for 1971–73.

Nonfuel Mineral Commodities.—Of the 39 metallic mineral commodities listed in table 2, 30 registered production increases in 1973 compared with 1972 output, and 9 showed declines.

Among the 23 industrial nonmetallic mineral commodities for which output data are given in table 2, 17 registered output increases relative to their 1972 performance, and 6 showed declines.

Tables 31 to 46 in the statistical summary section of this chapter give output levels of selected major nonfuel mineral commodities (metals and nonmetals) by major producers for 1971–73.

Mineral Fuel Commodities.—In 1973, the estimated world production of energy from all mineral fuel commodities reached a level of 8,001 million tons standard coal equivalent (SCE), compared with 7,566 million tons SCE in 1972 and 7,217 million tons SCE in 1971. This is the highest level of energy production yet recorded, with record production levels again being posted for each of the major

commercial energy sources [2] listed in table 2. The percentage distribution of each major energy source (coal, petroleum, and natural gas) along with hydro-geothermal-nuclear power for the period 1971–73 is given in the following tabulation:

Energy source	Share of total energy production (percent)		
	1971 [1]	1972 [1]	1973 [2]
Coal (including lignite)	33.0	32.1	30.9
Petroleum	43.6	44.1	45.4
Natural gas	21.1	21.4	21.3
Hydro, geothermal, nuclear electricity	2.3	2.4	2.4
Total	100.0	100.0	100.0

[1] Based on data in United Nations, World Energy Supplies 1969–72. Statistical Papers, Series J, No. 17, New York, 1974, p. 2.

[2] Estimate, based on extrapolation of United Nations data for 1972 using world production data for listed commodities reported and published by the U.S. Bureau of Mines.

Petroleum continued to increase its proportion of total energy production, rising to 45.4% in 1973, and thus remains the primary source of energy. Despite an increase in natural gas production, the proportion of total energy supplied by that mineral fuel declined from 21.4% in 1972 to 21.3% in 1973. The percentage of the total supplied by coal also declined again, falling to 30.9% as petroleum usage increased. Output data by major producing countries for coal, natural gas, and crude petroleum for the 3-year period 1971–73 is given in tables 47, 48, and 49.

TRADE

GENERAL TRENDS

Although complete data on the aggregate value of world mineral trade in 1973 is not yet available, it undoubtedly exceeded by a substantial amount that registered for 1972. Returns for only the developed market economy countries show a 44% increase relative to their 1972 level. In 1972, the latest year for which complete, reasonable reliable data is available, the estimated value of all mineral commodities traded was $102,331 million, an increase of 13.7% over 1971. This is the highest level of mineral commodity trade value yet recorded and represents a $12,294 million increase over the previous year's high. However, despite the increase in value, major mineral commodities' share of all commodities traded accounted for only 24.8% of the total, compared with 25.9% in 1971. This is the lowest percentage of the total since 1967, when this series was first begun. The estimated value of world trade for the period 1968–72 is shown in the following tabulation:

Year	Estimated value of all mineral commodities traded [1] (million dollars)	Increase relative to previous year (percent)	Mineral commodities' share of all traded (percent)
1968	63,361	11.7	26.6
1969	71,202	12.4	26.2
1970	83,865	17.8	26.5
1971	90,037	7.4	25.9
1972	102,331	13.7	24.8

[1] Value estimated from data on mineral commodities appearing in table 4 to which have been added a factor for all mineral commodities not included in that table. The factor added is based on comparison of complete mineral trade value returns for selected countries with data given for these same countries in the source for table 4, 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 4 represent about 81.5% of total mineral commodity trade.

Developing market economy countries continued to expand their output of mineral commodities for processing in the developed countries, as evidenced by the increase in both value and percentage of mineral commodity trade. The value of major mineral commodity trade contin-

[2] Excludes wood, charcoal, bagasse, animal dung, peat, and other minor fuels, although such fuels are used as commercial fuels in some countries, and a few nations account for a significant part of total energy consumption.

ued to expand for each of the various geographic sectors of the world, although the percentage of the total accounted for by each differed slightly from that of the previous year.

COMMODITY GROUP TRADE PATTERNS

The value of world export trade in major mineral commodity groups for the 5-year period 1968–72 is given in table 4. Table 5 gives the percentage of the total value of world trade in major mineral commodities accounted for by each major group, and table 6 records the growth in value of each major mineral commodity group from year to year. The value of world trade in mineral fuels continued to increase, and accounted for almost 50% of the total value of the major mineral commodity groups traded. The growth rate in this group was 16.1%, down from the 23.8% recorded the previous year, but still ahead of the other mineral groups. Iron and steel and crude nonmetals also continued to increase through the 5-year period shown, with iron and steel making up the second largest proportion of the total value of mineral commodities traded at 24.0%, down from the high of 25.0% recorded in 1970. The growth rate in iron and steel jumped substantially to 12.8%, up from 4.1% in 1971 but still well below the 24.6% growth rate recorded in 1970. Both the ores, concentrates, and scrap group and the nonferrous metals group rebounded from 1971 declines, increasing 6.5% and 11.6%, respectively. However, both of these mineral commodity groups also continued to account for a declining proportion of the total, falling to 9.2% and 13.9%, respectively, in 1972. From table 5 it can be seen that the mineral fuels commodity group continued to make up a growing percentage of the aggregate value of the major mineral commodity groups traded, a trend that undoubtedly will continue with sharp price rises, increased consumption levels brought on by an expanding population base, and energy shortages. Of the remaining four commodity groups, only crude nonmetals was unchanged, remaining at 3.5% of the total value of major mineral commodities traded.

Despite the increases recorded for the five major mineral commodity groups listed, the growth in value of the aggregate of these groups was again outpaced by the growth in value of all commodity groups traded. The growth in value of export trade of the aggregate of major mineral commodity groups increased 13.7%, compared with 18.7% for all commodity groups traded.

REGIONAL TRADE PATTERNS

World trade by geographic area and country of the major mineral commodity groups (metal ores, concentrates and scrap, iron and steel, nonferrous metals, nonmetals, and mineral fuels) in terms of dollar value in 1972 is given in tables 7, 8, and 9. Table 7 compares the aggregate of major mineral commodity trade by region with total commodity trade for these same regions in both value and percent. Table 8 gives origins and destinations for each of the major mineral commodity groups in terms of exports from and exports to the regions and countries indicated. Table 9 elaborates the data in the previous table by showing both source and destination for the aggregate of the major mineral commodities by the countries and regions shown in the stub and column heads of the table. Table 9 also aids in illustrating the relative self-sufficiency in or dependence upon mineral commodities by the regions selected.

The overall pattern of 1972 world trade in major mineral commodities in terms of developed and developing market economies and centrally planned economies is given in the following tabulation:

Destination [1]	Source of exports [1]				
	Market economy countries		Centrally planned economies	Undistributed [2]	Total
	Developed	Developing			
Value (million dollars):					
To market economy countries:					
Developed	32,940	27,210	3,120	−10	63,260
Developing	4,890	5,765	671	9	11,335
To centrally planned economy countries	1,894	586	5,390	5	7,875
Undistributed [2]	756	159	29	−14	930
Total	40,480	33,720	9,210	−10	83,400
Share of world total in percent:					
To market economy countries:					
Developed	39.5	32.6	3.7	([3])	75.9
Developing	5.9	6.9	.8	([3])	13.6
To centrally planned economy countries	2.3	.7	6.5	([3])	9.4
Undistributed [2]	.9	.2	([3])	([3])	1.1
Total	48.6	40.4	11.0	([3])	100.0

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

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

[3] Insignificant.

Every category reported separately in the value portion of the foregoing tabulation recorded a higher value than in 1971; however, the percentage distribution of the various economies remained relatively unchanged from those of 1971. Although the value of trade in major mineral commodities from developed market economies to all economies increased by $4,640 million in 1972, in terms of percent of the total value of world trade this increase remained unchanged. The most significant change in 1972 was the percentage increase in value of mineral commodities from the world to developed market economies at 75.9%, up from 75.0%. Although such percentage increases appear relatively small, they continue to support the trend of ever higher consumption levels by the developed market economies. This was also evidenced by the percentage of world trade in major mineral commodities from developing market economies to developed market economies at 32.6%, up from 31.8% in 1971. Receipts by developing market economies increased in value but again declined in percent of the total. Receipts by centrally planned economies remained at the previous year's level of 9.4%, while the percentage change in value of mineral exports from centrally planned economies to all economies decreased slightly to 11.0%.

In 1972, the proportion of trade in major mineral commodity groups to total trade of selected world areas varied considerably for the countries and regions listed. The Near East again took the lead with 85.7% of the total value of its exports accounted for by major mineral commodities. This was slightly below the previous year's share, as was the percentage of mineral commodities among total exports to that region. Other Africa ranked second in the share of mineral commodities among total commodity trade, showing an increase in the value of major mineral commodities exported from that region to 56.6% of all commodities exported.

The percentage of the total value of all commodities exported from Latin America declined to 36.2% from 42.3% in 1971. However, the value of the aggregate of major mineral commodities exported to that region more than doubled, and the value of nonmineral commodities was up over 78%. For "Not reported" areas, 72.8% of the total value of their exports were mineral commodities, compared with 44.7% the previous year. The United States again reduced the percentage of total

exports accounted for by mineral commodities, although the aggregate value of major mineral commodities increased. Both value and percentage of major mineral commodity groups imported by the United States rose in 1972. In Japan, mineral commodity imports as a percentage of the total declined from 41.3% to 38.0% in 1972, reflecting the continued recession in that country but still placing it ahead of all other regions and countries as the leading importer of major mineral commodities in terms of the percentage of total commodities imported. Centrally planned economy countries of Asia, along with the United States and the Republic of South Africa, had the lowest percentages of all commodities traded accounted for by mineral commodities. In the case of the Republic of South Africa, it should be remembered that the 9.2% of total listed trade made up by major mineral commodities excludes value data for gold, diamonds, and a variety of metals, the inclusion of which would considerably increase the value of mineral commodities exported by that country.

In table 8, value of world trade in each of the five major mineral commodities increased in 1972, with mineral fuels again having the largest value increase, up $5,440 million over 1971. The total value of exports of iron and steel increased $2,200 million to $20,040 million, with the major portion of the increase due to exports from the EEC, up $1,380 million over 1971. In the "Exports to" column, the areas and countries accounting for the major portion of the increase in trade in mineral fuels were the United States, up $1,332 million over the previous year, the EEC, up $1,860 million, and Latin America, up $1,810 million. The value of trade for centrally planned economy countries of Europe rose for each of the major mineral commodity groups, but centrally planned economy countries in Asia showed declines in each of the commodity groups exported to those areas. Although data continues to be excluded for several of the areas and commodities listed, it is presumed to be included under "Not reported." In addition, the value of gold moving in world trade continues to be excluded owing to the system of reported used, the Standard International Trade Classification Revised (SITC-R).

Sources and destinations for the aggregate of major mineral commodities in terms of major world areas and countries, as given in table 9, indicate the relative export-import position for those areas. In particular, comparison of total exports credited to each country or region (vertical grand total column) with total export receipts (horizontal grand total line) will indicate the position of each area as a net importer or net exporter of major mineral commodities. Except for Africa, centrally planned economy countries of the Far East and South Asia, and Australia and New Zealand, all areas showed increased exports receipts in 1972.

CONSUMPTION

NONFUEL MINERAL COMMODITIES

Despite the lack of world consumption data for many mineral commodities, it is reasonable to assume that consumption of most nonfuel mineral commodities increased in 1973, based on the performance of several major metals and nonmetals. Examination of these selected commodities indicates that consumption levels for all of them advanced over 1972 highs. Consumption of iron ore by 23 major world producers of pig iron (excluding the PRC), as given in table 10, reached 680.3 million tons. This figure, which is based on iron ore used in agglomerating plants, blast furnaces, and steelmaking, is 48.9 million tons or 7.7% above the 1972 level. U.S. consumption of iron ore was up 17.2%, while in Japan consumption rose 21.7 million tons, or 22.0%. The major nations of the EEC (which included the United Kingdon in 1973) increased consumption of iron ore by 6.8%. France accounted for the major portion of this increase, having raised iron ore consumption by 6.9 million tons. The centrally planned economy countries of Europe, which together made up over 31% of total consumption in 1973, raised their consumption level by 12.9 million tons. Though based in part upon estimates, the portion of total iron ore consumed that was used directly in steelmaking was again about 6 million tons. Of the remaining ore, approximately 48% was treated in

agglomerating plants prior to being fed to blast furnaces, and the largest portion (nearly 51%) was fed to blast furnaces and other facilities for production of pig iron and other products with or without agglomeration. The increase in the percentage of iron ore being treated in agglomerating plants indicates an increased use of lower grade iron ores as well as utilization of more efficient steel production techniques.

Iron and steel scrap consumption in 1973 amounted to over 295.7 million tons, nearly 19 million tons above the 1972 level. This is the highest consumption level of iron and steel scrap recorded, with scrap consumption by major steel producers up considerably. Table 11 gives iron and steel scrap consumption by 24 selected major countries subdivided into major economic groups. The United States remained the largest single consumer of iron and steel scrap of the countries listed with nearly 32% of the total, up 10.6 million tons from the previous year to a level of 94 million tons. Scrap consumption by Japan climbed 22.7% to 48.7 million tons while the U.S.S.R. was up only 2.9% at 46.3 million tons. Consumption by the EEC was up 6.3%, due in large measure to a consumption increase by West Germany of 7.3 million tons over 1972. Data for 1973 was not available for several countries, and lack of complete data necessitated the estimation of totals for certain others listed in the table. However, among the remaining countries listed, Canada recorded a 1.4-million-ton increase in iron and steel scrap consumption, which was 26.2% above that of the previous year.

Estimated world consumption of five major nonferrous metals is given in table 12. Consumption of all of the metals listed was up in 1973, with generally comparable rates of increase. Lead showed the largest percentage increase in consumption at 10.3% or 383,000 tons, and aluminum consumption was up 6.7% to 12.8 million tons. Copper consumption increased 8.1%, and zinc, 7.2%. These percentages represent quantitative increases of 642,000 tons and 370,000 tons for copper and zinc, respectively. Tin consumption continued to grow, jumping 16,000 long tons between 1972 and 1973, compared with a 3,000-long-ton increase between 1971 and 1972. The demand level for such mineral commodities was extraordinarily high in 1973, despite equally high price increases brought about in part by scarce energy supplies.

Data on world consumption of most nonmetallic mineral commodities continues to be unavailable. However, despite the lack of overall data, consumption of major commodities in this group, limestone, cement, and fertilizer materials, again advanced in 1973. Demand for sulfur increased again, despite the spread of pollution control regulation in major industrial countries. Consumption of sulfur was up 4.8% in 1973, an increase of 1.5 million tons over that of 1972. World consumption of nitrogen fertilizer for the 1972–73 fertilizer year (July 1, 1972, to June 30, 1973) was reported at 35.9 million tons, a 6.9% increase over that of the previous year. Phosphate consumption in terms of contained P_2O_5 increased from 22.0 million tons to 23.9 million tons, an 8.6% rise. Potash consumption in terms of K_2O equivalent for the 1972–73 fertilizer year was 18.9 million tons, a 5.6% increase over the previous year's total.[3]

MINERAL FUEL COMMODITIES

Consumption of mineral fuel commodities is reported in terms of consumption of the energy equivalent produced from the respective fuel. In 1972, the latest year for which worldwide reliable data is available, world consumption of mineral fuels, which include coal, oil, natural gas, and primary electric power (that power produced by means other than the burning of the aforementioned fossil fuels), amounted to 7,410 million metric tons SCE. This is a 4.6% increase over the 7,084 million tons SCE consumed in 1971. In terms of per capita consumption, an increase of 3.9% was registered in 1972, suggesting that the rate of worldwide growth in energy production is being exceeded by a more rapidly expanding population growth rate. Table 13 gives a detailed breakdown of energy consumption in terms of major energy source (solid fuels, liquid fuels, natural gas, and primary electric energy) and by continental divisions for the 5-year period 1968–72 as reported by the Statistical Office of the United Nations. Liquid fuels again in-

[3] British Sulphur Corp. Ltd. Statistical Supplement No. 4, November–December 1974, London, 1974.

creased their share of the aggregate of energy consumed in terms of SCE in 1972, rising to 43.5% of the total compared with 42.6% in 1971. Despite the quantitative increase in consumption of solid fuels, that energy source registered a smaller proportion of the aggregate, 32.5%, in 1972, compared with 33.7% the previous year. Consumption of natural gas and primary electrical power also increased quantitatively, but their percentage of the aggregate energy consumed remained relatively unchanged.

Comparison of the rates of growth in consumption of the various mineral fuel commodities between 1971 and 1972 indicates that the growth rate of primary electric power outpaced all other energy sources at 7.8%, but this source accounted for only 2.4% of the aggregate consumed in 1972. The growth in consumption of liquid fuels was 6.7%, compared with 5.8% for natural gas. Despite relatively rapid rates of growth over the past 5 years, consumption of natural gas continued to lag behind solid and liquid fuels at 1,603 million tons of SCE, or 21.6% of the aggregate.

Consumption of energy by market economy countries amounted to 5,261 million tons SCE in 1972, or 71% of the total world energy consumption. The distribution of the various energy sources in relation to their respective percentage of the aggregate varied considerably between market economy countries and centrally planned economies. In market economy countries, 51.2% of the total was accounted for by liquid fuels; 23.6%, by natural gas; 22.2%, by solid fuels; and the remainder, primary electricity. This compares with 24.4% by liquid fuels, 16.7% by natural gas, 57.7% by solid fuels, and 1.2% by primary electricity for centrally planned economy countries. The difference in the proportion of the aggregate accounted for by the various mineral fuel commodities by the two types of economies is due partly to the emphasis placed upon pollution control by market economy countries and partly because of the ready availability and lower cost of coal in centrally planned economy nations. Regionally, those areas with historically low cosumption levels experienced the largest percentage growth in consumption of aggregate fuel sources. Africa and the Near East increased aggregate consumption 9.8% and 8.0%, respectively, between 1971 and 1972, but Other America increased consumption by only 3.3%. In Western Europe, consumption of solid fuels declined for the third straight year, but consumption of natural gas was up 26.4%. Liquid fuels utilization was up 5.6%, and consumption of this energy source made up 57.9% of the aggregate in 1972. The centrally planned economy nations of Europe recorded a 4.8% increase in aggregate mineral fuel consumption. Of the total for this area, liquid fuels consumption, at 482 million tons SCE, was 8.1% above the 1971 level.

Per capita consumption increased for all regions listed except the Far East, which declined slightly. Developed market economies as a group continued to maintain the highest per capita consumption, again over 4 times that for centrally planned economies.

INVESTMENT

Worldwide mineral industry investment continued to expand in 1973 but with a major shift in emphasis on the areas involved. Comprehensive data on all such investment is not available, but figures for petroleum industry and iron and steel industry investment, as well as detailed geographic mineral industry investment by the United States, reflect this growth pattern. Information continues to be lacking on comparable mineral industry investment data for the centrally planned economy nations, which include the U.S.S.R., the PRC and a number of East European countries. However, although annual mineral industry investment data is rarely, if ever, published, announcements of major expansion plans and trade or cooperative agreements do indicate a general trend of substantial continued mineral industry upgrading or growth.

Annual investment expenditures in the steel industry for selected countries for 1971 and 1972, the latest years for which such data are available, is given in table 14. Total expenditures of $7,997 million in 1972 represent an increase of 3.6% over the revised 1971 total of $7,721 million, considerably smaller than the 23.2% increase between 1970 and 1971. Italy and

France continued to expand steel industry investment in 1972 in the amounts of $266 million and $340 million, respectively, while the other members of the EEC reduced their levels of investment. However, the decline of the latter was more than offset by the investment by Italy and France, giving the EEC the largest percentage of total steel industry investment in 1972 among the country or country groups listed. The European Free Trade Association (EFTA) increased steel industry investment 27.5%, with all members of the association listed having increased steel industry outlays in 1972 over 1971. Investment by two major steel producers, Japan and the United States, declined in 1972, the latter for the fifth straight year. Japanese steel industry investment was down nearly 5% while that of the U.S. steel industry fell almost 18%.

Expenditures by market economy countries in terms of capital investment and exploration expenses in the petroleum industry for 1971, 1972, and 1973 are given by geographic area in table 15, and by industry sector and type of expense in table 16. The total of both capital expenditures and exploration expenses for petroleum increased 19.7%, or $5,205 million from 1972 to 1973. The distribution of these expenditures in market economy countries for 1972 and 1973 is given in the following tabulation by area in percent of the total:

Area	Percent of total	
	1972	1973
United States	37.0	36.3
Other Western Hemisphere	12.7	11.3
Western Europe	17.3	15.8
Africa	4.5	3.5
Near East	3.9	4.5
Far East	10.9	8.3
Unspecified	13.7	20.3
Total	100.0	100.0

Although the percentage of the total accounted for by the United States declined slightly in 1973, that country continued to have the largest percentage of the total amount invested. Of the areas listed, only the Near East and unspecified areas increased their share of the total, with the latter rising to 20.3% in 1973 from 13.7% in 1972.

Table 15 shows that expenditures for petroleum capital investment increased for every area listed except Africa, off 3%, and the Far East, down $290 million or 10.7%. Exploration expenses were up for every area except Africa, which declined nearly 29%, and the Near East, which remained at its 1972 level. The United States, which accounted for the largest percentage of the $31,695 million invested in 1973, had an increase in total expenditures of over 17%, mainly for capital investment. Western Europe had expanded capital expenditures of 8.4%, while exploration expenses increased $50 million or 40%, but from a relatively small base. The Near East continued extensive expansion of its petroleum industry, with investments of $415 million, or 43% more in 1973 than in 1972 in capital expenditures. Particularly significant was the continued vast increase of investment in tanker construction, listed separately as unspecified and not distributed regionally. Total market economy investment in 1973 in tanker construction was $6,450 million, nearly 77% or $2,800 million above the 1972 level.

Market economy country petroleum industry investment by industry sector, as shown in table 16, indicates that expenditures for production of crude oil and natural gas continue to outpace all other sectors. In 1973, expenditures for that industry sector were up $2,825 million, or 29.5% over 1972, for a total of $12,415 million. The marine sector, which includes expenditures for tanker construction, was the second largest sector of investment expansion at $6,550 million, nearly 74% above the 1972 level. Excluding the two industry sectors mentioned previously, all other areas of capital investment declined except for those listed as "Other", which increased 8.5%, and pipeline investment, which remained stable. Most significant of the sectors of investment decline were marketing and chemical plants, which fell $345 million and $175 million, respectively, in 1973.

Preliminary figures for 1973 and revised data for 1972 regarding U.S. direct foreign investment in mineral industries is given in table 17. Total U.S. investment in mining, smelting, and refining increased 5.3% to $7,483 million, while earnings and income increased substantially from depressed 1972 levels. Canada continued to be the primary country of U.S. mining investment with 50% of the total value invested, while the Republic of South Africa and Australia showed investment

increases of $21 million and $82 million, respectively, in 1973. However, despite the 15.3% growth in value of investment in the Republic of South Africa, mining investment activity in the African continent declined 2.5%. Value of investment in Chile remained stable at $359 million in 1973 after a decline of almost $100 million between 1971 and 1972. Total direct U.S. investment in the petroleum industry in 1973 was valued at $29,567 million, up 12.6% from 1972. The largest percentage of this total was accounted for by Europe, where the value of U.S. investment was $8,387 million, up 22.4% over the previous year. The EEC, excluding its newer members Denmark, Ireland, and the United Kingdom, showed an increased investment of $1,031 million for a total of $4,394 million. Investment in the Canadian petroleum industry was up 10.6% but declined 13.4% in Venezuela and 7.7% in Africa. The Near East increased its U.S. investment level by $610 million, and international shipping was up 17.3%. Preliminary data indicates that the value of U.S. earnings in petroleum were up 86.7% in 1973 to a new high of $6,183 million, while income increased 53.0% to $4,325 million.

TRANSPORTATION

MARINE TRANSPORT

The transport of mineral commodities is accomplished by oceangoing vessels from three major classes: Tankers, bulk carriers, and freighters. The distribution of these vessels in terms of number of vessels, gross tonnage, and deadweight tonnage for the 5-year period 1969–73, as derived from a U.S. Maritime Commission report, is given in table 18. All vessels in all categories showed an increase in 1973 over 1972 except for gross tonnage of vessels classified as "Other," which declined less than 1.0%. It should be noted, however, that all vessels in each of these classes are not involved wholly or even partly in transporting mineral commodities. Tankers transport crude oil, natural gas, and refinery products but also move chemicals and products such as molten sulfur and whale oil. Bulk carriers, while heavily engaged in the transfer of metal ores, cement, and fertilizers, also move large quantities of bulk agricultural products. Freighters are not generally engaged in mineral commodity shipments but nonetheless move metal products as well as some ores and concentrates.

The relative movement of mineral commodities may be illustrated by world shipment of tanker and dry cargo by loadings and unloadings for the 5-year period given in table 19. Total world shipping increased 11.3% for a record 3,190 million tons. Separately, tanker cargo loadings increased 11.9%, and dry cargo loadings were up 10.5%.

Regional patterns of tanker and dry cargo movement by loadings and unloadings are given in tables 20 and 21, respectively. Tanker cargo unloadings continued to increase for major developed market economies, spotlighting the domestic shortages that developed in 1973. The United States showed unloadings of an additional 74 million tons for a 35.9% increase over the previous year's level, while Western European countries and Japan were up 8.5% and 13.7%, respectively. Canada and the Republic of South Africa also increased unloadings of tanker cargo but from a considerably smaller base. Developed market economies as a group increased loadings 9.1%, with nearly all of the increase coming from additional loadings of crude and refined products from Western Europe. Among the developing market economy countries the pattern was as expected with major petroleum producers showing increased loadings of tanker cargo. Tanker loadings in the Near East were up 17.8%, exceeding 1 billion tons for the first time, and Venezuela, despite declining production of petroleum for several years showed increased loadings of 3 million tons in 1973. The U.S.S.R. had equivalent amounts of tanker cargo being loaded and unloaded from its ports, with total unloadings for centrally planned economy nations up 18.5%. As regards world shipping of dry cargo, the regional pattern in 1973 was generally the same as that of the previous year. A major exception was the decline of nearly 4% in loadings of dry cargo in Western Europe, the first decline since 1967, which was the first year covered by this series of tables. The United States

increased loadings of dry cargo by 19.8%, while Australia and New Zealand were up 15.7%. The major regions or countries having substantial unloadings of dry cargo were Western Europe, Japan, and the United States, up 8.6%, 13.8%, and 5.2%, respectively, in 1973. Developing market economy countries raised the level of loadings 15.8%, or 60 million tons. The Far East and Other Latin America, which accounted for over half of the total cargo unloaded in developing market economies, were up 18.5% and 26.5%, respectively.

Data are not available on the percentage of total world commodity movement accounted for by mineral commodities, but it is possible to gain a general indication of such by observation of commodity traffic through the Panama Canal. In 1973, 55.6% by weight of all cargo transiting the Panama Canal consisted of mineral commodities. From this amount, it may be inferred that mineral commodities account for an even larger share of total world commodity movement because of the increasing tonnages of crude oil and refinery products moving by tankers and bulk carriers incapable of traversing the canal because of their size.

Regarding the number and size of vessels involved in mineral commodity movement, by yearend 1973 the world merchant fleet [4] numbered 21,600 vessels with a gross tonnage of 275,927,000 tons and a deadweight tonnage of 446,370,000 tons, increases of 2.8%, 10.1% and 11.7%, respectively, over 1972 totals. These percentages indicate continued increased growth rates in vessel numbers and capacity, although the rates varied markedly for the type of vessel. Bulk carriers had the highest percentage growth rate in both number of vessels and tonnage, with tankers a close second. Freighters, although having the lowest rate of growth of any vessel class in numbers, remained the most numerous class of vessel, totaling 11,170, or nearly 52% of the total. Vessels classified as other (passenger-cargo, passenger-refrigerated cargo, and refrigerated freighters) increased slightly in number and deadweight tonnage.

Tankers.—In 1973 the number of tankers increased by 232 vessels or 5.1%, but the additional vessels resulted in a 12.7% increase in gross tonnage and 14.3% increase in deadweight tonnage, indicating that many of these vessels were again in the supertanker class. Overall, the result was that the average size of tankers was increased in 1973 to 25,425 gross tons and 45,809 deadweight tons. Comparable figures for 1966 were 16,343 gross tons and 25,768 deadweight tons, respectively. Table 22 further illustrates the distribution of world oil tanker tonnage by size group for 1973, with 1966 data for comparison. By yearend 1973, the total world tanker fleet in service amounted to 220.0 million deadweight tons, with a record 197.6 million deadweight tons in progress or on order. Of the total tonnage in service, 38.5% was in the 205,000-deadweight-ton size class or over, an increase of 36.4% over the same size classes in 1972. Although there continued to be a massive increase in the larger size tankers, growth still continued in size classes 25,000 to 45,000 tons and 65,000 to 125,000 tons owing to port limitations in a number of countries. The United States, with a maximum allowable vessel size of 80,000 tons, will continue to rely on smaller tankers, barring construction of deep sea terminals. If and when all vessels in progress or on order are completed, and discounting reductions in tonnage due to scrapings, losses, or other deletions from the fleet, the total tanker fleet will come to 417.6 million tons, with nearly 55% by weight in ships over 205,000 tons. The draft of many of these vessels will preclude their deployment on some established shipping routes, necessitating the use of smaller tankers for transfer of crude oil and refinery products. The possible reopening of the Suez Canal, while reducing the distance between the Persian Gulf and European markets, is unlikely to seriously limit the use of very large carriers due to the magnitude of the volume of trade presently taking place.

The rapid buildup of very large tankers has resulted in the virtual replacement of a large percentage of the fleet. The following tabulation gives the percentage of total tonnage in terms of the year of

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

completion of vessels classified as tankers in 1972 and 1973:

Year of completion	Percent of total tonnage	
	1972	1973
Up to yearend 1945	2.7	2.1
1946–50	1.1	.9
1951–55	6.5	5.5
1956–60	15.2	13.4
1961–65	18.2	15.9
1966–70	34.8	30.5
1971–73	21.5	31.7

Source: British Petroleum Co. Ltd. BP Statistical Review of the World Oil Industry—1972 and 1973. Bayard Press, London, 1972, 1973, p. 14.

A breakdown of the world tanker fleet at yearend 1973 in terms of flag of registry ranked in order of national aggregate deadweight tonnage follows:

Country	Number of vessels	Deadweight tonnage (thousand tons)
Liberia	864	59,684
Japan	485	27,694
United Kingdom	442	26,924
Norway	349	21,941
Greece	308	12,201
France	137	9,731
United States	274	8,636
Panama	209	7,995
Italy	220	5,915
U.S.S.R	454	5,532
Sweden	75	4,097
Denmark	57	4,120
Spain	110	3,900
Netherlands	81	3,420
Other	748	18,691
Total	4,813	220,481

Bulk Carriers.—The world bulk carrier fleet increased by 261 vessels, or 7.4% in 1973. The growth rate of bulk carriers in both gross tonnage and deadweight tonnage also exceeded that for all other types of vessels. In terms of gross tonnage, the increase was 15.2% to 74,660,000 tons, for an average bulk carrier weight of 19,647 tons compared with 18,317 tons in 1972. Deadweight tonnage increased 16.3% to 126,140,000 tons, for an average deadweight tonnage per vessel of 33,195 tons in 1973 compared with 30,662 tons in 1972. The high rate of increase in bulk carriers continued from the previous year reflected the importance of ore carriers and large combinations (ore-oil-other material) carriers in variable market conditions. Although the Maritime Commission data does not distinguish mineral commodity oriented bulk carriers from those engaged in agricultural trade, other sources indicates that at yearend 1973, 11.0 million deadweight tons of combined carriers were in building progress or on order, compared with 16.8 million tons at yearend 1972. Information is not available as to the total number of these vessels currently in service, but it may be assumed that a substantial number of those in the building stage or on order at yearend 1972 were completed.

The total number of bulk carriers in service under the major flags of registry, ranked in order of aggregate deadweight tonnage for 1973, is indicated in the following tabulation:

Country	Number of vessels	Deadweight tonnage (thousand tons)
Liberia	787	30,200
Japan	530	20,978
Norway	344	15,702
United Kingdom	330	12,938
Greece	412	11,215
Italy	141	5,236
Sweden	79	3,706
Germany, West	75	3,675
Panama	146	2,513
India	52	1,992
France	57	1,851
Spain	50	1,390
U.S.S.R	145	1,268
Poland	60	1,051
Denmark	30	870
United States	26	617
Other	536	10,938
Total	3,800	126,140

Freighters.—Freighters are the major ocean carriers of processed mineral commodities, particularly metal smelter and mill products. At yearend 1973, the number of freighters had risen to 11,170 vessels, with a gross tonnage of 66,790,000 tons, up 2.5%, and a deadweight tonnage of 90,511,000 tons, up 1.8%. In terms of percentage of the world's merchant fleet, freighters accounted for 24.2% of the aggregate gross tonnage and 20.3% of the aggregate deadweight tonnage, both percentages representing slight declines from the previous year's proportion. However, demand for freighter shipments continued to increase as evidenced by the rise in shipment of finished and semifinished metal products through the Panama Canal.

Freighters also gained in average vessel size, increasing from 5,879 gross tons and 8,025 deadweight tons in 1972 to 5,979 gross tons and 8,103 deadweight tons in 1973.

The following tabulation lists the principal nations of registry of freighters in

order of their share in the aggregate deadweight tonnage of the total world freighter fleet at yearend 1973:

Country	Number of vessels	Deadweight tonnage (thousand tons)
Greece	900	8,417
U.S.S.R	1,337	8,299
Japan	1,004	8,159
United States	587	7,400
United Kingdom	662	6,297
Liberia	495	5,026
Panama	696	4,453
Germany, West	504	4,153
Cyprus	414	2,973
Norway	347	2,909
Netherlands	287	2,409
India	185	1,962
Other	3,752	28,054
Total	11,170	90,511

PANAMA AND SUEZ CANALS

The number and type of vessel, as well as the nature of the cargo moved, pointed up several significant trends in ocean traffic transiting the Panama Canal in 1973. Although the number of transits was down from the levels reached during the height of the Vietnam conflict, cargo tonnage moved increased 14.8% to 129,609,000 tons. Vessels of increased size and capacity transited the canal in reduced number of transits, with traffic in general recovering somewhat from the 1972 level, which had been depressed, at least in part, by the Japanese recession and labor strikes. The appearance of larger vessels within the capacity limits of the canal supported the worldwide trend to increased use of container ships as well as larger bulk carriers and tankers. The percentage of total cargo moved in 1973 that consisted of mineral commodities was 55.6%, or 72,041,000 tons, down slightly from 55.8% in 1972. However, although the portion of the total accounted for by mineral commodities was down, mineral commodity tonnage as a group increased 9,053,000 tons, or 14.4%, over that of 1972. Mineral commodity movement and its importance in Panama Canal activity is summarized in the following tabulation:

	Fiscal years		
	1971	1972	1973
Number of transits:			
Commercial ocean traffic	14,020	13,766	13,841
Other traffic	1,328	1,432	1,268
Total	15,348	15,198	15,109
Cargo moved (thousand metric tons):			
Commercial ocean traffic:			
Mineral commodities	72,561	62,988	72,041
Other commodities	47,969	47,999	56,087
Subtotal	120,530	110,987	128,128
Other traffic, all commodities	2,422	1,873	1,481
Total	122,952	112,860	129,609

A breakdown of commercial ocean traffic through the canal for the years 1972 and 1973, in terms of vessel type, cargo tonnage, number of transits, direction of movement (Atlantic to Pacific, Pacific to Atlantic), and by the status of the vessel (in ballast or laden) is given in table 23. Table 24 gives specific mineral commodities and commodity groups by direction of movement over a 3-year period.

The major portion of the total cargo moved through the canal was carried by bulk carriers, with tonnage moved by these vessels up 17.4%. No ore ships transited the canal in 1973, and although the number of transits of tankers declined by 6.0%, the tonnage moved was up 23.4%, with Atlantic-bound traffic showing over twice the tonnage shipped in 1972. Mineral commodity traffic from the Atlantic to the Pacific accounted for over 60% of the total mineral tonnage shipped. Iron and steel semimanufactures, petroleum, and coal and coke continued to be the major mineral products moved. Shipment of iron and steel was up 5.4%, with most of the traffic from Japan to the United States and Western Europe. Coal and coke shipments continued to decline in 1973, despite the increase in Japanese demand for coking coal. This was partly a result of Australia and Canada supplanting the United States as a supplier of coal but

also because an estimated 2.5 million tons from the United States bypassed the canal, using the Cape of Good Hope route to Japan. Shipment of crude oil from the Pacific to the Atlantic was up by nearly 4 times the 1972 level, while movement of refinery products increased almost 58%. Shipment of metal scrap for all metals also increased substantially from a total of 1,472,000 tons in 1972 to 3,303,000 tons in 1973, the increase primarily a result of Japanese demand. Other mineral commodities showing significant change in the tonnage moved were copper ore and concentrate at 603,000 tons shipped, up from 280,000 tons; zinc ore and concentrate at 785,000 tons, up from 515,000 tons; and sulfur at 1,107,000 tons, up 40.5% from 1972.

Although the Suez Canal remained closed for the sixth straight year, plans were underway for its eventual reopening and possible widening and deepening. With its continued closure, very large tankers moved most of the crude from the Persian Gulf to European markets by way of the Cape of Good Hope shipping route, and shipments also moved overland by pipeline from the producing areas to Eastern Mediterranean ports. As world markets have expanded significantly from the time of the initial closure of the canal, reopening may not drastically affect the utilization of supertankers by virtue of the enormous quantity they are capable of moving in a single shipment to meet present heavy demands. But it can be expected that, as in the case of the Panama Canal where tankers and bulk carrier size has edged up to the limit of the canal's capacity, so also will the Suez Canal see substantial traffic, particularly in petroleum products produced in Near East refineries.

OCEAN FREIGHT RATES

Available information indicates that rates for ocean freight jumped dramatically in 1973 as the energy crisis increased in tempo. The cost for haulage of cargo pushed rates well above their previous highs in 1970, as shown by United Nations indexes in table 25. Analysis of ocean freight rates for 1973 also showed increases of from 34.6% to nearly 3 times those registered in 1972. Increases were recorded for every consecutive quarter for each country and category listed except for West German and Norwegian tanker rates, which declined in the fourth quarter, and Italy, for which information was not available.

PIPELINES

Although 1973 was the year of the tanker due to substantial and rapid increases in demand for energy by the world's expanding economics, planned oil and gas pipeline construction continued generally unabated. Despite the general unavailability of complete worldwide summaries of existing pipeline systems, several projects of international significance in 1973 are highlighted in the following section.

The North Sea was a major development area following extensive discoveries of oil and gas offshore Norway and the United Kingdom. Construction on a 270-mile, 34-inch crude oil line from Ekofisk to Teesside, United Kingdom, was begun in May, following settlement of a participation agreement between the oil companies involved and Norway. Participants involved in a 36-inch crude line extending 130 miles from Cruden Bay to the Grangemouth refinery received authorization to begin construction in early 1973, with completion expected in late 1974. The 32-inch line from the Forties Field to Cruden Bay was due for completion in November 1973. A buyers consortium composed of West Germany, the Netherlands, Belgium, and France was scheduled to begin receiving gas in late 1975 from a 250-mile, 36- to 42-inch pipeline from Ekofisk to Emden, West Germany. In Europe itself, the Druzhba II line, extending 2,796 miles from the Ural-Volga region and paralleling Druzhba I, was completed, with design work for Druzhba III presently underway. Druzhba II is now also linked with the 1,140-mile crude line from Ust Balyk in Western Siberia, from which oil will be supplied to Poland, East Germany, Czechoslovakia, and Hungary.

In Italy, attempts are being made to greatly diversify energy sources. In addition to possible construction of a major pipeline from the Hossi R'Melgas Fields in Algeria, construction continues on Europe's largest natural gas pipeline from Bocholtz in the Netherlands to Mortara in northern Italy. A line from the northeast across Europe from the U.S.S.R. is also underway. This line, extending about 480 miles, is to cross Czechoslovakia to Baumgarten on the Austrian frontier.

In the Near East, general survey and feasibility studies have been completed in Iraq regarding the planned construction of a major crude oil pipeline. Agreement has been reached between Iraq and Turkey for the laying of a 560-mile, 40-inch pipeline to link Kirkuk with the Mediterranean port of Dortyal in southern Turkey. A strategic pipeline extending over 400 miles is also to join North Rumaila with Haditha on the Kirkuk-Mediterranean pipeline network. It will consist of two parallel lines and will be able to carry either Kirkuk crude to the Persian Gulf or North Rumaila crude to the Mediterranean. A deepwater tanker terminal to be built in the Gulf will have two 25-mile, 48-inch submarine pipelines. Iran is continuing construction of a 680-mile gas pipeline to the U.S.S.R., paralleling the existing 40 to 42-inch Bid Boland to Astara line, which has been in operation since 1970.

In the Western Hemisphere, court injunctions again resulted in postponement of construction on the 789-mile, 48-inch crude oil pipeline from the north slope of Alaska to a southern port terminal despite considerable precautions being taken to limit the destructive impact of an oil spill. However, in spite of the delays in laying the oil line, a study is underway for construction of a gas pipeline from the North Slope to a liquefaction plant on the south coast. Liquefied natural gas tankers would then move the gas to the west coast of the United States.

Studies are still underway regarding the transport of gas from the Mackenzie Delta in Canada to consumers in the United States. Preliminary review has also been completed on a 602-mile, 42-inch underground crude pipeline from Canada into New York State, paralleling the south shore of the St. Lawrence River to Oswego and Buffalo. Capacity of the line has been put at 500,000 barrels per day.

In Bolivia, plans have been revived regarding the feasibility of a 1,242-mile natural gas pipeline from the Santa Cruz Fields to São Paulo, Brazil. Gas originally destined for that country is now being exported to Argentina. Brazil also plans to move gas from offshore fields near Aracaju to a natural gas plant in Bahia by way of a 143-mile, 14-inch pipeline. The pipeline, presently underway, is scheduled for completion in May 1974. Ecuador will be selling newly developed crude oil to Colombia via the under-utilized Colombian trans-Andean pipeline. A 40-mile spur will be needed to connect the Andean line.

PRICES

In 1973 the average price of several major mineral commodities staged a dramatic advance. This was in line with general price increases for most mineral commodities, particularly as demand for fuels increased during the energy crisis. World production of raw steel in 1973 was up 10% over 1972 output, and although detailed information is not available on average world price levels for steel and other mineral commodities such as crude oil and petroleum refinery products, it is reasonable to assume that increases again occurred.

The average annual price of several major nonferrous metals for the 3-year period 1971–73 for the United States, the United Kingdom, and Canada is given in tables 26, 27, and 28, respectively, with average monthly prices for these same commodities for 1973. It can be seen from these tables that the average annual price of copper, lead, zinc, tin, and silver increased substantially from 1972 levels for all three countries. The only exception to this trend was aluminum, where prices fell for the third straight year in the United States and the United Kingdom, off 5.3% and 1.0%, respectively. Canadian aluminum producers ceased quoting a published price in 1972. Zinc prices were up 16.4% in the United States, 26.3% in Canada, and well over twice the 1972 price in the United Kingdom. U.S. zinc prices climbed steadily through the first 5 months, falling slightly in June. Prices then fluctuated mildly until December when a price jump of 34.5% was registered. Zinc prices increased throughout the year in the United Kingdom, with the largest rise in the final quarter. Canadian zinc price increases, while not as dramatic as for the United Kingdom, nonetheless rose steadily throughout the year except for a very slight drop in May. In the case of copper, the average annual price rose 66.5% in the United Kingdom, well ahead of the 16.3% and 24.1% increases in U.S. and

Canadian markets. United Kingdom copper prices rose throughout 1973 except for declines in May, September, and December. U.S. prices increased through April, then remained steady until November when they rose again, ending higher in December. Canadian copper prices were up in the first quarter and, despite several declines of minor significance, continued the year generally upward before falling off slightly in December. Lead prices rose on all three markets; the United Kingdom had a 41.7% increase over the 1972 level. A strongly defined upward trend continued throughout the year, except for a decline in August. The U.S. price of lead fell at the start of the year but then moved upward during the next 5 months, holding steady until December when the price increased again. The Canadian lead market was more erratic as prices rose in the first quarter, then declined 2 months before a slight increase in June, fell during the third quarter, then moved up before leveling off in December. Tin prices were up 28.7% in the United States and 27.7% in the United Kingdom. The pattern of price performance was generally the same in both countries, with price increases throughout the year except for declines in April and September. The price of silver gained on both U.S. and United Kingdom markets, increasing slightly over 50% for both.

The United Nations mineral commodity export price indexes and an analysis of export price indexes are given in tables 29 and 30. The overall crude minerals export price index indicates a jump of 40 index points, or 28.4% over 1972. Increases were made every quarter, ending at a high of 241 (1963=100). Separate export price indexes for metal ores and fuels showed gains of 20.2% and 31.5%, respectively. These two mineral commodity divisions had increases through each consecutive quarter of 1973, with the largest increase shown in the last quarter of the year.

Examination of the analysis of the export price indexes table indicates that the export price index of both developed and developing areas increased dramatically. The index of all minerals in developing areas was up 31.9% to a new average annual high of 178 index points. The index for nonferrous base metals for developing areas jumped 91 points to an annual average of 252, up 56.5%. Increases were recorded for each consecutive quarter of 1973 for the commodity groups listed. Export price indexes for developed areas were up 24.0% for all minerals and 38.0% for nonferrous base metals. As in the case of developing areas, the export price indexes were up for every quarter listed. The fourth quarter index figures are the highest yet recorded for export price indexes.

STATISTICAL SUMMARY OF WORLD PRODUCTION AND TRADE OF MAJOR COMMODITIES

The final 30 tables of this chapter (tables 31 to 60) extend the statistical series that was started in the 1963 edition of the International Area Reports volume of the Minerals Yearbook and that was then updated in the 1965, 1967, and subsequent editions up to 1972. They are primarily a supplement to other statistical data within this chapter but also serve as a summary of international production and trade data for major commodities covered in greater detail on a commodity basis in Volume I of the 1973 Minerals Yearbook and on a country basis in Volume III.

The data presented here on production (tables 31 to 49) in most instances represent the most accurate figure available at the time of compilation of this chapter, which was subsequent to the completion of all commodity and country chapters. Because of this, they may differ from data presented in this volume in the country chapters (where a more reliable figure became available after the country chapter was completed) and/or from the metric unit equivalent of data presented in Volume I (where a more reliable figure became available subsequent to the completion of the commodity chapter).

The data on world trade in major mineral commodities presented in this chapter (tables 50 to 60) may not correspond exactly to that presented elsewhere in the Minerals Yearbook because these summary tables are compiled 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 displaying the general pattern of trade in these commodities.

Table 1.—United Nations indexes of world [1] mineral industry production
(1963=100)

Industry sector and geographic area	1971	1972	1973	1973 by quarters 1st	2d	3d	4th
EXTRACTIVE INDUSTRIES							
Metals:							
Non-Communist world	134	132	138	134	140	137	140
Industrialized countries [2]	133	129	136	131	140	135	139
United States and Canada	129	126	138	127	144	140	140
Europe	126	126	127	130	131	116	131
European Economic Community [3]	86	83	77	88	76	68	75
European Free Trade Association [4]	149	146	153	160	162	127	163
Australia and New Zealand	206	214	222	202	224	220	242
Less industrialized countries [5]	136	136	141	139	140	139	143
Latin America [6]	141	143	147	141	148	146	152
Asia [7]	143	143	147	149	147	143	150
Communist Europe [8]	202	213	229	232	227	229	226
World	149	150	158	156	160	157	159
Coal:							
Non-Communist world	87	82	82	87	82	77	81
Industrialized countries [2]	85	79	78	83	79	74	78
United States and Canada	117	123	123	122	121	122	128
Europe	73	62	62	69	63	56	60
European Economic Community [3]	71	60	60	68	61	54	58
European Free Trade Association [4]	61	61	59	64	57	59	57
Australia and New Zealand	159	172	177	159	180	195	172
Less industrialized countries [5]	124	126	129	134	130	126	127
Latin America [6]	152	150	151	NA	NA	NA	NA
Asia [7]	121	122	126	130	128	123	125
Communist Europe [8]	128	130	135	137	132	132	137
World	104	102	104	108	103	100	105
Crude petroleum and natural gas:							
Non-Communist world	175	188	199	197	196	202	201
Industrialized countries [2]	141	151	151	158	148	147	154
United States and Canada	131	136	136	137	134	135	138
Europe	276	321	342	395	324	291	357
European Economic Community [3]	318	376	398	469	376	333	416
European Free Trade Association [4]	NA	NA	NA	NA	NA	NA	NA
Australia and New Zealand [9]	--	--	--	--	--	--	--
Less industrialized countries [5]	210	226	248	239	246	258	249
Latin America [6]	118	112	116	113	116	118	118
Asia [7]	225	254	294	281	287	311	295
Communist Europe [8]	187	198	212	215	214	211	208
World	178	190	202	201	200	204	203
Total extractive industry:							
Non-Communist world	144	148	157	155	157	157	159
Industrialized countries [2]	122	123	127	127	127	124	129
United States and Canada	127	131	135	132	135	135	138
Europe	108	105	109	116	110	101	110
European Economic Community [3]	104	101	104	113	105	96	104
European Free Trade Association [4]	128	125	131	134	135	119	137
Australia and New Zealand	176	184	190	172	192	197	200
Less industrialized countries [5]	190	202	221	214	219	227	223
Latin America [6]	125	122	126	121	125	126	NA
Asia [7]	211	237	272	263	267	285	274
Communist Europe [8]	165	174	185	189	186	183	184
World	150	157	166	166	166	166	167
PROCESSING INDUSTRIES							
Base metals:							
Non-Communist world	144	157	178	174	180	173	183
Industrialized countries [2]	142	155	175	173	178	171	180
United States and Canada	120	133	150	150	154	144	149
Europe	141	150	165	162	167	159	172
European Economic Community [3]	135	141	154	152	156	149	160
European Free Trade Association [4]	151	160	169	170	174	152	182
Australia and New Zealand	139	153	172	162	160	181	184
Less industrialized countries [5]	175	193	209	199	198	209	229
Latin America [6]	190	208	224	205	214	225	251
Asia [7]	152	171	191	196	177	190	200

See footnotes at end of table.

Table 1.—United Nations indexes of world [1] mineral industry production—Continued
(1963=100)

Industry sector and geographic area	1971	1972	1973	1973 by quarters 1st	2d	3d	4th
PROCESSING INDUSTRIES—Continued							
Base metals—Continued							
Communist Europe [8]	173	183	194	196	194	194	191
World	153	165	182	181	184	179	185
Nonmetallic mineral products:							
Non-Communist world	147	158	171	159	176	175	174
Industrialized countries [2]	142	152	165	152	171	168	167
United States and Canada	123	133	145	134	150	151	146
Europe	152	160	170	157	178	172	176
European Economic Community [3]	145	153	161	149	161	163	163
European Free Trade Association [4]	157	165	173	163	179	169	181
Australia and New Zealand	143	150	163	147	159	172	175
Less industrialized countries [5]	188	203	223	200	224	230	229
Latin America [6]	195	210	233	225	228	238	239
Asia [7]	184	195	214	196	221	221	217
Communist Europe [8]	196	210	226	224	231	222	228
World	166	177	192	183	197	192	194
Chemicals, petroleum, and coal products:							
Non-Communist world	196	214	237	229	237	235	245
Industrialized countries [2]	196	214	237	230	239	235	245
United States and Canada	180	200	217	209	219	220	221
Europe	203	219	246	243	248	234	259
European Economic Community [3]	200	212	240	237	241	229	252
European Free Trade Association [4]	199	213	228	225	231	211	243
Australia and New Zealand	193	208	234	211	239	253	234
Less industrialized countries [5]	191	210	232	222	225	235	247
Latin America [6]	198	215	239	NA	NA	NA	NA
Asia [7]	188	210	229	226	216	227	246
Communist Europe [8]	240	265	301	298	305	301	300
World	205	224	250	243	251	248	256
OVERALL INDUSTRIAL PRODUCTION							
Non-Communist world	155	166	182	178	182	179	190
Industrialized countries [2]	152	163	179	175	179	175	186
United States and Canada	142	153	168	164	169	169	170
Europe	152	159	172	172	173	160	184
European Economic Community [3]	147	153	166	166	166	154	176
European Free Trade Association [4]	156	164	172	169	174	158	186
Australia and New Zealand	150	159	173	161	171	183	177
Less industrialized countries [5]	178	193	211	200	209	214	222
Latin America [6]	172	185	200	NA	NA	NA	NA
Asia [7]	178	196	219	213	212	222	229
Communist Europe [8]	191	206	225	227	227	221	224
World	165	177	194	191	195	191	199

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 classification "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 zero in source, but both Australia and New Zealand produce natural gas; insufficient data available to calculate index number.

Source: United Nations. Monthly Bulletin of Statistics. August 1974, pp. xii-xxv.

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

Commodity		1971	1972	1973 p
METALS				
Aluminum:				
Bauxite	thousand metric tons	r 62,162	65,114	70,694
Alumina	do	r 22,784	23,616	26,538
Unalloyed ingot metal	do	r 10,324	11,004	12,117
Antimony	do	64	67	70
Arsenic, white [2]	do	50	42	47
Beryl [2]	metric tons	r 5,361	3,918	3,589
Bismuth [2]	do	r 3,776	4,008	3,923
Cadmium	do	r 15,425	16,687	17,013
Chromite	thousand metric tons	r 6,475	6,430	6,701
Cobalt:				
Mine [2]	metric tons	r 24,733	23,507	25,638
Refined	do	r 22,400	20,302	22,849
Columbium-tantalum concentrates [3]	do	r 10,794	15,562	24,039
Copper:				
Mine	thousand metric tons	r 6,072	6,651	7,136
Smelter	do	r 6,020	6,598	7,013
Gold	thousand troy ounces	r 46,495	44,718	43,070
Iron and steel:				
Iron ore	thousand metric tons	r 786,591	778,489	864,463
Pig iron [4]	do	r 429,766	456,145	504,412
Ferroalloys [4]	do	r 9,726	9,944	10,589
Crude steel	do	r 581,197	628,560	694,318
Lead:				
Mine	do	r 3,417	3,466	3,532
Smelter	do	r 3,341	3,470	3,534
Magnesium	do	r 233	233	237
Manganese ore	do	r 21,089	20,907	22,153
Mercury	thousand 76-pound flasks	r 301	278	276
Molybdenum	metric tons	r 77,614	79,109	82,191
Nickel	thousand metric tons	r 639	617	676
Platinum-group metals	thousand troy ounces	4,084	4,269	4,314
Selenium [5]	metric tons	1,136	1,219	1,115
Silver	thousand troy ounces	r 295,785	2 95,450	307,314
Tellurium [3]	metric tons	r 145	174	191
Tin:				
Mine [2]	thousand long tons	r 231	240	233
Smelter	do	232	236	229
Titanium concentrates:				
Ilmenite [3]	thousand metric tons	r 3,362	3,288	3,567
Rutile [2 3]	do	r 392	319	334
Tungsten, mine output, metal content	metric tons	r 35,791	38,436	38,365
Uranium oxide (U_3O_8) [3]	do	r 21,740	23,226	23,154
Vanadium [3]	do	r 16,934	18,545	19,223
Zinc:				
Mine	thousand metric tons	r 5,369	5,495	5,703
Smelter	do	r 4,731	5,119	5,231
NONMETALS				
Asbestos	do	r 3,584	3,774	4,171
Barite	do	r 3,725	3,902	4,316
Cement, hydraulic	do	r 608,780	649,461	694,396
Diamond:				
Gem	thousand carats	r 12,454	12,628	12,560
Industrial	do	r 28,913	31,182	31,167
Diatomite	thousand metric tons	r 1,524	1,544	1,588
Feldspar	do	r 2,553	2,541	2,594
Fluorspar	do	r 4,561	4,537	4,495
Graphite [2]	do	390	356	370
Gypsum	do	r 54,622	59,180	60,575
Magnesite [2]	do	r 9,183	9,126	9,234
Mica [3]	do	r 174	202	222
Nitrogen fertilizers, contained nitrogen [6]	do	r 32,919	35,053	38,812
Phosphate rock	do	r 85,456	91,389	99,995
Potash (marketable), K_2O equivalent	do	r 19,968	20,408	21,564
Pumice [3]	do	r 14,872	15,324	14,332
Pyrites, including cupreous, gross weight	do	r 25,248	23,218	22,110
Salt	do	r 144,409	147,336	150,749
Strontium minerals [3]	metric tons	r 111,343	100,098	93,559
Sulfur, elemental:				
Frasch and from ores	thousand metric tons	13,559	13,987	15,897
Byproduct	do	11,999	15,055	16,670
Talc, soapstone, pyrophyllite	do	r 4,646	4,790	5,232
Vermiculite [3]	do	416	465	500

See footnotes at end of table.

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

Commodity		1971	1972	1973 [p]
MINERAL FUELS AND RELATED MATERIALS				
Coal: [7]				
Anthracite	million metric tons	[r] 181	175	174
Bituminous	do	[r] 2,088	2,125	2,166
Lignite	do	800	804	819
Total	do	[r] 3,069	3,104	3,159
Coke:				
Metallurgical	thousand metric tons	[r] 341,628	343,547	366,850
Other types	do	[r] 21,186	18,384	17,841
Fuel briquets	do	[r] 116,874	94,713	86,761
Gas, natural, marketed	billion cubic feet	[r] 40,270	42,587	44,862
Peat	thousand metric tons	[r] 90,588	105,374	95,475
Petroleum, crude	million barrels	[r] 17,746	18,720	20,361

[p] Preliminary. [r] Revised.

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

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

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

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

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

[6] Years ending June 30 of that stated.

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

Table 3.—Approximate percentage distribution of world mineral commodity production by major areas in 1973 [1]

Commodity	Western Hemisphere			Eastern Hemisphere							World	
				Europe			Near East and Asia					
	North and Central America	South America	Total	Non-Communist	Communist	Africa	Non-Communist	Communist	Oceania	Total	Non-Communist	Communist
METALS												
Aluminum:												
Bauxite	24.5	16.9	41.4	11.3	10.3	5.7	5.2	0.9	25.2	58.6	88.6	11.2
Alumina	38.7	8.9	47.6	11.8	13.1	2.3	8.9	1.1	15.2	52.4	85.8	14.2
Aluminum ingot	41.6	1.5	43.1	23.8	15.2	2.1	12.0	1.2	2.6	56.9	83.6	16.4
Antimony, mine output	6.8	22.2	29.0	6.0	11.1	24.3	10.2	17.2	2.2	71.0	71.7	28.3
Arsenic, white [2]	[2] 9.2	2.4	11.6	54.9	15.3	17.2	1.0	NA	--	88.4	84.7	15.3
Beryllium, beryl concentrate [2]	([3])	41.2	41.2	.1	40.4	16.3	--	NA	2.0	58.8	59.6	40.4
Bismuth, mine output [2]	[2] 16.0	35.6	51.6	3.8	3.4	.1	24.5	6.4	10.2	48.4	90.2	9.8
Cadmium, smelter output	28.0	1.2	29.2	26.0	18.5	2.3	18.8	1.2	4.0	70.8	80.3	19.7
Chromium, chromite	.3	1.9	2.2	11.7	38.4	27.4	20.3	NA	--	97.8	61.3	38.7
Cobalt:												
Mine	13.2	--	13.2	5.1	6.6	72.0	--	NA	3.1	86.8	87.2	12.8
Smelter	4.6	--	4.6	13.7	7.4	74.3	--	NA	--	95.4	92.6	7.4
Columbium-tantalum concentrate [3]	11.2	81.3	92.5	--	NA	6.2	.5	NA	.8	7.5	100.0	NA
Copper:												
Mine	34.4	13.6	48.0	4.3	13.5	20.9	6.1	1.6	5.6	52.0	84.8	15.2
Smelter	30.7	10.4	41.1	9.0	13.6	19.1	13.3	1.6	2.3	58.9	84.8	15.2
Gold	7.7	1.4	9.1	.7	16.7	67.1	2.2	.5	3.7	90.9	82.8	17.2
Iron and steel:												
Iron ore	16.7	11.4	28.1	14.8	26.3	7.1	5.0	8.6	10.1	71.9	65.1	34.9
Pig iron and ferroalloys	20.7	1.6	22.3	24.6	24.0	1.0	19.7	6.9	1.5	77.7	69.1	30.9
Crude steel	22.3	1.8	24.1	25.6	25.7	.8	18.7	4.0	1.1	75.9	70.3	29.7
Lead:												
Mine	32.1	8.0	40.1	12.6	19.8	6.1	4.4	5.5	11.5	59.9	74.7	25.3
Smelter	27.7	4.5	32.2	20.6	20.4	3.2	7.0	5.1	11.5	67.8	74.5	25.5
Magnesium, smelter	49.0	--	49.0	21.9	24.0	--	4.7	.4	--	51.0	75.6	24.4
Manganese ore, gross weight	1.6	10.0	11.6	.2	37.1	31.2	8.4	4.5	7.0	88.4	58.4	41.6
Mercury, mine output	15.4	1.5	16.9	42.0	21.3	5.1	5.3	9.4	([4])	83.1	69.3	30.7
Molybdenum, mine output	79.0	8.1	87.1	.2	10.5	--	.3	1.8	.1	12.9	87.7	12.3
Nickel, mine output	48.2	.5	48.7	2.9	20.2	4.6	3.1	NA	20.5	51.3	75.1	24.9
Platinum-group metals, mine output	7.2	.6	7.8	([4])	56.8	34.9	.5	NA	([4])	92.2	43.2	56.8
Selenium, smelter output [3]	53.3	.7	54.0	13.6	NA	NA	32.1	NA	.3	46.0	100.0	NA
Silver, mine output	41.7	18.1	59.8	6.8	16.5	4.2	4.2	.5	8.0	40.2	83.0	17.0
Tellurium, smelter output [3]	68.0	9.4	77.4	NA	NA	NA	22.6	NA	NA	22.6	100.0	NA
Tin:												
Mine [2]	[2] .2	14.5	14.7	2.1	13.0	7.2	49.9	8.6	4.5	85.3	78.4	21.6
Smelter	2.0	5.0	7.0	11.6	13.2	3.8	52.7	8.7	3.0	93.0	78.1	21.9
Titanium concentrate:												
Ilmenite [3]	44.4	.1	44.5	25.7	NA	--	9.3	NA	20.5	55.5	100.0	NA
Rutile [3]	--	([4])	([4])	--	NA	--	1.7	NA	98.3	100.0	100.0	NA

See footnotes at end of table.

Table 3.—Approximate percentage distribution of world mineral commodity production by major areas in 1973 [1]—Continued

Commodity	Western Hemisphere			Eastern Hemisphere							World	
				Europe			Near East and Asia					
	North and Central America	South America	Total	Non-Communist	Communist	Africa	Non-Communist	Communist	Oceania	Total	Non-Communist	Communist
METALS—Continued												
Tungsten, mine output	14.9	10.1	25.0	6.4	19.3	3.3	16.5	26.2	3.3	75.0	54.5	45.5
Uranium oxide (U_3O_8)	70.1	.2	70.3	9.5	NA	20.2	NA	NA	NA	29.7	100.0	NA
Vanadium	20.7	5.0	25.7	10.7	17.5	46.1	--	NA	--	74.3	82.5	17.5
Zinc:												
Mine	34.6	9.3	43.9	13.5	17.9	4.6	7.4	4.3	8.4	56.1	77.8	22.2
Smelter	20.9	2.4	23.3	26.7	20.0	3.4	16.5	4.4	5.7	76.7	75.6	24.4
NONMETALS												
Asbestos	46.2	1.0	47.2	4.1	30.8	10.6	1.5	5.0	.8	52.8	64.2	35.8
Barite	31.1	7.2	38.3	26.5	12.2	3.8	12.2	6.6	.4	61.7	81.2	18.8
Cement, hydraulic	14.8	4.4	19.2	29.8	23.2	3.0	20.7	3.1	1.0	80.8	73.5	26.5
Diamond:												
Gem	--	3.4	3.4	--	15.1	81.3	.2	NA	--	96.6	84.9	15.1
Industrial	--	2.3	2.3	--	24.4	73.3	(4)	NA	--	97.7	75.6	24.4
Diatomite	37.9	.9	38.8	35.6	24.6	.4	.2	NA	.4	61.2	75.4	24.6
Feldspar	31.4	3.8	35.2	45.9	11.6	1.6	5.6	NA	.1	64.8	88.4	11.6
Fluorspar	32.3	2.8	35.1	27.7	13.9	6.3	8.5	8.5	(4)	64.9	77.6	22.4
Graphite [2]	[2] 17.7	1.1	18.8	11.4	23.2	4.1	14.1	28.4	--	81.2	48.4	51.6
Gypsum	36.3	1.8	38.1	37.1	11.1	2.3	8.7	1.0	1.7	61.9	87.9	12.1
Magnesite [3]	[2] .3	3.3	3.6	34.4	23.3	2.2	6.0	30.3	.2	96.4	46.4	53.6
Mica [3]	72.7	1.8	74.5	5.1	NA	3.2	17.2	NA	--	25.5	100.0	NA
Nitrogen fertilizers, contained nitrogen	25.5	.9	26.4	23.8	27.8	1.4	14.1	6.0	.5	73.6	66.2	33.8
Phosphate rock	38.4	.3	38.7	.1	23.0	28.8	1.7	3.2	4.5	61.3	73.8	26.2
Potash, K_2O equivalent (marketable)	29.5	.1	29.6	26.0	39.3	1.2	2.5	1.4	--	70.4	59.3	40.7
Pumice [3]	27.3	1.2	28.5	71.0	NA	.1	--	NA	.4	71.5	100.0	NA
Pyrite	3.2	--	3.2	31.6	39.5	4.8	8.7	11.3	.9	96.8	49.2	50.8
Salt	33.8	3.3	37.1	23.9	14.1	1.4	8.3	12.4	2.8	62.9	73.5	26.5
Strontium minerals [3]	82.6	1.2	83.8	14.0	NA	1.9	.3	NA	--	16.2	100.0	NA
Sulfur:												
Native (including Frasch)	58.3	1.0	59.3	.5	36.8	--	2.6	.8	--	40.7	62.4	37.6
Byproduct, elemental	59.9	(4)	59.9	15.1	11.9	.3	10.1	.7	2.0	40.1	87.4	12.6
Talc	23.6	2.1	25.7	15.7	9.1	.3	42.6	5.5	1.1	74.3	85.4	14.6
Vermiculite [3]	66.3	1.7	68.0	--	NA	31.5	.5	NA	--	32.0	100.0	NA
MINERAL FUELS AND RELATED MATERIALS												
Coal:												
Anthracite and bituminous	23.6	.3	23.9	11.8	33.3	2.8	5.4	20.1	2.7	76.1	46.6	53.4
Lignite	2.0	--	2.0	21.3	72.4	--	1.0	.3	3.0	98.0	27.3	72.7

See footnotes at end of table.

Table 3.—Approximate percentage distribution of world mineral commodity production by major areas in 1973 [1]—Continued

MINERAL FUELS AND RELATED MATERIALS—Continued												
Coke:												
Metallurgical	18.4	.9	19.3	23.7	31.1	1.2	15.7	7.7	1.3	80.7	61.2	38.8
Other types	--	.3	.3	11.1	40.9	.8	46.4	--	.5	99.7	59.1	40.9
Fuel briquets	--	--	--	12.6	72.3	(4)	13.8	NA	1.3	100.0	27.7	72.3
Gas, natural, marketed	58.8	2.2	61.0	11.5	22.4	.8	3.8	.2	.3	39.0	77.4	22.6
Peat	1.0	(4)	1.0	7.7	91.2	--	.1	NA	--	99.0	8.8	91.2
Petroleum, crude	20.8	8.1	28.9	.6	15.9	10.8	41.3	1.8	.7	71.1	82.3	17.7

NA Production data not available and no basis available for reliable estimate of output level.
[1] Percentages in this table have been calculated from the most reliable data available through May 15, 1975. For details on countries included in the various continental groupings, see text.
[2] U.S. data withheld to avoid disclosing individual company confidential data and not included in total upon which percentages have been calculated.
[3] Percentages calculated from a total including no estimates for production by Communist countries (except Yugoslavia).
[4] Production negligible less than 0.05% of world output.

Table 4.—Value of world export trade in major mineral commodity group [1]

(Million U.S. dollars)

Commodity group [1]	1968	1969	1970	1971	1972 [p]
Metals:					
All ores, concentrates, scrap	5,590	6,340	8,010	[r] 7,200	7,670
Iron and steel	11,420	13,700	[r] 17,070	[r] 17,770	20,040
Nonferrous metals	9,440	10,870	[r] 12,210	[r] 10,350	11,550
Subtotal	26,450	30,910	[r] 37,290	[r] 35,320	39,260
Nonmetals (crude only)	2,170	2,260	2,390	[r] 2,570	2,920
Mineral fuels	23,020	24,860	[r] 28,670	[r] 35,490	41,220
Total	51,640	58,030	[r] 68,350	[r] 73,380	83,400
All commodities	[r] 238,220	[r] 272,000	[r] 317,070	[r] 347,290	412,360

[p] Preliminary. [r] Revised.

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

Table 5.—Distribution of total value of export trade in major mineral commodity group, by group [1]

(Percent)

Commodity group [1]	1968	1969	1970	1971	1972
Metals:					
All ores, concentrates, scrap	10.8	10.9	11.7	9.8	9.2
Iron and steel	22.1	23.6	25.0	24.2	24.0
Nonferrous metals	18.3	18.8	17.9	14.1	13.9
Total	51.2	53.3	54.6	48.1	47.1
Nonmetals (crude only)	4.2	3.9	3.5	3.5	3.5
Mineral fuels	44.6	42.8	41.9	48.4	49.4
Grand total	100.0	100.0	100.0	100.0	100.0

[1] For detailed definition of groups, see footnote 1, table 4.

Table 6.—Growth of value of export trade in major mineral commodity group, by group [1]

(Percent increase over previous year)

Commodity group [1]	1968	1969	1970	1971	1972
Metals:					
All ores, concentrates, scrap	11.1	13.4	26.3	–10.2	6.5
Iron and steel	10.4	20.0	24.6	4.1	12.8
Nonferrous metals	17.9	15.1	12.3	–15.2	11.6
All metals	13.1	16.9	20.6	–5.3	11.2
Nonmetals (crude only)	8.5	4.1	5.8	7.5	13.6
Mineral fuels	10.3	8.0	15.3	23.8	16.1
All major mineral commodity groups	11.7	12.4	17.8	7.4	13.7
All commodity groups	11.4	14.2	16.6	9.5	18.7

[1] For detailed definition of groups, see footnote 1, table 4.

Table 7.—Significance of trade in major mineral commodity group [1] to total trade of various world areas 1972

Area and country [2]	Value, million U.S. dollars				Major mineral share of total commodities (percent)	
	Major mineral commodity groups		All commodities			
	Exports from	Exports to	Exports from	Exports to	Exports from	Exports to
Northern North America:						
Canada	5,235	2,107	20,180	17,630	25.9	12.0
United States	3,895	11,615	48,980	54,340	8.0	21.4
Total	9,130	13,722	69,160	71,970	13.2	19.1
Latin America	[3] 7,155	4,265	19,760	23,010	[4] 36.2	18.5
Europe:						
Market economy countries:						
EEC	17,680	26,150	124,000	115,390	14.3	22.7
EFTA	6,095	11,730	55,540	61,440	11.0	19.1
Other	1,035	3,070	8,740	15,210	11.8	20.2
Subtotal	24,810	40,950	188,280	192,040	13.2	21.3
Centrally planned economy countries	8,915	7,055	39,240	37,990	22.7	18.6
Total	33,725	48,005	227,520	230,030	14.8	20.9
Africa:						
Republic of South Africa	[5] 240	285	2,600	3,440	[4] 9.2	8.3
Other	[6] 8,290	1,708	14,660	14,920	[4] 56.6	11.5
Total	8,530	1,993	17,260	18,360	49.4	10.9
Near East	[7] 14,550	1,611	16,980	10,600	[4] 85.7	15.2
Far East and South Asia:						
Market economy countries:						
Japan	[8] 3,949	7,440	28,590	19,560	[4] 13.8	38.0
Other	[3] 2,960	3,661	20,050	23,550	[4] 14.8	15.6
Subtotal	6,909	11,101	48,640	43,110	14.2	25.8
Centrally planned economy countries	298	756	3,150	3,450	9.5	21.9
Total	7,207	11,857	51,790	46,560	13.9	25.5
Australia and New Zealand [9]	1,801	584	8,102	5,500	22.2	10.6
Not reported	1,302	1,363	1,788	6,330	72.8	21.5
Grand total	83,400	83,400	412,360	412,360	20.2	20.2

[1] For detailed definition of groups, see footnote 1, table 4.

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

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

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

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

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

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

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

[9] Not reported in source. Derived from United Nations World Trade Annual, vs. I, II, and III, 1974.

Source: Unless otherwise specified, data from United Nations Monthly Bulletin of Statistics. V. XXVIII, Nos. 4 and 9, New York, 1974, pp. xxi-xxxii and pp. xxiii-xxxiii.

Table 8.—Export origins and destinations for major mineral commodity group [1] shipments, by value, in 1972

(Million U.S. dollars)

Area and country [2]	Exports from					Exports to				
	Metal ores, concentrates, scrap	Iron and steel	Non-ferrous metals	Non-metals	Mineral fuels	Metal ores, concentrates, scrap	Iron and steel	Non-ferrous metals	Non-metals	Mineral fuels
Northern North America:										
Canada	1,400	410	1,360	335	1,730	110	580	235	92	1,090
United States	510	830	660	345	1,550	1,090	2,940	1,930	285	5,370
Total [3]	1,910	1,240	2,020	680	3,280	1,200	3,520	2,165	377	6,460
Latin America	1,480	195	830	(4)	4,650	110	1,060	330	105	2,660
Europe:										
Market economy countries:										
EEC	690	8,780	2,500	550	5,160	2,120	5,860	4,100	930	13,140
EFTA	540	2,410	1,910	245	990	980	2,420	2,040	410	5,880
Other	110	330	340	75	180	310	780	320	120	1,540
Subtotal	1,340	11,520	4,750	870	6,330	3,410	9,060	6,460	1,460	20,560
Centrally planned economy countries	740	2,550	1,160	475	3,990	830	2,680	850	365	2,330
Total [3]	2,080	14,070	5,910	1,345	10,320	4,240	11,740	7,310	1,825	22,890
Africa:										
Republic of South Africa	(1)	(4)	(4)	140	100	4	63	20	8	190
Other	500	(4)	1,280	280	6,230	12	720	130	56	790
Total [3]	500	(1)	1,280	420	6,330	16	783	150	64	980
Near East	(1)	(4)	(4)	(1)	14,550	16	650	115	110	720
Far East and South Asia:										
Market economy countries:										
Japan	(1)	3,610	265	(1)	74	1,790	95	740	195	4,620
Other	560	330	480	(1)	1,590	130	1,370	405	96	1,660
Subtotal [3]	560	3,940	745	(1)	1,664	1,920	1,465	1,145	291	6,280
Centrally planned economy countries	50	99	77	55	17	20	485	120	16	115
Total [3]	610	4,039	822	55	1,681	1,940	1,950	1,265	307	6,395
Australia and New Zealand [5]	759	192	429	17	5	11	180	59	39	295
Not reported [5]	331	304	259	403	409	137	157	156	93	820
Grand total	7,670	20,040	11,550	2,920	41,225	7,670	20,040	11,550	2,920	41,220

[1] For detailed definitions of groups, see footnote 1, table 4.
[2] For detailed definitions of areas listed below, see footnote 2, table 7.
[3] Not reported in source but derived from data therein.
[4] Not reported separately for this area; presumably included under "Not reported."
[5] Not reported in source. Derived from United Nations World Trade Annual, v. II, and III, 1974.

Source: Unless otherwise specified, data from United Nations Monthly Bulletin of Statistics. V. XXVIII, Nos. 4 and 9, New York, 1974, pp. xxi-xxxii and pp. xxiii-xxxiii.

Table 9.—Direction of trade in major mineral commodities [1] in 1972
(Million U.S. dollars)

Source [2]	Destination [2]									
	Northern North America			Latin America	Market economy Europe				Centrally planned economy Europe	Near East
	United States	Canada	Total [3]		EEC	EFTA	Other [3]	Total		
Northern North America:										
Canada	3,380	XX	3,380	96	380	707	37	1,124	12	13
United States	XX	975	975	541	813	291	116	1,220	11	71
Total [3]	3,380	975	4,355	637	1,193	998	153	2,344	23	84
Latin America [4]	3,010	488	3,498	1,521	784	563	103	1,450	133	10
Europe:										
Market economy countries:										
EEC	1,306	106	1,412	297	9,725	3,075	670	13,470	750	256
EFTA	532	108	640	162	1,970	2,011	409	4,390	281	90
Other [3]	128	7	135	31	400	194	36	630	184	22
Subtotal	1,966	221	2,187	490	12,095	5,280	1,115	18,490	1,215	368
Centrally planned economy countries	89	14	103	205	1,241	1,043	396	2,680	5,025	117
Total [3]	2,055	235	2,290	695	13,336	6,323	1,511	21,170	6,240	485
Africa:										
Republic of South Africa [5]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Other	857	99	956	511	4,270	1,275	420	5,965	194	11
Total [3]	857	99	956	511	4,270	1,275	420	5,965	194	11
Near East [7]	425	155	580	435	5,560	2,010	710	8,280	72	630
Far East and South Asia:										
Market economy countries:										
Japan [8]	1,133	113	1,246	346	228	153	93	474	133	214
Other [4]	428	19	447	51	187	57	28	272	70	47
Subtotal [3]	1,561	132	1,693	397	415	210	121	746	203	261
Centrally planned economy countries	2	3	5	6	40	4	--	44	73	2
Total [3]	1,563	135	1,698	403	455	214	121	790	276	263
Australia and New Zealand [9]	87	5	92	7	189	172	15	376	2	15
Not reported [3]	238	15	253	56	363	175	37	575	115	113
Grand total [10]	11,615	2,107	13,722	4,265	26,150	11,730	3,070	40,950	7,055	1,611

See footnotes at end of table.

Table 9.—Direction of trade in major mineral commodities [1] in 1972—Continued

(Million U.S. dollars)

Source [2]	Destination [2]									
	Africa			Market economy Far East and South Asia			Centrally planned economy Far East and South Asia	Australia and New Zealand	Not reported [3]	Grand total [10]
	Republic of South Africa	Other	Total [3]	Japan	Other	Total [3]				
Northern North America:										
Canada	4	4	8	369	60	429	23	33	117	5,235
United States	16	46	62	742	224	966	--	38	11	3,895
Total [3]	20	50	70	1,111	284	1,395	23	71	128	9,130
Latin America [4]	--	30	30	387	15	402	5	3	103	7,155
Europe:										
Market economy countries:										
EEC	36	549	585	46	143	189	134	15	572	17,680
EFTA	30	110	140	72	155	227	68	53	44	6,095
Other [3]	2	35	37	6	4	10	5	--	(11)	1,035
Subtotal	68	694	762	124	302	426	207	68	597	24,810
Centrally planned economy countries	--	177	177	175	97	272	173	1	162	8,915
Total [3]	68	871	939	299	399	698	380	69	759	33,725
Africa:										
Republic of South Africa [5]	NA	NA	NA	NA	NA	NA	NA	NA	240	240
Other [6]	5	175	180	343	49	392	31	2	48	8,290
Total [3]	5	175	180	343	49	392	31	2	288	8,530
Near East [7]	160	330	490	2,830	1,010	3,840	22	180	21	14,550
Far East and South Asia:										
Market economy countries:										
Japan [8]	23	126	149	XX	971	971	301	94	21	3,949
Other [4]	1	39	40	1,217	704	1,921	6	80	26	2,960
Subtotal [3]	24	165	189	1,217	1,675	2,892	307	174	47	6,909
Centrally planned economy countries	--	13	13	52	36	88	NA	--	67	298
Total [3]	24	178	202	1,269	1,711	2,980	307	174	114	7,207
Australia and New Zealand [9]	7	8	15	845	130	975	19	71	229	1,801
Not reported [3]	1	66	67	356	63	419	(12)	14	(13)	1,302
Grand total [10]	285	1,708	1,993	7,440	3,661	11,101	756	584	1,363	83,400

NA Not available. XX Not applicable.

[1] For detailed listing of commodities included, see footnote 1, table 4. It should be noted that certain commodities excluded for specific areas as indicated by footnotes are presumably included in grand totals.

[2] For detailed definitions of areas listed, see footnote 2, table 7.

[3] Not reported in source. Data represent difference between reported total and reported detail. In selected cases, reported detail exceeds the reported total by the amount indicated in the referenced footnote.

[4] Excludes crude nonmetals.

[5] Includes crude nonmetals and mineral fuels only.

[6] Excludes iron and steel.

[7] Includes mineral fuels only.

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

[9] Not reported in source. Derived from United Nations World Trade Annual, vs. I, II, and III, 1974.

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

[11] Summation of detail exceeds reported total by 19 million. Reason for discrepancy is unaccounted for.

[12] Summation of detail exceeds reported total by 31 million. Reason for discrepancy is unaccounted for.

[13] Summation of detail exceeds total by 279 million. Reason for discrepancy is unaccounted for.

Source: Unless otherwise specified, data from United Nations Monthly Bulletin of Statistics. V. XXVIII, Nos. 4 and 9, New York, 1974, pp. xxi-xxxii and pp. xxiii-xxxiii.

Table 10.—Iron ore consumption,[1] by selected major country
(Million metric tons)

Country	1971	1972	1973 p
European Economic Community:			
Belgium	r 17.1	20.2	20.2
France [2]	42.4	44.9	46.4
Germany, West	42.3	44.1	51.0
Italy	10.2	r 11.7	11.5
Luxembourg	14.2	14.4	14.7
Netherlands	5.6	6.3	6.8
United Kingdom [3]	27.5	e 26.1	28.5
Total	r 159.3	r 167.7	179.1
European Free Trade Association:			
Austria	5.5	5.6	6.1
Norway	1.1	1.1	NA
Portugal	e.4	e.5	NA
Sweden	r 9.8	r 9.9	e 4.6
Total	r 16.8	r 17.1	10.7
Other European market economies:			
Finland	1.4	1.6	NA
Spain	e 3.2	r 9.9	NA
Total	4.6	r 11.5	NA
Centrally planned economy countries of Europe:			
Czechoslavakia e	3.4	r 14.4	13.9
Hungary	3.5	3.6	3.9
Poland [4]	e 11.5	r 11.4	10.5
Romania e	8.5	1.4	9.5
U.S.S.R.e	159.6	r 164.5	171.0
Yugoslavia	r 3.1	r 4.1	e 3.5
Total	r 189.6	r 199.4	212.3
Other:			
Canada e	12.1	[5] 13.1	[5] 15.1
Japan	96.4	98.6	120.3
Turkey	2.0	2.2	NA
United States [6]	110.7	r 121.8	[7] e 142.8
Total	221.2	r 235.7	278.2
Grand total	r 591.5	r 631.4	680.3

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

[1] Yearly data based on a total of three categories: Iron ore for steelworks, for production of agglomerates, and iron ore and concentrate for blast furnaces. An estimated figure is based on a partial total of these three categories and is not a projected consumption level based on other information.

[2] Includes sinter produced at mines.

[3] Includes calcined ores.

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

[5] Source: Department of Energy, Mines and Resources, Ottawa, Canada, Iron and Steel (Preprint to Canadian Mineral Yearbook, 1974), November 1974.

[6] Excludes consumption of agglomerating plants located at mine sites.

[7] U.S. Bureau of Mines estimate.

Source: Unless otherwise specified, United Nations Economic Commission for Europe. Annual Bulletin of Steel Statistics for Europe, 1973. V. I, No. 1, New York, 1974.

Table 11.—Iron and steel scrap consumption, by selected major country
(Thousand metric tons)

Country	1971	1972	1973 p
European Economic Community:			
Beligium [1 2]	3,467	4,360	4,514
France [2 3]	8,107	8,525	8,960
Germany, West [3]	21,176	22,713	29,984
Italy [2]	11,174	12,378	13,238
Luxembourg	1,545	1,634	1,773
Netherlands	2,227	2,242	2,040
United Kingdom [1 3]	17,879	18,691	[2] 14,484
Total	r 65,575	r 70,543	74,993
European Free Trade Association:			
Austria [2 3]	1,578	1,575	1,585
Denmark [2 4]	520	506	420

See footnotes at end of table.

Table 11.—Iron and steel scrap consumption, by selected major country—Continued

(Thousand metric tons)

Country	1971	1972	1973 p
European Free Trade Association—Continued			
Norway [1 2 3]	484	490	NA
Portugal [1 2 3]	167	e 132	NA
Sweden [1 2]	r 3,164	r 3,285	[3 5] 3,568
Total	r 5,913	r 5,988	5,573
Other market economies:			
Finland	586	717	NA
Spain [3 6]	e 5,116	5,848	NA
Total	5,702	r 6,565	NA
Centrally planned economy countries of Europe:			
Czechoslavakia [1 2 3]	4,534	5,981	4,944
Hungary [1 3]	1,937	2,052	2,077
Poland [6]	e [2] 6,618	r 7,318	7,863
Romania [1 3 5]	2,995	2,830	2,704
U.S.S.R. [1 2 3 e]	43,850	44,947	46,257
Yugloslavia [1 3]	r 1,616	1,535	1,729
Total	r 61,550	r 64,663	65,574
Other:			
Canada [1 2 3]	5,240	5,487	6,923
Japan [3]	33,406	39,668	48,672
Turkey [1 3]	[2] 311	[5] 440	NA
United States [1]	74,904	83,418	[7] 93,974
Total	r 113,861	r 129,013	149,569
Grand total	r 252,601	r 276,772	295,709

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

[1] Excludes scrap consumption by rerollers.

[2] Excludes scrap consumption by iron foundries.

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

[4] Production of pig iron, which consumed 225,000 metric tons of scrap in 1971 and 37,300 metric tons in 1972, was discontinued at the close of 1972.

[5] Excludes scrap consumption in blast furnaces.

[6] Excludes scrap consumption in steelworks.

[7] Source: U.S. Bureau of Mines, 1974.

Source: United Nations Economic Commission for Europe. Annual Bulletin of Steel Statistics for Europe, 1973. V. I, No. 1, New York, 1974.

Table 12.—Estimated world [1] consumption of major nonferrous metals

Commodity		1971 r	1972 r	1973 p
Aluminum [2]	thousand metric tons	10,944	11,999	12,803
Copper [3]	do	7,309	7,888	8,530
Lead [4]	do	3,588	3,726	4,109
Zinc [5]	do	4,704	5,166	5,536
Tin [6]	thousand long tons	186	189	205

p Preliminary. r Revised.

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

[2] Apparently includes secondary metal.

[3] Primary and secondary refined metal.

[4] Chiefly primary, but including some secondary.

[5] Primary and secondary slab.

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

Source: Yearbook of the American Bureau of Metal Statistics. Fifty-third Annual Issue for the Year 1973. New York, 1974, 152 pp.

Table 13.—World energy consumption,[1] by energy source

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

Area [2] and year	Solid fuels	Liquid fuels	Natural and imported gas	Hydro, nuclear, imported electricity	Total energy	
					Aggregate [1]	Per capita (kilograms)
Market economy:						
North America:						
1968	481	928	790	47	2,247	10,141
1969	490	978	853	52	2,373	10,598
1970	496	1,024	897	54	2,471	10,914
1971	476	1,064	928	59	2,527	11,047
1972	501	1,151	945	65	2,662	11,531
Other America:						
1968	7	74	12	5	98	656
1969	8	82	13	6	107	701
1970	8	84	14	7	112	714
1971	8	91	16	7	122	756
1972	8	95	16	8	126	759
Caribbean America:						
1968	5	80	34	3	123	1,067
1969	6	82	36	3	127	1,073
1970	5	94	40	4	142	1,167
1971	5	99	41	4	149	1,188
1972	6	106	42	4	158	1,227
Western Europe:						
1968	456	601	58	46	1,161	3,317
1969	457	662	80	46	1,244	3,530
1970	441	753	108	48	1,350	3,814
1971	411	787	140	49	1,386	3,890
1972	376	831	177	53	1,436	4,000
Africa:						
1968	57	38	2	2	99	298
1969	57	40	2	3	102	298
1970	59	45	2	3	109	310
1971	63	53	2	3	122	338
1972	64	56	10	4	134	363
Near East:						
1968	6	40	13	1	59	599
1969	7	44	16	1	68	661
1970	7	50	27	1	85	809
1971	7	54	27	1	88	817
1972	7	59	28	1	95	857
Far East:						
1968	169	238	13	13	433	403
1969	180	276	13	15	483	439
1970	180	322	16	16	534	474
1971	172	348	17	17	554	483
1972	169	357	20	18	565	482
Oceana:						
1968	34	33	(3)	2	70	3,777
1969	35	35	(3)	3	73	3,889
1970	35	38	2	3	78	4,050
1971	36	38	3	3	80	4,094
1972	37	41	5	3	85	4,275
Total market economy:						
1968	1,216	2,032	921	119	4,289	20,258
1969	1,239	2,198	1,013	128	4,577	21,189
1970	1,231	2,409	1,107	134	4,882	22,252
1971	1,178	2,534	1,174	144	5,029	22,613
1972	1,167	2,696	1,243	155	5,261	23,494
Centrally planned economy:						
Europe: [4]						
1968	742	351	264	15	1,372	4,006
1969	762	380	285	16	1,444	4,179
1970	769	416	313	18	1,515	4,354
1971	785	446	341	18	1,591	4,532
1972	808	482	360	18	1,668	4,710
Asia: [5]						
1968	326	23	NA	5	354	460
1969	351	22	NA	5	378	484
1970	388	30	NA	5	424	532
1971	421	37	NA	6	464	573
1972	432	43	NA	6	481	584
Total centrally planned economy:						
1968	1,068	374	264	19	1,725	4,466
1969	1,114	402	285	21	1,822	4,668

See footnotes at end of table.

Table 13.—World energy consumption,[1] by energy source—Continued

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

Area [2] and year	Solid fuels	Liquid fuels	Natural and imported gas	Hydro, nuclear, imported electricity	Total energy	
					Aggregate [1]	Per capita (kilograms)
Centrally planned economy—Continued						
Total centrally planned economy—Continued						
1970	1,157	446	313	23	1,939	4,886
1971	1,206	483	341	24	2,055	5,105
1972	1,240	524	360	25	2,149	5,294
World total:						
1968	2,284	2,407	1,185	138	6,015	24,724
1969	2,352	2,601	1,298	148	6,399	25,852
1970	2,388	2,854	1,421	157	6,820	27,138
1971	2,384	3,017	1,515	167	7,084	27,718
1972	2,407	3,220	1,603	180	7,410	28,788

NA Not available.

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

[2] Areas listed are those appearing in source and have not been conformed in scope to standard terms used elsewhere in the Minerals Yearbook, except that the source term "Mid East" has been converted to "Near East."

[3] Nil or less than ½ unit.

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

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

Source: United Nations. World Energy Supplies 1968–71 and 1969–72. Statistical Papers, Series J, Nos. 15 and 16, New York, 1973 and 1974, pp. 3, 5.

Table 14.—Annual investment expenditure in the steel industry for selected countries

(Million dollars)

Country or country group	1971	1972 [p]
European Economic Community (EEC)	[r] 2,266	2,628
European Free Trade Association (EFTA) [1]	[r] 749	955
Other countries:		
Australia	104	216
Canada	[r] 399	402
Finland	[r] 59	29
Ireland	[r] 3	5
Japan [2]	[r] 2,430	2,310
Spain	[r] 211	229
Turkey	75	59
United States	[r] 1,425	1,164

[p] Preliminary. [r] Revised.

[1] Totals given exclude expenditures in Switzerland and any non-British Steel Corp. investment in the United Kingdom.

[2] Japanese fiscal years.

Source: Organization for Economic Cooperation and Development. The Iron and Steel Industry in 1972 and Trends in 1973, p. 80.

Table 15.—Market economy country petroleum capital expenditures and exploration expenses, by geographic area

(Million dollars)

	1971	1972	1973
United States:			
Capital expenditures	7,250	9,050	10,640
Exploration expenses	715	740	850
Total	7,965	9,790	11,490
Other Western Hemisphere:			
Capital expenditures	3,350	3,120	3,305
Exploration expenses	255	250	275
Total	3,605	3,370	3,580
Western Europe:			
Capital expenditures	4,150	4,450	4,825
Exploration expenses	75	125	175
Total	4,225	4,575	5,000
Africa:			
Capital expenditures	975	1,005	975
Exploration expenses	150	175	125
Total	1,125	1,180	1,100
Near East:			
Capital expenditures	825	975	1,390
Exploration expenses	50	50	50
Total	875	1,025	1,440
Far East:			
Capital expenditures	2,500	2,700	2,410
Exploration expenses	150	200	225
Total	2,650	2,900	2,635
Unspecified: Capital expenditures (no exploration expenses)	2,750	3,650	6,450
Total:			
Capital expenditures	21,800	24,950	29,995
Exploration expenses	1,395	1,540	1,700
Grand total	23,195	26,490	31,695

Source: Energy Division, Chase National Bank, N.A. Capital Investments of the World Petroleum Industry, 1973, pp. 8–9.

Table 16.—Market economy country petroleum industry capital expenditures, by industry sector and exploration expenses

(Million dollars)

	1971	1972	1973
Capital expenditures:			
Production:			
Crude oil and natural gas	6,520	9,590	12,415
Natural gasoline plants	695	515	510
Pipelines	1,200	1,230	1,230
Marine	2,875	3,775	6,550
Refineries	4,755	4,955	4,865
Marketing	3,380	2,825	2,480
Chemical plants	1,535	1,350	1,175
Other	840	710	770
Total	21,800	24,950	29,995
Exploration expenses	1,395	1,540	1,700
Grand total	23,195	26,490	31,695

Source: Energy Division, Chase Manhattan Bank, N.A. Capital Investments of the World Petroleum Industry, 1973, pp. 10–11.

Table 17.—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 3]	Income [2 3]
1970	6,168	675	553	21,714	2,935	2,608
1971	6,685	499	482	24,152	3,856	3,442
1972 [r]						
Canada	3,455	133	130	5,301	451	161
Latin American and other Western Hemisphere:						
Latin American Republics:						
Chile	359	NA	NA	NA	NA	NA
Venezuela	NA	NA	NA	1,548	254	246
Other	958	81	74	1,698	20	−23
Subtotal [4]	1,317	81	74	3,246	274	223
Other Western Hemisphere	782	94	98	1,046	29	21
Total	2,099	175	172	4,292	303	244
Europe:						
European Economic Community [5]	9	NA	NA	3,363	−96	−17
United Kingdom	5	NA	NA	2,312	110	62
Other Western Europe	60	NA	NA	1,177	−44	−17
Total	74	NA	NA	6,852	−30	28
Africa:						
South Africa, Republic of	137	26	18	215	NA	NA
Other	432	26	9	2,254	454	381
Total	569	52	27	2,469	454	381
Near East	5	NA	NA	1,767	1,358	1,402
Far East and Pacific:						
Japan	--	--	--	901	51	9
Australia	703	63	61	NA	NA	NA
New Zealand	8	(6)	--	NA	NA	NA
Other	197	−2	1	1,461	294	239
Total	908	61	62	2,362	345	248
International shipping	--	--	--	2,336	343	306
Grand total [7]	7,110	419	395	26,263	3,311	2,826
1973: [p]						
Canada	3,735	230	149	5,864	670	219
Latin American and other Western Hemisphere:						
Latin American Republics:						
Chile	359	NA	NA	NA	NA	NA
Venezuela	NA	NA	NA	1,341	487	488
Other	983	156	146	1,726	148	48
Subtotal [4]	1,342	156	146	3,067	635	536
Other Western Hemisphere	765	95	98	1,326	223	107
Total	2,107	251	244	4,393	858	643
Europe:						
European Economic Community:						
Denmark and Ireland	1	--	--	340	6	−21
United Kingdom	6	NA	NA	2,631	122	76
Other [5]	11	NA	NA	4,394	416	153
Subtotal	18	NA	NA	7,365	544	208
Other Western Europe	69	NA	NA	1,022	48	(6)
Total	87	NA	NA	8,387	592	208
Africa:						
South Africa, Republic of	158	36	26	274	NA	NA
Other	397	33	19	2,002	548	406
Total	555	69	45	2,276	548	406
Near East	5	NA	NA	2,377	2,242	2,146

See footnotes at end of table.

Table 17.—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 3]	Income [2 3]
1973: [p]—Continued						
Far East and Pacific:						
Japan	--	--	--	922	100	13
Australia	785	100	88	NA	NA	NA
New Zealand	8	NA	--	NA	NA	NA
Other	199	21	24	1,659	599	470
Total	992	121	107	2,581	699	483
International shipping	--	--	--	2,740	394	122
Grand total [7]	7,483	675	548	29,567	6,183	4,325

[p] Preliminary. [r] Revised. NA Not available.
[1] Sum of U.S. share in net earnings of subsidiary and branch profits.
[2] Sum of interest, dividends, and branch earnings.
[3] Data for petroleum earnings for the years listed have been revised downward due to overstatement of income that was originally computed on the basis of "posted" prices by source publication.
[4] Partial figure; excludes quantity for detail indicated as not available.
[5] Includes Belgium, France, Germany, Italy, Luxembourg, and the Netherlands.
[6] Less than ½ unit.
[7] 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. 54, No. 8, part II, August 1974, pp. 10–24.

Table 18.—World merchant fleet distribution, by type [1]

	1969	1970	1971	1972	1973
Number of vessels:					
Tankers	4,071	4,232	4,431	4,581	4,813
Bulk carriers	2,748	2,954	3,218	3,539	3,800
Freighters	10,980	10,998	11,095	11,087	11,170
Other	1,771	1,796	1,800	1,802	1,817
Total	19,570	19,980	20,544	21,009	21,600
Gross tonnage:					
Tankers ——thousand tons	79,457	88,896	99,105	108,558	122,370
Bulk carriers ——do	41,746	47,199	55,009	64,822	74,660
Freighters ——do	62,960	63,159	64,038	65,179	66,790
Other ——do	12,084	12,147	12,150	11,984	11,907
Total ——do	196,247	211,401	230,302	250,543	275,727
Deadweight tonnage:					
Tankers ——do	133,421	153,075	173,196	192,894	220,481
Bulk carriers ——do	67,638	77,173	90,962	108,512	126,140
Freighters ——do	87,250	87,428	88,305	88,970	90,511
Other ——do	9,214	9,323	9,276	9,176	9,238
Total ——do	297,523	326,999	361,739	399,552	446,370

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

Table 19.—World shipping (tanker and dry cargo) loadings and unloadings

(Million metric tons)

	1969	1970	1971	1972	1973
Loaded:					
Tanker cargo	1,276	1,440	1,526	1,645	1,841
Dry cargo	1,036	1,165	1,173	1,221	1,349
Total	2,312	2,605	2,699	2,866	3,190
Unloaded:					
Tanker cargo	1,243	1,403	1,505	1,633	1,833
Dry cargo	1,024	1,127	1,144	1,219	1,349
Total	2,267	2,530	2,649	2,852	3,182

Source: United Nations. Monthly Bulletin of Statistics. V. XXIX, No. 1, January 1975, p. xxiii.

Table 20.—World shipping of tanker cargo, by region
(Million metric tons)

Region	Loadings					Unloadings				
	1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
Developed market economies:										
Australia, New Zealand	1	1	2	2	2	25	22	17	16	16
Canada	--	1	2	5	6	16	15	18	24	29
Japan	1	--	1	2	1	166	201	223	241	274
South Africa, Republic of	--	--	--	--	--	10	12	16	14	18
United States	4	5	4	3	3	156	162	174	206	280
Western Europe	79	100	98	110	124	620	705	737	781	847
Other	1	6	13	21	20	3	5	12	21	21
Total	86	113	120	143	156	996	1,122	1,197	1,303	1,485
Developing market economies:										
Caribbean	57	63	63	60	62	79	89	100	100	107
Far East	51	59	64	81	88	74	83	91	102	104
Near East	586	659	762	856	1,008	12	13	12	14	14
North Africa	210	226	183	170	171	17	18	17	17	11
Other Africa	35	63	84	101	109	14	14	15	16	16
Venezuela	178	181	169	152	155	--	--	--	--	--
Other Latin America	11	11	9	13	17	35	44	48	52	60
Other	--	--	1	1	1	3	1	2	2	4
Total	1,128	1,262	1,335	1,434	1,611	234	262	285	303	316
Centrally planned economies:										
U.S.S.R	58	61	68	65	70	1	3	5	8	13
Other	4	4	3	3	4	13	16	18	19	19
Total	62	65	71	68	74	14	19	23	27	32

Source: United Nations. Monthly Bulletin of Statistics. V. XXIX, No. 1, January 1975, pp. xxiii–xxvi.

Table 21.—World shipping of dry cargo, by region
(Million metric tons)

Region	Loadings					Unloadings				
	1969	1970	1971	1972	1973	1969	1970	1971	1972	1973
Developed market economies:										
Australia, New Zealand	72	93	115	121	140	16	15	16	16	19
Canada	70	95	94	94	107	36	38	37	38	38
Japan	40	42	51	51	55	204	235	238	276	314
South Africa, Republic of	12	15	15	18	18	4	6	7	7	8
United States	177	213	182	206	247	125	131	133	135	142
Western Europe	231	239	240	258	248	416	460	449	466	506
Other	3	2	4	2	2	5	6	5	4	6
Total	605	699	701	750	817	806	891	885	942	1,033
Developing market economies:										
Caribbean	27	32	29	27	29	11	13	13	13	13
Far East	85	94	98	102	119	68	69	80	81	96
Near East	8	9	9	11	10	19	19	24	25	30
North Africa	29	28	28	29	31	17	17	20	22	26
Other Africa	71	75	74	75	85	19	23	25	23	26
Venezuela	21	23	27	28	28	4	4	4	5	5
Other Latin America	93	105	109	101	128	31	32	32	34	43
Other	10	--	9	7	10	1	3	3	4	3
Total	344	366	383	380	440	170	180	201	207	242
Centrally planned economies:										
U.S.S.R	47	46	45	44	43	10	11	10	22	24
Other	40	44	44	47	49	37	45	48	48	51
Total	87	90	89	91	92	47	56	58	70	75

Source: United Nations. Monthly Bulletin of Statistics. V. XXIX, No. 1, January 1975, pp. xxiii–xxvi.

Table 22.—Distribution of world oil tanker tonnage, by size group [1]

Size group (deadweight tons)	1966		1973			
			In service		New building in progress or on order at yearend	
	Million deadweight tons	Percent of total	Million deadweight tons	Percent of total	Million deadweight tons [2]	Percent of total
Under 25,000	30.0	30.2	27.0	12.3	1.1	0.6
25,000–45,000	25.3	25.5	29.5	13.4	6.4	3.2
45,000–65,000	21.2	21.3	22.4	10.2	1.5	.8
65,000–125,000	21.8	21.9	41.6	18.9	22.8	11.5
125,000–205,000	1.1	1.1	14.8	6.7	22.3	11.3
205,000–285,000	--	--	78.2	35.5	80.4	40.7
285,000 and over	--	--	6.5	3.0	63.1	31.9
Total	99.4	100.0	[3] 220.0	100.0	197.6	100.0

[1] Includes vessels 2,000 deadweight tons and over.
[2] Excludes 11.0 million deadweight tons combined carriers.
[3] Data differ slightly from total given in table 18 because of difference in source.

Source: British Petroleum Co. Ltd. BP Statistical Review of the World Oil Industry. Bayard Press, London, 1966, p. 15; 1973, p. 14.

Table 23.—Commercial ocean traffic through the Panama Canal in terms of number of transits and total cargo moved, by type of vessel

	Ore ships	Tankers	Combination carriers	Container cargo ships	Dry bulk carriers	General cargo ships	Other	Total
1972								
Number of transits:								
In ballast:								
Atlantic to Pacific	1	53	9	1	350	260	592	1,266
Pacific to Atlantic	--	667	1	--	70	129	130	997
Total	1	720	10	1	420	389	722	2,263
Laden:								
Atlantic to Pacific	3	906	44	185	1,155	2,766	630	5,689
Pacific to Atlantic	3	256	9	170	1,304	2,892	1,180	5,814
Total	6	1,162	53	355	2,459	5,658	1,810	11,503
In ballast and laden:								
Atlantic to Pacific	4	959	53	186	1,505	3,026	1,222	6,955
Pacific to Atlantic	3	923	10	170	1,374	3,021	1,310	6,811
Grand total	7	1,882	63	356	2,879	6,047	2,532	13,766
Cargo moved (thousand metric tons):								
Atlantic to Pacific	115	15,096	2,030	1,180	28,605	15,487	1,126	63,639
Pacific to Atlantic	106	4,150	382	1,281	21,806	16,789	2,772	47,286
Total	221	19,246	2,412	2,461	50,411	32,276	3,898	110,925
1973								
Number of transits:								
In ballast:								
Atlantic to Pacific	--	130	6	1	150	136	758	1,181
Pacific to Atlantic	--	472	2	1	71	142	145	833
Total	--	602	8	2	221	278	903	2,014
La len:								
Atlantic to Pacific	--	785	54	331	1,471	2,640	620	5,901
Pacific to Atlantic	--	382	9	371	1,367	2,570	1,227	5,926
Total	--	1,167	63	702	2,838	5,210	1,847	11,827
In ballast and laden:								
Atlantic to Pacific	--	915	60	332	1,621	2,776	1,378	7,082
Pacific to Atlantic	--	854	11	372	1,438	2,712	1,372	6,759
Grand total	--	1,769	71	704	3,059	5,488	2,750	13,841

Table 23.—Commercial ocean traffic through the Panama Canal in terms of number of transit and total cargo moved, by type of vessel—Continued

	Ore ships	Tankers	Combination carriers	Container cargo ships	Dry bulk carriers	General cargo ships	Other	Total
1973—Continued								
Cargo moved (thousand metric tons):								
Atlantic to Pacific	--	14,499	2,690	2,649	37,095	16,349	1,270	74,552
Pacific to Atlantic	--	9,248	422	3,376	22,089	15,493	2,881	53,509
Total	--	23,747	3,112	6,025	59,184	31,842	4,151	128,061

Source: Panama Canal Co. Annual Reports for 1972 and 1973.

Table 24.—Movement of mineral commodities through the Panama Canal, by commodity type and direction of movement

(Thousand metric tons)

Commodity	Atlantic to Pacific			Pacific to Atlantic			Total		
	1971	1972	1973	1971	1972	1973	1971	1972	1973
METALS									
Aluminum:									
Bauxite and alumina	1,256	1,518	1,593	450	781	576	1,706	2,299	2,169
Metal, except scrap	76	76	59	89	67	93	165	143	152
Chromium, chromite	10	42	96	209	110	185	219	152	281
Copper:									
Ore and concentrate	46	28	46	249	252	557	295	280	603
Metal, except scrap	15	18	17	765	598	753	780	616	770
Iron and steel:									
Iron ore	575	478	212	3,557	1,830	2,134	4,132	2,308	2,346
Pig iron, steel ingots, other crude forms, except scrap	293	77	143	37	71	20	330	148	163
Semimanufactures (excluding tinplate)	1,890	1,499	1,796	6,494	7,793	7,993	8,384	9,292	9,789
Lead:									
Ore and concentrate	6	1	3	193	165	136	199	166	139
Metal, except scrap	6	9	6	253	209	202	259	218	208
Manganese ore and concentrate	208	184	203	122	142	116	330	326	319
Tin:									
Ore and concentrate	6	2	3	85	70	78	91	72	81
Metal (including tinplate)	129	110	122	103	109	134	232	219	256
Zinc:									
Ore and concentrate	165	168	255	349	347	530	514	515	785
Metal, except scrap	8	10	9	144	126	147	152	136	156
Other and unclassified:									
Ore and concentrate	129	122	118	789	621	765	918	743	883
Metal, except scrap	49	34	59	172	172	213	221	206	272
Metal scrap, all metals	2,689	1,415	3,286	18	57	17	2,707	1,472	3,303
NONMETALS									
Asbestos	262	183	123	55	49	54	317	232	177
Borax	10	12	4	398	392	457	408	404	461
Cement	170	152	120	15	15	42	185	167	162
Clays and clay products:									
Fire clay and kaolin	328	291	281	35	37	31	363	328	312
Brick and tile	79	75	64	131	176	149	210	251	213
Diatomaceous earth	4	14	9	52	30	48	56	44	57
Fertilizer materials:									
Nitrogenous:									
Ammonium compounds	350	400	368	26	13	28	376	413	396
Sodium nitrate	23	8	33	466	358	304	489	366	337
Phosphatic	4,544	4,276	4,655	2	2	3	4,546	4,278	4,658
Potassic	305	276	345	429	605	498	734	881	843
Unclassified	891	824	1,114	82	84	138	973	908	1,252
Sodium compounds:									
Salt	117	112	108	505	593	505	622	705	613
Other	517	680	568	29	42	17	546	722	585
Sulfur	172	101	352	428	687	755	600	788	1,107

Table 24.—Movement of mineral commodities through the Panama Canal, by commodity type and direction of movement—Continued

(Thousand metric tons)

Commodity	Atlantic to Pacific			Pacific to Atlantic			Total		
	1971	1972	1973	1971	1972	1973	1971	1972	1973
MINERAL FUELS AND RELATED MATERIALS									
Coal and coke	22,181	14,341	13,864	382	509	361	22,563	14,850	14,225
Petrochemicals	324	369	435	294	383	259	618	752	694
Petroleum:									
Crude	4,712	5,172	4,622	1,330	1,821	7,159	6,042	6,993	11,781
Refinery products	9,421	8,636	8,406	1,858	1,959	3,087	11,279	10,595	11,493
Total	51,966	41,713	43,497	20,595	21,275	28,544	72,561	62,988	72,041

Source: Panama Canal Co. Annual Report, 1973, pp. 48–51.

Table 25.—Indexes of ocean freight rates

(1963=100, unless otherwise specified)

Year and quarter	London tanker brokers panel	Trip charter					Time charter				
		West Germany		Italy (general)	Norway		United Kingdom [1]				Norway (dry cargo)
		Dry cargo	Tankers		Dry cargo	Tankers	General	9,000–16,000 deadweight tons	20,000–40,000 deadweight tons	Over 40,000 deadweight tons	
1970	119	146	250	142	122	243	181	134	168	181	166
1971	118	99	144	87	90	133	93	92	93	94	132
1972: [2]											
First quarter	105	83	69	66	73	71	79	81	79	78	112
Second quarter	98	86	108	66	76	95	82	90	75	83	110
Third quarter	NA	102	117	85	85	120	95	87	93	101	119
Fourth quarter	111	132	151	113	103	164	134	115	134	141	152
Annual average	104	98	103	NA	82	104	98	93	95	101	119
1973: [2]											
First quarter	112	--	190	NA	134	188	175	138	178	186	201
Second quarter	122	--	347	NA	164	333	212	178	218	216	239
Third quarter	165	--	461	NA	202	429	267	199	261	292	305
Fourth quarter	171	--	288	NA	266	268	358	252	350	398	346
Annual average	140	--	290	NA	178	290	253	192	252	273	261

NA Not available.

[1] The United Kingdom figures are shown with original base 1968=100. Table is further subdivided into vessel tonnage classes of deadweight tons, rather than commodity classes.

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

Source: United Nations. Monthly Bulletin of Statistics. September 1973, p. xviii; June 1974, p. xxii.

Table 26.—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]
1971	29.000	51.433	[7] 13.815	16.128	167.348	154.564
1972	26.409	50.617	15.029	17,752	176.875	168.380
1973:						
January	25.000	51.763	14.818	18.662	179.045	201.659
February	25.000	53.946	15.388	19.276	192.014	223.621
March	25.000	59.181	16.000	19.853	205.102	230.918
April	25.000	59.458	16.016	20.317	202.400	220.720
May	25.000	59.458	16.480	20.392	209.114	240.118
June	25.000	59.458	16.500	20.308	212.274	262.090
July	25.000	59.458	16.500	20.342	237.548	270.560
August	25.000	59.458	16.500	20.340	243.565	263.647
September	25.000	59.458	16.500	20.314	240.303	267.511
October	25.000	59.458	16.500	20.369	245.909	283.562
November	25.000	59.538	16.500	20.353	262.440	285.995
December	25.000	65.742	17.715	27.365	300.987	313.667
Annual average	25.000	58.865	16.285	20.658	227.558	255.339

[1] Unalloyed ingot, 99.5%, delivered United States.
[2] Electrolytic copper, domestic refineries, on Atlantic seaboard.
[3] Refined lead, nationwide, except as noted.
[4] Prime Western slab, f.o.b., East St. Louis.
[5] Straits tin, New York.
[6] Cents per troy ounce, 999 fine, New York.
[7] Separate St. Louis and New York prices discontinued December 13, 1971. Effective December 13, 1971, one delivered price nationwide replaced delivered New York basis quotations. Figure given here is nationwide monthly average for December 1971 only.

Source: Yearbook of the American Bureau of Metal Statistics. Fifty-third Annual Issue for the Year 1973. New York, 1974, 152 pp.

Table 27.—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]
1971	28.515	49.273	11.507	14.076	159.438	154.195
1972	26.603	48.545	13.678	17.117	170.899	168.569
1973:						
January	24.581	50.756	14.416	17.527	172.298	200.10
February	25.325	56.379	15.402	19.110	182.650	221.18
March	25.794	68.468	16.872	21.502	194.788	227.81
April	25.912	72.001	17.539	23.253	194.099	218.02
May	26.400	70.402	17.963	24.879	197.304	234.37
June	26.877	79.322	19.273	29.711	206.271	258.45
July	26.472	91.611	21.262	38.062	224.626	280.73
August	25.828	93.794	19.840	41.424	227.660	267.30
September	25.229	94.794	20.129	44.174	227.041	263.29
October	25.343	93.681	21.360	52.655	246.255	284.90
November	29.504	103.006	22.111	73.246	254.657	282.81
December	28.644	101.039	26.834	73.269	293.974	308.81
Annual average	26.326	80.805	19.382	38.314	218.148	254.37

[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: Yearbook of the American Bureau of Metal Statistics. Fifty-third Annual Issue for the Year 1973. New York, 1974, 152 pp.

Table 28.—Nonferrous metal prices in Canada

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

Year and month	Aluminum [1]	Copper [2]	Lead [3]	Zinc [3]	Silver [4]
1971	29.21	52.202	13.368	15.962	154.573
1972	(5)	51.292	15.572	18.666	168.401
1973:					
January	(5)	52.254	15.001	19.514	201.625
February	(5)	54.740	15.920	19.586	223.394
March	(5)	60.017	16.053	20.933	230.889
April	(5)	59.957	15.988	20.985	220.686
May	(5)	59.950	15.987	20.982	239.676
June	(5)	60.096	16.026	22.465	262.057
July	(5)	61.620	16.008	23.001	(6)
August	(5)	66.735	15.937	24.901	(6)
September	(5)	66.451	15.869	25.578	267.470
October	(5)	73.919	16.868	27.969	288.771
November	(5)	74.068	17.516	28.026	285.913
December	(5)	74.043	17.516	28.806	313.861
Annual average	(5)	63.662	16.224	23.568	(6)

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

Source: Yearbook of the American Bureau of Metal Statistics. Fifty-third Annual Issue for the Year 1973. New York, 1974, 152 pp.

Table 29.—Mineral commodity export price indexes

(1963=100)

Year and quarter	Metal ores	Fuels	All crude minerals
1971	126	127	127
1972	134	143	141
1973:			
First quarter	139	153	150
Second quarter	154	163	160
Third quarter	166	179	175
Fourth quarter	184	258	241
Annual average	161	188	181

Source: United Nations. Monthly Bulletin of Statistics. New York, September 1974, p. xv.

Table 30.—Analysis of export price indexes

(1963=100)

Year and quarter	Developed areas		Developing areas	
	Total minerals	Nonferrous base metals	Total minerals	Nonferrous base metals
1971	145	151	119	161
1972	154	150	135	161
1973:				
First quarter	170	167	142	189
Second quarter	180	193	152	231
Third quarter	197	223	166	281
Fourth quarter	216	245	250	309
Annual average	191	207	178	252

Source: United Nations. Monthly Bulletin of Statistics. New York, September 1974, p. xv.

Table 31.—Leading world producers of bauxite
(Gross weight, thousand metric tons)

Country	1971	1972	1973 p
Australia	r 12,733	14,437	17,816
Jamaica	r 12,440	12,543	13,600
Surinam	6,718	7,777	8,100
U.S.S.R.e 1	r 4,100	r 4,200	4,300
Guyana	r 3,920	3,344	3,201
France	3,184	3,254	3,133
Guinea	r 1,997	2,050	3,050
Greece	2,861	2,436	2,600
Hungary	2,090	2,358	2,600
Yugoslavia	1,959	2,197	2,167
United States	2,020	1,841	1,909
Total	r 54,022	56,437	62,476
All others	8,140	8,677	8,218
Grand total	r 62,162	65,114	70,694

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

Table 32.—Leading world producers of aluminum
(Thousand metric tons)

Country	1971	1972	1973 p
United States	3,561	3,740	4,109
U.S.S.R.e	1,180	1,250	1,360
Japan	893	1,015	1,103
Canada	1,017	925	934
Norway	530	548	620
Germany, West	428	445	533
France	384	394	360
United Kingdom	119	171	252
Australia	r 224	206	e 207
Netherlands	116	166	190
Italy	120	122	184
Spain	r 126	140	168
India	r 176	179	e 154
Ghana	111	144	152
Total	r 8,985	9,445	10,326
All others	r 1,339	1,559	1,791
Grand total	r 10,324	11,004	12,117

e Estimate. p Preliminary. r Revised.

Table 33.—Leading world producers of mine copper
(Copper content of ore, thousand metric tons)

Country	1971	1972	1973 p
United States 1	1,381	1,510	1,558
Canada 1	654	720	816
Chile	708	717	735
Zambia	r 651	718	707
U.S.S.R.e 1 2	620	665	700
Zaire	407	437	488
Philippines	198	214	221
Peru	r 207	219	219
Australia	r 177	187	213
Papua New Guinea	--	124	183
South Africa, Republic of	157	162	176
Poland	r 122	135	155
Yugoslavia	94	103	148
Total	r 5,376	5,911	6,319
All others	r 696	740	817
Grand total	r 6,072	6,651	7,136

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

Table 34.—Leading world producers of iron ore, iron ore concentrates, and iron ore agglomerates

(Thousand metric tons)

Country	1971	1972	1973 p
U.S.S.R	203,008	208,127	216,000
United States	82,058	76,645	89,076
Australia	62,100	63,820	84,705
China, People's Republic of e	r 55,000	r 60,000	66,000
Brazil e	42,700	42,100	58,000
France	55,862	54,253	54,228
Canada	r 42,957	38,735	49,992
India	34,261	35,500	35,400
Sweden	34,367	33,124	34,811
Liberia	r 23,398	22,509	23,542
Venezuela	r 20,200	18,465	22,030
South Africa, Republic of	r10,496	11,223	10,955
Mauritania	8,457	9,400	10,480
Chile	11,225	8,640	9,402
Peru	r 8,831	9,414	8,964
Total	r 694,920	691,955	773,585
All others	r 91,671	86,634	90,878
Grand total	r 786,591	778,489	864,463

e Estimate. p Preliminary. r Revised.

Table 35.—Leading world producers of crude steel [1]

(Thousand metric tons)

Country	1971	1972	1973 p
United States	109,264	120,874	136,803
U.S.S.R	120,637	125,589	131,000
Japan	88,557	96,900	119,327
Germany, West	r 40,313	43,705	49,521
United Kingdom	r 24,174	25,321	26,676
France	22,859	24,054	25,264
China, People's Republic of e	21,000	23,000	25,000
Italy	17,452	19,815	20,995
Belgium	12,444	14,532	15,525
Poland	12,738	13,476	14,058
Canada	11,040	11,860	13,386
Czechoslovakia	12,069	12,727	13,200
Spain	r 7,794	9,554	10,740
Romania	6,803	7,401	8,161
Australia	6,736	6,744	7,682
Total	r 513,880	555,552	617,338
All others	r 67,317	73,008	76,980
Grand total	r 581,197	628,560	694,318

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

Table 36.—Leading world producers of mine lead

(Lead content of ore, thousand metric tons)

Country	1971	1972	1973 p
United States [1]	525	561	547
U.S.S.R. e	450	460	470
Australia	r 404	396	406
Canada	393	376	386
Peru [1]	r 166	184	199
Mexico [1]	157	161	179
Yugoslavia	124	120	e 124
Morocco	78	87	108
Bulgaria	102	102	102
China, People's Republic of e	r 100	r 100	100
Total	r 2,499	2,547	2,621
All others	r 918	919	911
Grand total	r 3,417	3,466	3,532

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

Table 37.—Leading world producers of manganese ore
(Gross weight, thousand metric tons)

Country	1971	1972	1973 p
U.S.S.R	7,318	7,819	8,000
South Africa, Republic of	3,237	3,271	4,176
Brazil	2,602	2,058	e 2,157
Gabon	1,903	1,937	1,919
India	1,842	1,642	1,535
Australia	1,050	1,168	1,522
China, People's Republic of e	1,000	1,000	1,000
Mexico	267	296	364
Zaire	r 329	369	334
Ghana	599	498	318
Japan	285	261	189
Total	r 20,432	20,319	21,514
All others	r 657	588	639
Grand total	r 21,089	20,907	22,153

e Estimate. p Preliminary. r Revised.

Table 38.—Leading world producers of mine tin
(Tin content of ore, long tons)

Country	1971	1972	1973 p
Malaysia	74,253	75,617	71,119
Bolivia	29,533	30,986	29,827
U.S.S.R. e	28,000	r 28,500	29,000
Indonesia	19,411	20,992	22,135
Thailand	21,346	22,072	20,591
China, People's Republic of e	20,000	20,000	20,000
Australia	r 9,876	11,808	10,369
Nigeria	7,210	6,844	5,744
Total	r 209,629	216,819	208,785
All others	r 21,763	23,337	24,063
Grand total	r 231,392	240,156	232,848

e Estimate. p Preliminary. r Revised.

Table 39.—Leading world producers of mine zinc
(Zinc content of ore, thousand metric tons)

Country	1971	1972	1973 p
Canada	r 1,134	1,129	1,236
U.S.S.R. e	650	650	670
Australia	r 453	507	478
United States	456	434	434
Peru	r 318	376	412
Mexico	265	272	271
Japan	294	281	264
Poland	194	195	e 210
Korea, North e	135	140	145
Germany, West	132	122	123
Sweden	99	114	119
China, People's Republic of e	100	100	100
Yugoslavia	99	97	e 100
Spain	88	89	94
Zaire	r 109	100	88
Total	r 4,526	4,606	4,744
All others	r 843	889	959
Grand total	r 5,369	5,495	5,703

e Estimate. p Preliminary. r Revised.

Table 40.—Leading world producers of hydraulic cement
(Thousand metric tons)

Country	1971	1972	1973 p
U.S.S.R	r 100,331	104,299	109,500
United States (including Puerto Rico)	r 72,861	76,708	79,377
Japan	r 59,434	66,333	78,024
Germany, West	41,013	43,145	40,860
Italy	r 35,052	36,882	39,961
France	r 28,848	30,245	30,720
China, People's Republic of e	r 11,500	14,000	15,000
Spain (including the Canary Islands)	r 17,161	19,500	22,236
United Kingdom	r 17,697	18,048	19,986
Poland	13,082	13,986	15,548
India	14,894	15,700	15,000
Brazil	9,803	11,381	13,398
Germany, East	8,473	8,857	9,548
Canada	8,225	9,050	9,874
Romania	8,523	9,212	9,848
Mexico	r 7,360	8,602	9,787
Turkey	r 7,553	8,424	8,952
Czechoslovakia	7,956	8,045	8,381
Total	r 469,766	502,417	536,000
All others	r 139,014	147,044	158,396
Grand total	r 608,780	649,461	694,396

e Estimate. p Preliminary. r Revised.

Table 41.—Leading world producers of nitrogen fertilizer compounds
(Thousand metric tons of contained nitrogen)

Country	1971	1972	1973 p
United States (including Puerto Rico)	8,161	8,091	8,472
U.S.S.R	5,423	6,055	e 6,800
Japan	2,105	2,125	2,454
China, People's Republic of e	1,230	r 1,663	2,055
France	1,351	1,417	1,472
Germany, West	1,505	1,321	1,471
Netherlands	r 957	1,038	1,205
Poland	1,030	1,081	1,147
India	838	946	1,051
Italy	956	1,034	1,046
Romania	647	827	874
Total	r 24,203	25,598	28,047
All others	r 8,716	9,455	10,765
Grand total	r 32,919	35,053	38,812

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

Table 42.—Leading world producers of phosphate rock 1
(Thousand metric tons)

Country	1971	1972	1973 p
United States	35,277	37,042	38,226
U.S.S.R. 2	20,246	20,982	23,000
Morocco	12,008	14,971	17,077
Tunisia	3,162	3,387	3,473
China, People's Republic of e	1,700	2,000	2,300
Nauru 3	1,867	1,340	2,323
Total	r 74,260	79,722	86,399
All others	11,196	11,667	13,596
Grand total	r 85,456	91,389	99,995

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.
3 Exports.

Table 43.—Leading world producers of marketable potash
(Thousand metric tons K_2O equivalent)

Country	1971	1972	1973 p
U.S.S.R	4,807	5,433	5,900
Canada	r 3,628	3,495	4,021
Germany, West	r 2,815	2,845	2,548
Germany, East	2,426	2,458	2,556
United States	r 2,348	2,412	2,361
France	2,000	1,760	2,263
Total	r 18,024	18,403	19,649
All others	r 1,944	2,005	1,915
Grand total	r19,968	20,408	21,564

p Preliminary. r Revised.

Table 44.—Leading world producers of pyrite
(Gross weight, thousand metric tons)

Country	1971	1972	1973 p
U.S.S.R. e	r 7,000	r 7,200	7,300
Spain	r 2,440	2,140	2,188
China, People's Republic of e	2,000	2,000	2,000
Japan	2,343	1,579	1,275
Italy	r 1,504	1,382	1,169
Romania e	840	840	870
Norway	r 778	795	792
Finland	866	857	777
Sweden	r 592	486	450
United States	821	753	568
South Africa, Republic of	750	439	551
Germany, West	r 495	422	446
Portugal	559	553	532
Korea, North e	500	500	500
Total	r 21,488	19,946	19,418
All others	r 3,760	3,272	2,692
Grand total	r 25,248	23,218	22,110

e Estimate. p Preliminary. r Revised.

Table 45.—Leading world producers of salt
(Thousand metric tons)

Country	1971	1972	1973 p
United States (including Puerto Rico)	40,012	40,869	39,862
China, People's Republic of e	16,500	18,000	18,000
U.S.S.R	12,000	12,200	12,200
Germany, West	8,921	8,464	e 9,450
United Kingdom e	r 9,207	8,778	8,518
India	5,430	6,520	7,004
France	r 5,635	5,404	e 6,304
Canada	5,028	4,914	4,833
Mexico	4,360	4,558	e 4,600
Italy	r 4,574	4,018	e 4,427
Australia	r 3,849	e 4,000	e 4,000
Romania	2,948	3,147	e 3,296
Poland	r 2,962	3,010	3,079
Netherlands	3,167	2,803	3,044
Germany, East	2,221	2,187	e 2,286
Brazil	1,477	2,168	1,855
Spain	r 1,979	1,865	2,022
Columbia	638	1,023	1,313
Bahamas	1,213	807	1,121
Japan	946	687	1,015
Argentina	824	1,005	e 1,005
Total	133,891	136,427	139,234
All others	r 10,518	10,909	11,515
Grand total	r 144,409	147,336	150,749

e Estimate. p Preliminary. r Revised.

Table 46.—Leading world producers of elemental sulfur
(Thousand metric tons)

Country	1971	1972	1973 p
United States	8,758	9,388	10,182
Canada	4,796	6,949	7,407
U.S.S.R. e	r 3,700	r 3,900	4,150
Poland e	2,727	2,941	3,562
France	r 1,801	1,730	1,810
Mexico	1,178	944	1,608
Iran	497	669	778
Japan	409	499	681
Iraq e	60	247	535
Germany, West	184	219	333
Total	r 24,110	27,486	31,046
All others	r 1,448	1,556	1,521
Grand total	r 25,558	29,042	32,567

e Estimate. p Preliminary. r Revised.

Table 47.—Leading world producers of coal (all grades)
(Million metric tons)

Country	1971			1972			1973 p		
	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total
U.S.S.R. [1]	153	r 563	r 716	156	575	731	e 158	e 586	744
United States	6	503	509	10	537	547	13	530	543
China, People's Republic of e	(2)	r 390	r 390	(2)	r 400	r 400	(2)	430	430
Germany, East	263	e 1	264	248	e 1	249	246	e 1	247
Germany, West	r 105	[3] 117	r 222	110	108	218	119	97	216
Poland	35	145	180	38	151	189	39	157	196
United Kingdom	--	147	147	--	120	120	--	130	130
Czechoslovakia	85	29	r 114	86	28	114	81	28	109
Australia	23	49	72	24	60	84	25	61	86
India	4	71	75	3	75	78	3	77	80
South Africa, Republic of	--	59	59	--	58	58	--	62	62
Korea, North e	(4)	30	r 30	(4)	34	34	(4)	37	37
Yugoslavia	30	1	31	30	1	31	32	1	33
France	3	33	36	3	30	33	3	26	29
Hungary	23	r 3	r 26	22	3	25	23	3	26
Bulgaria	27	(4)	27	26	(4)	26	26	(4)	26
Japan	(4)	r 34	34	(4)	29	29	(4)	23	23
Total	r 757	r 2,175	r 2,932	756	2,210	2,966	768	2,249	3,017
All others	r 43	94	137	48	90	138	51	91	142
Grand total	800	r 2,269	r 3,069	804	2,300	3,104	819	2,340	3,159

e Estimate. p Preliminary. r Revised.
[1] Excludes output from the U.S.S.R. controlled portion of Svalbard (Spitzbergen).
[2] Output small, included under anthracite and bituminous.
[3] Including pech coal.
[4] Less than ½ unit.

Table 48.—Leading world producers of marketed natural gas
(Billion cubic feet)

Country	1971	1972	1973 p
United States	22,493	22,532	22,648
U.S.S.R	7,501	7,818	8,334
Canada	2,499	2,914	3,119
Netherlands	1,536	2,052	2,495
Romania	r 892	926	976
United Kingdom	r 657	943	1,018
Iran	299	448	702
Germany, West	555	634	681
Italy	473	501	541
Mexico	479	496	542
Venezuela	368	388	460
France	252	260	266
Germany, East	101	184	e 245
Argentina	r 228	218	e 235
Poland	190	206	213
Total	r 38,523	40,520	42,475
All others	r 1,747	2,067	2,387
Grand total	r 40,270	42,587	44,862

e Estimate. p Preliminary. r Revised.

Table 49.—Leading world producers of crude oil
(Million 42-gallon barrels)

Country	1971	1972	1973 p
United States	3,454	3,455	3,361
U.S.S.R	2,772	2,943	3,094
Saudi Arabia	1,741	2,202	2,773
Iran	1,662	1,839	2,139
Venezuela	1,295	1,178	1,229
Kuwait	1,167	1,201	1,102
Libya	1,008	820	794
Nigeria	558	665	750
Iraq	624	539	741
Canada	492	561	654
United Arab Emirates [1]	387	440	559
Indonesia	326	395	489
Algeria	280	386	401
China, People's Republic of e	r 268	r 314	375
Qatar	157	177	208
Mexico	177	161	165
Argentina	155	158	154
Australia	113	120	142
Oman	107	103	107
Romania	103	105	106
Brunei	47	67	79
Total	r 16,893	17,829	19,422
All others	r 853	891	939
Grand total	17,746	18,720	20,361

e Estimate. p Preliminary. r Revised.
[1] Abu Dhabi and Dubai, formerly listed under Trucial States.

Table 50.—Major world trade in bauxite and alumina in 1972 [1]

(Thousand metric tons)

Source country	1972 production by source country [2]	1972 export by source country [2]	Recipient country [3]													
			Austria	Canada	France	West Germany	Italy	Japan	Netherlands	Norway	Spain	Sweden	United Kingdom	United States [4]	U.S.S.R.	Selected others [5]
Bauxite:																
Australia	14,437	[e] 8,300	--	--	303	1,405	177	3,009	--	--	--	8	9	505	--	147
Dominican Republic	1,035	1,311	--	--	--	--	--	--	--	--	--	--	--	1,040	--	--
France	3,254	86	--	--	XX	58	6	--	--	--	--	--	9	--	--	8
Ghana	362	316	--	99	--	--	--	--	--	--	19	--	220	--	--	--
Greece	2,436	1,011	--	--	110	88	--	7	141	--	42	24	60	3	441	13
Guinea	2,050	[e] 700	--	--	--	--	34	--	--	--	--	--	--	66	328	35
Guyana	3,344	2,326	2	1,597	57	63	38	17	4	--	28	11	3	719	--	51
Haiti	687	770	--	--	--	--	--	--	--	--	--	--	--	492	--	--
Hungary	2,358	662	--	--	--	59	--	--	--	--	--	--	--	--	--	--
India	1,684	16	--	--	--	--	13	3	--	--	--	--	8	--	--	--
Indonesia	1,277	[e] 1,250	--	135	--	--	17	1,074	--	--	--	--	--	8,357	--	52
Jamaica	12,543	7,162	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Malaysia	1,076	987	--	109	--	--	--	822	--	--	--	--	--	15	--	--
Sierra Leone	694	694	--	350	--	224	76	--	--	--	--	--	6	2,575	--	12
Surinam	7,777	[6] 3,746	22	307	29	27	7	6	--	--	--	--	--	XX	--	--
United States	1,841	30	--	26	--	2	10	56	--	--	1	3	--	--	794	--
Yugoslavia	2,197	1,813	6	--	--	356	267	--	--	--	3	--	--	--	--	--
Other and not specified	6,062	NA	(7)	--	19	49	33	3	1	--	8	(7)	4	1	152	18
Total	65,114	NA	30	2,623	518	2,331	678	4,997	146	--	101	46	319	13,773	1,715	336
Alumina:																
Australia	3,068	2,421	--	217	--	--	--	542	--	--	--	--	--	1,060	--	164
Canada	1,149	[8] 22	--	XX	2	--	1	--	--	--	(7)	--	1	174	--	--
France	1,112	384	(7)	(7)	XX	27	124	(7)	5	24	--	(7)	1	21	--	23
Germany, West	916	207	95	(7)	5	XX	8	(7)	116	2	--	28	5	1	--	25
Greece	476	237	--	--	--	--	9	--	37	--	--	--	--	97	--	--
Guinea	663	[e] 660	16	--	--	89	--	--	--	107	126	--	5	5	--	54
Guyana	238	261	--	1	--	--	21	--	--	16	--	--	--	52	--	--
Hungary	520	485	64	--	--	--	--	--	--	--	--	--	--	--	244	8
Jamaica	[9] 2,416	2,416	--	207	--	--	--	--	--	484	--	151	299	679	--	20
Japan	1,644	220	--	--	--	--	--	XX	--	--	--	--	--	125	--	20
Surinam	1,378	1,278	--	--	--	184	16	--	189	103	--	--	--	518	--	68
United States	6,328	797	(7)	248	1	12	3	1	(7)	225	(7)	21	2	XX	243	1
Yugoslavia	135	23	6	--	--	--	--	--	--	--	--	--	--	--	--	--
Other and not specified	3,573	NA	1	(7)	2	(7)	4	5	(7)	73	5	2	3	11	211	8
Total	23,616	NA	182	673	10	312	186	548	347	1,034	131	202	316	2,743	698	391

See footnotes at end of table.

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 is 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 were obtained from the Statistical Office of the United Nations and other sources. Data on alumina production are generally for output prior to calcination, while data on alumina exports, also from the Statistical Office of the United Nations and official country source data, include aluminum hydroxide and thus may not be exactly comparable.

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

4 Includes U.S. Virgin Islands.

5 Countries included are as follows: Bauxite—Belgium, Denmark, Finland, Iceland, Luxembourg, New Zealand, Switzerland, and Yugoslavia; alumina—Australia, Belgium, Denmark, Finland, Greece, Israel, Luxembourg, New Zealand, Portugal, Switzerland, and Yugoslavia.

6 Official export; differs from figure in country chapter of Minerals Yearbook, Volume III.

7 Less than ½ unit.

8 Excludes artificial corundum, which may account for the large difference in figures.

9 Figure reported by the Statistical Office of the United Nations as being based on Jamaican exports.

Table 51.—Major world trade in unrefined and unwrought copper in 1972 [1]

(Thousand metric tons)

Source country	Destination															
	Belgium-Luxembourg	Brazil	Czechoslovakia	France	Germany East	Germany West	Italy	Japan	Netherlands	Spain	Sweden	Switzerland	United Kingdom	United States	Other and unspecified	Total [2]
Belgium-Luxembourg	XX	--	--	117	--	68	29	--	1	1	(3)	--	12	--	(3)	229
Canada	9	1	--	11	--	31	5	1	1	1	5	2	135	136	8	346
Chile [4]	8	8	(3)	32	--	122	54	45	5	5	20	2	83	67	[5]104	556
Germany, West	28	4	1	23	--	XX	18	(3)	3	6	1	10	19	--	33	145
Peru [4]	14	--	--	--	--	16	--	8	--	--	--	--	2	92	[6]38	169
U.S.S.R	--	1	35	--	--	11	(3)	--	53	--	--	--	12	--	[7]46	158
United Kingdom	(3)	(3)	--	1	--	16	14	4	8	5	2	1	XX	4	6	60
United States	10	15	--	23	--	27	26	30	3	(3)	2	1	11	XX	26	174
Zaire [4]	257	--	--	33	--	12	45	10	7	--	--	--	5	--	[8]53	424
Zambia [4]	5	47	--	72	--	65	89	164	4	16	17	11	141	--	[9]78	710
Other and unspecified [10]	6	(3)	(3)	40	(3)	99	12	13	3	2	5	3	50	35	37	305
Total [2]	338	74	36	352	(3)	468	293	274	88	36	53	31	471	333	428	3,277

XX Not applicable.

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

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

[3] Less than ½ unit.

[4] Source: World Bureau of Metal Statistics, World Metal Statistics, V. 27, No. 12, 1974.

[5] Includes 45,000 tons to the People's Republic of China and 28,200 tons to Argentina.

[6] Includes 13,000 tons to the People's Republic of China.

[7] Includes 29,200 tons to Hungary.

[8] Includes 6,000 tons to India and 4,000 tons to Greece.

[9] Includes 30,000 tons to India and 16,000 tons to the People's Republic of China.

[10] Includes the following countries (total exports in thousand tons in parentheses following names): Australia (62); Austria (7); Denmark (8); Finland (7); France (11); Italy (54); Japan (26); the Netherlands (26); New Zealand (2); Norway (18); Spain (8); Switzerland (1); and Yugoslavia (90).

Table 52.—Major world trade in iron ores, concentrates, and agglomerates (excluding roasted pyrite) [1] in 1972

(Thousand metric tons)

Source country	Recorded total 1972 export of source country [3]	Recorded imports of principal recipient country [2]						
		Canada	United States	Belgium-Luxembourg	Czechoslovakia	France	Germany, West	Hungary
Algeria	[4] 2,300	--	--	478	--	15	--	--
Angola	5,125	--	--	51	--	853	917	--
Australia	54,080	--	698	855	--	700	1,662	--
Brazil	30,512	36	1,132	1,477	248	3,181	8,330	--
Canada	28,724	XX	18,460	53	--	15	2,197	--
Chile	7,027	--	313	--	--	--	--	--
France	19,072	--	--	14,438	--	XX	3,972	--
India	21,864	--	--	153	674	(5)	13	100
Liberia	22,978	162	2,805	1,104	--	1,613	6,758	--
Malaysia	366	--	--	--	--	--	--	--
Mauritania	[4] 8,618	--	40	1,211	--	2,364	725	--
Norway	2,919	--	(5)	[6] 9	--	1	[6] 2,755	--
Peru	[e] 9,000	--	1,340	1	--	396	61	--
Philippines	2,306	--	11	--	--	--	--	--
Sierra Leone	2,283	--	--	--	--	--	658	--
South Africa, Republic of	5,120	--	26	2	--	--	(5)	--
Spain	1,896	--	(5)	78	--	460	747	--
Sweden	28,069	57	277	[6] 7,691	368	1,373	[6] 8,696	--
U.S.S.R	38,400	--	--	--	[7] 11,396	(5)	349	[7] 3,492
United States	2,129	1,497	XX	--	--	(5)	5	--
Venezuela	[e] 18,000	--	11,101	428	--	158	2,605	--
Other countries and origin unreported [8]	2,144	1	132	49	--	430	220	--
Total	312,932	1,753	36,335	28,078	[9] 12,686	11,559	40,670	[9] 3,592

Source country	Recorded imports of principal recipient country [2]							
	Italy	Netherlands	Poland	Romania	United Kingdom	Other Europe [10]	Japan	Total of listed imports
Algeria	--	--	3	--	--	--	--	496
Angola	--	--	--	--	369	387	2,563	5,140
Australia	1,316	(5)	--	--	1,266	532	48,295	55,324
Brazil	2,077	1,064	230	--	1,958	2,445	9,335	31,513
Canada	951	454	--	--	3,762	782	2,075	28,749
Chile	--	--	--	--	--	--	6,684	6,997
France	15	(5)	--	--	--	--	--	18,425
India	1	--	429	[7] 1,317	--	263	17,901	20,851
Liberia	4,130	1,773	--	--	731	700	2,752	22,528
Malaysia	--	--	--	--	--	--	388	388
Mauritania	1,182	--	--	--	1,720	527	1,088	8,857
Norway	[6] 36	[6] 697	281	--	[6] 922	361	--	5,062
Peru	--	--	--	--	--	--	6,940	8,738
Philippines	--	--	--	--	--	--	2,455	2,466
Sierra Leone	--	663	--	--	--	--	1,246	2,567
South Africa, Republic of	23	--	--	--	87	29	4,579	4,746
Spain	172	131	--	--	195	--	--	1,783
Sweden	[6] 136	[6] 884	981	--	[6] 3,698	880	535	25,576
U.S.S.R	1,115	--	10,624	[7] 4,528	1,045	3,121	1,115	36,785
United States	45	--	--	--	--	144	624	2,315
Venezuela	1,493	--	--	--	1,555	--	--	17,340
Other countries and origin unreported [8]	616	--	--	[11] 1,770	43	93	[12] 2,926	6,280
Total	13,308	5,666	12,548	7,615	17,351	10,264	111,501	312,926

[e] Estimate. XX Not applicable.

[1] Disparities between recorded total exports of source countries and totals of recorded imports of recipient countries from each listed source country are generally due to (1) time lag between shipment and receipt, and (2) the fact that the latter totals are incomplete, representing only the imports of the nations listed in the column heads and in footnote 10.

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

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

[4] Source: Boudet, E. Panorama de l'Industrie Minière du Continent Africain en 1972. Annales des Mines, October 1973, pp. 88–122.

[5] Less than ½ unit.

[6] Figures adjusted from those reported in official import statistics of Belgium–Luxembourg, West Germany, Italy, the Netherlands, and the United Kingdom, to adjust for ores originating in Sweden and recorded as a part of the exports of that country in official Swedish export statistics, but

shipped through Narvik, Norway, and as a result credited in recipient country's import statistics as originating in Norway.

[7] Source: Official export statistics of listed source country.

[8] Summation of recorded exports for the following countries (exports of each in thousand tons follow the country name in parentheses): Austria (1); Belgium–Luxembourg (3); Bolivia (1); Czechoslovakia (54); Denmark (8); Finland (8); West Germany (5); Hong Kong (173); Korea, North (527—Japanese imports only); Korea, Republic of (475); Morocco (148—imports of West Germany, Italy, and Portugal); the Netherlands (77); Poland (1); Tunisia (664).

[9] No total officially reported; figure is a summation of reported exports of source countries to this recipient country.

[10] Includes the following countries with recorded total imports as indicated in parentheses in thousand tons: Austria (1,504); Finland (771); East Germany (2,733 from the U.S.S.R. only); Greece (427); Norway (13); Portugal (366); Spain (4,147); Switzerland (20); Yugoslavia (283).

[11] Derived; difference between reported total and sum of reported exports of source countries to this recipient country.

[12] Includes receipts from the following countries (quantities in thousand metric tons): New Zealand—1,080; North Korea—527; Republic of Korea—469; Mozambique—334 (reported, but probably originating in the Republic of South Africa or Swaziland); Indonesia—268; Hong Kong—172; and Panama—76.

Table 53.—Major world trade in steel ingots and semimanufactures in 1972, by area
(Thousand metric tons)

Exporting country and area	Destination [1]						
	North America			Europe			
	Canada	United States	Latin America [2]	European Economic Community	European Free Trade Association	Other market countries	Centrally planed economy countries [3]
North America:							
Canada [6]	XX	1,028.9	102.5	56.4	58.1	25.5	24.9
United States	650.8	XX	644.1	410.8	139.7	138.5	12.0
Total	650.8	1,028.9	746.6	467.2	197.8	164.0	36.9
Europe:							
Market economy countries:							
European Economic Community:							
Belgium-Luxembourg	113.0	1,439.0	155.0	9,993.0	1,205.0	322.0	386.0
France	128.0	1,258.0	267.0	3,574.0	1,189.0	395.0	268.0
Germany, West [7]	246.2	2,083.2	344.2	5,585.7	2,206.1	766.1	1,446.9
Italy	43.1	376.9	68.5	1,652.5	285.1	219.0	322.0
Netherlands [8]	--	593.0	107.0	1,844.0	781.0	247.0	84.0
Subtotal	530.3	5,750.1	941.7	22,649.2	5,666.2	1,949.1	2,506.9
European Free Trade Association:							
Austria	7.6	31.2	10.1	701.5	347.8	85.2	220.9
Denmark	--	.1	.7	81.7	163.7	6.6	.6
Norway	--	4.0	1.8	149.0	344.8	39.5	.2
Portugal	--	--	1.7	4.4	1.0	4.5	.1
Sweden	17.0	127.0	34.0	467.0	710.0	136.0	77.0
Switzerland [9]	1.6	8.6	.4	67.6	44.0	6.8	.4
United Kingdom	155.6	1,086.0	408.6	468.3	555.3	753.2	186.0
Subtotal	181.8	1,256.9	457.3	1,939.5	2,166.6	1,031.8	485.2
Other:							
Finland	--	17.9	--	154.1	299.9	7.3	71.8
Greece	--	59.1	--	21.3	.2	21.4	.1
Spain [9]	.1	87.9	255.8	593.6	128.7	11.0	247.8
Yugoslavia	--	5.0	--	53.0	35.0	1.0	251.0
Subtotal	.1	169.9	255.8	822.0	463.8	40.7	570.7
Centrally planned economy countries:							
Bulgaria	--	--	6.9	277.2	65.1	241.7	355.2
Czechoslovakia	101.8	26.5	2.2	713.2	379.6	309.5	990.1
Germany, East [10]	NA	.7	NA	76.6	27.2	47.1	NA
Hungary	--	--	12.3	226.1	146.6	225.2	241.1
Poland	21.7	127.1	132.6	105.3	156.7	171.5	630.0
Romania [11]	--	--	--	248.8	39.9	81.7	472.1
U.S.S.R	--	--	202.0	100.4	93.9	285.4	5,311.9
Subtotal	123.5	154.3	356.0	1,747.6	909.0	1,362.1	8,000.4
Total	835.7	7,331.2	2,010.8	27,158.3	9,205.6	4,383.7	11,563.2
Africa: South Africa, Republic of	8.0	53.1	9.1	77.6	89.7	13.7	--
South Asia and Far East:							
India	1.7	6.4	.8	.5	1.0	.2	87.4
Japan	698.0	5,658.0	2,007.0	1,116.0	777.0	657.0	665.0
Total	699.7	5,664.4	2,007.8	1,116.5	778.0	657.2	752.4
Oceania: Australia [12]	12.0	72.0	23.0	31.0	11.0	14.0	--
Grand total	2,206.2	14,149.6	4,797.3	28,850.6	10,282.1	5,232.6	12,352.5

See footnotes at end of table.

Table 53.—Major world trade in steel ingots and semimanufactures in 1972, by area—Continued

(Thousand metric tons)

Exporting country and area	Destination[1]							
			South Asia and Far East					
	Africa	Near East[4]	Japan	Other market economy countries	Centrally planned economy countries[5]	Oceania	Unallocated	Total
North America:								
Canada[6]	3.3	11.1	0.2	12.5	1.9	15.7	--	1,341.0
United States	62.8	167.0	13.3	335.3	33.7	23.2	--	2,631.2
Total	66.1	178.1	13.5	347.8	35.6	38.9	--	3,972.2
Europe:								
Market economy countries:								
European Economic Community:								
Belgium-Luxembourg	323.0	171.0	--	105.0	24.0	9.0	--	14,245.0
France	722.0	288.0	--	84.0	47.0	24.0	19.0	8,263.0
Germany, West[7]	286.2	318.3	.8	311.4	287.2	8.0	--	13,890.3
Italy	414.4	215.6	.4	29.1	134.6	1.4	14.8	3,777.4
Netherlands[8]	25.0	73.0	1.0	21.0	8.0	--	6.0	3,790.0
Subtotal	1,770.6	1,065.9	2.2	550.5	500.8	42.4	39 8	43,965.7
European Free Trade Association:								
Austria	13.7	41.7	.3	3.8	9.2	2.5	4.9	1,480.4
Denmark	.4	.1	--	.1	6.4	--	--	260.4
Norway	7.1	2.7	--	3.2	--	--	--	552.3
Portugal	19.7	--	--	3.1	--	--	.1	34.6
Sweden	8.0	5.0	2.0	15.0	39.0	4.0	8.0	1,649.0
Switzerland[9]	.5	.7	--	.2	--	--	3.3	134.1
United Kingdom	212.8	208.1	1.6	493.1	45.6	71.9	--	4,646.1
Subtotal	262.2	258.3	3.9	518.5	100.2	78.4	16.3	8,756.9
Other:								
Finland	--	9.1	--	--	5.1	--	.5	565.7
Greece	52.4	23.3	--	--	--	--	--	177.8
Spain[9]	83.9	54.8	--	1.7	--	--	8.2	1,473.5
Yugoslavia	--	6.0	2.0	12.0	--	--	--	365.0
Subtotal	136.3	93.2	2.0	13.7	5.1	--	8.7	2,582.0
Centrally planed economy countries:								
Bulgaria	11.4	128.8	8.0	8.6	2.1	--	--	1,105.0
Czechoslovakia	97.5	339.8	--	27.9	52.1	--	--	3,040.2
Germany, East[10]	NA	NA	NA	NA	NA	NA	1,182.4	1,334.0
Hungary	38.5	119.2	--	86.3	11.1	--	--	1,106.4
Poland	18.1	37.6	20.0	22.9	34.2	--	--	1,477.7
Romania[11]	6.7	12.2	--	--	61.3	--	274.3	1,197.0
U.S.S.R	295.6	366.5	--	115.2	115.1	--	508.6	7,394.6
Subtotal	467.8	1,004.1	28.0	260.9	275.9	--	1,965.3	16,654.9
Total	2,636.9	2,421.5	36.1	1,343.6	882.0	120.8	2,030.1	71,959.5
Africa: South Africa, Republic of	--	24.8	.1	2.6	--	1.8	238.9	519.4
South Asia and Far East:								
India	38.6	43.5	--	83.9	--	4.4	9.6	278.0
Japan	743.0	1,340.0	--	5,215.0	1,451.0	595.0	--	20,922.0
Subtotal	781.6	1,383.5	--	5,298.9	1,451.0	599.4	9.6	21,200.0
Oceania: Australia[12]	11.0	45.0	29.0	369.0	60.0	142.0	--	819.0
Grand total	3,495.6	4,052.9	78.7	7,361.9	2,428.6	902.9	2,278.6	98,470.1

NA Not available. XX Not applicable.

[1] Because some countries do not report destinations for a portion of exports (see unallocated col-

umn), 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, Iran, Iraq, Jordan, Kuwait, Lebanon, Muscat and Oman, Qatar, Saudi Arabia, People's Democratic Republic of Yemen, Syria, United Arab Emirates, Turkey, and Yemen Arab Republic.

[5] Consists of 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.

[6] Excludes heavy sections, light sections, and strip.

[7] Excludes exports to East Germany.

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

[9] Partial figure; derived from import data of partner countries. Source: Statistical Office of the United Nations. 1972 World Trade Annual. V. III, Walker and Co., New York, 1974, 570 pp.

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

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

[12] Year ended June 30, 1972.

Table 54.—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
1972									
United States	27.4	45.1	--	--	0.4	--	18.8	--	91.7
Western Europe:									
Belgium-Luxembourg [5]	26.2	15.5	10.4	--	10.7	--	--	18.2	81.0
France	7.1	4.1	43.6	--	46.7	--	7.7	2.7	111.9
Germany, West	17.7	28.1	57.8	--	6.8	0.3	3.3	--	114.0
United Kingdom	5.0	12.4	5.3	--	--	--	--	--	22.7
Total	56.0	60.1	117.1	--	64.2	.3	11.0	20.9	329.6
Japan	88.9	16.3	--	--	--	13.0	4.3	1.2	123.7
Grand total	172.3	121.5	117.1	--	64.6	13.3	34.1	22.1	545.0
1973									
United States	16.4	43.6	.1	--	--	13.0	19.7	--	92.8
Western Europe:									
Belgium-Luxembourg [6]	--	10.9	32.7	6.9	10.4	--	--	16.2	77.1
France [7]	13.4	5.4	32.8	--	25.8	--	--	--	77.4
Germany, West	18.0	6.1	56.2	--	10.6	.9	--	--	91.8
United Kingdom	--	10.8	--	--	.5	--	16.4	2.9	30.6
Total	31.4	33.2	121.7	6.9	47.3	.9	16.4	19.1	276.9
Japan	81.1	25.9	--	--	--	8.5	12.8	1.9	130.2
Grand total	128.9	102.7	121.8	6.9	47.3	22.4	48.9	21.0	499.9

[1] Imports by countries other than those listed as destinations are believed to be generally smaller than those for listed countries.

[2] Includes Mexico.

[3] Includes Yugoslavia.

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

[5] Gross weight of ore for January through October only.

[6] Gross weight of ore for January through September only.

[7] Metal content of ore for January through September only.

Source: Monthly Bulletin of the International Lead and Zinc Study Group. Lead and Zinc Statistics, v. 13, No. 4, April 1973, p. 24; v. 14, No. 4, April 1974, p. 24.

Table 55.—Major world trade in lead bullion and refined lead [1]

(Thousand metric tons)

Destination	Exporting region								
	North America	Latin America [2]	Western Europe [3]	Eastern Europe [4]	Africa	Asia	Oceania	Origin not reported by continent	Total [5]
1972									
United States	75.8	76.9	26.4	--	8.0	0.2	35.0	1.0	223.2
Western Europe:									
Belgium-Luxembourg [6]	.5	--	13.9	--	--	--	--	2.2	16.6
France	--	--	28.5	2.0	6.7	--	--	.9	38.1
Germany, West	4.9	2.1	73.8	.6	1.5	10.4	23.9	--	117.2
Italy [7]	--	23.7	39.5	.5	14.6	13.3	--	22.4	114.0
Netherlands	--	7.1	25.2	2.8	--	1.0	9.3	--	45.4
Switzerland	2.0	3.0	15.7	.3	--	--	.9	.5	22.4
United Kingdom	46.4	--	--	--	5.9	--	153.0	.4	205.7
Other [8]	.6	r 3.3	33.6	9.8	3.2	--	--	.2	50.7
Total	54.4	r 39.2	230.2	16.0	31.9	24.7	187.1	26.6	610.1
Japan	.3	1.9	--	--	.8	1.2	--	.2	4.4
Grand total	130.5	r 118.0	256.6	16.0	40.7	26.1	222.1	27.8	837.7
1973									
United States	56.2	57.3	1.6	--	5.1	--	41.3	.1	161.6
Western Europe:									
France	1.0	--	34.6	.2	1.0	.2	--	--	37.0
Germany, West	2.9	1.4	93.4	--	1.6	15.0	17.8	--	132.1
Netherlands	1.5	6.9	12.6	2.6	--	1.7	10.9	--	36.2
Switzerland	1.3	2.6	11.8	--	--	--	1.3	--	17.0
United Kingdom	45.3	--	--	--	9.1	--	156.9	2.5	213.8
Other [9]	.7	.5	15.2	.1	4.0	--	--	--	20.5
Total	52.7	11.4	167.6	2.9	15.7	16.9	186.9	2.5	456.6
Japan	30.6	7.2	.2	--	2.0	9.0	9.1	.3	58.4
Grand total	139.5	75.9	169.4	2.9	22.8	25.9	237.3	2.9	676.6

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 East European countries including trade between countries of this group apparently total 70,000 tons or more per year.

[2] Includes Mexico.

[3] Includes Yugoslavia.

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

[5] Reported totals.

[6] January through November.

[7] January through September.

[8] Includes Austria, Denmark, Finland, Norway, and Sweden.

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

Source: Monthly Bulletin of the International Lead and Zinc Study Group. Lead and Zinc Statistics, v. 13, No. 5, May 1973, pp. 24–25; v. 14, No. 5, May 1974, p. 24.

Table 56.—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
1972									
United States	123.0	92.2	6.4	--	4.3	--	5.3	--	231.2
Western Europe:									
Belgium-Luxembourg [5]	307.5	15.5	71.2	--	32.5	--	--	40.6	467.3
France	77.9	47.4	30.7	--	24.8	8.8	2.2	--	191.8
Germany, West	117.3	47.3	64.3	2.8	--	6.3	6.4	--	244.4
United Kingdom	8.2	6.1	15.3	--	--	--	21.3	8.4	59.3
Other [6]	31.7	13.8	89.4	--	--	1.2	28.1	--	164.2
Total	542.6	130.1	270.9	2.8	57.3	16.3	58.0	49.0	1,127.0
Japan	139.4	261.1	--	--	--	55.7	60.0	1.6	517.8
Grand total	805.0	483.4	277.3	2.8	61.6	72.0	123.3	50.6	1,876.0
1973									
United States	112.7	58.2	2.6	--	--	.5	6.6	--	180.6
Western Europe:									
Belgium-Luxembourg [7]	339.0	27.3	28.1	--	5.7	--	--	88.7	488.8
France [8]	42.0	37.2	42.7	--	19.8	7.5	3.0	--	152.2
Germany, West	148.2	47.8	92.6	2.7	5.6	2.0	4.8	--	303.7
United Kingdom	--	24.9	5.7	--	--	--	20.5	11.2	62.3
Other [6]	22.8	19.1	99.5	--	4.0	.4	27.1	--	172.9
Total	552.0	156.3	268.6	2.7	35.1	9.9	55.4	99.9	1,179.9
Japan	150.9	195.0	--	--	--	43.0	99.9	8.1	496.9
Grand total	815.6	409.5	271.2	2.7	35.1	53.4	161.9	108.0	1,857.4

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

Source: Monthly Bulletin of the International Lead and Zinc Study Group. Lead and Zinc Statistics, v. 13, No. 4, April 1973, p. 25; v. 14, No. 4, April 1974, p. 25.

Table 57.—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]
1972									
United States	246.0	35.4	97.7	8.8	21.2	27.3	35.9	1.7	474.1
Western Europe:									
Belgium-Luxembourg [5]	1.8	--	1.3	5.2	10.7	6.7	1.9	5.6	33.2
France	.8	--	22.7	9.1	1.0	16.7	--	.5	50.8
Germany, West	5.6	--	113.5	6.6	6.3	1.1	--	--	133.1
Italy [6]	3.1	--	18.1	2.5	6.6	--	1.0	--	33.7
Netherlands	--	--	10.4	3.2	2.0	3.0	--	.3	18.9
Sweden	1.0	--	32.9	4.9	--	--	--	--	38.8
Switzerland	--	--	26.9	1.4	1.8	2.7	--	--	32.8
United Kingdom	67.5	.6	67.1	25.7	10.6	.5	41.1	11.5	224.7
Other [7]	.2	--	14.4	3.5	1.6	--	--	--	19.7
Total	80.0	.6	307.3	62.1	40.6	30.7	44.0	17.9	585.7
Japan	--	.2	--	--	--	7.2	--	--	7.4
Grand total	326.0	36.2	405.0	70.9	61.8	65.2	79.9	19.6	1,067.2
1973									
United States	312.7	19.2	83.0	15.2	25.8	38.7	38.2	1.2	534.0
Western Europe:									
Denmark	.3	--	11.4	.1	.8	--	--	--	12.6
France	1.3	--	39.9	8.5	--	7.6	--	.8	58.1
Germany, West	2.1	--	97.6	4.4	1.2	1.2	.1	--	106.6
Netherlands	1.2	--	17.9	2.5	--	5.3	--	--	26.9
Sweden	.5	--	37.2	3.1	--	--	--	--	40.8
Switzerland	--	--	19.5	2.2	3.4	3.4	--	--	28.5
United Kingdom	59.8	.3	92.4	27.6	2.3	.9	34.7	1.7	219.7
Total	65.2	.3	315.9	48.4	7.7	18.4	34.8	2.5	493.2
Japan	4.6	.4	2.1	3.1	--	16.3	.5	--	27.0
Grand total	382.5	19.9	401.0	66.7	33.5	73.4	73.5	3.7	1,054.2

[1] Includes Mexico.
[2] Includes Yugoslavia.
[3] Includes Bulgaria, East Germany, Poland, and the U.S.S.R.
[4] Reported totals.
[5] January through November.
[6] January through September.
[7] Includes Austria, Denmark, and Finland.

Source: Monthly Bulletin of the International Lead and Zinc Study Group. Lead and Zince Statistics, v. 13, No. 5, May 1973, pp. 26–27, v. 14, No. 5, May 1974, p. 25.

Table 58.—World movement of solid fuels in 1971 and 1972 [1]

(Thousand metric tons, standard coal equivalent)

Source area	Destination										
	Market economy countries								Centrally planned economy countries [7]	Destination unspecified [8]	World [9]
	North America [2]	Caribbean America [3]	Other America [4]	Western Europe [5]	Africa	Near East	Far East	Oceania [6]			
1971											
Market economy countries:											
North America [2]	16,965	450	2,570	15,705	45	--	24,725	5	115	10	60,590
Western Europe [5]	150	25	65	31,620	r 335	--	45	--	660	40	32,950
Africa	15	--	--	925	905	--	220	15	--	430	2,505
Far East	--	r 105	20	--	--	--	740	--	--	5	875
Oceania [6]	--	5	45	3,165	--	--	16,670	345	30	5	20,275
Centrally planned economy countries [7]	--	125	145	25,950	660	--	4,870	--	40,020	120	71,890
Total [9]	17,130	r 710	2,845	77,365	r 1,945	--	47,270	365	40,825	610	189,085
1972											
Market economy countries:											
North America [2]	17,755	580	2,545	15,810	--	--	23,990	--	65	5	60,750
Western Europe [5]	145	50	145	29,940	245	--	10	--	855	60	31,490
Africa	10	--	--	795	660	--	110	--	--	300	1,880
Far East	--	145	145	--	--	--	495	10	--	5	800
Oceania [6]	--	40	35	3,160	--	--	20,285	115	--	5	23,640
Centrally planned economy countries [7]	--	105	225	27,210	690	--	4,065	--	40,230	350	72,880
Total [9]	17,910	920	3,095	76,915	1,595	--	48,955	125	41,150	725	191,440

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, Columbia, and Venezuela.

[4] All South America except Columbia 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 rounding.

Source: United Nations. World Energy Supplies 1969–72. Statistical Papers, Series J, No. 17, New York, 1974, pp. 41–47.

Table 59.—World movement of crude petroleum in 1971 and 1972 [1]

(Thousand metric tons)

Source area [2]	Destination										
	Market economy countries								Centrally planned economies Europe	Destination unspecified	World
	North America	Caribbean America	Other America	Western Europe	Africa	Near East	Far East	Oceania			
1971											
Market economy countries:											
North America	36,590	20	--	20	--	--	20	--	--	--	36,650
Carribean America	38,300	61,890	6,590	20,600	30	--	460	--	--	--	127,870
Other America	140	750	1,000	110	--	--	--	--	--	--	2,000
Western Europe	--	--	--	2,060	10	--	--	--	--	--	2,070
Africa	13,120	24,400	5,650	203,250	3,750	730	3,470	80	4,400	--	258,850
Near East	26,210	12,480	14,350	367,250	20,200	22,300	224,040	12,110	4,610	13,230	716,780
Far East	5,600	1,030	--	100	--	--	38,390	1,270	--	--	46,390
Oceania	400	--	--	70	--	--	230	--	--	--	700
Centrally planned economies Europe	--	4,760	--	26,950	2,270	--	1,500	--	38,950	730	75,160
Total	120,360	105,330	27,590	620,410	26,260	23,030	268,110	13,460	47,960	13,960	1,266,470
1972											
Market economy countries:											
North America	45,950	--	--	--	--	--	30	--	--	--	45,980
Caribbean America	34,570	59,830	4,880	17,080	--	--	440	--	--	--	116,800
Other America	1,080	3,050	1,870	90	--	--	50	--	--	--	6,140
Western Europe	60	--	--	4,960	20	--	30	--	--	--	5,070
Africa	30,240	22,030	4,300	188,770	2,880	580	5,240	--	5,740	--	259,780
Near East	33,620	23,730	21,810	420,580	21,100	22,920	246,520	12,550	11,220	--	814,050
Far East	8,170	2,860	--	1,080	--	--	41,690	710	--	--	54,510
Oceania	40	--	--	340	--	--	170	--	--	--	550
Centrally planned economies Europe	40	5,260	--	23,810	2,330	--	360	--	45,190	--	76,990
Total	153,770	116,760	32,860	656,710	26,330	23,500	294,530	13,260	62,150	--	1,379,870

[1] Data are based on general trade system.

[2] For details on countries included in each area, see footnotes to table 58.

Source: United Nations. World Energy Supplies 1969–72. Statistical Papers, Series J. No. 17, New York, 1974, pp. 58–67.

Table 60.—Refined petroleum fuel trade in 1971 and 1972, by Continental Area [1]

(Million metric tons)

Continental area [2]	Exports		Imports		Bunkers	
	1971	1972	1971	1972	1971	1972
Market economy countries:						
North America	8.01	9.08	116.10	128.10	17.12	16.48
Caribbean America	129.26	123.05	15.39	15.27	15.67	13.72
Other America	.70	1.36	4.27	3.03	1.76	1.70
Western Europe	97.19	105.56	122.63	129.36	48.41	51.76
Africa	4.84	5.76	13.32	12.44	8.09	7.75
Near East	56.91	54.30	3.31	3.17	24.89	23.97
Far East	24.52	29.73	48.45	44.74	27.57	29.77
Oceania	2.36	2.16	5.55	6.31	3.97	4.43
Centrally planned economy countries:						
Centrally planned Asia	NA	.21	1.29	1.42	NA	NA
Centrally planned Europe	37.70	40.23	6.63	6.31	NA	NA
Total [3]	361.49	371.44	336.93	350.15	147.52	149.63

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 from country to country in the method of reporting bunkering materials.

[2] Continental areas are the same as those used in table 58 except that Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Romania, and the U.S.S.R. are reported under the group term "Centrally planned Europe," while the People's Republic of China, North Korea, Mongolia, and North Vietnam are reported under the group term "Centrally planned Asia."

[3] Reported totals; may differ from sum of detail due to rounding.

Source: United Nations. World Energy Supplies 1969–72. Statistical Papers, Series J, No. 17, New York, 1974, pp. 77–88.

The Mineral Industry of Algeria

By John L. Albright [1]

Natural gas and petroleum activities were expanded during the year, as petroleum production and trade dominated Algeria's mineral industry. Mineral trade fell short of anticipated levels, but processing, production, and distribution facilities were enlarged, and important exploration and sales contracts were negotiated. Algeria completed the last year of the 1969–73 Economic Plan, and government planners prepared the 1974–77 4-year plan. Mineral industries will be expanded, and the country's supporting electrical distribution and transportation systems will be enlarged.

Highway, natural gas and petroleum pipeline as well as railroad expansion plans were being developed, and Algerian engineers finalized expansions to be carried out at several maritime terminals. Cement and iron and steel producers supplied the basic materials for numerous construction projects that were underway in the country during the year, and these basic industries were being enlarged to meet growing demands. The state-owned Société Nationale pour la Recherche, la Production, le Transport, la Transformation, et la Commercialisation des Hydrocarbures (SONATRACH) obtained a 10-year, $250 million [2] loan from a consortium of major international banks to be used for developing the country's oil and gas industries, which was guaranteed by the Banque Algérienne de Développement. Additional loans totaling $300 million were secured in 1973 by Banque Algérienne de Développement and Banque Extérieure d'Algérie for developing the construction, electricity, and petroleum industries. Six United States banks agreed to lend the funds to the state-controlled Algerian banks for a period of 10 years.[3]

Oil receipts accounted for $0.9 billion, or nearly 40% of Algeria's 1973 General Budget income, and the Government anticipated them to rise to $1.4 billion in 1974. Algeria was one of North Africa's major crude oil and natural gas producers and exporters, and the country held important reserves. Crude oil reserves were four times as large as those in the Arab Republic of Egypt, Morocco, and Tunisia combined, and Algeria's natural gas reserves were the largest in Africa and fourth in the world after the U.S.S.R., the United States, and Iran.

PRODUCTION

Production of most metals declined during 1973, but increases were recorded in crude oil and refined petroleum products output as well as natural gas. Crude oil output averaged 1.097 million barrels per day, a 4.1% increase over the 1972 average rate of production. Algeria had planned to produce about 429 million barrels of crude oil during 1973, and some 536 million to 575 million barrels in 1980. However, because of delays in field development, reduced output from older fields, and a slower than anticipated discovery rate, Algeria lowered its projected 1974 and 1975 production rates to slightly above 1 million barrels per day, and in September notified buyers that it would cut its 1974 and 1975 supply commitments from 20% to 25%. Algeria's output of refined petroleum products increased in 1973, as the Arzew petroleum refinery came onstream. Natural gas production exceeded that of 1972, by

[1] Mineral specialist, Division of Fossil Fuels—Mineral Supply.

[2] Where necessary, values have been converted from Algerian dinars (DA) to U.S. dollars at the rate of DA4.55=US$1.00.

[3] Mineral specialist, Division of Fossil Fuels—1973, p. 12.

an estimated 2.9%, and the industry's condensate production at Hassi R'Mel reported a 44% increase from 1972. Production of liquefied natural gas (LNG) for export was hindered by technical difficulties encountered at the Skikda plant.

Table 1.—Algeria: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Antimony concentrate:			
Gross weight [e]	150	150	150
Metal content [e]	60	60	60
Copper concentrate:			
Gross weight	2,167	1,615	1,502
Metal content	514	373	[e] 350
Iron and steel:			
Iron ore, gross weight, thousand tons	3,147	3,669	3,135
Pig iron, do	333	398	359
Crude steel, do	[e] 40	65	[e] 65
Lead concentrate:			
Gross weight	7,216	7,470	6,150
Metal content	4,669	5,048	[e] 4,160
Mercury, 76-pound flasks	246	13,361	13,300
Silver, thousand troy ounces	[e] 200	[r e] 210	[e] 170
Zinc concentrate:			
Gross weight	30,097	28,291	25,478
Metal content	15,794	16,597	[e] 14,960
NONMETALS			
Barite:			
Crude	46,000	60,352	70,756
Powder	36,500	35,200	[e] 41,000
Cement, hydraulic, thousand tons	968	928	1,018
Clays:			
Bentonitic	9,516	19,910	[e] 20,000
Kaolin	1,841	4,279	[e] 4,500
Diatomite	4,428	4,564	[e] 4,600
Fertilizer materials:			
Phosphate rock, thousand tons	491	547	611
Ammonium nitrate, do	117	NA	NA
Gypsum [2], do	8	[e] 10	[e] 10
Lime, hydraulic [3], do	40	15	12
Pyrite:			
Gross weight	27,422	27,901	12,020
Sulfur content	12,614	12,800	5,529
Salt, thousand tons	116	108	130
Sand and gravel: [3]			
Sand, thousand cubic meters [4]	88	NA	NA
Gravel, do	55	NA	NA
Stone, crushed [3], do	1,301	NA	NA
Strontium mineral, celestite, gross weight	360	1,800	[e] 1,800
Sulfur, elemental [e]	20,000	20,000	20,000
MINERAL FUELS AND RELATED MATERIALS			
Coal, thousand tons	14	12	13
Gas, natural:			
Gross production [e], million cubic feet	260,000	350,000	360,000
Marketable (including liquefied), do	105,096	119,504	167,391
Natural gas liquids (condensate), thousand 42-gallon barrels	5,919	7,084	[e] 12,400
Petroleum:			
Crude, do	279,627	384,858	400,515
Refinery products:			
Gasoline, do	4,845	5,087	7,399
Jet fuel and kerosine, do	1,814	2,086	2,683
Distillate fuel oil, do	6,938	7,064	8,534
Residual fuel oil, do	3,963	3,916	12,503
Other, do	1,809	1,391	6,777
Refinery fuel and losses, do	[e] 968	1,794	1,293
Total, do	[e] 20,337	21,338	39,189

[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 of the order of 175,000 tons annually.

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

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

TRADE

Algeria signed commercial and tariff conventions with neighboring Morocco and Tunisia, but these agreements were not expected to affect appreciably mineral trade between the signers. Small amounts of various minerals were imported during 1973, and petroleum and natural gas accounted for the bulk of Algeria's mineral exports. In 1973, SONATRACH accounted for 96.8% of Algeria's crude oil exports; the other exporters were Compagnie Française des Pétroles (Algérie), Essence et Lubrifiant de France—Entreprise de Recherches et d'Activités Pétrolières (Elf-ERAP), and Getty Petroleum Co. SONATRACH's shipments fell 0.3% during 1973, but exports to the United States increased 45.5% and those to Italy exceeded 1972 shipments by 23%. More than one-third of Algeria's oil exports was shipped through Arzew, and the remainder from Bejaia, Skikda, and La Skhirra, Tunisia.

Petrolane Inc., a major U.S. distributor of liquefied petroleum gas (LPG), concluded a contract with SONATRACH in 1973 for purchasing at least 1,093 million barrels of LPG by 1983. Sun Oil Co. of the United States signed a letter of intent with SONATRACH for LPG shipments beginning in 1975. Petróleo Brasileiro S.A. (PETROBRÁS) will import 19.2 million barrels of Algerian crude oil in 1974, according to the terms of a 1973 contract. Tropical Gas Co., also of the United States, signed a contract with SONATRACH during 1973 for an undisclosed amount of butane and propane to be marketed in the Western Hemisphere.

Important negotiations were conducted during 1973 that will affect future exports of natural gas. Several large sales contracts were signed with U.S. and Western European businessmen, a commitment was made to construct a high-capacity international gasline from Algeria to Italy, the country's LNG tanker fleet was being formed, and liquefaction and tanker-loading facilities were being expanded. LNG exports for 1973 fell below the expected level, as equipment failures interrupted the LNG output at Skikda.

Table 2.—Algeria: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum metal, including alloys, all forms	r 494	138	France 128.
Copper:			
Ore and concentrate	3,432	1,100	All to Bulgaria.
Metal, including alloys, all forms	2,425	1,714	France 1,542.
Iron and steel:			
Ore and concentrate thousand tons	1,779	2,388	Romania 1,593; Czechoslovakia 526.
Roasted pyrite	11,500	--	
Metal:			
Pig iron, ferroalloys, similar materials	297,737	274,114	People's Republic of China 148,716; Arab Republic of Egypt 42,184; Italy 31,250.
Semimanufactures	125	734	France 608.
Lead:			
Ore and concentrate	7,421	5,658	Spain 2,617; Tunisia 2,000; West Germany 1,011.
Metal, including alloys:			
Scrap	644	--	
Semimanufactures	3	--	
Magnesium metal, all forms	--	11	All to Belgium-Luxembourg.
Nickel metal, including alloys and scrap	3	67	All to France.
Zinc:			
Ore and concentrate	25,070	28,052	Italy 12,965; Yugoslavia 6,150; Spain 4,150.
Ash and residue	2,100	--	
Metal, including alloys:			
Scrap	981	640	All to France.
Semimanufactures	67	12	Do.
Other ore and concentrate, n.e.s	1,580	820	All to Italy.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS			
Clays, crude, n.e.s.:			
Bentonite	1,760	3,912	Oman 3,000; Netherlands 500.
Kaolin	1,460	1,682	Cuba 722; People's Republic of China 526.
Other	4,000	6,500	Morocco 6,000; Nigeria 500.
Diatomite and other infusorial earth	2,719	3,431	France 1,161; Morocco 1,083; Italy 573.
Fertilizer materials:			
Crude, phosphatic	r 455,181	315,863	Poland 110,090; France 72,788; Czechoslovakia 50,815.
Manufactured, nitrogenous	8,180	--	
Ammonia	6,200	--	
Fluorspar	61,750	--	
Salt	38,000	32,150	France 20,000; Dahomey 7,350.
Stone, sand and gravel:			
Dimension stone, crude and partly worked	234	--	
Sand, excluding metal bearing	165	--	
MINERAL FUELS AND RELATED MATERIALS			
Gas, natural, liquefied million cubic feet	57,003	(1)	
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	r 248,905	363,133	France 85,298; West Germany 81,044; Spain 37,803; United States 36,312; Italy 31,676.
Refinery products:			
Gasoline ---do---	510	849	Netherlands 572; West Germany 158; Italy 118.
Jet fuel and kerosine ---do---	74	--	
Distillate fuel oil ---do---	896	1 2 306	NA.
Residual fuel oil ---do---	1,339	1 2 2,098	NA.
Lubricants ---do---	(3)	NA	
Other ---do---	--	1 2 425	NA.
Total ---do---	2,819	3,678	

r Revised. NA Not available.
1 Official data not available owing to printing error in official trade returns.
2 Data from U.S. Bureau of Mines, International Petroleum Annual, 1972.
3 Less than ½ unit.

Table 3.—Algeria: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Oxide and hydroxide	574	145	All from France.
Metal, including alloys, all forms	4,052	4,440	Norway 1,115; France 769; West Germany 673; Belgium-Luxembourg 628.
Antimony metal, including alloys, all forms 1	14	46	Belgium-Luxembourg 40.
Arsenic oxide and acid	40	30	France 30.
Cadmium metal, including alloys, all forms 1 kilograms	104	--	
Chromium:			
Oxide and hydroxide	19	16	West Germany 13.
Metal, including alloys, all forms kilograms	20	--	
Copper:			
Copper sulfate	246	1,038	Italy 917.
Metal, including alloys, all forms	4,627	5,790	Italy 1,081; West Germany 429; Belgium-Luxembourg 372.
Germanium metal, including alloys, all forms 1 kilograms	76	--	
Iron and steel:			
Roasted pyrite	11	10	All from Morocco.
Metal:			
Scrap	458	38	France 36.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Pig iron, ferroalloys, similar materials	2,760	2,717	West Germany 949; France 547; Spain 500.
Steel, primary forms	16,383	28,343	Sweden 11,723; West Germany 11,627.
Semimanufactures:			
Rails and accessories	8,981	30,683	France 23,400; West Germany 548.
Tubes, pipes, fittings	119,961	64,015	France 16,540; Japan 13,751; Italy 11,899; Argentina 8,857.
Other	342,936	374,005	Italy 104,161; West Germany 74,669; Belgium-Luxembourg 52,390.
Lead:			
Ore and concentrate	24	126	Morocco 120.
Oxide	210	727	France 617; Italy 80.
Metal, including alloys, all forms	1,997	3,011	United Kingdom 871; Tunisia 832; Bulgaria 346.
Magnesium metal, including alloys, all forms	2	11	France 6; United Kingdom 4.
Manganese:			
Ore and concentrate	6	--	
Oxide	1	3	All from Belgium-Luxembourg.
Mercury—76-pound flasks	39	102	France 27; Mexico 16.
Molybdenum ore and concentrate—kilograms	6	--	
Nickel metal, including alloys, all forms	26	36	Czechoslovakia 19; France 9.
Platinum-group metals and silver metal, including alloys:			
Platinum group—troy ounces	514	579	All from France.
Silver—do	386	32,092	Switzerland 15,853; France 10,334.
Rare-earth metals:			
Oxides—kilograms	187	(2)	All from France.
Metal, including alloys—do	54	(2)	Mainly from West Germany.
Tin metal, including alloys, all forms—long tons	64	190	United Kingdom 60; Indonesia 30; Malaysia 27.
Titanium:			
Ore and concentrate	124	356	Australia 306.
Oxide	515	1,087	United Kingdom 785; West Germany 266.
Metal, including alloys, all forms	1	(2)	All from France.
Tungsten metal, including alloys, all forms [1]—kilograms	48	(2)	Mainly from France.
Zinc:			
Oxide	192	184	West Germany 36; Italy 34; Netherlands 31.
Metal, including alloys, all forms	1,131	1,086	Belgium-Luxembourg 663; United Kingdom 89.
Other:			
Ore and concentrate	80	--	
Oxides, hydroxides, peroxides, n.e.s	50	84	France 73; West Germany 6.
Metals, including alloys, all forms:			
Metalloids	22	35	West Germany 22; Italy 5.
Pyrophoric alloys—kilograms	124	39	All from West Germany.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	40,835	37,632	Italy 37,546.
Grinding and polishing wheels and stones	309	1	Mainly from Libya.
Asbestos	4,837	3,414	Canada 2,857; Botswana 420.
Barite and witherite	12,549	2,971	Italy 2,964.
Boron materials:			
Crude natural borates—kilograms	604	9,566	France 6,025; Spain 2,640.
Oxide and acid—do	3,212	5,356	France 2,010; Italy 2,000.
Bromine—do	118	318	West Germany 250.
Cement	544,796	814,468	U.S.S.R. 191,461; Spain 171,458; Turkey 127,705.
Chalk	4,203	12,604	France 5,865; Belgium-Luxembourg 5,796.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Kaolin	5,741	5,867	United Kingdom 5,485.
Other	1,412	3,178	Morocco 1,794; France 1,247.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Clays and clay products (including all refractory brick)—Continued			
Products:			
Refractory (including nonclay brick)	10,012	14,853	France 5,369; West Germany 2,831; Austria 2,677.
Nonrefractory	6,623	6,858	Italy 2,208; Span 1,705; France 984.
Cryolite and chiolite	2	--	
Diatomite and other infusorial earth	3	19	France 17.
Feldspar	1,344	96	All from France.
Fertilizer materials:			
Crude and manufactured:			
Nitrogenous	96,252	176,023	Romania 57,793; France 30,639; Bulgaria 28,216.
Phosphatic	214,466	139,235	Spain 52,156; United States 36,502; Morocco 30,276.
Potassic	69,178	79,233	Spain 46,330; United States 17,400.
Other, including mixed	1	3,887	United States 3,843.
Ammonia	55,519	7,609	United States 7,578.
Fluorspar	563	19	All from Netherlands.
Gypsum and plasters	304	(2)	Mainly from West Germany.
Iodine	3	1	Do.
Lime	8,283	3,680	Spain 1,750; France 901; Italy 665.
Magnesite	125	441	Austria 300; Netherlands 96.
Mica, crude, including splittings and waste	130	--	
Pigments, mineral:			
Natural, crude	216	598	France 436; West Germany 102.
Iron oxides, processed	193	468	West Germany 346.
Precious and semiprecious stones, except diamond, manufactured ____kilograms	505	--	
Quartz crystal ____do	23	4	All from United States.
Salt and brine	3	8	West Germany 5.
Sodium and potassium compounds, n.e.s	9,253	13,631	Italy 6,293; Spain 4,040.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	1,990	317	All from Italy.
Worked	33	73	France 68.
Dolomite, chiefly refractory grade	491	453	Spain 400; France 53.
Gravel and crushed rock	19,050	31,434	Italy 26,727; Spain 4,300.
Quartz and quartzite	581	64	All from West Germany.
Sand, excluding metal bearing	278	23	France 20.
Sulfur:			
Elemental:			
Other than colloidal	38,892	56,989	Poland 51,930; France 5,059.
Colloidal	5,701	3,601	France 3,600.
Sulfur dioxide	399	168	West Germany 99; France 64.
Sulfuric acid	13	1,618	Tunisia 1,600.
Talc, steatite, soapstone, pyrophyllite	3,191	2,630	France 2,408.
Other nonmetals, n.e.s.:			
Crude:			
Pozzolan and santorin earth	2	--	
Vermiculite, perlite, chlorite	919	354	France 346; Italy 8.
Other	163	243	West Germany 239.
Oxides and hydroxides of magnesium, strontium, barium	7	-- 56	Spain 50.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	315	5,446	France 4,817.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	20	9	France 5; United Kingdom 2.
Carbon black	2,095	1,393	France 575; Spain 438.
Coal, all grades, including briquets	42,996	58,558	Romania 24,175; Morocco 10,160; Spain 8,450; U.S.S.R. 8,385.
Coke and semicoke	275,406	239,055	West Germany 56,352; U.S.S.R. 53,434; Italy 51,195; Netherlands 32,475.
Hydrogen, helium, rare gases	39	32	France 25; Italy 4.
Peat	700	5	All from France.
Petroleum:			
Crude ____thousand 42-gallon barrels	10	--	

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
MINERAL FUELS AND RELATED MATERIALS —Continued			
Petroleum—Continued			
Refinery products:			
Gasoline			
thousand 42-gallon barrels	r 21	46	Italy 31; Netherlands 14.
Jet fuel and kerosine ---do---	1	1	All from Netherlands.
Distillate fuel oil ---do---	r 164	107	Italy 37; Spain 28; United States 22.
Residual fuel oil ---do---	r 130	103	Italy 74; Spain 29.
Lubricants ---do---	296	469	Italy 372; Spain 95.
Other:			
Liquefied petroleum gas ---do---	1,184	955	Italy 743; France 163; Spain 40.
White spirit ---do---	17	18	All from Netherlands.
Petroleum jelly and wax ---do---	67	30	West Germany 23.
Asphalt and bitumen ---do---	r 433	515	Spain 303; Italy 110; France 51.
Petroleum coke and flux ---do---	12	10	United Kingdom 6; France 4.
Unspecified ---do---	r 6	8	Italy 7.
Total ---do---	r 2,331	2,262	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	1,372	1,090	France 516; Netherlands 328; Japan 204.

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

COMMODITY REVIEW

METALS

Iron and Steel.—The Société Nationale de Sidérurgie (SNS) iron and steel manufacturing complex, at El Hadjar near Annaba in the northeast, finished its first full year of production in 1973 at the annual rate of 400,000 tons of steel after commencing operations during the previous year. Nippon Steel Corp. of Japan will provide technical assistance to enable the Algerians to increase the plant's production capacity to 2 million tons per year by 1980. Under the terms of a 1973 contract, Algerian engineers will receive training in Japan, and during 1973–74 Nippon Steel will expand the capacity of the two small SNS blast furnaces and spiralweld pipe mill. During 1973 SNS purchased some 60,000 tons of Japanese hot coil for manufacturing steel pipes. Redman Heenan Process Engineering Ltd. of the United Kingdom will install a roll-forming line at El Hadjar. First phase of production from the new facility will begin in March 1974, and the second phase has been scheduled to commence 4 months later.

Mercury.—The Société Nationale de Recherche et d'Exploitation Minière (SONAREM) mercury plant at Ismail near Azzaba continued production at near capacity during the year, with an estimated total output of 13,300 flasks (34.5 kilograms each) of 99% pure mercury, valued at an estimated $3.8 million. In 1973, Algeria discussed worldwide mercury prices and unstable market conditions with representatives of Italy, Mexico, Spain, Turkey, and Yugoslavia, all major producers of mercury. No specific policies or price changes were announced by the group, but they agreed to strive for a more stable market and to meet again early in 1974.

NONMETALS

Barite.—Algeria continued as Africa's largest producer of barite, after Morocco, and the Government launched an international appeal for the design and construction of a barite production plant, to be built at Tizi Ouzou approximately 100 kilometers east of Algiers.

Cement.—During 1973, cement was produced at plants in Meftah, Pointe Pescade, and Zahana, but demand exceeded output necessitating imports of the commodity. Expansion activities continued at the Zahana facility near Arzew, and new plants were under construction at Hadjar Soud, south of Annaba, and Meftah near Algiers. Construction of the 500,000-ton-per-year Hadjar Soud cement plant began in 1969 and was originally scheduled for completion during 1971; Meftah's 1-million-ton-per-year plant was under construction in 1970; and the expansion of cement produc-

tion facilities at Zahana began in 1971. Algeria's state-owned Société Nationale des Matériaux de Construction (SNMC) planned joint ventures in cement plants to be built in neighboring Morocco and Tunisia. Algeria and Morocco agreed to establish a joint plant in Oujda, Morocco, near Tlemcen, Algeria, with a capacity to produce cement at the rate of 1 million tons per year. According to the 1972 agreement signed by the two countries, the plant will begin production in 1976 and the output will be shared. Algeria reached an agreement with Tunisia in 1973 for a plant of the same capacity to be constructed at Djebel Boulahneche, Tunisia, in the Thala region near the Algerian border. Output from the new plant will be utilized by both countries.

Fertilizer Materials.—Rail shipments of phosphate rock from the Djebel Onk deposit to the Annaba fertilizer plant were delayed in 1973 by severe flooding along the 300-kilometer railroad connection. Production facilities at Annaba were rated at 550,000 tons per year of mixed fertilizers, 182,500 tons per year of phosphoric acid, and 547,500 tons per year of sulfuric acid. The fertilizer output capacity consisted of 125,000 tons of ammonium phosphates, 75,000 tons of mixed binary fertilizers, 150,000 tons of mixed ternary fertilizers, and 200,000 tons of triple superphosphates.

Salt.—Four facilities produced the following tonnage of salt during 1973: Annaba, 15,000 tons; Arzew, 80,000 tons; Ferry à Ighil Izane, 28,000 tons; and Sétif, 7,000 tons. Domestic consumption totaled 98,000 tons, of which the petroleum industry used 18,000 tons, chemical plants 10,000 tons, and others 70,000 tons. Exports in 1973 set a record at 62,000 tons, more than double the 1970 level, and Guinea, France, Morocco, and Niger were the principal importers.

MINERAL FUELS

Fourth quarter 1973 petroleum production cutbacks and reductions in exports were overshadowed by Algeria's far-reaching program to increase oil discoveries and expand petroleum and natural gas processing and transportation facilities. In July 1973, SONATRACH and the French company Omnium Technique des Transports par Pipelines (OTP) created a joint company, Société Algérienne d'Engineering Industrial et Pétrolier (ALEIP), which will study the management, processing, and transportation of petroleum and chemical products. Capital investment in ALEIP will be shared 60% by SONATRACH and 40% by OTP.

Five Algerian tankers were in service in 1973: two crude oil (*Gassi Touil,* 41,465 deadweight tons (dwt) and *Hassi Messaoud,* 49,771 dwt); one refined petroleum products (*Skikda,* 22,144 dwt); one LPG (*Berga,* 6,310 cubic meters); and one methane (*Hassi R'Mel,* 40,109 cubic meters). The tanker *Skikda* was purchased from the U.S.S.R. in 1973. Cie. Nationale Algérienne de Navigation (CNAN), Algeria's state-owned shipping company, secured loans totaling $200 million during 1973 from international financial institutions for the construction of three additional LNG tankers. The balance of required capital will be met by export credits from the constructing country. Each vessel will have a liquid capacity of 125,000 cubic meters (4.4 million cubic feet) and will cost $100 million to build. A total of 13 of these specialized tankers are to be placed in service by CNAN by 1980. Construction contracts will be issued early in 1974, and the tankers should be ready for service late in 1976 or early in 1977. These ships will transport LNG to Europe and the United States from Arzew and Skikda liquefaction facilities.[4]

Eight Organization of Arab Petroleum Exporting Countries (OAPEC) members, Abu Dhabi, Algeria, Bahrain, Iraq, Kuwait, Libya, Qatar, and Saudi Arabia, formed the Arab Maritime Petroleum Transport Co. (AMPTC) in January 1973 with head offices in Kuwait and a charter providing for an initial capital investment of $500 million. Preliminary plans were developed to purchase several crude oil supertankers, and an order was placed with Chantiers Navals de l'Atlantique of France for the construction of AMPTC's first two 278,000 dwt supertankers. Tentative delivery will be October 1977 for the first vessel and April 1978 for the second. Orders will probably be placed with foreign shipyards in 1974, for two or three more supertankers.

Port facilities valued at $244 million were under construction at Bettioua, adjacent to Arzew. One loading dock will serve ships transporting LPG, two docks for petroleum tankers, one dock for ammonia

[4] Journal of Commerce and Commercial. V. 317, No. 23038, Sept. 21, 1973, p. 24.

tankers, and six docks for methane gas tankers of up to 125,000 cubic meters liquid capacity. Construction will take 3 years, but part of the new loading facilities will be placed in service in 1974.

Petroleum and Natural Gas.—*Petroleum.*—During 1973 SONATRACH signed joint oil exploration venture agreements with four foreign oil companies for concession areas in the Sahara Desert totaling 61,000 square kilometers. In each case SONATRACH kept the 51% controlling share of the undertakings. Under an agreement with Deutsche Erdölversorgungsgesellschaft mbH (Deminex), the West German firm will invest $103 million exploring for oil over a 12-year period in six blocks of territory totaling 28,600 square kilometers, in the Ghardaia, Great Eastern Erg, Hassi Ben Guebbour, and Ouargla regions.[5]

Spain's Hispanica de Petroleos S.A. (Hispanoil) will invest $33.6 million in their search for oil in a three-block concession covering 10,200 square kilometers. Two of the blocks are in the Ouargla region and the third is in the Touggourt region.[6] Sun Oil Co., of the United States, obtained two blocks with a combined area of 9,475 square kilometers. Exploration will be for 4 years in the 5,375-square-kilometer Great Eastern Erg block and 3 years in the 4,100-square-kilometer Ouargla block.[7] Total-Algérie, a subsidiary of the French Cie. Française des Pétroles (C.F.P.) will explore four areas totaling 12,700 square kilometers. Exploration will be carried out for a period of 3 years on two 2,000-square-kilometer blocks in the El Harcha and Naial areas of the Ouargla region, and for 5 years over 4,000 square kilometers in Ouan di Mesta and 3,280 square kilometers in Zemlet el Mederba, both located in the Great Eastern Erg region.[8] All of the joint venture exploration agreements provide for the foreign operators to reimburse SONATRACH for earlier geophysical work, and all natural gas discovered reverts to the state-owned concern without compensation. If commercial discoveries of oil are made, SONATRACH and the foreign companies will share the output in proportion to their shares of involvement, and SONATRACH will reimburse the discoverer a percentage of the exploration costs. In December, Hispanoil spudded its first wildcat, KG–1, at Kef el Argoub.

Eighty-four wells were completed during 1973, an increase of 6.3% over the previous year, and five additional wells were drilling at yearend. Drilling, which fell from 327,000 meters in 1971 to 239,000 meters in 1972, increased during 1973 to 254,000 meters. Despite this increased activity, no new oil or gas discoveries were reported, and at the end of the year, 970 producing oil wells were in service (921 flowing and 49 artificial lift), up 37 from 1972. Forty development wells were drilled in the Hassi Messaoud oilfield, Algeria's largest, where 10 rigs worked during the year.[9] Crude oil reserves were set at 9.9 billion barrels at yearend 1973.

In November Algeria raised the posted price of its crude oil to $9.25 per barrel retroactive to October 16, up 92.7% from the earlier posting of $4.80, and SONATRACH managers were contemplating a further increase for the first-quarter 1974. Oil and gas sales contracts will be negotiated in Algerian dinars, rather than U.S. dollars, in accordance with the Algerian Minister of Finance's effort to protect the Algerian mineral market from fluctuations of the U.S. currency.[10]

SONATRACH announced plans to increase crude oil storage facilities by 919,300 barrels at Ohanet, near the Libyan border, and to install four additional pump stations on the Ohanet to Haoud el Hamra crude oil pipeline. When completed, these new installations will increase the capacity of the line to 360,000 barrels per day from its present capacity of 160,000 barrels per day. SONATRACH completed the connecting Haoud el Hamra to Skikda crude oil pipeline in 1972. Construction continued on the LPG/condensate trunkline between Hassi Massaoud and Arzew and was expected to be completed by yearend 1973. The line used 853 kilometers of 15 to 41 centimeter pipes and was constructed by Willbros (Overseas) Ltd., a British-based branch of the U.S. firm William Brothers Construction Co. LPG will be transported from

[5] Petroleum Economist. V. 41, No. 1, January 1974, p. 32.
[6] Nouvelles Economiques (Algiers, Algeria). No. 135, August 1973, p. 11.
[7] Middle East Economic Survey (Beirut, Lebanon). V. 16, No. 24, Apr. 6, 1973, pp. (i)–(iii).
[8] Pétrole Information. No. 1277, June 8–14, 1973, p. 21.
[9] World Oil. V. 179, No. 3, Aug. 15, 1974, pp. 61–63 and 122.
[10] Petroleum Times. V. 77, No. 1967, Aug. 10–24, 1973, p. 44.

Hassi Messaoud to Hassi R'Mel through 30-centimeter pipes, and a mix of condensate and LPG will be pumped from Hassi R'Mel to Arzew through 41-centimeter pipes. In 1974 the Willbros firm will increase the capacity of two of the line's six pump stations and construct an additional station. The pipeline's LPG capacity will remain at 17,000 barrels per day, but the scheduled improvements will increase the line's condensate capacity from 20,000 to 66,000 barrels per day.

C. Itoh & Co. Ltd. and Japan Gasoline Co. Ltd., Japanese firms, completed the petroleum refinery at Arzew, which has been under construction since 1970. Officially inaugurated in June 1973, the new refinery began processing Hassi Messaoud crude oil at the rate of 50,000 barrels per day and imported residual oils at the rate of 4,000 barrels per day. Asphalt, gasoline, kerosine, LPG, lubricating oil and grease, and paraffin will be marketed principally in Western Algeria, but most of the plant's output—fuel oil, gas oil, and naphtha—will be sold to European consumers.[11] British engineers from Burmah Oil Co. Ltd. will provide technical assistance in operating the oil and grease plant. Tenders were out for the construction of a 177,000-barrel-per-day refinery, the country's largest, to be built at Skikda. Both Haoud el Hamra crude oil and imported residual oils will be used as feedstock, and a full line of refined petroleum products will be produced for Eastern Algerian markets and for export.

Natural Gas.—Proved natural gas reserves at yearend 1973 were estimated at 98.9 trillion cubic feet, with more than one-third in the rich Hassi R'Mel Field. Long-distance gaslines transported gas from inland producing fields to consuming centers and export facilities along the coast. SONATRACH signed several important sales contracts with foreign companies for deliveries of natural gas which will extend into the 1990's. Most of the exports will be liquefied at Arzew and Skikda and exported as LNG in special ocean-going tankers to the United States and Western Europe. Italy will build a large-capacity submarine gasline connecting its natural gas pipeline system to Algeria's producing fields. Panhandle Eastern Pipe Line Co. of the United States negotiated a preliminary contract with SONATRACH in 1972 for the supply of Algerian natural gas to U.S. markets, and in 1973 the two parties signed a sales contract under which the American company will import 158.9 billion cubic feet of natural gas annually for a 20-year period beginning in 1979. Algeria agreed to furnish one-half of the LNG tankers necessary to transport the gas to the United States. Early in the year, the U.S. Federal Power Commission (FPC) gave its approval to El Paso Natural Gas Co.'s plans to import 1 billion cubic feet daily of Algerian natural gas over a 25-year period. The Algerian gas will be liquefied at Arzew, and deliveries have been scheduled to begin in 1976 to the U.S. ports, Cove Point, Maryland and Savannah, Georgia.[12] Negotiations between El Paso and SONATRACH for a second export contract were conducted during 1973, but a settlement was delayed when the FPC failed to grant approval for the plan, and the contract with SONATRACH expired on December 31, 1973. The volume of gas involved in the second El Paso-SONATRACH contract was identical to the first agreement, and the two parties had planned to begin LNG deliveries in 1978. During 1973 another U.S. company, Distrigas Corp., failed to gain FPC approval for its plans to import Algerian natural gas, and its contract also expired on December 31. The two companies probably will renegotiate their natural gas contracts during 1974.

In 1973, the Société d'Achat du Gaz Algérian pour l'Europe (SAGAPE), a West European consortium, renegotiated a 1972 LNG supply contract with Algeria, increasing purchases to 1.5 billion cubic feet per day over a 20-year period. The original agreement between the foreign companies and SONATRACH was signed in December 1972 by SAGAPE members Gaz de France, Société de Distribution du Gaz S.A. of Belgium, and West Germany's Bayerische Ferngas GmbH, Gasversorgung Sueddeutschland GmbH, and Saar-Ferngas AG. The Austrian company Austria Ferngas GmbH, and the Swiss company Schweizerische Aktiengesellschaft fuer Erdgas joined the SAGAPE consortium during 1973. Another West German company, Ruhrgas AG, placed an order with SONATRACH in 1973 for 423.8 billion cubic feet of gas per year to be shipped as LNG over a 20-year period beginning in 1979, and Spain's Empresa Nacional del Gas contracted with SONATRACH in 1973 for 158.9 billion

[11] Nouvelles Economiques (Algiers, Algeria). No. 134, July 1973, p. 6.
[12] Oil Daily. No. 5471, Apr. 6, 1973.

cubic feet of natural gas to be delivered also over a 20-year period.

SONATRACH and the Italian Ente Nazionale Idrocarburi (ENI) signed an accord on October 19 by which ENI will construct a 2,500-kilometer gasline between Algeria and Italy, and the Italians immediately obtained transit approval across Tunisia for the project. Sicilian and Tunisian markets will also be served by the new gasline. The pipeline will connect La Spezia, Italy, with the Hassi R'Mel gasfield in Algeria and will deliver 413 billion cubic feet of natural gas annually to the Italians over a 25-year period of time beginning in 1978. ENI's pipeline project includes 23 compressor stations and 900,000 tons of steel pipes, and construction teams will encounter water depths of up to 460 meters in the Mediterranean Sea crossing. Bechtel Corp. of the United States prepared the feasibility study in 1972, which called for the line to be composed of seven 30-centimeter pipes in the submerged section between Cap Bon, Tunisia, and the Sicilian coast.

Two major Algerian natural gas pipelines were being enlarged in 1973. Constructors John Brown Ltd. of the United Kingdom was awarded the contract to build two compressor stations on the 102-centimeter Hassi R'Mel to Skikda line, which will increase the throughput of that important gasline to 890 million from 551 million cubic feet per day. Each compressor station will have four gas turbines with an aggregate of 60,000 horsepower. This increased capacity will be utilized to supply the fourth liquefaction line under construction at Skikda.[13] General Electric Co. received a $73 million SONATRACH contract in 1973 to build five compressor stations for the 102-centimeter Hassi R'Mel to Arzew gasline. Construction of this large diameter pipeline to Arzew began in March 1972 by the Italian firm Saipem SpA. When installed, the new stations will boost the natural gas pipeline's throughput capacity from 0.6 billion to 1.3 billion cubic feet per day. The gasline will serve the liquefaction units being built at Arzew by Chemical Construction Corp. (Chemco), a U.S. firm. During 1973, SONATRACH obtained a $157 million loan from the U.S. Export-Import Bank for the construction of liquefaction facilities at Arzew, and Chemico began work on the Arzew LNG plant. Initial output was scheduled for April 1976, with full production planned for mid-1977.[14] Six liquefaction trains will produce LNG for U.S. markets.

Algeria's new Skikda LNG plant began production in 1972 but encountered operating problems in 1973 which forced it to shut down in May and again in October for repairs. The plant was unable to resume operations by the end of the year. Ammonia production was interrupted also during the year at the Arzew plant by equipment problems. The British firm Pritchard Rhodes, Ltd., signed a contract with SONATRACH for the construction of two liquefaction units and auxiliary installations to the Skikda LNG plant. In addition to liquefying natural gas, the new units at Skikda will produce butane, ethane, and propane. Engineering and construction of SONATRACH's petrochemical complex to be built at Skikda will be carried out by Toyo Engineering Corp. of Japan, and the Italian firm SNAM Progetti SpA assumed the responsibility for building the polyethylene unit at Skikda. British engineers from Chem Systems International, Inc. will assist SONATRACH in monitoring the construction phase of the petrochemical project, and production at the planned complex will include caustic soda, chlorine, ethylene, polyethylene, and polyvinyl chloride.

A LNG technology program was added to the Algerian Petroleum Institute's curriculum at Oran, and plans were developed to offer this speciality to up to 125 students annually. Several hundred skilled technicians will be required in the near future to staff Algeria's natural gas industry processing and shipping facilities.

[13] Petroleum Times. V. 77, No. 1957, Mar. 23, 1973, p. 31.
[14] Pages 2–3 of work cited in footnote 7.

Table 4.—Algeria: Crude oil production [1]

(Thousand barrels)

Year	Daily average	Total	Cumulative	Change in daily production, percent
1971	785.4	286,686	2,856,096	−23.7
1972	1,062.3	388,802	3,244,898	+35.3
1973	1,097.3	400,497	3,645,395	+ 3.3

[1] Production figures differ from those shown on table 1 because of difference in source.

Table 5.—Algeria: SONATRACH crude oil exports

(Thousand 42-gallon barrels)

Countries	1972	1973
Austria	811.3	--
Belgium	19,098.9	577.6
Brazil	13,371.5	--
Bulgaria	4,687.8	1,875.4
Canada	--	1,146.1
Denmark	--	1,996.5
East Germany	1,588.1	--
Egypt, Arab Republic of	946.9	2,061.6
France	18,398.7	20,635.7
Italy	27,292.3	33,577.4
Morocco	6,078.2	7,389.0
Netherlands	11,915.9	6,347.9
Norway	--	2,507.4
Romania	2,223.2	1,127.7
Spain	31,595.5	30,557.4
Sweden	6,120.4	5,551.9
Switzerland	6,068.3	4,527.7
United Kingdom	7,605.8	13,812.8
United States	28,213.2	41,045.3
West Germany	71,452.6	82,060.0
Others	2,214.8	1,986.5
Total	259,683.4	258,783.9

Table 6.—Algeria: Crude oil production by company

(Thousand barrels per day)

Company	1971	1972	1973
SONATRACH	546.1	817.3	838.7
Total-Algérie [1]	132.0	144.2	148.6
Elf-ERAP	104.7	97.0	106.6
Getty Petroleum Co	2.6	3.8	3.4
Total	785.4	1,062.3	1,097.3

[1] Compagnie Française des Pétroles (Algérie).

Source: Organization of the Petroleum Exporting Countries. Annual Statistical Bulletin, 1973. (Totals differ from those shown on table 1 because of difference in source.)

Table 7.—Algeria: Refinery capacity and production of refined products [1]

(Thousand barrels per day)

	1971	1972	1973
Capacity	57.5	115.8	115.8
Production:			
Distillate fuels	19.0	19.3	23.4
Gasoline	13.3	13.9	20.3
Kerosine	5.0	5.7	7.4
Residual fuel oil	r 10.9	10.7	34.3
Others	5.0	3.8	18.6
Total production	53.2	53.4	104.0

r Revised.

[1] See table 1 for annual production totals, refinery fuel, and losses.

Table 8.—Algeria: Refinery crude throughput

(Thousand barrels per calendar day)

	1971	1972	1973
Cie. Raffinage en Afrique du Nord-Hassi Messaoud	2.3	2.2	2.2
Société de la Raffinage d'Alger	53.4	52.2	50.3
SONATRACH, Arzew	--	4.0	51.5
Total	55.7	58.4	104.0

The Mineral Industry of Angola, Mozambique, and Portuguese Guinea

By Janice L. W. Jolly [1]

ANGOLA

In 1973, the mineral industry of Angola emerged with a marked change in the direction of oil exports, which was caused by the Arab oil embargo on Portugal. Portugal was taking less than 10% of Angola's oil in 1972, but nearly 33% by the end of 1973. Oil production increased in importance in the Angolan economy, and total exports grew more than 37% in value to $764 million.[2] Petroleum ($194.3 million), diamonds ($92 million), and iron ($52 million) accounted for 44% of the total export earnings. Since 1969, export growth has more than doubled. Another positive aspect of Angola's growth in 1973 was a trade surplus and a fundamental improvement in its balance of payments. Angola's gross national product (GNP) was estimated at $2.82 billion ($470 per capita), growing at about 11% annually.[3]

The Portuguese Nuclear Energy Junta, Campanhia Mineira do Lobito S.A.R.L. (CML) and the South African General Mining and Finance Corp. formed a corporation to explore and exploit ore in two former CML concessions. The Angolan Government will collect a 12% tax on profits. Starting with the first commercial sale of radioactive and other ores (or of derivative products), the company will pay an annual sum of approximately $4,057 to the Portuguese Nuclear Energy Junta during the first 10 years, and twice that amount during the following years. The French firm of TOTAL-Compagnie Minière et Nucleaire (CMN) also completed an agreement with the Portuguese Nuclear Energy Junta concerning exploitation of radioactive ores in Angola.

A new venture was formed to exploit minerals other than diamonds, oil, and natural gas in a 4,349-square-mile area along the Cunene River frontier between Angola and the Territory of South-West Africa. This new association, Companhia Mineira de Cunene Co., is owned 51% by the South African firm of Johannesburg Consolidated Investments (JCI), 39% by CML, and 10% by the Angolan Government. The Sociedade Mineira da Huila Lda. of Sa da Bandeira was reportedly negotiating with foreign companies for large-scale exploration of the gold-bearing conglomerates in southern Angola. The U.S. Chromalloy American Corp. was reportedly interested in prospecting for gold. A first-phase investment of $1 million was visualized. It was announced that the Department of Geology and Mines plans to spend about $8 million in 1974 on research and development.

The Government extended the concessions awarded to Companhia de Petróleos de Angola (PETRANGOL) in the offshore areas and the Cuanza and Congo River Regions until June 30, 1976. New wording was proposed for the original 1969 Decree Law pertaining to royalties. In the future, PETRANGOL will pay 12.5% of the value of oil extracted and subsequently refined for sale.

Cabinda Gulf Oil Co. negotiated a contract with the Government and relinquished part of its concession in Cabinda. An agreement was reached whereby Cabinda Gulf would pay compensation to the Government for a decline in dollar value. The Government also has the right in need to purchase 37.5% of Cabinda Gulf's production at current world prices and because the royalty

[1] Physical scientist, Division of Ferrous Metals—Mineral Supply.

[2] Where necessary, values have been converted from Angola escudo (A. Esc) to U.S. dollars at the rate of A. Esc = US$0.04057.

[3] U.S. Consulate, Luanda, Angola. State Department Telegram 9437, Apr. 16, 1974.

payments of 12.5% can be received in the form of oil, up to one-half of total production is available for purchase by the State.[4] Gulf Oil Co. (Cabinda Gulf Oil) has invested about $300 million in Cabinda. Six other U.S. companies are in stages of making large investments. It was also reported that Sun Oil International Inc. and Amerada Hess Oil Corp. would form a joint venture for oil exploration in Angola.

The Portuguese Council of Ministers authorized expansion of the Luanda oil refinery to 2 million tons per year, as well as the installation of a refinery for solid bituminous products at Ambriz. An oil refinery with an initial annual capacity of 15 million tons was being planned for Moçamedes. A steel mill is also planned for Moçamedes, and four new foundries were being built. Rights were granted to the Riverwood Corp. to produce petroleum products from bituminous deposits in the Companhia dos Asfaltos de Angola (ASFAL) concession area located north of Luanda.[5] Work was expected to begin in 1974 on a new hydroelectrical system at Chicapa in eastern Angola to supply Henrique de Carvalho and the diamond exploration concession of Companhia de Diamantes de Angola (DIAMANG) in the far northeast. By yearend, a new thermal power station was also being planned at Alto Catumbele, as well as a high-tension powerline between the Navala powerplant and the Cassinga mine.

The port of Cabinda handled more traffic than other ports in 1973, owing to expansion of the oil industry there. Eighty-seven percent of Cabinda's traffic was crude oil. A new addition for long-distance shipping was planned to start in 1974 and be completed by 1976. An addition of an alongside wharf for pelletized and containerized cargo was planned for Luanda, mainly to handle ore from the Cassala-Quitungo iron ore mines.

PRODUCTION AND TRADE

The total value of mineral production (excluding refinery production) was $402.7 million, 39% higher than that of 1972 ($289.9 million). Petroleum production increased 1.1 million tons to 8.2 million tons, and was valued at approximately $215.8 million. Crude oil was still the principal mineral export in 1973. Although posted oil prices were increased only toward the end of 1973, crude oil displaced coffee as the primary export. The long-term significance of the energy crisis is that enlarged output and higher prices mean oil will play an increasingly strategic role and will reduce Angola's dependence on the more vulnerable sudden adverse swings of agricultural materials. Most of the oil production (7.5 million tons) was still coming from the approximately 100 offshore wells of Cabinda Gulf. A group formed by PETRANGOL, Sociedad Portuguesa de Exploração de Petróleos (ANGOL), and Texaco Oil Co. (TEXACO), started production at its Cabeca de Cobra Field, raising the production of the province to 12,000 barrels per day. Ninety percent of Angola's oil production was exported to the following countries in 1973: Portugal, Canada, the United States, Japan, West Germany, Great Britain, Sweden, São Tomé e Principe, and Trinidad and Tobago. (Oil exports to Trinidad and Tobago were discontinued in June.)[6] A total of 7.2 million tons of oil was exported. In 1973, only 33% of the Angolan fuel market was supplied with local products. Angola was a net exporter of fuel oil but was dependent upon imports for two-thirds of its diesel fuel requirement, half of its gasoline consumption, and all of its lubricating oils and greases.

In 1973, the Luanda refinery produced 702,663 tons of fuel oil and other petroleum products, an 11% increase over 1972 production. The output of gasoline increased 33%; jet fuel increased 4%; butane gas increased 3%; kerosine increased 7%; and fuel oil increased 12%. The production of diamonds, valued at $92 million, was significantly higher than the $80 million for 1972. The production of 2.12 million carats in 1973 varied only slightly from the 2.15 million carats produced by DIAMANG in 1972.

Iron ore production increased 25%. Japan was a major importer of Angola's iron ore. Angola's 25 foundries poured approximately 27,600 tons of cast iron, 3,450 tons of cast steel, 3,010 tons of nonferrous castings, and 1,320 tons of other castings in 1973. Hydraulic cement production increased 23% to 767,549 tons, valued at $1.97 million. Shipments were primarily to Nigeria, but

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[4] Standard Bank Review (London). Angola. November 1973, p. 22.

[5] Mining Annual Review. Angola. June 1974, pp. 353–354.

[6] Marches Tropicaux et Mediterraneens (Paris). No Angolan Oil Imports for Trinidad and Tobago. V. 29, No. 66, Dec. 14, 1973, p. 3670.

also to Gabon, Congo, Zaire, the Ivory Coast, and the Malagasy Republic. The Export Promotion Department of Angola was also reportedly looking towards Israel as a potential cement importer. Other mineral commodities produced during 1973 included sea salt, valued at $973,152, shipped mainly to Zaire, Portugal, and Zambia; and building stone (marble and granite), valued at $1.1 million. Rock asphalt, beryl, clays, gypsum, and manganese ore accounted for the remainder of the mineral production.

Table 1.—Angola: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Beryllium, beryl, gross weight	90	175	115
Gold, mine output, metal content:			
Placer ---troy ounces	44	39	--
Vein ---do	--	1,665	--
Total ---do	44	1,704	--
Iron ore and concentrate, gross weight ---thousand tons	6,165	4,831	6,052
Manganese ore and concentrate, gross weight	23,000	37,700	4,682
NONMETALS			
Cement, hydraulic ---thousand tons	530	624	768
Clays, kaolin	1,040	854	667
Diamond:			
Gem ---thousand carats	1,810	1,616	1,594
Industrial ---do	603	539	531
Total ---do	2,413	2,155	2,125
Gypsum	25,842	83,376	46,655
Salt	90,284	125,302	96,717
Stone:			
Dimension:			
Granite blocks ---cubic meters	5,650	8,610	7,578
Marble blocks ---do	953	1,623	1,201
Other, limestone	532,037	713,700	--
Talc	--	70	--
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	56,098	55,535	49,637
Natural gas:			
Gross production ---million cubic feet	[r e] 27,000	31,393	36,000
Marketable production [e] ---do	1,500	2,000	2,300
Petroleum:			
Crude ---thousand 42-gallon barrels	33,922	50,855	58,910
Refinery products:			
Gasoline ---do	445	296	542
Jet fuel ---do	558	441	566
Kerosine ---do	143		157
Distillate fuel oil ---do	752	559	778
Residual fuel oil ---do	2,590	1,907	2,895
Other ---do	195	158	98
Refinery fuel and losses ---do	281	202	--
Total ---do	4,964	3,563	5,036

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

[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.

Table 2.—Angola: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum metal, including alloys, all forms	252	458	Japan 110; Republic of South Africa 108; West Germany 76.
Beryllium, beryl ore and concentrate	50	100	All to United States.
Copper:			
Ore and concentrate	7	6	Mainly to Japan.
Metal, including alloys, all forms	166	171	West Germany 171.
Iron and steel:			
Ore and concentrate ---thousand tons	5,498	5,151	Japan 2,174; West Germany 1,009; France 506.
Semimanufactures	1,187	1,841	Zaire 777; Portugal 646; United States 240.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Lead:			
Oxides	(1)	--	
Metal, including alloys:			
Scrap	74	82	All to Republic of South Africa.
Semimanufactures	(1)	1	Mainly to St. Thomas and Principe.
Manganese ore and concentrate	11,262	50,981	France 24,802; Japan 16,358; Spain 9,821.
Uranium ore and concentrate	--	1	All to Portugal.
Zinc:			
Oxides	--	3	All to Mozambique.
Metal, including alloys, all forms	r 160	88	Republic of South Africa 42; Spain 39; Zaire 6.
Other:			
Ore and concentrate	143,580	77,544	NA.
Base metals, including alloys, all forms, n.e.s	1	(1)	All to ships stores and Zaire.
NONMETALS			
Cement	86,316	148,122	Nigeria 74,000; Gabon 40,070; Zaire 9,697.
Clays and clay products, including all refractory brick, crude clays, n.e.s	50	77	Zaire 74; St. Thomas and Principe 3.
Diamond, all grades ---thousand carats--	2,340	2,200	All to Portugal.
Fertilizer materials	298	518	West Germany 448; Portugal 50; France 20.
Gypsum and anhydrite	10,963	12,287	Mozambique 12,286; St. Thomas and Principe 1.
Lime	--	54	All to Zaire.
Mica, all forms	--	5	Do.
Salt	25,259	31,939	Zaire 26,161; Portugal 3,446; Zambia 1,449.
Sodium and potassium compounds, n.e.s	(1)	23	Zaire 22.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	63	7	St. Thomas and Principe 5; Zaire 1.
Other	19,036	26,973	West Germany 9,402; Netherlands 5,914; Belgium-Luxembourg 4,659.
Worked	11	3	Mainly to St. Thomas and Principe.
Gravel and crushed rock	367	520	Mozambique 393; Portugal 107; Zaire 20.
Sand, excluding metal bearing	1	1	Mainly to Portugal and ships stores.
Sulfur and sulfuric acid	1	--	
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	303	414	Mainly to St. Thomas and Principe.
Coal and coke, including briquets	(1)	--	
Hydrogen, helium, rare gases	10	8	Zaire 3; Bunkers 3; St. Thomas and Principe 1.
Petroleum:			
Crude ---thousand 42-gallon barrels--	34,207	49,212	Canada 18,037; Japan 11,453; Trinidad and Tobago 8,273.
Refinery products:			
Gasoline ----------do----	1	1	All to bunkers.
Kerosine ----------do----	(1)	(1)	Do.
Jet fuel ----------do----	491	557	Mainly to aircraft stores.
Distillate fuel oil ----------do----	234	182	Mainly to bunkers.
Residual fuel oil ----------do----	r 1,788	1,592	Bunkers 702; United Kingdom 270; Belgium-Luxembourg 235.
Lubricants ----------do----	5	4	Mainly to bunkers.
Other:			
Liquefied petroleum gas do----	1	1	Mainly to St. Thomas and Principe.
Bituminous mixtures, n.e.s ----------do----	(1)	(1)	Mainly to Mozambique.
Total ----------do----	r 2,520	2,337	

r Revised. NA Not available.
1 Less than ½ unit.

Table 3.—Angola: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Oxide and hydroxide	7	4
Metal, including alloys, all forms	1,106	1,350
Arsenic trioxide, pentoxide, acids	32	40
Chromium oxide and hydroxide	74	40
Cobalt oxide and hydroxide	(1)	(1)
Copper:		
Matte	43	46
Metal, including alloys, all forms	439	762
Gold, unworked and partly worked ---troy ounces	16	93
Iron and steel:		
Ore and concentrate	--	100
Oxide and hydroxide	238	244
Metal:		
Scrap	1,188	7,571
Pig iron, including cast iron	2,617	547
Sponge iron, powder, shot	64	30
Ferroalloys	3,898	5,314
Steel, primary forms	r 18,413	51
Semimanufactures	r 93,429	92,351
Lead:		
Oxide	55	294
Metal, including alloys, all forms	553	632
Magnesium, including alloys, all forms	2	--
Manganese oxides	2	86
Mercury ---76-pound flasks	38	49
Nickel, including alloys, all forms	6	16
Platinum-group metals, including alloys, all forms ---troy ounces	--	5
Silver, including alloys ---do	10,225	3,860
Tin, including alloys, all forms ---long tons	r 45	44
Titanium oxides	413	495
Tungsten:		
Ore and concentrate	3	--
Metal, including alloys, all forms	--	1
Zinc:		
Oxide	171	159
Metal, including alloys, all forms	660	1,459
Other:		
Ore and concentrate—		
Of molybdenum, tantalum, vanadium, zirconium	(1)	--
Of base metals, n.e.s	6	--
Oxides, hydroxides, peroxides of metals, n.e.s	13	36
Metal, including alloys, all forms	r 10	10
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	19	26
Grinding and polishing wheels and stones	116	121
Asbestos	1,312	887
Barite and witherite	15	8
Boron materials:		
Crude natural borates	38	1
Oxide and acid	8	2
Cement	5,519	5,551
Chalk	635	878
Clays and clay products:		
Crude clays, n.e.s	1,711	1,911
Products, refractory, including nonclay brick	4,286	3,340
Cryolite and chiolite	--	12
Diatomite and other infusorial earth	356	488
Feldspar and fluorspar	--	173
Fertilizer materials:		
Crude, phosphatic	130	3
Manufactured:		
Nitrogenous	23,616	29,630
Phosphatic:		
Thomas (basic) slag	100	159
Other	6,650	8,683
Potassic	9,427	5,664
Other, including mixed	37,119	27,868
Ammonia	276	229
Graphite, natural	3	6
Gypsum and plasters	124	140
Lime	81	25
Magnesite	1	3
Mica, all forms	54	40
Pigments, mineral	37	44

See footnotes at end of table.

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

Commodity		1971	1972
NONMETALS—Continued			
Precious and semiprecious stones, except diamond:			
Natural	carats	1,500	600
Manufactured	do	740	150
Salt and brine		300	1,025
Sodium and potassium compounds, n.e.s		3,017	3,619
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked		r 359	13
Worked		307	3
Dolomite, chiefly refractory grade		388	572
Gravel and crushed rock		45	8
Quartz and quartzite		16	36
Sand, excluding metal bearing		217	432
Sulfur:			
Elemental, all forms		722	616
Sulfur dioxide		8	1
Sulfuric acid		1,069	696
Talc, steatite, soapstone, pyrophyllite		288	313
Other nonmetals, n.e.s.:			
Oxides and hydroxides of magnesium, strontium, barium		7	2
Other, n.e.s		422	436
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural		21	40
Carbon black and gas carbon		1,273	1,236
Coal, coke, peat		r 12,269	4,414
Hydrogen, helium, rare gases		5	10
Petroleum refinery products:			
Gasoline	thousand 42-gallon barrels	114	740
Kerosine	do	37	51
Jet fuel	do	19	65
Distillate fuel oil	do	r 1,436	2,467
Lubricants	do	r 116	137
Other:			
Liquefied petroleum gas	do	109	127
Mineral jelly and wax	do	5	5
Pitch	do	(1)	(1)
Bituminous mixtures, n.e.s	do	7	3
Total	do	r 1,843	3,595
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals		295	514

r Revised.
1 Less than ½ unit.

COMMODITY REVIEW

Metals.—*Copper.*—Sociedade de Investigações Mineiras (SIMEIRA), founded with the Portuguese Compania União Fabril and the Swiss Société Anonyme du Chrome as shareholders, expected to start exploiting the copper deposits at Mavoio and Tetelo in 1974 with an initial investment of about $1.3 million. Ore reserves are estimated at 23 million tons. The copper deposits, located south of Maquela do Zombo in the Uige District of northern Angola, were expected to produce 20,000 tons of concentrate in 1974. The copper deposits known as the "Englishman's Mine" near Benquela were also planned for exploitation. A request to operate this mine was reportedly filed by a local company. DIAMANG was prospecting for copper in the Cunene District.

Gold.—A gold and silver deposit was discovered near the Loge River in the northern Luanda District. CML detected the presence of gold from surveys made in the Cassinga Area and planned an extensive exploration program. The company considers 10 grams per ton necessary to make the project feasible. Gold deposits were also discovered near the Cuito River at Maleo and at Mupupa in the Dirico zone of the Cuando-Cubango District. Angola's Department of Geology and Mines received an application for a mining concession from a firm headquartered in Benguela.

Iron Ore.—There was only a modest increase in CML's iron ore output in 1973. At Cassinga, 6 million tons per year of iron ore was being produced; at Companhia do Manganés de Angola's Cassala-Quitungo mines near Salazar, the output was nearly 2.5 million tons per year. During 1973, mining feasibility studies were completed on the medium-to-low-grade ores at Cassinga and Cassala-Quitungo. CML hopes to pelletize the 2 billion tons of low-grade (under 45% Fe) ore at Cassinga. Along with South

African, German, French, and British interests, CML planned to invest more than $80 million beginning in 1974, and by 1977 planned to pelletize half of Cassinga's annual production into pellets grading 64% Fe. The pelletizing plant at Cassinga will be financed by the South African Industrial Development Corp. and the Union Corp. (51%), and CML (35%), with the balance coming from Freid. Krupp Hüttenwerke AG of West Germany, Usinor of France, and the British Steel Corp.

It was announced that the iron ore deposits at Cassala and Quitungo may be mined by a group composed of a Japanese firm, C. Itoh & Co. Ltd., Companhia do Manganés de Angola, and the Portuguese Government. Ore reserves at Cassala and Quitungo are estimated at 43,700,000 and 48,400,000 tons, respectively. The ore is magnetite averaging 32.5% Fe. Plans are to open pit mine, producing 4.2 million tons of ore annually. A concentrator will produce 1,750,000 tons of 67.5% Fe for a pelletizing plant that will produce 1,800,000 tons annually. The project will be financed by C. Itoh & Co., and the pellets will be sold to Kawasaki Steel Co. Ltd. Work started on the project during 1973, and production was reportedly scheduled for 1976, by which time the extension to Luanda's mineral port is expected to be finished. Initial exports were planned to be about 2 million tons of iron ore pellets per year.

Nonmetals. — *Diamond.* — Approximately 70% of the diamonds mined in 1973 were gem stones. All diamonds were shipped to Portugal for processing, but only 25% of the foreign currency earnings from diamonds were reported as repatriated to Angola. DIAMANG retains producing areas totaling about 50,000 square miles on the northeastern Kasai River Basin and in the north-central Cuango Basin. Prospecting by the Consôrcio Mineiro de Diamantes (CONDIAMA), a consortium consisting of DIAMANG (45%), the South African firm De Beers Consolidated Mines Ltd. (45%), and the Angola Government (10%), continued operating in the concession areas received in 1971 when the former DIAMANG areas were redistributed.

Feldspar.—Two deposits containing feldspar, rock crystal (quartz), and other ores were located within 5 or 6 miles of the Caxito-Ambrizite road in the Luanda District. Applications were filed for exploiting two 247-acre reserves.

Marble.—Angola's marble deposits cover an area of 869 square miles. Four mines were operational, one each in Moçamedes, Nova Lisboa, Lobito, and Luanda. Domestic construction uses a substantial quantity of the marble produced.

Phosphate Rock.—An exclusive mining concession was granted to the Diversification and Development Fund (supported by the Coffee Institute of Angola) for exploration, exploitation, and commercialization of phosphate in the Zaire Districts. The zone of concession extends south of the Congo River to the 7°42′ parallel of south latitude, near Ambrizete. Prospecting was planned to start in 1974. A phosphate deposit was reportedly found about 30 miles from the Luanda-Catile road. Companhia dos Fosfatos de Angola (COFAN), of which the U.S. firm of Pickands-Mather and Co. is a large shareholder, discovered "large" reserves of phosphate in the Cabinda Area. The company has had prospecting and exploration rights since Nov. 22, 1968. COFAN hopes to invest $68 million in a phosphoric acid plant located at Cabinda and plans to export as much as $40 million worth of fertilizer products each year. A large complex was authorized to manufacture various types of agricultural fertilizers at Roger Williams, near Nova Lisboa in the central plateau region. Initially, production capacity was planned for approximately 220,000 tons per year. Production was planned to begin by 1977.

Salt.—Additional salt extraction was planned for Ngunga (7,000 tons per year) and Bahia Fanta (10,000 tons per year).

Mineral Fuels.—*Petroleum.*—The output of the deposits south of Luanda increased more than 300,000 tons during the first 9 months of 1973. ANGOL shipped the first crude oil (21,000 tons) from the Cuanza Fields to Brazil late in the year. Oil production in the Zaire Basin concession area of PETRANGOL-ANGOL increased substantially. This area offered scope for further expansion, and negotiations continued in 1973 with a number of companies for concessions in this sector.

ANGOL, with concessions in north and south Qunquela, Mulencos, and near Ambriz and the Cuanza River Basin, announced a $14.6 million oil prospecting program with technical assistance given by

the French TOTAL Oil Co. ANGOL-TOTAL has invested about $25.8 million in past Angola oil enterprises. In November 1973, the sounding ship *Pelican* arrived at Luanda to begin prospecting in the maritime zone of Ambriz for the ANGOL-TOTAL group. Using the *Pelican* at Ambriz to prospect was described as secondary to the land drilling effort expected by the ANGOL-TOTAL association. ANGOL was working with TEXACO in the Zaire interior region.

A new field, estimated to produce 4,000 barrels per day, was discovered by Cabinda Gulf near the mouth of the Zaire River. Cabinda Gulf was planning a 20-mile pipeline, mainly onshore, to bring the oil into the main tank area. Petrofina, operator for a group composed of PETRANGOL and private Portuguese interests, announced testing of an oil discovery located 12.4 miles south of Santo Antonio do Zaire, on the N'Zombo structure in the Zaire River Basin. The test indicated 2,000 barrels per day. Both wells, Gulf's offshore 84–13X well and PETRANGOL's N'Zombo onshore well, were producers from the Lower Cretaceous.[7]

All of the petroleum companies were expected to intensify activities in 1974. The total investment planned is $68.9 million. Requests for concessions south of Porto Amboim and near Moçamedes were near approval. The total crude petroleum production of Angola was expected to reach 9 million tons in 1974, including 7,500,000 tons produced by Cabinda Gulf and 1,200,000 tons by PETRANGOL and its associated companies.

The Luanda refinery supplied 55% of the gasoline needs and 23% of domestic oil needs for Angola in 1973. Angola continued to depend on foreign supplies for half of all its liquid fuels except fuel oil. The expansion of the Luanda refinery from 700,000 tons to 1 million tons started on Nov. 5, 1973, with inauguration of a new section.

MOZAMBIQUE

Mozambique's mineral production value for 1973 was estimated at $50.1 million;[8] however, the export base was still largely agricultural. The gross national product (GNP) exceeded $2.4 billion, and was 7% higher than the 1971 estimate (in current prices). A deficit of $8.7 million occurred in the balance of payments for 1973; this was a distinct change from the positive trade balance of $6.9 million achieved in 1972. As a result, foreign exchange and imports were severely rationed, a policy which discouraged investments. Capital repatriations were only permitted in installments, and were limited to 10% per year of the investment and liquid reserves.[9] At yearend 1973, Mozambique was carrying an external debt of more than $600 million. Mozambique also experienced an inflation rate of 10.4% in 1973, resulting in large part from the energy crisis caused by the Arab oil embargo. Gasoline rationing was instituted in November 1973. The Arab crude oil export restrictions posed problems for Mozambique both as a consumer and exporter of fuel. Mozambique's oil reserves were nearing a critical level at the end of 1973.

Much of Mozambique's mineral wealth still remains undeveloped. Great hopes for increased mineral development are pinned to the Cabora Bassa Dam project, which is expected to be finished in 1974–75. Cabora Bassa is the keystone to the development of an extensive network of mines and factories. Among the minerals located near the project are large reserves of coal, a 35-million-ton reserve of titaniferous magnetite, and deposits of manganese, nickel, copper, fluorspar, chrome, and asbestos. A steel industry and a fertilizer factory were planned. An aluminum industry was also in a preliminary study phase, utilizing the power from Cabora Bassa. With completion of the dam, an iron works is planned near Tete that will produce 250,000 tons of iron annually and 160,000 tons of titaniferous coke. Total investments of $79,239 were forecast for the iron works. An iron foundry was planned for Quelimane, capital of the Zambezia District, that will produce articles for domestic use. The foundry was expected

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[7] World Oil. Angola. V. 179, No. 3, Aug. 15, 1974, p. 128.

[8] Where necessary, values have been converted from Mozambique escudo (M. Esc) to U.S. dollars at the rate of M. Esc=US$0.039.

[9] U.S. Embassy, Lourenço Marques. State Department Airgram A-70, Apr. 5, 1974, 2 pp.

to cost about $198,098. A phosphoric acid plant was authorized for the Lourenço Marques District. An investment of about $19.8 million was visualized.[10]

Plans were made to expand and modernize the ore loading system at Beira for the expected increase in coal exports when the coal mines step up their production in 1975. The coal will be exported to Japan and Portugal. Major improvements in the Lourenço Marques port area were specified in the 6-year development plan, to begin in April 1974. The improvement in the port at Nacala was expected to be finished in 1974 and will permit ships up to 150,000 tons to dock. Work was underway on a planned expansion of the naval dockyard at Ponto-Dobelo in southern Mozambique. The terminal was scheduled for completion by 1977 and will be expanded to cope with the higher level of traffic expected, particularly the export of bulk ores and crops. It will accommodate up to 250,000-ton vessels. The Mozambique Road Authority invited tenders for road construction from the port of Antonio Enes to the Lake Niassa port of Meponda. The estimated cost was $37.2 million. When completed in 1979, the road will be the fourth tarred highway running from Mozambique's coast to the western hinterlands.

Official announcement of Mozambique's fourth development plan (1974–79) was made in late 1973. An acceleration in the growth of goods production and services was planned, with emphasis on intensified exploration of available natural resources and an increase in exportable goods. Private investments were allotted in the plan for mining development and amounted to $24 million, 1.1% of the $2.2 billion total (public and private) expenditures planned.[11]

Mozambique Government Decree No. 62/73 of Nov. 16, 1973, reorganized the Mozambique Department of Geology and Mines to permit the agency to better serve the expected increase in mining activity. The organization will operate from three regional offices: (1) The Regional Services of the North, located at Nampula and servicing the Zambezia, Moçambique, Cabo Delgado, and Niassa Districts; (2) the Regional Services of the South, with head office in Lourenço Marques, and servicing Lourenço Marques, Gasa, and Inhambane Districts; and (3) the Regional Services of the Center, located at Manica and servicing the Beira, Vila Pery, and Tete Districts.

An investigation by a French firm, which was started 4 years ago in northern Mozambique between the 13th and 16th parallels, was completed in 1973. The investigation cost $3.2 million and covered an area of 66,447 square miles, extending from Montepuez to Porto Amelia, along the coast to Moma and then to the Malawi border. The surveys included aerial magnetic, scintillometric, and geochemical investigations followed by ground traversing and mineral deposit mapping.[12] The technical reports and maps were expected in a short time. Several aerial photographic surveys were planned or completed in 1973. An area covering 222,390 acres was surveyed, including Matundo on the north bank of the Zambezi River. About $200,000 will be spent on a color photographic survey of about 62,100 square miles of the Zambezi River valley. The sum of $24,000 was allotted for an aerophotogrammetric study of the Lourenço Marques Region. Other investigations are taking place in the Pebane and Alto Ligonha Regions. A geological map at a scale of 1:250,000 is expected from these studies. A West German scientific team made a field study of marine placer deposits along the Mozambique coast. The results were not available at the time of this report.

Several prospecting concessions were requested in 1972.[13] Sociedade Mineira de Mutala, Lda. requested a concession for all minerals in the Zambezi District between 15°53'S, 15°59'S, and 37°57'E. Sociedad Mineira de Marropino Lda. requested a concession for all minerals except radioactive ores within the boundaries of 15°54'S and 16°03'S and 38°24'E and 37°57'E. Empresa de Minérios do Ultramar Ltd. (EMUL) requested a prospecting concession for copper, nickel, gold, and iron in the area located between 17°15'S, 33°20'E, and the Rhodesian border. The Sociedade Mineira de Mocubela, Lda., requested a prospecting

[10] Economia de Moçambique (Beira). Cimental dos Santos Analisa a Conjunctura Economica de Mozambique. (Economic Outlook of Mozambique). V. 10, No. 9, September 1973, p. 9.

[11] U.S. Embassy, Lourenço Marques. State Department Airgram A–11, Jan. 25, 1974, 2 pp.

[12] Mining Annual Review. Mozambique. June 1974, p. 355.

[13] Boletim Oficial de Moçambique (Lourenço Marques). Actividade Nas Minas E Pedreiras Em 1972. (Mining and Mineral Activity in 1972). V. 3, No. 115, Oct. 2, 1973. Pp. 1–34.

concession for all minerals except radioactive ores in the Zambezi District between 16°03'S and 16°12'S, and 38°03'E and the River Melela. Prospecting concessions for all minerals except petroleum products and diamonds were held by Companhia Moçambicana de Minas S.A.R.L. (COMOCMIN) in several areas near the Zambezi River and the Malawi frontier.

PRODUCTION AND TRADE

Excluding sand and gravel, clays, and refinery products, the mineral commodities produced in 1973 were valued at $27.2 million. The principal commodities produced are shown in table 4. The value of petroleum refinery products for 1973 amounted to $22.9 million. Cement ($18.3 million), lime ($2.8 million), and granite and quarry stone ($2.1 million) were the other principal commodities produced. Columbium-tantalum minerals ($647,227) and sea salt ($744,849) were also important. In general, Mozambique's industrial production increased about 10% in 1973 to an estimated $540 million.[14] Some industries such as cement (up 41%) registered a sizable increase in 1973.

Much of Mozambique's coal production was used locally, but future plans to expand the industry included an expanded foreign market. The Moatize coal mines will be able to sell all the coking coal it can produce until 1976. Mozambique planned to export 1 million tons per year to the South African Iron and Steel Industrial Corp. (ISCOR) and 400,000 tons to Japan initially, but eventually planned to export 4 million tons per year. Companhia Carbonífera de Moçambique (CCM) was reportedly expected to conclude a contract with the Portuguese Antonio Campalimaud group to supply about 900,000 tons per year of coal. CCM was also approached by a West German group interested in buying 8 million tons per year of coal.[15]

The only significant nonagricultural exports were gasoline, fuel oil, and asphalts produced by the Lourenço Marques refinery. In 1973, oil products accounted for 6.5% of the total exports, which were valued at $353.6 million. Of the Portuguese territories, Mozambique was most affected by the oil crisis. The price of fuel increased locally by 200% compared with prices in January 1973. In 1973, most of its crude oil was imported from Iraq (787,847 tons of the total 836,224 tons). The Sociedade Nacional de Refinação de Petroleos, S.A.R.L. (SONAREP) refinery at Lourenço Marques operated at maximum capacity. Refined products (424,917 tons) were exported to the Republic of South Africa, Southern Rhodesia, and Swaziland. Plans to expand this installation were abandoned.[16]

Mineral export trends suffered no radical changes during 1973. Minerals exported were, in order of importance, coal, columbium-tantalum, copper concentrate, semiprecious stones, fluorspar, bentonite, asbestos, and mica. Mozambique's main export customers were Portugal (38%), the United States (13%), Republic of South Africa (8%), India (8%), and the United Kingdom (5%). Exports to Japan showed a notable drop in the first half of 1973. This was related to a decision by Japanese Snomitono Shiji Co. to renounce its exploitation of an iron mine in the Portuguese territory.[17] The Republic of South Africa supplied 14% to 15% of Mozambique's imports, and was second only to Portugal. Statistics on foreign trade are shown in tables 5 and 6.

COMMODITY REVIEW

Metals.—*Bauxite.*—An investigation into the bauxite deposits at Marondo Mountain was planned to define the commercial reserves and type of mining required.

Copper.—Progress in developing the Edmundian mine was made by the Edmundian Investments (Pty.) Ltd. in the Vila Pery District. Plans were made for producing 6,000 tons of copper concentrate per year. Francesco Gibelino held a concession for copper mining at Chidue in the Tete District. Plans were made for copper prospecting in the Fingoe Series (especially in the Chindue Area), and in the Manica Series. Emilio Manuel dos Santos made a request for a copper and nickel concession in the Lourenço Marques District at Namaacha.[18]

Gold.—The ancient Bragança gold mine was reopened. The mine had been flooded since 1919. A gold deposit was discovered

[14] U.S. Embassy, Lourenço Marques. State Department Airgram A–110, June 28, 1974, 8 pp.
[15] Mining Journal (London). Mozambique Coal Attracts Buyers. V. 282, No. 7222, Jan. 18, 1974, p. 38.
[16] Afrique-Asie (Paris). Impact and Limits of the Embargo. V. 4, No. 17, February 1974, p. 26.
[17] Le Moniteur Africain (Dakar). Japan and Africa; Small Aid But "Aggressive" Trade. Feb. 28, 1974, pp. 13–16.
[18] Work cited in footnote 13.

in Manica County in the Vila Pery District. Mining concessions for gold included those held in the Vila Pery District by the Companhia Mineira Aurifera Monarch, Lda. (Monarch mine), and by Mario Poskievich Chikara (Boa Esperanca mine); and those held in the Tete District by Bernardo Lourenco Casal (Fundão mine), and Irene A. dos Santos Lopes (Metosso ou Catao mine), both of which are located near Macanga.[19] In the Zambezia District, the Empresa Mineira do Alto Ligonha S.A.R.L. held a gold mining concession on the Naculúe mine.

Iron Ore.—Companhia de Urâno de Moçambique S.A.R.L. completed its evaluation of titaniferous iron ore deposits of the Tete District. Hondeminas continued drilling the extensive Honde River iron deposits. Iron mining concessions in force as of Dec. 31, 1972,[20] included the Chaca mine in the Mozambique District held by Maria v.m.r. da Silveira. In the Niassa District, an iron mining concession was requested by Maria Antunes Gil near Comandante Augusto Cardoso. Several concessions for mining

[19] Work cited in footnote 13.
[20] Work cited in footnote 13.

Table 4.—Mozambique: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Aluminum, bauxite, gross weight	7,713	5,419	5,594
Beryllium, beryl concentrate, gross weight	13	8	1
Bismuth, mine output, metal content	[r] 2	3	--
Columbium and tantalum, ore and concentrate, gross weight:			
Columbite-tantalite	59	54	--
Microlite	15	61	56
Tantalite	--	42	29
Copper ore and concentrate:			
Gross weight	1,654	706	954
Metal content	414	176	238
Gold, mine output, metal content, troy ounces	19	5	--
NONMETALS			
Abrasives, natural, garnet, kilograms	1,744	--	--
Asbestos	1,430	534	566
Cement, hydraulic, thousand tons	[r] 416	468	611
Clays:			
Bentonite, including montmorillonite	6,374	8,315	3,844
Kaolin, including china clay	1,726	1,838	175
Feldspar	--	295	--
Fluorspar	8,218	1,429	--
Gem and ornamental stones:			
Amazonite, kilograms	3,500	--	--
Beryl crystals, do.	143	10	30
Obsidian, do.	244,150	139,000	--
Tourmaline, do.	3,000	1,000	--
Lime	9,230	6,992	9,664
Lithium minerals, lepidolite	700	10	--
Mica, mainly scrap	950	230	--
Salt:			
Marine	[r] 27,743	31,217	41,367
Rock [e]	20	20	20
Sand, quartz	6,813	--	--
Stone:			
Limestone, thousand tons	646	991	1,060
Granite and other quarry, n.e.s., do.	761	872	946
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous, do.	329	336	394
Petroleum refinery products:			
Gasoline, thousand 42-gallon barrels	1,113	1,020	1,068
Kerosine, do.	328	250	171
Jet fuel, do.			307
Distillate fuel oil, do.	[r] 1,451	1,469	1,242
Residual fuel oil, do.	[r] 2,377	2,182	2,242
Other:			
Asphalt, do.	201	226	241
Liquefied petroleum gas, do.	153	175	177
Refinery fuel and losses, do.	848	681	NA
Total, do.	[r] 6,471	6,003	NA

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] In addition to the commodities listed, other varieties of crude construction materials (clays, sand, gravel, and stone) may be produced for local use, but information is inadequate to make reliable estimates of output levels.

Table 5.—Mozambique: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Columbium and tantalum minerals	[1] 144	1
Iron and steel semimanufactures	NA	393
NONMETALS		
Asbestos	[1] 239	NA
Cement, hydraulic	[1] 20,509	1,780
Clays, crude bentonite	[1] 4,671	2,036
Gem stones, except diamond ---kilograms	[1] 2,100	13,000
Salt	[1] 7,051	7,185
MINERAL FUELS AND RELATED MATERIALS		
Coal	[1] 53,949	55,386
Petroleum refinery products:		
Gasoline ---thousand 42-gallon barrels	449	371
Jet fuel and kerosine ---do---	591	61
Distillate fuel oil ---do---		2,073
Residual fuel oil ---do---	1,962	1,820
Other:		
Liquefied petroleum gas ---do---	NA	54
Asphalt, bitumen, petroleum coke ---do---	NA	108

NA Not available.
[1] Data for 11 months (January–November) only.

Table 6.—Mozambique: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, including alloys, all forms	[1] 590	715
Copper metal, including alloys, all forms	[2] 186	NA
Iron and steel semimanufactures [3]	92,010	77,003
NONMETALS		
Cement, hydraulic	NA	33,336
Fertilizer materials, manufactured	37,215	34,250
Sodium and potassium compounds, caustic soda	3,334	2,370
MINERAL FUELS AND RELATED MATERIALS		
Coal, anthracite and bituminous	368,939	255,577
Petroleum:		
Crude ---thousand 42-gallon barrels	6,228	5,784
Refinery products:		
Gasoline ---do---	183	121
Kerosine ---do---	213	232
Jet fuel, distillate fuel oil, residual fuel oil ---do---	757	942
Lubricants ---do---	111	62
Other ---do---	NA	31

NA Not available.
[1] Excludes pipes, tubes and fittings, which was not reported in source.
[2] Data for 11 months (January–November) only.
[3] Partial figure, but believed to represent by far the largest part of the total.

hematite and magnetite were requested and granted near Manica in the Vila Pery District.

Uranium.—Twelve requests for working radioactive ore deposits located in various parts of the territory were made to the Department of Geology and Mines early in 1973. Uranium occurs in Zambezia, Ribaue, Nampula, and in Chimaninani, as well as in the Tete District. The Sociedade Mineira de Marropino Lda. signed a contract with the Junta for Nuclear Energy granting the company exclusive uranium mining rights in Zambezia. Mining concessions in force in December 1972 for radioactive minerals in the Tete District included the Mavuzi mine of Entreposto Comercial de Moçambique S.A.R.L. and the Catipo mine of Minas do Catipo, Lda., both located at Moatize.

Nonmetals.—*Apatite.*—The occurrence of apatite in the Milange Area was under investigation.

Asbestos.—Minas Gerais de Moçambique outlined extensive near-surface deposits of excellent-grade anthophyllite in the ultrabasic rocks of Mavita in central Mozambique. A crushing and sizing plant was under construction and was expected to

begin producing in 1974. A pilot plant processing 10 tons per day has been in operation.

Cement.—A surplus of cement is expected in 1975 when the Cabora Bassa Dam is completed. At that time, Mozambique's production capacity is expected to be about 1.2 million tons per year, whereas consumption is not expected to exceed 600,000 tons. There are three cement factories, with a fourth under construction: (1) Matola at Lourenço Marques has a capacity of 820,000 tons; (2) Nova Maceira in Beira has a capacity of 506,000 tons; and (3) a third in Nacala, which also produces white cement, has a capacity of 100,000 tons.

Clays.—Kaolin.—A $1.2 million expansion of the porcelain mosaic factory of the Ceramica Brazil-Mozambique Co. was planned. The factory started operating in August 1973 at Lourenço Marques. It is hoped that, when expansion is complete, the kaolin presently supplied by Brazil will be replaced by the porcelain clay found in the Tete District, or from neighboring Swaziland. The investment for the expansion is from Brazilian entrepreneurs. A new ceramics factory, with a capacity of 3,500 tiles daily, was planned for Vila Cabral, capital of Niassa District. The factory is expected to cost about $79,239.

Diamond.—Companhia de Diamantes de Moçambique, S.A.R.L. (DIAMOC) held a prospecting concession for diamonds in the Tete District.

Diatomite.—Diatomite concessions were held in the Lourenço Marques and Gaza Districts, but no production was recorded for 1972 or 1973. The Diana mine, held by Kieselguhr, Lda., and the Marina mine, held by A.B. Frasco, are located in the Lourenço Marques District; the Concha mine, held by A.B. da Costa, is located in the Gaza District.

Fluorite.—Companhia Mineira de Tete, S.A.R.L. (CMT) was incorporated in 1973 with initial capital of $400,000, subject to an increase to $2 million. Participants in CMT, which proposes to mine fluorite in the Tete District, are the U.S. Bethlehem Steel Corp. and several subsidiaries; Companhia Mineira do Lobito, S.A.R.L., (CML), (Angola); Companhia de Urânio de Moçambique, S.A.R.L.; Finmine, A.G., and Montecatini-Edison S.p.A. (Montedison), (Italy). Prospecting in the area was previously conducted by CML, which spent approximately $400,000. The exclusive mining rights include all minerals except radioactive minerals, petroleum products, coal, and diamond in two areas in the vicinity of Djanquire (Chioco), 16°20'S and 32°40'E, and Domba (Changara), 16°40'S and 33°10'E. CMT is obligated to spend at least $360,000 for prospecting in the first 3 years. The Government receives 10% of all shares issued by CMT and charges a tax of 50% on net profits when exploitation begins. CMT will also pay a 3% minerals tax on the value of minerals produced in the first 5 years, and 6% after 5 years. The contract is subject to renegotiation after 15 years and every 10 years thereafter.

Interminas-Fluorites de Moçambique, S.A.R.L. completed a drilling program in its fluorite concessions at Canxixe in central Mozambique.

Mica.—In the Zambezia District, the center of a large pegmatite area, Empresa Mineira do Alto Ligonha, S.A.R.L. was showing a renewed interest in mining mica, kaolin, tantalite, and bismuthinite. A reassessment of the mica reserves in the area was carried out during 1973 with the help of the Government Department of Mines and Geology. Encouraging results were reported.

Semiprecious Stones.—The production of semiprecious stones continued to increase. A deposit of semiprecious stones was discovered in the Zambezia District, about 25 miles from Gile. Tourmaline of excellent quality and an unusual range of colors occurs in the Alto Ligonha area and, south of these deposits, two emerald mines have come into significant production. Two deposits of garnet of unusual light-red and purplish-red color were mined with steady production.

Mineral Fuels.—*Coal.*—CCM, the only company currently mining coal in Mozambique, produced 394,195 tons of bituminous coal in 1973. CCM applied for concession land adjacent to its mine in Moatize. It is currently considering underground and/or open pit exploitation to raise the total annual production to 2 to 3 million tons. The bulk of the coking coal was intended for sale to Japan on long-term contract. Forty percent of the coal production is not of coking quality. The Zambezi Plan Bureau has been studying areas along the Zambezi River. All of these areas were open to interested companies, except that reserved for

COMOCMIN, a company associated with Johannesburg Consolidated Investment Co., Ltd. (JCI) in an area between the Sanangoé and Mefidze Rivers. The most promising areas are reportedly between the Mucanha and Vuzi Rivers, on the northern bank of the Zambezi, and between the Mucanha River and Chicoa in the Tete District. There are other deposits yet to be evaluated in Catur (13°45'S, 35°37'E) and in Maniamba (12°43'S, 35°26'E) in the Niassa District. These deposits can be serviced by railroad to Nacala. Coal is also found in the Vila Pery District at Espungabera (20°28'S, 32°46'E) near the Rhodesian border, but infrastructure to remove it is lacking. The mineral-rich border district of Tete is expected to export over 8 million tons of coal annually when operations are in full swing.

Petroleum and Natural Gas.—A 372.6-mile-long natural gas conduit was planned from the Pande deposit in the Inhambane District to Lourenço Marques, and was expected to cost $118.6 million. When the pipeline is finished, the gas is expected to be exported to the Republic of South Africa. Gulf-Amoco was in the process of abandoning the Pande gasfield in 1973. The South African firm of Southern Oil Exploration Corp. (Pty.) Ltd. (SOEKOR) was interested in the field, but the possibility of producing fertilizers locally was also being considered. The Socidade de Estudos e Investimentos S.A.R.L. (Grupo Champalimaud) was also interested in the Pande gasfield and planned to build a complex to make ammonia for use in fertilizers from the Pande gas.[21]

At the end of 1973, several international oil companies were showing renewed interest in exploration in Mozambique. According to the Mozambique Department of Geology and Mines, the renewed interest in petroleum exploration in Mozambique was caused by three factors: (1) A rise in petroleum prices; (2) new exploration techniques; and (3) promising geological indications.

Hunt International Petroleum Co. requested an extension on its exploration permit. The petroleum prospecting vessel *Lady Christine* was operating off Pande. A French geological survey company, Compagnie Generale Geophysique (CGG) was engaged by Hunt International to undertake a geophysical study using the *Lady Christine*. Two U.S. firms, TEXACO and Kilroy, as well as SOEKOR had filed for concessions. The Department of Geology and Mines reported in December 1973 that SOEKOR had been given prospecting rights. The U.S. firm Imperial was invited to consider a concession in the Mozambique and Zambezia Districts. Kilroy expected to prospect for petroleum in the area near Beira, and TEXACO was to prospect in the Cabo Delgado District and Inhambane in the Ponto do Ouro Area. SOEKOR planned to prospect for petroleum in the area near Beira. Kilroy, SOEKOR and TEXACO formed a consortium in the Lourenço Marques and Joao Belo District.[22]

Sociedade Nacional de Refinação de Petróles, S.A.R.L. (SONAREP) hoped to increase the 64,000-barrel-per-day production of its refinery in Matola. The Lourenço Marques refinery has a capacity of 800,000 tons of crude oil per year. Plans to boost its capacity to 2.5 million tons per year were being postponed as a result of the oil crisis and general economic and political problems.

PORTUGUESE GUINEA

The fourth development plan (1974–79) was announced in 1973. Investments for Portuguese Guinea from 1974 to 1976 were forecast to reach a total of $27.6 million.[23] Exploration of the maximum potential of natural resources was listed as one of the principal objectives. Exxon was reportedly undertaking oil exploration in offshore waters of the Nation, which has been renamed Guinea Bissau.

[21] Economia de Moçambique (Beira). Estudios e Comentários—As Prospesções de gás e petróleo em Moçambique (Studies and Comments—The Gas and Oil Prospects in Mozambique). V. 11, No. 3, March 1974, p. 25.

[22] Work cited in footnote 21.

[23] Actualidade Economica (Luanda). Fourth Development Plan for Portuguese Territories. Dec. 27, 1973, pp. 47–57.

OTHER PORTUGUESE POSSESSIONS

Oil was reportedly discovered in São Tomé e Principe by the Portuguese and the concession given to a British firm.[24]

[24] L'Essor (Bamako). Excerpts from Interview with MLSTP (Liberation Movement In São Tomé e Principe) General Secretary Pinto da Costa. June 15, 1973, pp. 1, 4.

The Mineral Industry of Argentina

By Ronald F. Balazik [1]

Argentina is one of the most industrialized nations of South America, but its mineral industry accounts for only about 5% of the gross domestic product (GDP). Consequently, Argentina is heavily dependent on mineral imports despite the rapid modernization of its mining technology in recent years.

In December 1973, President Peron announced the adoption of a 3-year economic development plan. The plan proposes several programs for Argentina's mineral industry, particularly in the copper, petrochemical, and steel sectors. Most of the programs are directed toward three goals: National self-sufficiency, expansion of production for export, and country wide integration of facilities.

In November 1973, the Government promulgated a new mining promotion law. The law, which supersedes 1972 legislation, provides the basis for establishing a multifaceted promotional system to increase mineral exploration and production. The principal change from the previous legislation is a provision that limits major benefits of the law to firms with over 80% of company assets owned by Argentine nationals.

The Argentine Congress also passed a law governing foreign investments within the country. The law prohibits foreign investment in the mining industry without prior approval of the Congress. Foreign firms are defined by the law as companies with 50% to 100% foreign capitalization.

The Government began negotiations with several countries to promote programs in various sectors of the mining industry. The countries involved in these negotiations included Bolivia, Czechoslovakia, Italy, Spain, and the Soviet Union. The negotiations focused on the construction of new facilities, technical assistance, and purchases of mining equipment.

PRODUCTION

Production levels of most mineral commodities during 1973 did not vary greatly from those of 1972. However, production of washed coal reportedly decreased 50%, and natural gas output increased significantly.

[1] Geographer, Division of Fossil Fuels—Mineral Supply.

Table 1.—Argentina: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Antimony, mine output, metal content ——kilograms——	14,000	21,060	[e] 25,000
Beryllium, beryl concentrate, gross weight	[r] 253	84	[e] 270
Bismuth, mine output, metal content ——kilograms——	210	--	[e] 500
Chromium, chromite, gross weight	300	[e] 300	[e] 300
Columbium-tantalum, columbite-tantalite concentrates, gross weight ——kilograms——	[r] 5,025	--	--
Copper:			
Mine output, metal content	[r] 505	1,134	[e] 1,200
Smelter output [e]	[r] 40	[r] 80	80
Iron and steel:			
Iron ore and concentrate, gross weight ——thousand tons——	282	231	218
Pig iron ——do——	[r] 861	849	804
Ferroalloys, electric furnace ——do——	[r] 23	35	[e] 42
Crude steel ——do——	1,913	1,900	1,940
Semimanufactures ——do——	[r] 4,046	4,934	[e] 4,900
Lead:			
Mine output, metal content	39,888	37,718	36,000
Smelter	[r] 43,800	45,000	37,800
Manganese ore and concentrate, gross weight	13,772	11,186	[e] 11,000
Silver, mine output, metal content ——thousand troy ounces——	3,179	2,122	[e] 2,500
Tin, mine output, metal content ——long tons——	700	542	[e] 550
Tungsten, mine output, metal content	[r] 174	88	[e] 70
Uranium, mine output, U_3O_8 content ——kilograms——	[r] 37,985	37,007	38,000
Zinc:			
Mine output, metal content	[r] 43,863	44,781	40,700
Smelter	33,500	39,200	37,100
NONMETALS			
Abrasives, natural, n.e.s., garnet	--	--	NA
Asbestos	393	908	[e] 1,000
Barite	[r] 21,260	23,265	[e] 25,000
Boron minerals, crude	59,984	52,438	NA
Cement, hydraulic ——thousand tons——	5,553	[2] 5,445	[2] 5,181
Chalk	78,281	64,744	NA
Clays:			
Bentonite	85,969	87,608	[e] 90,000
Foundry earth	2,562	1,300	NA
Fuller's earth (decolorizing clay)	937	479	[e] 500
Kaolin	[r] 68,485	89,321	[e] 90,000
Refractory	[r] 142,175	145,156	NA
Other ——thousand tons——	[r] 2,001	1,487	NA
Diatomite	9,587	10,767	[e] 9,600
Feldspar	[r] 36,726	64,230	[e] 64,000
Fertilizer materials:			
Crude, natural phosphates (guano)	594	410	NA
Manufactured, nitrogenous	87,250	95,126	
Ammonia, anhydrous	3,812	4,778	
Fluorspar	72,334	60,177	[e] 60,000
Graphite	147	25	[e] 150
Gypsum, crude	[r] 507,559	508,044	[e] 508,000
Lithium, spodumene and amblygonite, gross weight	81	49	[e] 50
Mica:			
Sheet	[r] 160	116	[e] 120
Waste and scrap	[r] 3,095	2,094	[e] 2,100
Pigments, natural mineral, ocher	256	264	NA
Pumice and related volcanic materials	[r] 18,978	32,525	[e] 19,000
Rhodochrosite	81	135	NA
Salt:			
Rock ——thousand tons——	3	1	NA
Solar ——do——	[r] 821	1,003	NA
Total ——do——	824	1,004	NA
Sand and gravel:			
Sand:			
Construction ——do——	[r] 10,900	11,610	NA
Silica sand (glass sand) ——do——	153	168	NA
Gravel ——do——	8,414	4,490	NA
Stone:			
Dimension:			
Flagstone	[r] 83,754	51,633	NA
Granite	19,554	25,658	
Marble and other calcareous, n.e.s	[r] 25,383	20,162	
Sandstone ——thousand tons——	[r] 72	1,419	

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
NONMETALS—Continued			
Stone—Continued			
Crushed, broken, and unspecified:			
Basalt ---thousand tons	[r] 3,097	3,744	
Calcite, nonoptical ---do	16	4	
Dolomite ---do	200	216	
Granite, crushed ---do	[r] 6,687	6,527	
Limestone ---do	[r] 12,333	13,000	NA
Marble rubble ---do	[r] 82	193	
Quartz ---do	62	92	
Quartzite ---do	1,497	1,175	
Serpentine ---do	[r] 36,827	45,597	
Shell marl ---do	92,990	52,646	
Strontium minerals, celestite	2,137	1,096	[e] 1,100
Sulfates, natural:			
Aluminum (alum)	10,501	12,646	
Iron (melanterite)	903	150	NA
Magnesium (epsomite)	1,458	--	
Sodium (mirabilite)	[r] 20,406	19,470	
Sulfur, elemental, refined	38,182	42,210	32,800
Talc and related materials:			
Pyrophyllite	7,263	8,325	NA
Steatite	5,661	3,225	NA
Talc	[r] 36,863	25,488	[e] 40,000
Vermiculite	4,288	4,148	[e] 4,000
Zeolite	60	85	NA
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	2,679	5,562	NA
Carbon black [e]	30,000	30,000	30,000
Coal, bituminous ---thousand tons	632	694	675
Coke, all types, including breeze ---do	474	[e] 475	[e] 476
Gas, natural:			
Gross production ---million cubic feet	[r] 286,651	277,643	314,807
Marketed ---do	[r] 228,121	218,350	[e] 235,000
Natural gas liquids:			
Natural gasoline ---thousand 42-gallon barrels	3,088	[e] 3,000	
Butane ---do	3,623	4,094	NA
Propane ---do	3,200	3,171	
Total ---do	9,911	[e] 10,265	[e] 10,000
Peat, agricultural	3,985	6,431	NA
Petroleum:			
Crude oil ---thousand 42-gallon barrels	[r] 154,509	158,462	153,729
Refinery products:			
Gasoline ---do	37,132	38,306	39,959
Jet fuel ---do	2,753	2,820	8,225
Kerosine ---do	5,847	5,836	5,692
Distillate fuel oil ---do	41,651	41,609	41,289
Residual fuel oil ---do	58,364	59,148	49,302
Lubricants ---do	1,062	1,544	1,723
Other:			
Liquefied petroleum gas ---do	[r] 9,645	10,252	10,108
Naphtha ---do	4,806	NA	NA
Asphalt ---do	4,431	3,824	3,214
Petroleum coke ---do	2,393	2,553	2,327
Unspecified ---do	418	2,856	15,989
Refinery fuel and losses ---do	[r] 8,745	7,975	
Total ---do	[r] 177,247	176,723	177,828

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

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

[2] Does not include white cement.

TRADE

Argentina's mineral industry continued to exhibit an unfavorable balance of trade in 1973. The trade balance was most adversely affected by substantial increases in imports of crude and refined petroleum. The total value of mineral trade was derived principally from commodities in the mineral fuels and metallic minerals sectors.

Detailed trade data for 1972 and 1973 were not available at the time that this chapter was written. The latest trade statistics available are those for 1971, and are contained in the 1972 Minerals Yearbook chapter.

COMMODITY REVIEW

METALS

Aluminum.—Construction of Argentina's first aluminum smelter was nearly completed at Puerto Madryn by yearend 1973, but full-scale operation of the facility was not planned until 1975. The 140,000-ton-per-year smelter, built with Italian technical assistance at a cost of $150 million,[2] is owned by ALUAR, S.A., a private Argentine firm. Under a long-term contract with ALUAR, Alcoa of Australia Ltd. tentatively scheduled deliveries to the smelter of 280,000 tons of alumina annually beginning in 1975. Full-scale production at the plant was hindered by delays at the Futaleufu hydroelectric project, which was to provide the power vital to smelter operations. The Futaleufu project, located about 500 kilometers west of Puerto Madryn, was rescheduled for completion by early 1975. ALUAR planned to install two temporary 27-megawatt gas turbogenerators in 1974 for small initial operations until power from the Futaleufu powerplant is available.

Copper.—During 1973, Compañía Minera Aguilar S.A. (CMA), a subsidiary of St. Joe Minerals Corp., formulated plans for an international combine to finance development of the Pachon porphyry copper deposits in San Juan Province. Cost of development is estimated at $200 million, and commercial open pit production is expected to begin by 1980. A 220-kilometer all-year road was completed during 1973, and preparations for an ore-concentration pilot plant were underway at yearend. Pachon reserves were revised upward to 550 million tons of ore grading 0.65% copper and 0.015% molybdenum. The deposits apparently could make Argentina self-sufficient in copper and may produce a surplus for export, but additional exploration and metallurgical work was underway at yearend to conclusively prove reserve estimates.

Several other copper exploration and development ventures also were underway in 1973. In addition to its Pachon effort, CMA conducted exploration activities in Mendoza and Neuquen Provinces, where large deposits of copper and molybdenum are believed to exist. A consortium of Shell Oil Company and Placer Development Ltd. reportedly reached an agreement in principle for a copper-exploration contract with Fabricaciones Militares, a complex of industrial firms operated by the Argentine Armed Forces. Noranda Mines Ltd. discovered some copper deposits in western Argentina and was preparing for further exploration by yearend. Falconbridge Copper Ltd. continued its exploration work, but suspended operations under a 1971 contract to determine the feasibility of working disseminated porphyry deposits in western Argentina.

Iron and Steel.—During 1973, the Government authorized Sociedad Mixta Siderúrgica Argentina (SOMISA), the state-owned steel concern, to begin a 5-year program for increasing output of steel products from 2.5 million tons to 4 million tons per year. Cost of the expansion program is estimated at $200 million. The Government withdrew approval of expansion plans for Propulsora Siderúrgica S.A., a privately owned company, to accommodate the SOMISA program.

Hierro Patagónico de Sierra Grande S.A. (Hipasam), a government-controlled steel company, began to award major construction contracts in 1973 for its 2-million-ton-per-year magnetite ore concentration plant in Rio Negro Province. The plant, which reportedly will be the largest of its kind in the world, is part of a $130 million mining, concentration, and pelletizing complex under development. Construction of the plant was expected to cost $25 million and was scheduled for completion by 1975. SOMISA was expected to receive most of the output from the new plant.

In early 1973, SOMISA signed a contract with the Corporación Minera de Bolivia (COMIBOL) for 50,000 tons of iron ore from Bolivia's Mutún deposits. The shipment will be used to test the suitability of

[2] Where necessary, values have been converted from Argentine pesos (M$N) to U.S. dollars at the rate of M$N5.00=US$1.00.

Mutún ore for SOMISA's operations. If the ore proves satisfactory, a second shipment of 100,000 tons will be arranged, possibly as part of a continuing supply from Bolivia.

Lead and Zinc.—Mining operations at the CMA lead and zinc mine were halted by a labor strike for 2 weeks in November 1973. The strike involved 1,500 workers, but ended when a company-union agreement granted increased wages as well as additional worker benefits. Some mine property was reportedly damaged during the strike by riots and sabotage, but CMA smelters continued to operate by utilizing reserve supplies of lead and zinc concentrates.

Uranium.—Comisión Nacional de Energía Atómica (CNEA), the Government agency responsible for uranium exploration and production, reportedly discovered a new uranium deposit. Reports indicated that the deposit, located near San Rafael in Mendoza Province, could yield over 400 tons per year of uranium concentrate. Prior to the reported discovery, the Government claimed proved reserves of U_3O_8 totaling 16,000 tons.

Argentina's Atucha nuclear power station, the first atomic powerplant in Latin America, was nearly operational at yearend. The 319-megawatt facility, located about 95 kilometers northwest of Buenos Aires, will receive its uranium supply from deposits at Sierra Pinada in Mendoza Province. Reportedly, uranium from Sierra Pinada is also slated for export by the Government.

In 1973, the Government awarded construction contracts for its second nuclear powerplant to Atomic Energy of Canada Ltd. (AECL) and Italimpianti, of Italy. The planned 600-megawatt facility, located approximately 550 kilometers northeast of Buenos Aires, will cost about $270 million and will be fueled by domestically mined uranium. AECL will provide the nuclear components required; Italimpianti will supply the conventional equipment, such as turbines and generators.

NONMETALS

Cement.—Six companies operated 16 cement plants with a combined estimated annual capacity of 7,353,600 tons. Cia. Sudamérica de Cemento Portland Juan Minetti e Hijos S.A. continued work on a new cement plant with a design capacity of 440,000 tons per year. The plant was scheduled to be fully operational by yearend 1974.

Fertilizer Materials.—The Government commissioned a study to determine the feasibility of constructing a phosphate plant to supply Petrosur, the sole producer of chemical fertilizer in Argentina. If construction is approved, the plant is tentatively scheduled to begin operations by 1976. The Government also conducted negotiations concerning the construction of a fertilizer plant in Bolivia. Planned capacity of the plant would be 1,000 tons of ammonia and 1,500 tons of urea annually, which Bolivia would sell to Argentina.

MINERAL FUELS

Coal and Coke.—Production of washed coal reportedly decreased 50% during 1973. All production came from the Río Turbio Area in far-southwestern Argentina, where the only active coal mine is located.

In 1973, Yacimientos Carboníferos Fiscales (YCF), the Government coal mining entity, prepared a feasibility study to increase gross production at Río Turbio to 3 million tons annually. Such an increase apparently would satisfy Argentina's entire domestic coal requirements. However, YCF also planned studies for increasing output of up to 5 million tons of coal per year. In addition, Government planning was under way at yearend for foreign participation in the exploitation of the Río Turbio deposits.

Petroleum and Natural Gas.—Argentina's crude oil output in 1973 decreased to 421,000 barrels per day, a decline of 3% from the record high production of that of 1972. Yacimientos Petrolíferos Fiscales (YPF), the Government petroleum agency, produced 71% of the total output. Private companies holding contracts with YPF first granted under the 1967 Hydrocarbons Law accounted for 28% of production; the largest of these companies are owned by U.S. firms. The remaining output was produced by private firms operating under earlier agreements with the Government.

According to government data, natural gas output rose 13% to a record high of 862 million cubic feet per day. YPF was responsible for 81% of the production.

Total proved reserves of crude oil in 1973 were reported to be approximately 2.5

billion barrels. Natural gas reserves of about 6,997 billion cubic feet were also reported.

Geologic and geophysical surveying, and oil and gas drilling activities were as follows:

		1971	1972	1973
Geologic and geophysical surveying:				
Geologic	party months	90.0	84.0	NA
Gravimetric	do	15.5	14.0	NA
Magnetic	do	--	--	NA
Seismic	do	276.0	284.5	NA
Total	do	381.5	382.5	NA
Drilling, wells drilled:				
Exploratory:				
Oil	number	NA	r 91	116
Gas	do	NA	r 38	34
Dry	do	NA	r 161	185
Total	do	r 312	r 290	335
Development:				
Oil	do	NA	266	207
Gas	do	NA	14	14
Dry	do	NA	45	29
Total	do	r 284	r 325	250
Total wells drilled	do	r 596	r 615	585

r Revised. NA Not available.

Total footage drilled in 1973 declined slightly to 4,137,939 feet. Development drilling decreased about 10% to 3,098,612 feet. YPF accounted for all but six of the exploration wells drilled. Affiliates of Amoco Oil Co., Cities Service Co., and Shell Oil Co. were responsible for the remaining exploration drilling.

By yearend 1973, YPF had developed an ambitious oil exploration and development plan to increase petroleum output. The plan called for drilling 620 new wells in 1974 and included the expenditure of $600 million on oil exploration and development.

Late in 1973, YPF was preparing to begin a new drilling program offshore of Santa Cruz Province and the island of Tierra del Fuego. Drilling will be done in water 20 to 200 meters deep. YPF reportedly has purchased deep-drilling equipment from the Soviet Union and drilling rigs from Romania.

A new seismic survey system never before employed in Latin America was utilized in Mendoza Province during 1973 by Geophysical Services Inc., a U.S. firm. The system, which employs a thin explosive cord rather than conventional charges, reportedly provides more useful information at reduced survey costs.

During 1973, the Government stopped granting petroleum concessions to private companies; oil exploration and development rights were reserved solely for YPF. All foreign companies that held concessions relinquished them during the year. Private companies may continue to participate in exploration and development activities only as contractors in association with YPF.

Argentina's refining capacity at yearend 1973 was an estimated 630,000 barrels per day. YPF's seven refineries accounted for approximately 60% of the total national capacity; eight privately owned plants held the remaining capacity. Domestic refineries processed an average of 471,338 barrels per day, which represented an increase of about 2% over that of 1972. Approximately 88% of the crude oil processed was from domestic sources.

YPF continued the $10 million, 25,000-barrel-per-day expansion project at its Plaza Huincul refinery during 1973. Plans were also developed by YPF for capacity increases costing a total of $75 million at Campo Duran, Dock Sud, and La Plata. In addition, two private companies planned to enlarge their refineries at Lomas de Zamora and Bahia Blanca.

Overall sales of principal petroleum products remained at the same level as in 1972. However, notable increases were registered by motor gasoline (5%) and natural gas (16%).

Pipeline transport of crude and refined products increased 27% to about 127 million barrels in 1973. Much of the increase

was accounted for by two new crude oil pipelines that began operations during the year, one from Villa Mercedes to La Matanza and another from Puerto Rosales to La Plata. Three additional natural gas pipelines reportedly were under construction by Gas del Estado (GDE), a state-owned concern. GDE also agreed in late 1973 to construct a 1,200-kilometer, $150 million pipeline system to link points in Mendoza, San Luis, and Córdoba Provinces.

The Government conducted negotiations with other nations during 1973 to encourage cooperative efforts in the petroleum and natural gas industry. In February, the Minister of Industry and Mining signed an agreement with Venezuela calling for the exchange of technical expertise in oil exploration and development. In August, YPF and GDE offered to help the Bolivian Government construct a liquefied petroleum gas (LPG) plant in Bolivia. Both companies promised technical and financial assistance in return for the opportunity to purchase butane and propane from the plant. At yearend, YPF was negotiating joint-venture exploration agreements with European and African oil concerns, as well as South American countries. Foreign countries involved in negotiations with YPF included Bolivia, Chile, Ecuador, Libya, and Uruguay.

In early 1973, GDE formulated plans for a modern automated system to monitor and regulate pressure in the Buenos Aires natural gas distribution network. The system would serve an area of 13,000 square kilometers and a population of about 7 million. Major components of the system, which is estimated to cost $5 million, would include 250 remote-controlled monitoring and regulating stations, a computerized control center, and a communications network.

The Government approved construction of a natural gas processing plant in Santa Fe Province. The plant is designed to produce 61,500 tons of propane and butane annually. Contractor for the project is Hydrocarbons Research Inc.

At yearend, the Government was preparing to launch a massive $1 billion investment program to continue development of its chemical and petrochemical industry. Montecatini Edison (Montedison) S.p.A., an Italian chemical combine, will act as general consultant to the Government in its development efforts. Most plans and investments focus on petrochemical complexes at La Plata and Bahia Blanca, both near Buenos Aires. Construction was under way on several olefin and aromatic facilities in both areas during 1973. The Government owns at least 51% interest in virtually all of the projects; the remaining shares are held by local and foreign companies. The Government also established new regulations in 1973 for controlling public and private capital investments of both domestic and foreign origin in the petrochemical industry.

The Mineral Industry of Australia

By Charlie Wyche [1]

Continuing the upward trend of more than a decade, a new overall production record was set in 1973 for the Australian mineral industry. Most sectors of the mining industry showed increases, and preliminary data placed the total value of minerals produced during the year at $2.64 billion,[2] an increase of nearly 15% over $2.3 billion reported for 1972. When the value added by initial metallurgical treatment and other forms of processing was considered, the value of Australia's metal and mineral output was estimated at over $3.4 billion in 1973, compared with $2.9 billion in 1972. With respect to the national economy, value of minerals produced and processed in Australia during 1973 represented 4.4% of the $77 billion adjusted gross national product (GNP). The mineral output index (1959=100) approximated 500 in 1973, compared with 465 and 414 in 1972 and 1971, respectively. Advances in the mineral industry occurred despite several broad constraints on mining imposed during 1973. First, the Government eliminated a number of tax concessions that the industry previously enjoyed, and second, the Government took actions that gave it a larger role in exploration, production, processing, and exportation.

Of the more than 70 mineral commodities regularly produced in Australia, about a dozen showed substantial increases in production during 1973. Among the commodities showing increases were iron ore, bauxite-alumina, copper, coal (black and brown), manganese, and nickel. Most of these were included with the 10 commodities that accounted for 75% to 80% of the national output in 1972, the most recent year for which complete statistics were available. The leaders, arranged in order of value in million dollars, were as follows: Iron ore concentrates and pellets, 497; black (bituminous and subbituminous) coal, 370; crude petroleum, 301; construction materials, 204; bauxite, 190; lead in ore and concentrate, 84; zinc in ore and concentrate, 81; beach sand (including rutile, zircon, and ilmenite), 69; tin-in-concentrate, 65; and brown coal, 40.

Western Australia remained the country's largest mineral producing State, supplying 30% of the national total value in 1973. The value of mineral production in Western Australia (dominated by iron, nickel, and gold) reached $787 million in 1973, compared with $648 million for the preceding year. Shipments of iron ore from this State increased 37% over 1972 to more than 70 million tons. All mines recorded substantial gains, especially the Robe River limonite deposits, which supplied the expanded pellet plant at Cape Lambert. Nickel production was up by 12%, and gold mining near Kalgoorlie was stimulated by increased prices.

New South Wales silver-lead-zinc and coal output ranked the State as the second largest mineral producer with 22% of the national total. The copper industry, benefiting from fewer labor stoppages and booming copper prices, was also a contributing factor. Queensland with its large base metal and coal production placed third, accounting for 17% of the value of the year's output. Queensland dominated Australia's copper production. A 150,000-ton-per-year output rate was achieved at the Mount Isa Mines Ltd. smelter. Victoria, the only State producing brown coal, was a close

[1] Physical scientist, Division of Nonferrous Metals—Mineral Supply.

[2] Unless otherwise indicated, values have been converted from Australian dollars (A$) to U.S. dollars at the rate of A1$=US$1.43.

fourth with 16%. South Australia, Tasmania, and Northern Territory, with production of such commodities as copper, tin, and bauxite, contributed 7%, 5%, and 3%, respectively, of the total value of national mineral production.

Despite government control of both raw and semiprocessed mineral trade, Australian mineral exports expanded in 1973 to an estimated value of about $2 billion, an increase of 11% over that of 1972. The value was attributed to higher prices for iron ore and pellets, alumina, and black coal, which accounted for about 57% of mineral exports. Increases in value of exports were also recorded for refined nickel, refined copper, tin, pig iron, manganese ore, and crude oil. More than 85% of the exports of iron ore and black coal went to Japan. Shipments of coal to Japan totaled 25.5 million tons; another 3 million tons went to South Korea, Taiwan, and a number of European countries. Imports of mineral products continued to decline as Australia became more self-sufficient in mineral commodities, particularly petroleum. The 1973 value of imported mineral products was about $243 million (excluding gold). Substantial quantities of phosphate rock, sulfur, asbestos, and industrial diamond were imported.

Expenditures for petroleum exploration increased from $116 million in 1972 to about $136 million in 1973, but exploration expenditures for other minerals declined. In 1972, about $85 million was spent on commodities other than petroleum, 28% below that of the preceding year.

PRODUCTION

Australia's mineral production in 1973 recorded substantial gains in both value and volume. More than half of the commodities showed increases, and the total value of minerals produced was 15% greater than the record set in 1972. Commodities that showed decreases during the year included zinc, tin, several minor metals, and a few nonmetallic products.

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

Commodity	1971	1972	1973 [p]
METALS			
Aluminum:			
Bauxite, gross weight ---------- thousand tons --	12,733	14,437	17,816
Alumina ---------- do ----	2,713	3,068	4,025
Metal, refined ---------- do ----	224	206	207
Antimony, mine output (content of antimony and lead concentrates) ----------	1,362	1,366	1,499
Beryllium, beryl, gross weight ----------	72	62	[e] 70
Bismuth, mine output, metal content ----------	256	362	[e] 370
Cadmium:			
Mine output, metal content ----------	1,487	1,625	[e] 1,500
Smelter output (refined) ----------	560	720	678
Cobalt, mine output (content of zinc and nickel concentrates) ----------	796	770	[e] 800
Columbium-tantalum concentrates, gross weight ------	[r 1] 159	[1] 253	[e] 200
Copper:			
Mine output, metal content ----------	177,261	186,812	212,660
Blister:			
Primary ----------	142,867	144,655	162,219
Secondary ----------	6,938	4,173	4,656
Refined:			
Primary ----------	127,044	139,107	144,514
Secondary ----------	[r] 34,782	34,637	33,075
Gold:			
Mine output, metal content -------- troy ounces --	672,491	754,866	548,523
Refined (excluding recovery from scrap) -- do ----	598,201	652,595	395,872
Iron and steel:			
Iron ore, gross weight ---------- thousand tons --	62,063	64,401	84,705
Pig iron ---------- do ----	6,128	6,491	7,658
Ferroalloys:[2]			
Ferrochromium, high carbon ----------	313	1,396	[e] 2,000
Ferromanganese, high carbon ----------	38,852	56,631	[e] 56,000

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 [p]
METALS—Continued			
Iron and steel—Continued			
Ferroalloys [2]—Continued			
Ferronickel	349	--	--
Ferrosilicon	9,960	9,271	e 10,000
Silicomanganese	21,316	16,607	e 17,000
Total	70,790	83,905	e 85,000
Crude steel thousand tons	6,737	6,743	7,682
Steel semimanufactures [3] do	r 5,707	5,165	e 6,000
Lead:			
Mine output, metal content	403,557	396,001	405,638
Metal:			
Primary:			
Bullion, for export	161,549	139,977	149,986
Refined	163,236	179,743	190,355
Total	324,785	319,720	340,341
Secondary (excluding remelt)	30,190	29,140	30,087
Manganese ore, gross weight thousand tons	r 1,050	1,165	1,522
Mercury 76-pound flasks	r 10	20	e 20
Molybdenum, mine output, metal content	r 11	4	1
Nickel:			
Mine output, metal content	r 35,549	35,548	40,064
Metal, refined [e]	15,000	16,500	36,700
Platinum-group metals [e 4] troy ounces	1,400	1,400	1,950
Rare-earth minerals, monazite concentrate, gross weight	4,381	5,107	4,393
Selenium [5] kilograms	r 9,720	36,550	e 40,000
Silver:			
Mine output, metal content thousand troy ounces	21,811	21,888	21,974
Refined do	r 8,282	8,491	7,765
Tin:			
Mine output, metal content long tons	9,876	11,808	10,369
Smelter output (primary only) do	6,233	6,916	6,795
Titanium concentrates, gross weight:			
Ilmenite	r 813,800	707,413	708,959
Leucoxene	14,560	10,730	24,041
Rutile	374,705	313,139	327,877
Tungsten, mine output, metal content	r 1,816	1,985	1,537
Zinc:			
Mine output, metal content	452,647	507,055	477,538
Smelter:			
Dust	5,468	8,332	NA
Primary	r 258,698	295,030	297,174
Secondary	7,043	8,660	NA
Zirconium concentrates, gross weight	r 408,334	355,015	354,290
NONMETALS			
Abrasives, natural:			
Beach pebble	1,617	2,068	NA
Garnet (sales)	516	537	NA
Asbestos	r 756	16,838	e 32,000
Barite	53,811	26,288	e 18,000
Cement, hydraulic thousand tons	4,721	4,936	5,248
Clays:			
Bentonite and bentonitic clay	288	394	e 350
Brick clay and shale thousand tons	7,648	8,065	e 8,500
Cement clay and shale do	292	309	e 310
Damourite clay (sales)	474	405	e 400
Fire clay thousand tons	241	277	e 280
Fuller's earth	91	--	--
Kaolin and ball clay	76,497	65,663	e 90,000
Other thousand tons	1,689	594	NA
Diatomite	1,927	1,537	e 1,500
Feldspar	3,253	3,133	e 3,100
Fertilizer materials, crude, phosphate rock	6,786	1,051	5,000
Fluorspar	464	877	e 1,280
Gem stones [e] value, thousands	$21,000	$39,550	NA
Gypsum	889,222	959,095	e 1,014,000
Kyanite and sillimanite (sillimanite only produced)	857	575	600
Lime [6]	r e 800,000	769,327	e 780,000
Lithium minerals, petalite, gross weight	1,674	1,071	1,100
Magnesite	18,087	19,995	e 20,000
Perlite, crude	2,122	1,807	NA
Pigments, natural mineral, ocher	71	599	NA
Pyrite, including cupreous:			
Gross weight	230,778	243,694	210,000
Sulfur content	105,391	113,867	101,000
Salt thousand tons	[7] 3,788	[7] 3,340	e 4,000

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity		1971	1972	1973 [p]
NONMETALS—Continued				
Sand and gravel:				
Construction sand	thousand tons	18,394	19,884	NA
Gravel	do	12,849	12,771	NA
Stone:				
Dolomite	do	366	392	NA
Limestone for cement	do	7,128	7,420	[e] 7,900
Limestone for other uses	do	3,208	3,074	NA
Silica in the form of quartz, quartzite, and glass sand	do	1,112	1,058	NA
Other:				
Crushed and broken	do	50,275	51,115	NA
Dimension	do	[8] 81	[8] 318	NA
Unspecified	do	[9] 28,465	[9] 30,977	NA
Sulfur:				
Byproduct [10]	do	318	351	NA
Sulfuric acid (from all source materials)	do	1,600	1,953	NA
Talc, soapstone, pyrophyllite		47,876	43,849	[8] 56,000
MINERAL FUELS AND RELATED MATERIALS				
Coal:				
Bituminous [11]	thousand tons	49,002	59,689	60,703
Lignite	do	23,382	23,697	24,677
Total	do	72,384	83,386	85,380
Coke:				
Metallurgical	do	4,405	4,591	4,945
Gas house (including breeze)	do	197	85	[e] 80
Total	do	4,602	4,676	5,025
Fuel briquets	do	1,391	1,214	1,181
Gas, natural, marketable production	million cubic feet	79,049	112,580	144,764
Natural gas liquids	thousand 42-gallon barrels	1,692	[e] 2,400	[e] 3,100
Petroleum:				
Crude	do	112,914	119,513	142,277
Refinery products:				
Aviation gasoline	do	[r] 409	270	250
Other gasoline	do	[r] 65,628	67,376	75,112
Jet fuel	do	[r] 10,655	10,265	11,285
Kerosine	do	[r] 1,377	981	1,380
Distillate fuel oil	do	[r] 37,600	37,160	44,167
Residual fuel oil	do	[r] 36,569	32,286	36,496
Lubricants	do	[r] 2,931	2,761	2,645
Other:				
Refinery gas	do	799	793	884
Liquefied petroleum gas	do	3,711	3,981	4,144
Solvents	do	1,579	1,409	1,706
Bitumen	do	2,749	2,925	2,948
Unspecified	do	6,265	7,246	9,375
Refinery fuel and losses	do	15,214	13,719	16,039
Total		[r] 185,486	181,172	206,431

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

[1] Exports (production not officially reported).

[2] Data are for year ended November 30 of that stated.

[3] Data are for year ended November 30 of that stated for plants owned by The Broken Hill Pty. Co. Ltd. and Australian Iron & Steel Pty. Ltd., and for normal calendar year for facilities owned by Commonwealth Steel Co.

[4] Partial data; figures represent estimated refinery recovery from nickel concentrates exported to Japan from Kambalda. Additional quantities of palladium and platinum are present in Kambalda concentrates produced for domestic smelting as well as in those for export to Canada for smelting, but reportedly platinum-group metals are not recovered from domestically smelted materials, and the quantity recovered in Canada (if any) is not reported.

[5] Partial figure; output by Peko-Wallsend Ltd. only; the Electrolytic Refining & Smelting Co. of Australia Pty. Ltd. also produces selenium from tankhouse slimes containing 1% to 3% selenium, but output data are not available for publication.

[6] Data are for year ended June 30 of that stated.

[7] Excludes production from Victoria, for which data are not available.

[8] Excludes production from Northern Territory, Australian Capital Territory, and Queensland.

[9] Excludes production from Western Australia.

[10] Sulfur content of materials obtained as a byproduct of nonferrous metallurgical operations and oil refining. Excludes sulfur content of pyrite but includes sulfur recovered in compounds and as acid in addition to sulfur recovered in elemental form.

[11] Includes semianthracite and semibituminous.

TRADE

The export and import data summaries, shown in tables 2 and 3, respectively, were provided by the Commonwealth Bureau of Census and 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.

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

Commodity	1970–71	1971–72	Principal destinations, 1971–72
METALS			
Aluminum:			
Bauxite, gross weight [2] thousand tons	5,056	e 5,175	Japan 3,009; West Germany 1,405.
Alumina, gross weight [2] do	1,685	2,460	NA.
Metal:			
Scrap	2,335	2,823	Japan 2,759.
Unwrought	79,846	96,239	NA.
Semimanufactures	4,735	5,048	New Zealand 1,684; Malaysia 924; Papua New Guinea 525.
Beryllium ore and concentrate, gross weight	59	54	All to United States.
Cadmium metal, refined, unwrought and semimanufactures	506	658	United States 193; Netherlands 126; United Kingdom 111.
Chromium:			
Chromite ore and concentrate, gross weight	--	11	United Kingdom 10.
Chromium oxides and hydroxides	53	212	New Zealand 204.
Columbium and tantalum, columbite-tantalite concentrate, gross weight	123	170	United States 130.
Copper:			
Ore and concentrate, gross weight	140,217	141,396	United States 133,507.
Matte	6,871	3,791	All to Belgium-Luxembourg.
Metal:			
Copper-lead dross and speiss	1,420	1,287	All to United States.
Copper slags and residue	81	132	Belgium-Luxembourg 113.
Scrap, including alloy scrap	111	582	Japan 425; United Kingdom 113.
Unwrought:			
Blister and cement	7,105	5,869	Japan 5,868.
Other, unalloyed	36,014	56,517	United Kingdom 16,507; France 15,263; West Germany 15,108.
Alloyed	37	17	New Zealand 16.
Semimanufactures:			
Unalloyed	14,005	15,307	New Zealand 7,352; Singapore 1,812; Malaysia 1,470.
Alloyed	3,752	3,294	Hong Kong 1,617; Singapore 453; New Zealand 416.
Gold:			
Ore and concentrate, metal content [3] troy ounces	151,354	213,429	NA.
Mint bullion do	96,635	108,865	Singapore 67,508; Hong Kong 39,963.
Refined bullion do	88,922	9,690	All to Hong Kong.
Iron and steel:			
Iron ore and concentrate thousand tons	48,348	50,239	Japan 45,573.
Scrap do	468	553	NA.
Pig iron and equivalent materials do	389	528	Japan 226; People's Republic of China 188; Italy 71.
Ferroalloys	2,555	222	New Zealand 189.
Steel ingots and other primary forms thousand tons	119	298	Philippines 117; Hong Kong 49; Japan 29.
Steel semimanufactures do	423	529	New Zealand 100; United States 74; Papau New Guinea 28.
Lead:			
Ore and concentrate, gross weight	83,097	93,537	United States 41,342; Japan 16,715; Belgium-Luxembourg 15,078.
Slag and residue	3,034	2,342	Japan 1,944; United Kingdom 360.
Oxides	2,254	2,731	Malaysia 885; Thailand 665; New Zealand 445.
Metal:			
Scrap, including alloy scrap	524	183	West Germany 70; Republic of Korea 50.
Unwrought:			
Bullion, lead-silver, lead content	179,814	137,862	United Kingdom 112,821; Netherlands 12,706.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1970–71	1971–72	Principal destinations, 1971–72
METALS—Continued			
Lead—Continued			
Metal—Continued			
Refined	123,374	130,347	United Kingdom 46,546; United States 39,817.
Alloys, antimonial and other	3,277	3,898	New Zealand 1,593; Thailand 597; Philippines 538.
Semimanufactures	r 3,672	5,137	United Kingdom 3,537; Republic of Korea 870.
Magnesium oxide	1,398	1,696	New Zealand 826, United States 747.
Manganese ore, gross weight	703,828	NA	
Molybdenum ores and concentrates, gross weight	107	1	NA.
Nickel metal and alloys: [4]			
Unwrought -- value, thousands	$29,413	$36,452	NA.
Semimanufactures	1,567	1,137	Netherlands 490; Singapore 236; Indonesia 145.
Platinum-group metals --- troy ounces	8,365	12,442	Hong Kong 9,719; Singapore 1,960.
Rare-earth metals, monazite concentrate, gross weight	r 5,154	4,793	France 2,984; United Kingdom 1,048; United States 713.
Silver:			
Concentrates and lead-silver bullion, silver content [3] thousand troy ounces	11,279	12,776	NA.
Mint bullion do	7,896	6,744	United Kingdom 4,913; Japan 1,822.
Other do	63	58	New Zealand 41; Singapore 12.
Tin:			
Ore and concentrate, gross weight long tons	35,441	9,103	United Kingdom 4,152; Malaysia 2,377.
Oxides do	4	8	Japan 3; New Zealand 3.
Metal:			
Unwrought do	r 1,433	2,139	United States 1,289; New Zealand 324.
Semimanufactures -- do	192	474	United States 210; Philippines 107; Papua New Guinea 44.
Titanium concentrates, gross weight:			
Ilmenite (excluding beneficiated ilmenite)	641,062	515,278	United Kingdom 234,903; France 142,455.
Leucoxene	8,562	14,325	United States 13,766.
Rutile	377,224	314,771	United States 157,492; United Kingdom 31,654; Netherlands 29,441.
Tungsten concentrate, gross weight:			
Scheelite	1,214	1,789	West Germany 943; United Kingdom 579.
Wolframite	1,002	736	Belgium-Luxembourg 219; United Kingdom 198.
Vanadium ores and concentrates	56	273	Japan 237; Italy 32.
Zinc:			
Ore and concentrate, gross weight	383,482	364,147	United Kingdom 111,291; Japan 105,838.
Oxide	2,326	3,937	Thailand 2,460; Indonesia 573.
Metal:			
Slags and residues	5,782	5,809	Belgium-Luxembourg 2,585; Republic of South Africa 1,587; Taiwan 542.
Unwrought	136,831	199,275	United Kingdom 46,022; United States 39,673; India 22,300; Taiwan 18,532.
Semimanufactures	2,174	1,446	New Zealand 398; Hong Kong 271; South Vietnam 250.
Zircon concentrates, gross weight, minimum 30% $ZrSiO_4$	360,171	364,344	Japan 104,745; United States 53,071; France 33,804.
Other:			
Nonferrous metals and alloys, n.e.s.:			
Scrap	2,010	10,119	Singapore 7,494; Malaysia 1,322.
Unwrought and semimanufactures:			
Magnesium, beryllium and their alloys	13	9	New Zealand 4.
Molybdenum, tungsten and their alloys	12	4	New Zealand 3.
NONMETALS			
Abrasives:			
Crude, natural -- value, thousands	r $70	$98	West Germany $42; Japan $27.

See footnotes at end of table.

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

Commodity	1970–71	1971–72	Principal destinations, 1971–72
NONMETALS—Continued			
Abrasives—Continued			
Grinding wheels and stones	159	141	New Zealand 64; Philippines 31; Malaysia 15.
Asbestos, crude and fiber	228	2,387	Japan 2,133.
Barite	29,768	16,937	Brunei 15,257.
Cement, hydraulic	13,810	8,006	Papua New Guinea 4,765; Nauru Island 1,499.
Clays and clay products:			
Crude clays, including fireclay and sillimanite	7,461	5,000	United Kingdom 2,413; Japan 1,259; New Zealand 742.
Products, refractory bricks	3,582	2,551	New Zealand 846; Indonesia 344; New Caledonia 308.
Diamond:			
Gem carats	3,313	4,090	United States 1,107; Israel 751; United Kingdom 618.
Industrial do	142,362	91,187	United States 60,213; United Kingdom 24,756.
Fertilizer materials, manufactured:			
Nitrogenous	834	7,763	Indonesia 6,758.
Phosphatic (excluding basic slag)	75	10,557	Indonesia 10,160.
Potassic	146	48	Papua New Guinea 43.
Other, including mixed	13,551	33,125	United States 20,336; Philippines 7,849.
Gem stones, except diamond:			
Opals value, thousands	r $12,900	$14,910	Hong Kong $6,676; Japan $3,516; United States $1,896.
Sapphires do	r $3,665	$3,492	Thailand $1,906; United Kingdom $469; Hong King $451.
Other do	r $593	$651	United States $161; Hong Kong $144; West Germany $124.
Gypsum	259,465	313,329	New Zealand 110,139; Malaysia 51,551; Taiwan 46,089.
Lime (quicklime, slaked lime, hydraulic lime)	178	225	New Caledonia 87; Papua New Guinea 80; Timor 58.
Magnesite	2,317	59	United Kingdom 28; Norfolk Island 16.
Pigments, mineral:			
Micaceous iron oxide	33	36	New Zealand 19; Papua New Guinea 6.
Iron oxides, other	33	38	Papua New Guinea 19; Fiji 11.
Pyrite, unroasted, gross weight	22,123	111	Papua New Guinea 85.
Salt and brine thousand tons	3,048	2,386	Japan 2,354.
Stone, sand and gravel:			
Dimension stone	1,209	731	Japan 574; United States 88.
Sand, gravel, limestone flux, and other calcareous stone	210,928	218,812	Japan 154,183; United States 60,046.
Sulfur, sulfuric acid	183	136	Papua New Guinea 53; Fiji 32.
Talc and steatite	36,138	30,648	Netherlands 14,469; Japan 14,230.
Other nonmetals:			
Crude quartz, mica, feldspar, fluorspar and cryolite	6,908	1,446	Japan 1,050; New Zealand 372.
Refractory materials, crude, except clays and magnesite	217	99	Timor 48; New Zealand 12.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	12,706	16,194	New Zealand 5,466; Indonesia 3,243; Malaysia 2,123.
Coal, bituminous and lignite and peat (including briquets):			
Bituminous coal and briquets thousand tons	19,139	21,909	Japan 18,231; United Kingdom 1,609.
Lignite, peat and briquets thereof do	9	11	Japan 10.
Coke and semicoke do	593	73	New Caledonia 47; Venezuela 26.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	1,516	6,859	United States 2,383; United Kingdom 2,143; Japan 1,567.
Refinery products:			
Gasoline do	r 1,933	1,550	New Zealand 820; Singapore 455.
Jet fuel do	1,549	2,558	New Zealand 1,174; United States 787; Fiji 375.
Kerosine do	192	235	New Zealand 187; Fiji 27.
Distillate fuel oil do	3,022	3,421	New Zealand 1,059; Singapore 731; Republic of South Africa 362.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1970–71	1971–72	Principal destinations, 1971–72
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Residual fuel oil			
thousand 42-gallon barrels	1,963	1,384	Japan 567; New Caledonia 375.
Lubricants ——— do	1,014	1,044	New Zealand 356; Kenya 206; Republic of South Africa 197.
Other ——— do	r 183	324	New Zealand 194.

e Estimate. r Revised. NA Not available.

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

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

[3] Data from "Australian Mineral Industry, Quarterly Review—Quarterly Statistics," Bureau of Mineral Resources, Geology, and Geophysics. V. 25, No. 4, June 1973, and are for years beginning March 1 of that stated.

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

Source: Unless otherwise specified: Overseas Trade Bulletin No. 69, 1971–72, Commonwealth Bureau of Census and Statistics, Canberra, Australia, 1973.

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

(Metric tons unless otherwise specified)

Commodity	1970–71	1971–72	Principal sources, 1971–72
METALS			
Aluminum metal:			
Scrap ———	566	701	New Zealand 622.
Unwrought ———	328	633	Canada 325; United Kingdom 257.
Semimanufactures ———	3,480	3,093	United States 1,236; United Kingdom 719; West Germany 633.
Antimony metal, all forms ———	27	72	People's Republic of China 49; Malaysia 10.
Arsenic trioxide ———	1,040	962	Sweden 267; France 191; People's Republic of China 154.
Bismuth metal, all forms ———	15	13	United Kingdom 7; Belgium-Luxembourg 5.
Chromium ore and concentrate ———	31,529	6,508	Philippines 6,198.
Cobalt and cobalt base alloys ———	80	68	Zambia 24; Belgium-Luxembourg 19.
Copper:			
Ore and concentrate ———	39	5	New Zealand 4.
Metal and alloys:			
Scrap:			
Unalloyed ———	749	681	New Zealand 326; Papua New Guinea 178; Malaysia 75.
Alloyed ———	1,659	2,057	New Zealand 1,363; Papua New Guinea 405.
Unwrought ———	145	81	United States 34; United Kingdom 17.
Semimanufactures ———	3,598	4,334	United Kingdom 2,912; Japan 831; United States 114.
Gold:			
Crude bullion, gold content troy ounces	123,168	58,403	Fiji 44,905; Papua New Guinea 13,272.
Refined bullion ——— do	7,177	53,845	Fiji 37,360; Papua New Guinea 15,145.
Iron and steel:			
Ore and concentrate, including roasted pyrite ———	2,393	5,984	Philippines 5,808.
Scrap ———	1,012	190	New Zealand 138.
Ferroalloys:			
Powder:			
Manganese ———	595	1,404	Republic of South Africa 865; Japan 372.
Other ———	233	189	Republic of South Africa 59; Japan 38.
Shot:			
Ferrochromium ———	10,595	4,991	Republic of South Africa 2,979; Japan 1,501.
Ferromanganese ———	9,241	9,370	Japan 5,834; Republic of South Africa 2,518.
Ferromolybdenum ———	234	148	United States 80; Belgium-Luxembourg 36.
Ferrosilicon ———	12,281	9,771	Japan 3,519; Republic of South Africa 2,731; Norway 1,643.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1970–71	1971–72	Principal sources, 1971–72
METALS—Continued			
Iron and steel—Continued			
Ferroalloys—Continued			
Shot—Continued			
Ferronickel	1,914	1,029	All from New Caledonia.
Other	4,134	2,674	United Kingdom 1,177; Republic of South Africa 826.
Steel, primary forms	39,367	70,630	Japan 69,411.
Semimanufactures	633,312	548,256	Japan 441,622; United Kingdom 43,394.
Lead metal and alloys, all forms	96	42	New Zealand 14; United Kingdom 13.
Magnesium metal and alloys, all forms	1,280	1,505	Norway 746; United States 488; U.S.S.R. 206.
Manganese ore and concentrate:			
Battery grade	996	1,636	All from Ghana.
Metallurgical grade	3,535	3,228	People's Republic of China 3,130.
Mercury 76-pound flasks	1,283	1,243	Mexico 579; Spain 217; Philippines 155.
Nickel:			
Matte and similar materials	1,308	623	Canada 606.
Metal and alloys:			
Unwrought	2,102	1,348	Canada 1,248.
Semimanufactures	1,196	628	United Kingdom 537; United States 48.
Platinum group metals troy ounces	332,358	382,133	United Kingdom 231,601; West Germany 134,119.
Silicon metal	3,403	1,950	West Germany 772; Sweden 515; Italy 315.
Silver and alloys, unwrought and semimanufactures, containing 75% or more silver, silver content troy ounces	68,215	39,148	Fiji 13,903; United States 8,828; New Zealand 7,097.
Tin metal and alloys, all forms long tons	137	2,489	West Germany 2,071; Japan 308.
Tungsten metal and alloys, all forms	18	13	United Kingdom 5; United States 4.
Zinc metal and alloys, all forms	248	160	United Kingdom 89; Japan 43.
NONMETALS			
Abrasives, natural, except diamond	1,518	1,188	United States 474; New Zealand 284.
Asbestos:			
Chrysotile	54,303	46,329	Canada 43,310.
Amosite	11,671	12,306	Republic of South Africa 7,985; Canada 4,321.
Other	5,783	10,430	Canada 9,292.
Barite and witherite, natural and ground	915	1,660	People's Republic of China 1,200; United States 281.
Boron minerals, crude and concentrates	1,692	1,989	United States 1,964.
Cement, hydraulic	120,504	184,964	United Kingdom 114,280; United States 27,682; Spain 17,591.
Chalk	7,887	7,785	France 5,043; United Kingdom 2,736.
Clays:			
Bentonite	74,667	65,524	United States 64,775.
White clays, including kaoline	43,319	27,649	United Kingdom 22,991; United States 4,608.
Fireclay and ball clay	22,152	10,948	United States 6,903; United Kingdom 4,018.
Other	15,981	9,621	United States 8,084; Republic of South Africa 1,119.
Diamond:			
Gem carats	49,816	44,016	Israel 15,624; Belgium-Luxembourg 14,784; Republic of South Africa 5,708.
Industrial, including dust do	743,002	567,075	Republic of South Africa 313,873; United States 106,521.
Diatomite and other infusorial earth	6,191	7,651	United States 6,109; Japan 854.
Feldspar, leucite, nepheline	5,123	9,149	Canada 6,327; People's Republic of China 701.
Fertilizer materials:			
Crude:			
Nitrogenous	3,242	3,159	Chile 3,066; People's Republic of China 73.
Phosphatic, phosphate rock thousand tons	2,107	1,654	Nauru 929; Christmas Island 502.
Manufactured:			
Nitrogenous	19,191	5,766	West Germany 3,311; France 774; East Germany 464.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1970–71	1971–72	Principal sources, 1971–72
NONMETALS—Continued			
Fertilizer materials—Continued			
Manufactured—Continued			
Phosphatic	3,141	2,433	United States 1,545; Japan 851.
Potassic	155,737	146,804	Canada 82,350; United States 61,418.
Other, including mixed	9,000	15,308	West Germany 6,864; Italy 5,901; Japan 2,032.
Fluorspar and Cryolite:			
Fluorspar	33,490	27,212	Republic of South Africa 18,000; United Kingdom 7,902.
Cryolite, natural	310	244	Denmark 243.
Graphite, natural	1,800	1,160	People's Republic of China 332; Republic of Korea 277; Sri Lanka 268.
Gypsum, crude and calcined	1,109	957	United Kingdom 430; United States 248.
Kyanite and sillimanite:			
Kyanite	1,595	3,410	United States 3,189.
Sillimanite	10	8	All from United Kingdom.
Magnesite, crude, calcined and fused	215	223	United States 169.
Mica:			
Block and/or sheet	8	6	All from India.
Splittings	r 88	110	Do.
Ground and scrap	1,040	764	Republic of South Africa 380; India 240; People's Republic of China 150.
Pigments, mineral, iron oxides	10,165	10,291	West Germany 6,324; United Kingdom 697; Austria 427.
Precious and semiprecious stones (except diamond) value, thousands	r $3,060	$2,791	Australia (reimported) $611; Thailand $386; West Germany $345.
Salt	7,046	42,649	West Germany 31,857; United Kingdom 10,560.
Stone, sand and gravel:			
Dimension stone, crude and partly worked:			
Marble	7,053	6,344	Italy 6,134.
Slate	121	198	Japan 123; Italy 59.
Other	2,206	2,491	Italy 1,047; Republic of South Africa 563; Finland 511.
Dolomite	443	778	West Germany 629; United States 145.
Gravel and crushed rock	4,042	4,258	Italy 3,577;; United Kingdom 188.
Limestone (except dimension)	596,264	739,173	All from Japan.
Quartz and quartzite	1,126	1,000	Sweden 719; West Germany 137.
Sand, excluding metal bearing	401	1,537	United States 1,066; New Zealand 196.
Sulfur:			
Elemental, all forms	273,332	276,764	Canada 211,666; United States 54,821.
Sulfuric acid	9	7	West Germany 2; United States 2.
Talc, steatite	8,419	671	United States 549.
Vermiculite	3,961	4,482	Republic of South Africa 3,985; People's Republic of China 267.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,223	906	United States 484; Trinidad and Tobago 381.
Carbon black and gas carbon	3,292	3,139	United States 2,228; United Kingdom 760.
Coal, all types, including briquets	11,042	14,977	Republic of South Africa 13,870.
Coke and semicoke	5,773	987	All from United States.
Peat	4,097	41,997	West Germany 41,425.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	r 86,105	68,934	Kuwait 18,972; Iraq 15,866; Saudi Arabia 11,419.
Refinery products:			
Gasoline do	4,159	2,746	Iran 907; Singapore 566; Republic of Korea 360; Bahrain 343.
Jet fuel do	519	232	Singapore 135; Iran 78.
Kerosine do	701	814	Bahrain 283; People's Democratic Republic of Yemen 208; Kuwait 191.
Distillate fuel oil do	3,619	3,166	Singapore 1,727; Bahrain 929; Saudi Arabia 382.
Residual fuel oil do	10,113	15,711	Singapore 7,095; Iran 2,123; Bahrain 1,977.

See footnotes at end of table.

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

Commodity	1970–71	1971–72	Principal sources, 1971–72
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Lubricants			
thousand 42-gallon barrels	366	351	Netherlands Antilles 171; United States 124.
Other:			
Liquefied petroleum gas do	(2)	1	Mainly from United States.
Bitumen do	89	22	Singapore 13; United States 6.
Petroleum coke do	678	659	United States 657.
Unspecified do	3,851	4,408	Bahrain 3,284; Iran 428.

r Revised.
[1] Data are for years beginning July 1.
[2] Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—The rapid growth in production of aluminum in recent years continued in 1973. Australian producers benefited by the resurgence of world demand for aluminum, which rose 14% in 1973 to 13.1 million tons. Output of bauxite and alumina set new records, and production of refined aluminum was marginally higher than the 206,000 tons produced in 1972. The small increase in aluminum production was attributed to a 3-week strike at the Bell Bay smelter in mid-1973. The output of about 4 million tons of alumina in 1973, compared with 3.1 million tons for 1972 was attributed to Alcoa of Australia Ltd. sharp increase in production.

Alcoa became the largest producer of alumina in the Southern Hemisphere. Capacity at Pinjarra was increased to 600,000 tons of alumina per year, and work to expand this to 900,000 tons was begun. Ultimately, the capacity will be expanded to 3.4 million tons. Before expansion, Alcoa negotiated contracts with American Metal Climax Inc. (AMAX) and with the Argentinian company Aluar to supply a combined total of 150,000 tons per year beginning in late 1975. The company holds bauxite leases along the Darling Range near Perth to the Southern area beyond Bunbury. Bauxite is mined near Jarrahdale, a few miles south of Perth, and Pinjarra, 55 miles south of Perth. The Jarrahdale ore was transported by train to Alcoa's plant at Kwinana, near Perth, where alumina output was 1.5 million tons in 1973. Production from both plants was shipped from Kwinana, but Pinjarra output will eventually go to the port of Bunbury, where a major dredging program was under way.

Other potential Western Australian producers were the Hanwright-CSR group, which had large tonnages in the Darling Range, and AMAX, with its big deposit in the northern part of the State. Originally the Hanwright group (Pacminex) was to build a refinery in Swan Valley just outside Perth, but unfavorable environmental reaction caused a change in plans. A new site was selected, and Pacminex will probably be the next Australian bauxite producer. Alwest Ltd. is also a potential bauxite producer.

Comalco Ltd., by far Australia's largest bauxite producer, operated the largest mine at Weipa in Queensland. The company's shipments of beneficiated bauxite in 1973 amounted to 9.1 million tons, an increase of 2.0 million tons over the 1972 figure. Of this total, 4.3 million tons (47%) went to Gladstone and Bell Bay for processing into alumina, 1.7 million tons (19%) went to Japan, and 3.1 million tons (34%) went to Europe and other areas, including 0.8 million tons to the alumina plant of Eurallumina S.p.A. in Sardinia, Italy. The greater part of the increase in sales was due to higher demand for bauxite at the Gladstone refinery in Queensland, following the completion of its third expansion and to the demand for bauxite for the Sardinian plant. Sales of bauxite to customers outside the Comalco group amounted to 8.2 million tons compared with 6.5 million tons in 1972. Sales of calcined bauxite

were considerably higher in 1973 than in 1972, the result of greater activity in the world steel industry. Strong demand is expected to continue in coming years, and to meet this growth, a second calcining kiln is being installed at Weipa at a cost of $4.5 million. It should be completed in the second half of 1974. Other facilities under construction at Weipa were additional houses and township amenities, at a cost of over $14 million. Exploration for new deposits by the company continued during 1973.

Comalco was also expanding its primary aluminum facilities. A program to raise the capacity of the Bell Bay Tasmania smelter from 95,600 tons per year to 114,500 tons was in progress. The additional output would initially supply the expected growth in both the domestic and export markets, but the amount exported would decrease as demand from Australian customers increased. Included in the smelter project was the installation of an additional station for casting extrusion billet and rolling stock. This will involve a cost of almost $30 million. Of this, $1.5 million will be spent on equipment to bring the smelter into compliance with the provisions of Tasmania's Environmental Protection Act.

Shipments of alumina from the first stage of the plant at Gove, Northern Territory, began in late 1972. Construction of the alumina plant second stage was completed during July and will bring the plant to its full initially planned capacity of 1 million tons of alumina per year. Gove Alumina Ltd. exported 1,073,000 tons of bauxite and 80,000 tons of alumina during the year.

Copper.—Domestic mine production of copper in 1973 was 212,660 tons, about 14% higher than that of 1972; the increase resulted mainly from an improvement in production at Mount Morgan Ltd., and at Mount Isa, Australia's largest producer. Production at Mount Isa, however, was somewhat affected by modifications to the smelter carried out under the current expansion program, but at Mount Morgan difficulties associated with the flash smelter were overcome and output increased substantially.

In 1973, Mount Isa treated 4.38 million tons of copper ore containing 2.9% copper. Blister copper production amounted to 118,100 tons. Approximately 86% of the copper was mined from the 1100-foot-level ore body. The production capability of the mine was substantially increased by the completion and commissioning of the F58 copper ore hoisting shaft, the rail haulage loop on No. 19 level, and the crushing and ore handling system serving both K57 and K58 shafts. Ventilation shafts were deepened to the 19 level to provide a greater volume of air for increased copper production from the 1100-foot ore body. Mine development increased to 40,167 meters following the completion of major projects associated with expanded production and a reduction in stope development requirements. Approximately 1.3 million cubic meters of fill material were placed.

The principal copper producers and quantities of their output in recent years are summarized in table 4.

Table 4.—Australia: Major copper industry facilities

Facility	Production (metric tons of copper)[1]		
	1970	1971	1972
Mine:			
Mount Isa Mines Ltd	84,225	122,143	130,958
Mount Morgan Ltd	6,971	7,232	11,041
Broken Hill Field	3,644	3,751	4,871
Cobar Mines Pty. Ltd	8,313	6,258	7,145
Mount Lyell Mining & Railway Co. Ltd	16,720	21,227	22,054
Electrolytic Zinc Co. of Australasia, Ltd	1,674	2,448	2,824
Tennant Creek Field	5,482	6,254	6,710
Smelters:			
Mount Isa Mines Ltd	81,663	121,148	117,800
Mount Morgan Ltd	8,034	7,942	6,475
The Electrolytic Refining & Smelting Co. of Aust. Ltd[2]	9,315	11,244	12,430
Refineries:			
Mount Isa Mines Ltd	80,521	115,987	114,707
The Electrolytic Refining & Smelting Co. of Aust. Ltd	21,959	24,639	23,911

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

Kanmantoo Mines Ltd. completed the first full year of operation at its open pit copper mine at Kanmantoo, South Australia. A total of 877,921 tons of ore was mined and treated during the year to produce 34,522 tons of copper concentrates containing 7,864 tons of copper and 1,628 kilograms of silver.

The Mount Lyell Mining & Railway Co. Ltd. produced 90,000 tons of copper concentrates in 1973, of which some 70,000 tons went to Japan for smelting. The balance was sent to The Electrolytic Refining & Smelting Co.'s smelter at Port Kembla. Exploration drilling was continued within the Queenstown mining lease throughout the year at a level slightly above that of last year. Fifty-two holes were completed, totaling 61,800 meters of drilling compared with 44 holes and 53,300 meters last year. The drilling was largely directed toward consolidating and extending information on known ore bodies, particularly the Cap Horn, Twelve West, and Crown Three ore bodies. The probable ore reserves in 1973 totaled 32,962,000 tons, grading 1.5% copper.

Cobar Mines Pty. Ltd. reported treating 680,000 tons of ore containing 2% copper during 1973. In 1972, when operations were interrupted by a 10-week strike, 433,000 tons were treated. All concentrates were shipped to Port Kembla for smelting and refining. Ore production was at a rate in excees of 750,000 tons most of the year, and mine development to incease production to 850,000 tons per year was on schedule. The decline from the 540-meter level reached the 630-meter level. Ventilation circuits were established, and silling of the Western ore body at this horizon commenced. Production started from the first of two open stopes developed in the Eastern ore system above the 360-meter level. A third grinding mill was installed in the concentrating plant, and additional flotation capacity required for production in excess of 850,000 tons per year was installed. The intensive program of shaft sinking and development for production from known ore bodies at Cobar as well as exploratory drilling for new ore bodies, was part of the major expansion effort that was expected to continue for some years. Broken Hill South Ltd. holds 76⅔% interest in Cobar Mines and was the manager.

Peko-Wallsend Ltd.'s copper smelter at Tennant Creek, Northern Territory, began operation during the year. The $34 million plant, under construction for 3 years, poured its first blister copper in December, and the production rate is expected to reach 15,600 tons per year by mid-1974. The smelter will be supplied with feed from the new 700,000-ton Warrego concentrator. The Warrego mine produced 500,000 tons of ore from a reserve of 5 million tons of 2.65% copper. Both the Peko and Gecko mines also supplied the Warrego concentrator with feed material. The Peko mine produced 150,000 tons of ore, based on reserves of 4 million tons, and the Gecko mine produced 100,000 tons of ore from a reserve of 1.5 million tons of 4.7% copper.

C.S.R. Company Ltd. announced the discovery of further mineralization near the Mount Gunson Mines Pty. Ltd. in South Australia. About 4 million tons of sulfide ore with an estimated average grade of 2% copper was delineated by diamond drilling some 2 miles from the concentrator. The Mount Gunson mine has been under care and maintenance since December 1971.

Gold.—In 1973, domestic production of gold decreased to 548,523 ounces, about 27% below the 1972 output. The major cause of the decline was a 13% decrease in production from Western Australia where production decreased from 347,300 ounces in 1972 to 302,200 ounces in 1973. Most of the decrease occurred during the first 9 months of 1973; production during the last 3 months increased sharply. The rise was mainly attributed to increased output from the Kalgoorlie District (Golden Mile) of the State, which rose to 60,000 ounces during the last quarter. Also, production was adversely affected by problems arising from the curtailment of development and the nonreplacement of equipment in 1972 when the closure of many mines appeared imminent.

The gold mining operations of Gold Mines of Kalgoorlie Ltd. (GMK) and Poseidon N.L. Lake View and Star Ltd. were amalgamated into a new company, Kalgoorlie Lake View Pty. Ltd. Lake View and GMK combined their leases and other mining assets associated with the Kalgoorlie mining operations. Western Mining Corp. Ltd. provided $1 million for work-

ing capital and undertook management responsibility for its equity. GMK has a 47% interest in the company; Lake View has 47%; and Westminer Investments, a wholly owned subsidiary of Western Mining, has a 6% interest. Plans were being considered to take in the Great Boulder gold mine where underground workings are accessible from the adjacent Lake View property. Proven ore reserves at GMK at the end of 1973 were 2,297,000 tons assaying 0.19 ounce gold per ton.

Higher prices for gold led to increased exploration activity by other companies in the Kalgoorlie District. The main target for exploration was the Mt. Charlotte and the Southern ore bodies. Three holes, one at Charlotte and two at Southern, cut ore-grade mineralization at the 1,700-foot depth, indicating depth continuity. The Mt. Charlotte ore body was being prepared for mining between the 1090- and 1200-foot levels and Southern was being prepared between the 500- and 900-foot levels. Exploration and development at Central Norseman Gold Corp. N.L. were resumed. Kalgoorlie Southern Gold Mines N.L. issued shares to finance further exploration on its leases to the south of the Golden Mile. The principal gold producers and the quantities recovered during 1973 were as follows:

Company	Gold produced (troy ounces)
Central Norseman Gold Corp. N.L	67,528
Golden Plateau N.L	16,214
Kalgoorlie-Lake View Pty. Ltd	193,475
Hill 50 Gold Mine N.L	21,845
North Kalgurli (1912) Ltd	37,020
Peko-Wallsend Ltd	189,742

Iron and Steel.—Some of the gloom of 1972 was dissipated in 1973 by strong price rises in the iron and steel industry. After the small 1972 growth rate, the iron and steel industry resumed the rapid growth that began in the mid-sixties. The production of crude steel increased 14% above the 1972 level of 6,743,000 tons. The higher output reflected both increased demand for steel and the implementation in 1972 of additional production capacity at Port Kembla. Production would have been higher, except for labor problems during the first half of 1973. The overall increase in iron ore production was 32% in 1973, compared to a 4% increase during 1972. The larger output was attributed to the Pilbara zone, Western Australia, which increased production by nearly 19 million tons to a record of almost 70 million tons, a jump of 37%. The companies in the area were planning expenditures totaling about $220 million to increase output at present mining areas. About $1.5 million was spent in 1973 on development work. Other new developments including new townsites, pellet plants, and plant expansion could total an additional $1 billion.

Japan was the principal destination for iron ore and iron ore pellets. In 1973, exports to Japan totaled 65 million tons and constituted 77% of total exports of iron ore and pellets. The increase resulted mainly from the commencement of shipments from the Robe River project and from additional exports by other Pilbara producers to meet increased demand. Negotiations between Australian iron ore exporters and Japanese steel industry representatives resulted in iron ore price increases. Increases of about 15% were requested to compensate for a reduction in the value of sales contracts caused by a devaluation of the U.S. dollar.

The iron ore producers were optimistic about long-term prospects since announcement by the Minister of Mines of Western Australia, that measured, indicated, and inferred reserves in the State were assessed as 24 billion tons. About 5 billion tons of the total was limonite ore with about 55% iron content, and nearly 19 billion tons was hematitic ore containing at least 55% iron. High-grade reserves (above 60% iron content) were estimated to be 8.8 billion tons. In addition, an agreement was reached during the year between the Western Australian Government and Northern Mining Corp. N.L. on the proposed development of iron ore deposits at Weld Range, Mount Gould, Mount Hale, and Robinson Range. The agreement will allow detailed economic and engineering studies to proceed. Iron ore reserves are estimated to total more than 300 million tons.

The principal iron ore producers and

quantities shipped during the year were as follows:

Company	Iron ore (thousand metric tons)
Goldsworthy Mining Ltd., Western Australia (lump)	8,200
Hamersley Iron Pty. Ltd., Western Australia (lump, pellets)	27,300
Western Mining Corp. Ltd., (WMC), Western Australia (lump)	669
The Broken Hill Pty. Co. Ltd. (BHP), Western Australia (lump)	6,295
The Broken Hill Pty. Co. Ltd. (BHP) South Australia (lump, pellets)	7,937
Savage River Mines, Tasmania (pellets)	2,826
Frances-Greek Iron Mining Corp. Pty. Ltd. Northern Territory (lump)	692
Mount Newman Iron Ore Co., Western Australia (lump)	26,132

The two mines operated by Hamersley Iron Pty. Ltd. (Mount Tom Price and Paraburdoo) produced 27.3 million tons of iron ore in 1973 compared with 21.8 tons in 1972. Some 19 million tons came from the Mount Tom Price mine, and 8.3 million tons, from Paraburdoo. Commercial production at Paraburdoo began early in the year, and output was increased as rapidily as possible to meet the strong demand for iron ore. Production is expected to reach 15 million tons per year by 1974. Geological reconnaissance of areas for which rights of occupancy were granted by the Western Australia Government was completed. Scout drilling and detailed mapping began in the more promising areas. This exploration could increase Hamersley's total ore reserves to around 6 billion tons, of which 2 billion would be high-grade hematite; 2.5 billion tons, low-grade hematite; and 1.5 billion tons, limonite.

Mount Newman Iron Ore Co. expanded its Pilbara, Western Australia, facilities to increase capacity to a yearly rate of 35 million tons of iron ore by 1974. Production in 1973 was 26 million tons compared with 21.4 million tons in 1972. Already one of the world's largest open pit iron ore mining operations, Mount Newman installed a third secondary crusher. Also, additional drills and trucks were added at the Mount Whaleback mine. Four new locomotives and the required ore cars were added to the rolling stock on the 265-mile railroad connecting the mine with Port Hedland. Additional housing was under construction at Mount Newman and Port Hedland to accommodate the larger work force.

The Broken Hill Pty. Co. Ltd. (BHP) and its wholly-owned subsidiaries produced nearly all of Australia's primary iron and steel during 1973. The consolidated annual reports for periods ending May 31, 1972, and May 31, 1973, summarize output of various products as follows:

Commodity	Quantity (thousand metric tons)	
	1972	1973
Pig iron	6,022	7,117
Steel ingots and billets	6,579	7,233
Blooms and slabs	5,543	6,167
Sheets, bars, billets, etc	2,869	3,099
Plate and strip	2,273	2,458
Merchant	1,518	1,551
Rod	550	545
Narrow cold-rolled strip	103	111
Tinplate	317	243

Pig iron production of The BHP group increased to 7,117,000 tons, and raw steel output advanced to 7,233,000 tons, 18% and 10%, respectively, above the 1972 level. The major contributor to the improvement in output was the Port Kembla plant which boosted iron production to 3.5 million tons and steel production to 4 million tons. The record iron and steel tonnages were attributed to improved economic conditions, the recently commissioned No. 5 blast furnace, and the startup of new basic oxygen steelmaking facilities. During the year, work was completed on the final units in the expansion program to increase the annual capacity of Port Kembla to 5.5 million tons of raw steel. Pig iron and raw steel production of 1.9 million and 2.1 million tons, respectively, were both above the tonnages of the previous year at the Newcastle plant. At the Whyalla plant, the pig iron output reached 934,000 tons, and steel production was 1.2 million tons. The Kwinana blast furnace was operated on a regular basis to produce pig iron for export. The production of pig iron amounted to a record 725,000 tons.

Lead and Zinc.—The Australian lead industry in 1973 recorded gains in all sectors after a year of falling mine and smelter production. The increases were credited largely to an absence of major industrial stoppages and were in line with general economic growth. Mine output of zinc,

however, decreased and production of refined zinc was only marginally higher than in 1972. Exports of lead bullion and refined lead increased about 11% and 13%, respectively, but export of zinc concentrates was reduced by 17%.

Mine production of lead in 1973 rose 2% to 405,638 tons, and production of primary refined lead, by 6% to 190,355 tons. Slightly lower ore production and lower grades of ore at the Broken Hill group of mines resulted in a reduction in lead concentrates produced. The decrease, however, was more than offset by increased lead ore output at the Cobar mines in New South Wales. Operations at Cobar returned to normal after a year in which production was interrupted by a major work stoppage. At EZ Industries Ltd. in Tasmania, ore output rose 15% and mine lead production rose slightly over 8%. The increases reflect the recently completed expansion program and the change to double shift production at the mines.

Mine production of zinc decreased 5% to 477,538 tons, but production of primary refined zinc increased slightly to 297,174 tons. Moderate increases in mine production of zinc were recorded by Mount Isa in Queensland, Cobar mines in New South Wales, and EZ Industries in Tasmania. At the New South Wales mines of Broken Hill zinc production declined around 8%.

Mount Isa mines treated 4.4 million tons of silver-lead-zinc ore in the year ended June 30, 1973, yielding 8.8 million ounces silver, 112,510 tons of lead, and 98,348 tons zinc, compared with 9.1 million ounces of silver, 121,058 tons of lead, and 90,973 tons of zinc in 1972. There was a small net reduction in silver-lead-zinc ore reserves at the Mount Isa mine and an increase at the Hilton mine. Reserves of silver-lead-zinc in the Mount Isa and Hilton mines were 56 million and 37 million tons, respectively. Exploration work at Hilton was mainly concerned with preparation for a program of underground exploratory development and drilling.

Tycho Mining Co. Ltd. announced plans to develop a $1.3 million zinc mine at Youanmi, in Western Australia, with a yearly production rate of 10,000 tons of zinc concentrate from proven reserves of 110,000 tons of ore. Tycho also has a 21% interest in the prospect at Freddie Well, about 300 miles northeast of Perth. Other partners in the venture are Kalmin Exploration Co., 30%, and Australian Ores & Minerals Co., Ltd. 49%. Reserves of 627,000 tons of ore with a cutoff grade of 9.8% zinc were proven. A concentrator will be built on the site. Concentrate samples were sent to Japanese smelters for testing.

Electrolytic Zinc Co. of Australasia, Ltd. set a new record in zinc production. A total of 193,200 tons of slab zinc was produced for the year ending June 30, 1973, an increase of 10% over that of 1972. The new residue treatment plant and the No. 6 cell unit installed in 1972 operated at full capacity throughout the year. Higher mine output was achieved in the first half of the year, but production rates were seriously affected in the second half by a 5-week strike. Construction of the world's largest fluid-bed roaster for zinc concentrate began at Electrolytic Zinc. A $6,850,000 order was placed with Lurgi (Australia) Pty. Ltd. for construction of the roaster. Ancillary works in conjunction with roaster construction will add an estimated $2,100,000 to costs. Completion of the roaster, which will have a grate area of approximately 147 square yards and a capacity of 800 tons of zinc concentrate per day, was planned for mid-1975.

The Zinc Corp. Ltd. and New Broken Hill Consolidated Ltd. (NBHC) treated 1.8 million tons of ore in 1973, 10% less than in 1972. Combined production was 165,000 tons of lead, 199,000 tons of zinc, and 328,029 ounces of silver, compared with 170,000 tons of lead, 221,000 tons of zinc, and 141,094 ounces of silver in 1972. Total production from the two mines at Broken Hill, New South Wales, was curtailed by a cave-in during September in a section of the NBHC mine. The caving blocked a main haulage drive and caused all transport of ore on that level to cease until late January 1974.

The principal producing companies and quantities recovered in concentrates and other mine products in recent years were as follows, in tons:

Mine	1970		1971		1972	
	Lead	Zinc	Lead	Zinc	Lead	Zinc
North Broken Hill Ltd	66,234	48,524	64,837	49,451	58,584	46,648
Broken Hill South Ltd	25,733	29,012	17,791	13,408	5,425	3,318
The Zinc Corp. Ltd	95,245	78,120	86,105	79,152	86,039	78,832
New Broken Hill Consolidated Ltd (NBHC)	81,742	148,374	84,248	142,269	85,010	142,101
Mount Isa Mines Ltd	142,744	92,694	115,987	90,982	112,510	102,313
Electrolytic Zinc Co. of Australasia Ltd. (Read-Rosebery)	14,982	49,872	18,864	64,172	19,879	66,559

Manganese.—Operations in Western Australia and the Northern Territory reported record output of 1,522,416 tons of manganese ore in 1973, up 26% above the quantity reported in 1972. The record production resulted mainly from a 53% increase in production by Groote Eylandt Mining Co. Pty. Ltd. following a major expansion program. The expansion will cost the company $27 million and strengthen its position as a major long-term supplier of manganese ore. The deposit, which was estimated to contain more than 100 million tons of ore, was developed initially to supply BHP ferroalloy plant at Bell Bay in Tasmania. However, during 1973, some 80% of ore shipped was consigned to export markets.

The manganese ore was mined at a number of separate quarries from which different grades of ore were obtained. The ore was crushed, washed, sized, and treated by gravity concentration in a plant capable of handling 12,000 tons of ore per day. Products were hauled by road to the port where they were stocked to await shipment.

Manganese mining activities in Western Australia were centered around Woodie during 1973. Operations involved the transport of managanese ore from Woodie to Port Hedland. Total shipments of ore from Port Hedland (320,000 tons averaging 47% manganese) were principally to Japan.

Mining operations by Longreach Manganese Pty. Ltd., also at Woodie, involved road transport of the manganese ore to Port Hedland, a distance of about 240 miles. Shipments by Longreach from Port Hedland in 1974 were 75,000 tons (50%) manganese. Negotiations with Japanese steel mills over the establishment of a mining venture based on deposits of ferruginous manganese ore at Ripon Hills were undertaken and extensive exploration work continued. The Risdon plant of Electrolytic Zinc produced 3,952 tons of manganese dioxide recovered as a sludge during the electrolysis of zinc sulfate. The material was used as a trace element in fertilizers and for chemical processes.

Nickel.—The improvement in world markets for nickel in 1973 resulted in a 12% increase in Australia's production. The world consumption of nickel was estimated to have increased by approximately 25%. WMC, Australia's largest nickel producer, announced that sales were 35% higher than in 1972. Improved world markets were also reflected by developments in domestic nickel mining projects. The Anaconda Australia Inc., Conzinc Riotinto of Australia Ltd., and New Broken Hill Consolidated Holdings Ltd. consortium brought the Redross project into production in December. Development work at the mine site was suspended in 1972 because of marketing problems. Annual mine production was expected to reach 170,000 tons of ore, which will be treated at the Fimiston mill of North Kalgurli Mines Ltd. The mill, previously used for the treatment of gold ores, was converted to treat nickel ores.

In June 1973, WMC announced it would purchase the output of the partly developed Carr-Boyd Rocks project jointly owned by North Kalgurli Mines and Great Boulder Mines Ltd. Development work that ceased in September 1972 was again underway. Mine production will be transported by road to the treatment plant of Great Boulder at Fimiston. Annual output is expected to reach 3,000 tons of nickel in concentrate, which will be purchased by WMC for subsequent treatment at its Kwinana refinery or at its Hampton smelter near Kalgoorlie. Ore reserves contained in three vertical pipes were assessed at 1.8 million tons averaging 1.4% nickel and 0.49% copper.

In 1973, the Kambalda mines operated

by WMC produced 31,110 tons of contained nickel compared with 31,500 tons in 1972. An additional 2,390 tons of nickel were recovered from purchased ore (1,600 tons in 1972). Grinding and flotation capacity was increased, and nickel concentrate grades and recovery were improved. An additional spray dryer was installed. The refinery operated satisfactorily, with recovery at design levels and production at the rate of 20,000 tons per year. The increased output was achieved by modifications to existing equipment and minor additions of new equipment.

Equipment for grinding matte from the Kalgoorlie smelter was installed thus making it possible to feed mixed concentrate and matte. The smelter was well advanced at yearend. First shipments of high-grade matte to overseas customers were made in May 1973. Production was at about one-half the design rate by yearend.

Another Western Australian project in progress was the Poseidon mine at Mount Windarra. This mine is jointly owned by Poseidon and WMC. Production of approximately 14,000 tons of nickel in concentrates was scheduled for late 1974. WMC will own one-half of the output and will smelt Poseidon's half before sale to Sherritt Gordon Mines Ltd. of Canada. Indicated and inferred reserves at Mount Windarra were estimated at more than 15 million tons of 2.32% nickel and 0.2% copper, with about 15 million tons of lower grade ore.

In Queensland, work was nearing completion on Australia's first laterite nickel mining project, the $320 million Greenvale enterprise. When completed in 1974, Greenvale will be the largest laterite nickel venture in the world and will add about $86 million per year to Australia's minerals export income. Greenvale is a joint venture of Australia Mining Co. N.L., Metals Exploration N.L., and Freeport Minerals Co. The project will come into operation with sales contracts covering about 95% of output during the life of the mine. Japan and West Germany will be major outlets for Greenvale nickel.

Metals Exploration and Freeport produced nickel sulfide ore from the small Nepean mine in Western Australia and have a joint interest in the Mount Keith nickel prospect in that State. The drilling program at Mount Keith indicated reserves of more than 200 million tons of ore containing 0.6% nickel as nickel sulfide.

Silver.—Mine production of silver recovered as a coproduct or byproduct of lead-copper and zinc rose 3% in 1973, mainly due to increased production of lead and copper from the Mount Isa mine. At Broken Hill, output was down 30%, resulting from voluntary restraints on production at the lead plant and the termination of operations at the South mine. Queensland produced 50% and New South Wales 42% of all silver mined in Australia during 1973; the remainder was accounted for by Tasmania (7%) and two other States (1%). About 85% of the silver output was recovered in lead-silver bullion from smelting lead concentrates. Zinc and copper concentrates contained 8% and 6% of the silver output, respectively, and other mine products (including gold bullion) contained 1% of the total. Principal producers of silver and their output during 1971 and 1972 were as follows:

Company	Quantity (thousand troy ounces)	
	1971	1972
North Broken Hill Ltd	3,394	3,019
Broken Hill South Ltd	1,122	121
Zinc Corp. Ltd	2,122	2,087
New Broken Hill Consolidated Ltd	1,993	1,645
Mount Isa Mines Ltd	8,224	8,816
Electrolytic Zinc Co. of Australasia Ltd	1,560	1,543

In the Mount Isa Area, which has become the largest source of silver in Australia, some 11 million ounces of silver was produced. Silver occurred as a constituent of both lead-zinc ore at a concentration of about 6 ounces per ton, and copper ore at 0.16 ounce per ton.

Less than one-half of the domestic mine production was refined locally. The remainder was exported mainly in lead bullion and concentrates. Production of refined silver decreased 9% to 7.8 million ounces in 1973, from 8.5 million ounces in 1972. The most important producer of refined silver was the Broken Hill Associated Smelters Pty. Ltd. at Port Pirie, South Australia, where output was 6.3 million ounces in 1973. The silver was recovered from lead concentrates obtained from Broken Hill. The copper refinery of The Electrolytic Refining & Smelting Co. of Aust. Ltd. (E.R.&S.) at Port Kembla produced 1.7

million ounces in 1973. The silver was contained in copper concentrates from Cobar and Mount Lyell and slimes from the electrolytic copper refinery at Townsville. In addition to these supplies, E.R.&S. purchased quantities of mine sweepings, jewellers' scrap and scrap copper, some of which contained silver. The Royal Mint in Perth produced 0.4 million ounces of refined silver in 1973, about one-third of which was derived from bullion of domestic origin.

Exports of silver in lead bullion and concentrates, and all other products in 1972, totaled about 9 million ounces.

Tin.—Australia's tin industry in 1973 reversed the upward trend in mine production initiated in 1963 and declined about 12% compared with that of 1972. The decline was attributed to a drop in production at several major mines and export controls introduced by the International Tin Council (ITC) in early 1973.

Renison Ltd., Australia's largest tin producer, reported a slight drop in production because of a 3-month strike. Although the quantity of ore treated declined about 20% from that of 1972, the grade of ore rose from 1.30% to 1.49% tin, and tin recovery also increased from 65.7% to 71.2%. This higher recovery resulted from finer grinding of the ore. Renison announced an increase in tin ore reserves from 7,149,000 tons to 7,928,000 tons with ore grade increasing from 1.30% to 1.34%. The installation of a heavy media separation plant, to be completed in mid-1974, will increase mill capacity from 400,000 to 700,000 tons per year and enable treatment of lower grade ore.

The Aberfoyle group, consisting of Aberfoyle Ltd., Ardlethan Tin N.L., and Cleveland Tin N.L., reduced operations to the smallest feasible working scale in 1973. Studies indicated this was the most economic method of maintaining these ore bodies rather than ceasing production and placing the mines on a care and maintenance basis. The company reported disappointing earnings caused by increased operating costs and fluctuating tin prices as reason for this action. Principal mine producers of tin concentrate and quantities of contained tin produced in 1973 were as follows:

Company	Quantity (long tons)	
	1971	1972
Aberfoyle Tin Co. N.L	480	412
Ardlethan Tin N.L	1,318	1,210
Cleveland Tin N.L	1,814	1,620
Cooglegong Tin Pty. Ltd	98	82
Gibsonvale Alluvials N.L	394	431
Greenbushes Tin N.L	317	370
J. A. Johnson & Sons Pty. Ltd	80	85
Pilbara Tin Pty. Ltd	256	288
Ravenshoe Tin Dredging Ltd	465	502
Renison Ltd	5,231	5,102
Storeys Creek Tin Mining Co. N.L	120	113
Tableland Tin Dredging N.L	452	432
Tullabong Tin Ltd	238	243

Domestic consumption of primary tin was 32,000 long tons in 1973. Approximately 60% of Australia's industrial use was in the manufacture of tinplate.

Titanium Concentrates.—Australia continued to dominate the world mineral sands market in 1973 with increased rutile production from the east coast and ilmenite from the west coast. Industry sources reported a rise of 5% in rutile production and a marginal increase in ilmenite over that for 1972; however, zircon production was down slightly. Despite three currency adjustments that made Australian sands more expensive on the world market, producers received high prices, particularly for rutile and zircon.

Mining activity along a 100-mile stretch of the Australian west coast continued at a high level during the year. Expansion of mineral sands production proceeded from Jurien Bay to Geraldton, where proven and probable reserves exceeded 130 million tons of heavy-sand products. Companies involved were Allied Eneabba Pty. Ltd., Ilmenite Minerals Ltd., A. V. Jennings Industries (Aust.) Ltd., and West Coast Rutile Ltd.

Allied Eneabba formally commissioned its 45,000-ton-per-year pilot plant on April 6. In November, it was announced that the company would begin construction of a 350,000-ton-per-year plant at a cost of about $12.4 million, to be fully operational by late 1975. Anticipated annual production at that time will be 200,000 tons of ilmenite and 50,000 tons of rutile. Leucoxene, zircon, monazite, and kyanite will also be produced in commercial quantities. During the pilot operation it became clear that dredging the deposit from a moving dredge pond was unsatisfactory; future mining will be conducted by dry methods.

For the time being, exports will be made from the port of Geraldton, but the company will probably build port facilities nearer the mining operation. A narrow-gage railway was also contemplated.

The litigation concerning 22 mineral claims in the Eneabba beach sands was decided in favor of Western Titanium, Ltd. A final appeal to the Privy Council in London was being considered. If the decision stands, Allied Eneabba's resources will be reduced to about 8 million tons of mineral concentrates, 0.75 million of which contain rutile. However, Eneabba contemplates no change in its plans or the scale of operations.

A. V. Jennings Industries began processing sands on a pilot scale in March. Construction of a $13 million full-scale plant was underway, to be operational in 1974 at the annual rate of 120,000 tons of ilmenite, 35,000 tons of leucoxene, 40,000 tons of rutile, and some zircon.

A process for upgrading rutile, developed by the Commonwealth Scientific and Industrial Research Organization (CSIRO) and Murphyores Incorporated Pty. Ltd., was being tested jointly by Murphyores and Mitsubishi Chemical Industries Ltd. in a pilot plant at Kurosaki, Japan. Planning began about midyear for a commercial-scale plant to be built in Australia. Successful exploitation will permit expanded use of east coast ilmenites, which were in minimal demand for pigment production because of chromium and vanadium content.

West Coast Rutile Ltd., a joint-venture company, one-third held by Mining Corp. of Australia Pty. Ltd., and two-thirds by Kamilaroi Mines Ltd., completed a feasibility study on its 54 claims at Jurien Bay. Exploration indicated 3.2 million tons of heavy sands. Potential annual production was estimated at 150,000 tons of ilmenite, 19,000 tons of leucoxene, 25,000 tons of rutile, and some zircon and kyanite.

South of Perth, Westralian Sands, Ltd., established a new open pit mine in the Tutunup Area, from which most of Westralian's production was coming at year-end. Mining in the area between Yoganup and the Capel River ceased about midyear. Exploration further north was undertaken in a joint venture with Tioxide Australia Pty. Westralian's production in the fiscal year ending June 30 exceeded 230,000 tons of which 85% was ilmenite.

Project Mining Corp. drilled nine claims at Hardy Inlet, near Augusta. The deposit showed an indicated reserve of 1 million tons of ilmenite. The company will initiate mining as soon as environmental permission is received.

Western Titanium, Ltd., continued construction of its ilmenite upgrading plant at Capel, near Bunbury. The plant will produce a synthetic rutile of 94% TiO_2 grade and is expected to come onstream in April 1974. The company reports production of 43,553 tons of upgraded ilmenite between February 1, 1969, and June 30, 1973.

NONMETALS

Phosphate Rock.—Compared with domestic requirements, Australia's production of phosphate rock remained negligible. The 5,000-ton production in South Australia was the only domestic source of phosphate rock in 1973.

Broken Hill South formed Queensland Phosphate Pty. Ltd. in June 1972 and continued to develop the 2-billion-ton phosphate deposit at Lady Anne, in northwest Queensland. Queensland Phosphate acquired all mining properties previously held by Broken Hill South in the phosphate area. Broken Hill South will manage the project. Expenditures on the project during the year were almost $2.2 million, much of which was incurred on the construction of the 100-ton-per-day pilot plant. Plant operations confirmed the data that previously produced high-grade phosphate in the laboratory. Concentrates were prepared for shipment to fertilizer manufacturers in Australia and Japan for full-scale plant tests. Additional samples of concentrate for laboratory tests were sent to New Zealand, India, South Korea, and the Philippines, and discussions were in progress to arrange plant trials in those countries.

Several companies continued active exploration for phosphate in Queensland, including the International Minerals and Chemical Development Corp. of the United States, Continental Oil Co. of Australia, Ltd., and Mobile Oil Australia Ltd.

Imports of phosphate rock were 3.3 million tons, most of which came from Nauru and Ocean Islands in the Pacific, Christmas Island in the Indian Ocean, and Africa.

Salt.—The continued strong demand for salt by the Australian heavy chemical industry was reflected in an increase of over 20% in production during 1973. There was also a substantial increase in consumption of salt in 1973, and exports, mostly to Japan, were nearly three times the 1972 level. All developments in the salt industry, particularly in Western Australia, were intended to satisfy the requirements of Japan, which consumed about 7.0 million tons in 1973. All domestic production came from solar exaporating pans or dry salt lakes.

Salt production in Queensland increased significantly, but Western Australia remained the main source of supply in 1973, and South Australia retained second place. Production in Western Australia was given greater impetus when the four principal producers secured an increase of $1.10 per ton in the c.i.f. prices for salt exported to Japan. The companies were Dampier Salt Ltd., Leslie Salt Co., Texada Salt Co., and Shark Bay Salt Co., which produced over 90% of the Western Australian output. Dampier Salt Ltd. and Leslie Salt Co. will benefit most from Japan's increased order, since Texada's maximum production capacity will be 600,000 tons per year until 1975 by agreement with the Western Australian Government. Shark Bay Salt, a relatively small producer, reported that it must first make adjustments to its own production areas before it can increase output to any great extent.

Capacity of Dampier Salt Ltd.'s solar field was 3.5 million tons per year. This was an increase of about 60% above the previous capacity of 2.2 million tons. Shipments in 1973 totaled some 1.2 million tons, and much larger shipments are scheduled for 1974. The company, in which Comalco has a 50% interest, is to establish a central research and development laboratory in Melbourne.

In South Australia, Imperial Chemical Industries of Australia and New Zealand Ltd. (ICIANZ) reported output of 580 tons from its Dry Creek salt fields in 1973. At Whyalla, BHP produced 80,000 tons of salt by solar evaporation. Salt was recovered from saline lakes in both the northwest and western areas of Victoria. However, the principal producer was Cheetham Salt Ltd., which operated solar evaporating pans near Laverton on Port Phillip Bay and at Lara and Geelong on Corio Bay.

Sulfur.—There were no known commercial deposits of elemental sulfur in Australia in 1973, and imports were substantial. A total of 420,000 tons was imported during 1973, which represented a 68% increase compared with that of 1972. Canada, the chief source of supply, accounted for 62% of total Australian imports; the United States supplied 21%; and Poland supplied the bulk of the remainder. Although there were no known domestic sulfur deposits, the following three oil companies had sulfur recovery units: Petroleum Refineries (Australia) Pty. Ltd. (plants at Altona, Victoria, and Hallets Cove, South Australia), Shell Refining (Australia) Pty. Ltd. (plant at Clyde, New South Wales), and American International Oil Co (plant at Bulwer Island, Queensland). The combined capacity of those plants was 90 tons of elemental sulfur per day; however, actual production depended on the sulfur content of refinery feedstock.

The total production of pyrites in 1973 was about 280,000 tons. A few companies produced pyrites for use in the manufacture of sulfuric acid: Mount Lyell, Tasmania (byproduct of base metal operations), Nairne Pyrites (pyrite mining), Gold Mines of Kalgoorlie (byproduct of gold mining), and Electrolytic Zinc (Tasmania). Mount Morgan's operation in Queensland also recovered pyrite concentrates as a byproduct of base metal mining, but the complete output was exported. Electrolytic Zinc produced 52,332 tons in 1972.

Domestic production of sulfuric acid in 1972 increased to about 1,953,000 tons. Of the total output, about 72% was made from elemental sulfur, 10% from pyrites, 17% from zinc and lead concentrates, and 1% from other material. Consumption of sulfuric acid in 1973 was 1,930,000 tons, of which 79% was used in the manufacture of superphosphate, 4% for ammonium sulfate, and 16% for mining and metallurgical uses.

MINERAL FUELS

Coal.—*Black.*—The year 1973 was good in many ways for the Australia coal industry. Both bituminous and lignite production were again at record levels, but the rate of increase was lower than that

for 1972. According to preliminary data, total coal production was 85.4 million tons, 2% more than in 1972. Domestic consumption increased sharply, and strikes were few. Although exports were lower than in 1972, there was considerable progress towards placing the trade with Japan on a more satisfactory basis. The imposition of an export control on coal by the Australian Government was also a major factor in declining shipments.

Production of black coal in New South Wales and Queensland in 1973 increased by 2% to 58 million tons. These two States supplied over 90% of the total black coal output. Mines in Western Australia, South Australia, and Tasmania, in order, produced a total of 2.7 million tons. Production in New South Wales increased to a combined total of 40 million tons of raw coal, 2 million tons more than in 1972. This was the 10th successive year that total coal production increased. The increase in production was not uniform but was concentrated in the opencut and underground mines in the Liddell Area of the Singleton North West District and in the underground mines on the South Coast. Production from some other areas declined, and overall production of 34 million tons from underground mines was lower than in either of the 2 preceding years and only marginally higher than in 1970. There were 78 mines in production in New South Wales on December 30, 1973, compared with 84 mines at the end of 1972. Employment, which had been falling since early 1972, continued to fall during 1973. On December 30, 1973, 13,750 men were employed, 940 less than in January 1973.

The Queensland Government announced in October that a consortium of companies was planning development of a multi-million-dollar coking coal deposit at Hail Creek, 60 miles southwest of Mackay. The opencut project will involve the building of a new coastal port capable of handling 100,000-ton bulk carriers, a new 85-mile railroad line, and a new town to accommodate 1,900 people. The Bowen Basin coalfield in which the project is situated has indicated reserves of 5 billion tons of coking coal and 2 billion tons of steaming coal. Also in Queensland, the Minister for Mines announced in July that State exploration has discovered several billion tons of subbituminous coals at shallow depth north of Alpha in the Galiee Basin. Companies were invited to investigate the deposits.

BHP reported plans to develop a new mine at Teralba, New South Wales. The mine will supply coking coal to the Newcastle steelworks beginning in 1976. Coal will be conveyed along a 1-½-mile tunnel from the new colliery to the Stockton Borehole colliery for transport to the steelworks. The mine will be designed to produce 4,500 tons of coal daily.

Theiss Bros. Pty. Ltd. concluded an agreement in June with Queensland Alumina Ltd. (QAL) to supply 12 million tons of steaming coal from its Callide opencut mine for use in firing steam boilers at QAL's Gladstone alumina refinery. Coal is to be supplied at a rate of 450,000 tons per year starting in 1974. The Callide mine currently supplies coal to the Calcap Power Station of the Capricornia Regional Electricity Board at a rate of approximately 575,000 tons per year.

Black coal reserves were estimated at around 26 billion tons, consisting of approximately 13 billion tons in Queensland; 12 billion tons in New South Wales; and the remaining 1 billion tons in Victoria, Tasmania, South Australia, and Western Australia. About 16 billion tons of the reserve consist of coking coal. Black coal output as reported by the Joint Coal Board in leading producing States is given in table 5.

Table 5.—Production of black coal
(Thousand metric tons)

State	1970 r	1971 r	1972
Queensland	10,124	11,620	17,612
New South Wales	35,900	34,576	39,176
Tasmania	114	124	131
South Australia	1,856	1,492	1,602
Western Australia	1,217	1,190	1,168
Total	49,211	49,002	59,689

r Revised.

Domestic consumption of black coal in recent years was as follows:

Industry	Quantity (thousand metric tons)		
	1970	1971 r	1972
Iron and steel	7,956	7,653	8,948
Electricity	12,512	13,874	14,607
Railways	130	76	33
Town gas	384	249	131
Cement	790	793	899
Metallurgical coke	541	440	473
Other (including bunkers)	2,261	2,404	2,303
Total	24,574	25,489	27,394

r Revised.

Lignite.—The State Electricity Commission (SEC) of Victoria mined 23,443,000 tons of brown coal from the Latrobe Valley reserves in 1973. This was 95% of the total Australian output. The remainder was produced by private operations in the Anglesea, Bacchus Marsh, and Gelliondale areas.

Coal deposits in the Latrobe Valley stretch over a 30-mile belt that varies between 5 and 10 miles wide. Seams range in thickness from 200 to 450 feet beneath an overburden of usually around 50 feet. The total reserves amenable to opencut extraction were approximately 10 billion tons.

The Latrobe brown coal is a young, relatively soft coal, and in its raw state is a low-grade fuel with a high moisture content. With the application of a special combustion technique, however, it becomes an efficient fuel source for the power stations in the coal fields. The use pattern showed that 80% of the total was for power generation, about 15% was for the manufacture of briquets (a portion of which was used in power generation), and 5% was used for factory fuel.

Over the next decade, capital expenditure on new projects in the Latrobe Valley will exceed $450 million. The principal unit will be the Yallourn power station, which will be in operation by 1980. Brown coal will be transported directly from the Yallourn opencut by belt conveyor to the powerhouse.

Petroleum and Natural Gas.—The growth trend for both petroleum and natural gas was maintained by Australia's thriving fuel industry throughout 1973. Crude oil produced from indigenous sources was 142,277,000 barrels, 19% above the 1972 figure and 70% of domestic requirements. From this 70%, up to 90% of the nation's supply of gasoline, diesel distillate, aviation turbine kerosine, and heating oil was produced. Natural gas during the same period reached a production level of 145,000 million cubic feet, an increase of 28% over 1972. Consumption of natural gas, including field and plant usage, during 1973 totaled 145 billion cubic feet, an increase of 28% over that of 1972.

The increased production of oil and gas was attributed mainly to expanded output from the Gippsland Basin Field, where production was 23% higher than in 1972, and made up 89.3% of the total domestic output. BHP and Esso Exploration & Production Australia Inc. produced a total of 107,885,000 barrels of crude oil from the Gippsland Basin Field during the year. Of this quantity, 1,708,000 barrels came from the Barracouta Field, 45,645,000 barrels from Halibut, and 59,798,000 barrels from Kingfish. The balance of 734,000 barrels was condensate produced from the gasfields. A monthly production record of 350,000 barrels per day was reached in May. Total production of liquefied petroleum gas by BHP and Esso amounted to 894,000 tons. Natural gas deliveries totaled 40.5 billion cubic feet. Ethane production totaled 25,700 tons. Construction of an ethane pipeline from Long Island Point to Altona was completed, and deliveries of ethane started in December. Also in the Bass Strait, BHP and Esso announced that the MacKerel Field was considered a commercial oilfield with recoverable reserves of 200 million barrels. Plans to bring this field into production by 1977 and the Tuna Field by 1978 were being formulated.

Production of crude oil continued at Barrow Island Field in Western Australia. The average daily production rate throughout the year was approximately 40,000 barrels. Barrow Island was producing from 326 of 411 oil wells at the end of 1973. The 1973 daily output in the two other oil-producing States was as follows: Queensland 90 barrels, and Victoria 2,880 barrels.

Exploration for natural gas continued to be fruitful. Discoveries were made at Coonatie, Big Lake, Fly Lake, Brolga, and Brumby in the Cooper Basin, and further delineation drilling was carried out on the Mudrangie and Della structures. It was reported that recoverable gas reserves from these fields could exceed 2 billion cubic

feet. The number of gas-producing wells at the end of 1973 was 64. The average daily gas production per well in various States was as follows: Queensland 1.03 million cubic feet, South Australia 6.2 million cubic feet, Victoria 24.5 million cubic feet, and Western Australia 5.4 million cubic feet.

The total recoverable gas reserves of Australia as of December 31, 1973, were estimated at 20 trillion cubic feet. Crude oil reserves stood at 2.3 billion barrels on December 31, 1973, compared with 1.6 billion barrels at yearend 1972.

Under the terms of the Petroleum Search Subsidy Act, the Commonwealth paid $13.7 million in subsidies to petroleum exploration companies during 1973. The Act is designed to encourage exploration by providing 30% of the cost of geophysical investigations and drilling. By yearend 1973, a total of $162 million had been spent on exploration. Of this expenditure, onshore operations accounted for $50.7 million, and offshore operations for $111.3 million.

Production capacity of Australia's 12 petroleum refineries at yearend was 764,000 barrels per stream-day, which is equivalent to 34.1 million tons per year. Output of refinery products in 1973 totaled 171 million barrels compared with 151 million in 1972. Consumption of refined products during the year totaled 204 million barrels. Principal consumer categories included automotive fuel 35%, fuel oil 22%, automotive distillate 13%, refinery fuel 8%, and aviation turbine fuel 4%. Imports of refinery products totaled 85 million barrels, and exports totaled 22 million barrels.

The Mineral Industry of Austria

By Grace N. Broderick [1]

The Austrian economy in 1973 continued its vigorous economic growth. The gross national product (GNP), according to the Austrian Institute of Economic Research, increased about 6% from 1972 to 1973. As in previous years, the mineral industry represented only a small part of the GNP. Aluminum, antimony, copper, lead and zinc, iron and steel, cement, clays, graphite, magnesite, crude oil, and natural gas remained the principal mineral commodities produced in the country.

[1] Physical scientist, Division of Ferrous Metals—Mineral Supply.

Table 1.—Austria: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 [p]
METALS			
Aluminum:			
Alumina (abrasive grade), gross weight	27,226	26,257	28,223
Metal:			
Primary	[r] 90,696	83,988	89,131
Secondary	[r] 14,292	43,224	26,389
Antimony:			
Mine output, metal content	[r] 467	502	577
Antimony sulfide	661	NA	NA
Cadmium metal	25	26	29
Copper:			
Mine output, metal content of ore	2,649	2,303	2,742
Metal, refined, including secondary	21,295	22,693	22,875
Germanium, metal content of concentrates kilograms	5,000	5,000	[e] 5,000
Iron and steel:			
Iron ore and concentrate, gross weight thousand tons	4,171	4,132	4,210
Pig iron do	2,849	2,846	3,006
Ferroalloys (electric furnace) do	5	5	6
Crude steel do	3,960	4,070	4,238
Semimanufactures do	3,054	[1] 3,055	3,198
Lead:			
Mine output, metal content of ore	7,715	6,668	6,139
Metal, smelter output:			
Primary	9,314	9,777	9,913
Secondary	5,881	6,505	5,472
Manganese, Mn content of domestic iron ore	[r] 81,635	80,198	81,009
Silver metal, including secondary troy ounces	219,911	191,940	192,904
Tungsten, metal content of—			
Crude ore	57	--	--
Concentrate	45	--	--
Zinc:			
Mine output, metal content of ore	21,073	20,480	22,151
Metal, refined	15,969	16,877	16,999
NONMETALS			
Barite	789	202	428
Cement, hydraulic thousand tons	5,491	6,365	6,260
Clays:			
Illite	248,785	291,538	327,168
Kaolin:			
Crude	302,334	329,336	300,742
Marketable	92,165	89,919	[e] 82,000
Other	80,592	153,500	131,189
Diatomite	3,084	2,453	2,135
Feldspar, crude	2,656	3,076	2,050

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
NONMETALS—Continued			
Graphite, crude	21,392	18,772	17,211
Gypsum and anhydrite, crude thousand tons	594	760	871
Lime do	672	798	962
Magnesite:			
Crude do	1,556	1,429	1,419
Sintered or dead burned do	508	451	485
Caustic calcined do	191	180	180
Pigments, mineral, iron mica	7,969	8,194	9,796
Pumice (trass)	32,237	28,518	24,631
Salt:			
Rock thousand tons	1	1	1
In brine:			
Evaporated do	252	256	291
Other do	223	241	e 246
Total do	476	498	e 538
Sand and gravel:			
Quartz sand do	621	822	890
Industrial sand do	328	334	NA
Other sand and gravel do	r 6,442	6,821	6,214
Stone: [2]			
Dimension stone do	110	94	NA
Quartz and quartzite do	98	103	113
Other quarry stone and broken stone do	1,944	1,703	NA
Sulfur:			
Byproduct, recovered elemental do	3	e 3	e 3
Content of gypsum and anhydrite used for sulfur raw materials do	19	e 20	e 21
Other, including recoverable content of nonferrous sulfide ores and of spent oxide do	13	r e 17	e 18
Total do	35	40	42
Talc and soapstone	91,621	83,212	92,205
MINERAL FUELS AND RELATED MATERIALS			
Coal, brown coal, lignite thousand tons	3,770	3,756	3,634
Coke:			
Breeze do	1,638	411	438
Metallurgical do		1,255	1,280
Total do	1,638	1,666	1,718
Gas, manufactured, all types [3] million cubic feet	81,082	77,763	NA
Gas, natural:			
Gross production do	66,790	69,327	80,163
Marketed production do	64,293	65,459	80,093
Natural gas liquids, condensate thousand 42-gallon barrels	NA	150	NA
Oil shale	490	380	500
Petroleum:			
Crude thousand 42-gallon barrels	17,546	17,281	17,982
Refinery products:			
Gasoline do	11,697	12,255	13,425
Jet fuel do	777	905	962
Kerosine do	62	60	
Distillate fuel oil do	12,534	15,044	17,642
Residual fuel oil do	22,768	22,911	25,346
Lubricants do	1,935	1,818	1,968
Liquefied petroleum gas do	1,026	1,200	1,185
Bitumen do	1,674	1,959	1,657
Other do	2,490	3,438	3,743
Refinery fuel and losses do	1,240	1,419	1,048
Total do	56,203	61,009	66,976

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

[1] Excludes finished steel castings.

[2] Excluding stone used by the cement and iron and steel industries.

[3] Includes blast furnace and coke oven gas. Manufactured gas is reported in source as gas having a calorific value of 4,200 calories per cubic meter. (1 cubic meter equals 35.3145 cubic feet.)

Table 2.—Austria: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Oxide and hydroxide (including manufactured corundum)	22,141	22,734	Poland 5,442; West Germany 3,765; Sweden 2,644.
Metal, including alloys:			
Scrap	11,083	31,954	West Germany 18,077; Italy 12,360.
Unwrought	27,141	27,086	West Germany 17,593; Italy 2,882; Yugoslavia 1,500.
Semimanufactures	28,083	34,384	United Kingdom 3,748; United States 2,518; Portugal 2,112.
Antimony ore and concentrate	234	357	West Germany 341.
Cadmium metal, including alloys, all forms kilograms	500	3,500	Belgium-Luxembourg 3,000.
Chromium:			
Chromite	39	580	Italy 500.
Oxide kilograms	500	100	NA.
Colombium and tantalum, tantalum metal, including alloys, all forms do	31,300	11,500	NA.
Copper:			
Ore and concentrate	3,476	4,850	East Germany 3,556; Czechoslovakia 1,294.
Copper sulfate	1,120	1,423	Czechoslovakia 1,143; Italy 280.
Metal, including alloys, all forms:			
Scrap	299	373	West Germany 370.
Unwrought	6,710	6,338	West Germany 5,392.
Semimanufactures	10,550	12,226	United Kingdom 2,386; Yugoslavia 1,796; Switzerland 1,533; Sweden 1,231.
Gold metal, unworked or partly worked troy ounces	20,384	23,374	Italy 11,574; West Germany 9,549.
Iron and steel:			
Ore and concentrate, except roasted pyrite	600	640	Belgium-Luxembourg 600.
Metal:			
Scrap	4,498	12,883	Italy 8,227; West Germany 1,339.
Pig iron, ferroalloys, and similar materials thousand tons	16	6	Poland 1; West Germany 1; United Kingdom 1.
Steel:			
Primary forms do	393	331	West Germany 254; Italy 23.
Semimanufactures:			
Bars, rods, angles, shapes and sections do	201	200	Switzerland 41; West Germany 39; Italy 33.
Universals, plates, and sheets do	563	617	West Germany 177; U.S.S.R. 129; Italy 77.
Hoop and strip do	79	107	Switzerland 35; West Germany 14; Italy 12.
Rails and accessories do	34	58	Switzerland 35; Algeria 9.
Wire do	54	52	Switzerland 17; Hungary 7; Israel 10.
Tubes, pipes and fittings do	91	113	Sweden 24; Switzerland 22; United Kingdom 13; West Germany 12.
Castings and forgings, rough do	7	6	Switzerland 3; West Germany 1.
Lead:			
Oxide	1,259	1,351	Czechoslovakia 944; Yugoslavia 359.
Metal, including alloys, all forms	3,836	682	Italy 313; West Germany 230.
Magnesium metal, including alloys, all forms	440	1,834	West Germany 1,247; Italy 582.
Manganese oxide	359	246	Brazil 206.
Mercury 76-pound flasks	r 270	363	West Germany 232.
Molybdenum metal, including alloys, all forms	441	491	NA.
Nickel metal, including alloys, all forms	399	597	West Germany 393; Yugoslavia 56.
Platinum-group metals and silver metal, including alloys, all forms:			
Platinum group troy ounces	10,127	11,896	West Germany 6,816; Poland 965; Romania 965.
Silver:			
Bullion thousand troy ounces	145	164	All to West Germany.
Other (powder) do	42	16	Do.
Semimanufactures do	145	103	Yugoslavia 96.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Tin:			
Oxide ——long tons	55	46	Poland 20; Czechoslovakia 18; Portugal 6.
Metal, including alloys, all forms ——do	12	23	Yugoslavia 4; Denmark 3; West Germany 3.
Titanium oxide	(1)	(1)	NA.
Tungsten:			
Ore and concentrate	100	9	All to West Germany.
Metal, including alloys, all forms	126	96	NA.
Zinc:			
Ore and concentrate	280	--	
Oxide	1	(1)	
Metal, including alloys, all forms	803	1,045	West Germany 726; Yugoslavia 167; Switzerland 98.
Other:			
Ore and concentrate	71	51	All to West Germany.
Ash and residue containing nonferrous metals	35,161	34,386	Italy 21,843; West Germany 10,565; Yugoslavia 1,852.
Waste and sweepings of precious metals ——kilograms	25,138	9,141	West Germany 8,906.
Oxides, hydroxides and peroxides of metals, n.e.s	186	329	Czechoslovakia 307.
Base metals, including alloys, all forms, n.e.s	39	50	West Germany 38; Belgium-Luxembourg 7.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum and other natural abrasives	3	3	NA.
Dust and powder of precious and semi-precious stones (including diamond) ——kilograms	2	--	
Grinding and polishing wheels and stones	r 8,811	8,419	Romania 972; West Germany 921; Yugoslavia 766; Italy 764.
Asbestos	20	136	West Germany 118.
Barite	(1)	--	
Cement	r 224,118	202,059	Hungary 113,240; Yugoslavia 50,422; Poland 14,402.
Chalk	3,892	2,441	Italy 728; Hungary 617; Switzerland 439.
Clays and clay products (including all refractory brick):			
Crude clays:			
Kaolin (china clay)	22,090	16,501	Italy 11,073; Switzerland 3,085; Yugoslavia 1,778.
Other	906	364	Argentina 72; West Germany 61; Belgium-Luxembourg 41.
Products:			
Refractory (including nonclay bricks)	297,998	225,746	France 45,223; West Germany 37,231; Sweden 17,603.
Nonrefractory	27,793	8,374	West Germany 7,283; Switzerland 760; Italy 121.
Cryolite and chiolite, natural	20	--	
Diamond, industrial ——thousand carats	10	10	All to Yugoslavia.
Diatomite and other infusorial earths	166	152	Yugoslavia 118.
Feldspar	1,363	1,120	Italy 786; Lebanon 200; Israel 134.
Fluorspar	20	--	
Graphite, natural	21,745	18,791	Poland 6,820; West Germany 4,272; Italy 4,012.
Gypsum and plasters	163,341	172,122	West Germany 141,657; Switzerland 30,452.
Lime	r 24,936	5,786	West Germany 4,283; Switzerland 127.
Magnesite	191,711	166,000	West Germany 48,854; France 11,771; Hungary 9,874.
Mica, all forms	32	11	Poland 5; Finland 2.
Pigments, mineral, including processed iron oxides	5,750	5,306	West Germany 1,386; United Kingdom 1,000; Netherlands 570.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Precious and semiprecious stones, including diamond:			
Natural ——kilograms——	r 485	472	United States 153; West Germany 131; Sweden 70.
Manufactured ——do——	986	1,424	West Germany 249; United States 210; Hungary 100.
Salt	5	2	NA.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous, including marble and limestone	r 122,858	89,738	West Germany 83,386; Switzerland 5,893.
Slate	14	65	West Germany 64.
Other	73,356	42,011	West Germany 38,901; Sweden 2,099.
Worked:			
Paving and flagstone	17,921	13,872	Switzerland 9,354; West Germany 4,493.
Slate	(1)	--	
Other	3,033	1,850	West Germany 716; Switzerland 700; United States 312.
Dolomite	9,483	7,235	West Germany 3,274; United Kingdom 1,317; Singapore 700; Philippines 630.
Gravel and crushed rock	672,357	848,513	Switzerland 525,558; West Germany 309,290.
Limestone	50	390	West Germany 327; Switzerland 63.
Quartz and quartzite	335	280	Czechoslovakia 124; Hungary 106.
Sand excluding metal bearing	186,180	175,276	West Germany 104,611; Switzerland 60,188; Italy 7,737.
Sulfuric acid and oleum	254	15	NA.
Talc, steatite, soapstone and pyrophyllite	74,225	70,920	West Germany 33,688; Italy 10,813; Switzerland 8,052.
Other nonmetals, n.e.s.:			
Crude	4,653	4,485	West Germany 4,142.
Slag, dross, and similar waste, not metal bearing	23,190	39,564	West Germany 34,984; Czechoslovakia 3,721.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	2	(1)	NA.
Carbon black and gas carbon	4	3	NA.
Coal:			
Anthracite and bituminous, including briquets	34	3	NA.
Lignite and lignite briquets	6,108	5,168	West Germany 5,148.
Coke and semicoke	19,792	90,463	Romania 82,960; West Germany 6,921.
Hydrogen, helium and rare gases ——thousand cubic feet——	4,811	4,240	West Germany 3,207; Hungary 892.
Peat, including peat briquets and litter	2	265	Switzerland 132; Italy 56.
Petroleum refinery products:			
Gasoline, aviation and motor ——thousand 42-gallon barrels——	2	1	Mainly to Hungary.
Kerosine and jet fuel ——do——	(1)	(1)	NA.
Distillate fuel oil ——do——	16	18	West Germany 17.
Residual fuel oil ——do——	(1)	(1)	NA.
Lubricants ——do——	895	978	Poland 532; Czechoslovakia 261.
Other ——do——	32	72	Poland 42; Yugoslavia 22.
Total ——do——	945	1,069	
Mineral tar and other coal-, petroleum-, or gas-derived chemicals	8,348	30,554	Hungary 14,581; Czechoslovakia 6,316; West Germany 5,530.

r Revised. NA Not available.
1 Less than ½ unit.

Table 3.—Austria: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum			
Bauxite	24,464	30,687	NA.
Oxide and hydroxide	198,644	187,321	West Germany 9,775; France 1,828 (174,270 unreported).
Metal:			
Unwrought including scrap	19,928	51,172	U.S.S.R. 38,529; Hungary 6,609.
Semimanufactures	11,219	16,558	West Germany 5,774; Switzerland 4,752; Sweden 1,169.
Antimony:			
Ore and concentrate	--	37	West Germany 27; Canada 10.
Metal, including alloys, all forms	104	144	Yugoslavia 45; People's Republic of China 40; United Kingdom 39.
Arsenic trioxide, pentoxide and acids	41	74	France 50; West Germany 24.
Cadmium metal, including alloys, all forms	6	6	West Germany 3.
Chromium:			
Chromite	92,290	60,384	Turkey 14,214; Republic of South Africa 12,430; Iran 12,169.
Oxide and hydroxide	318	303	West Germany 144; U.S.S.R. 65; East Germany 36.
Cobalt oxide and hydroxide, kilograms	2,500	2,000	Canada 1,000.
Columbium and tantalum, tantalum metal, including alloys, all forms, do	10,400	17,700	West Germany 10,000; United States 7,500.
Copper:			
Copper sulfate	59	81	Switzerland 49; Italy 21; West Germany 11.
Metal, including alloys:			
Scrap	9,483	7,878	West Germany 5,657; Switzerland 1,451; Italy 358.
Unwrought	35,564	39,451	West Germany 18,457; Zambia 6,818; Republic of South Africa 5,221.
Semimanufactures	6,230	6,637	West Germany 3,398; Sweden 923; Switzerland 614.
Gold metal, unworked and partly worked, thousand troy ounces	1,547	1,096	Switzerland 879; West Germany 134.
Iron and steel:			
Ore and concentrate, except roasted pyrite, thousand tons	1,842	1,504	Brazil 1,114; U.S.S.R. 322.
Roasted pyrite, do	276	176	Italy 147; West Germany 18.
Metal:			
Scrap, do	83	52	Poland 21; West Germany 18; U.S.S.R. 7.
Pig iron including cast iron [1], do	78	92	U.S.S.R. 49; Hungary 21; West Germany 9.
Ferroalloys:			
Ferromanganese, do	17	20	Norway 12.
Other, do	35	48	Czechoslovakia 6; Yugoslavia 5; Norway 5; Italy 5.
Steel:			
Primary forms, do	145	75	Hungary 32; Poland 10; West Germany 6.
Semimanufactures:			
Bars, rods, angles, shapes and sections, do	89	91	West Germany 56; Hungary 19.
Universal, plates, and sheets, do	77	101	West Germany 51; Belgium-Luxembourg 15; France 12.
Hoop and strip, do	16	19	West Germany 8; Switzerland 6.
Rails and accessories, do	2	4	West Germany 3.
Wire, do	9	11	West Germany 4; Belgium-Luxembourg 3; Sweden 2.
Tubes, pipes and fittings, do	106	163	West Germany 95; Italy 28; Switzerland 12.
Castings and forgings, rough, do	9	9	West Germany 6.
Lead:			
Ore and concentrates	4,941	7,145	All from Italy.
Oxides	26	101	West Germany 48; United Kingdom 31; France 20.
Metals, including alloys:			
Unwrought, including scrap	15,448	15,983	Yugoslavia 10,370; Bulgaria 2,009; West Germany 1,157.
Semimanufactures	475	419	West Germany 168.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Magnesium metal, including alloys, all forms	844	3,694	Poland 2,740; Italy 253.
Manganese:			
Ore and concentrate	739	707	Netherlands 394; West Germany 207.
Oxides	349	328	West Germany 226.
Mercury 76-pound flasks	641	513	West Germany 174; Netherlands 107; Algeria 93.
Molybdenum:			
Oxides	637	891	NA.
Metal, including alloys, all forms	8	10	West Germany 7.
Nickel:			
Matte, speiss, and similar materials	533	949	Netherlands 531; United Kingdom 189; Republic of South Africa 87.
Metal, including alloys:			
Unwrought, including scrap	1,609	2,623	United Kingdom 532; Netherlands 362; France 359; Australia 277.
Semimanufactures	902	839	West Germany 506; United Kingdom 193.
Platinum-group metals and silver metal, including alloys, all forms:			
Platinum group troy ounces	18,487	51,313	West Germany 46,875.
Silver:			
Bullion thousand troy ounces	4,112	4,344	United States 1,093; West Germany 881; United Kingdom 868.
Other (powder) do	NA	48	West Germany 39.
Semimanufactures do	781	958	West Germany 527; Switzerland 412.
Tin metal, including alloys, all forms long tons	r 723	648	Netherlands 170; West Germany 112; Malaysia 93.
Titanium oxide	7,081	8,900	West Germany 4,959; United Kingdom 1,503; Finland 954.
Tungsten:			
Ore and concentrate	3,076	2,643	NA.
Oxide and hydroxide	212	194	West Germany 103.
Metal, including alloys, all forms	113	36	United States 16; West Germany 7.
Zinc:			
Ore and concentrate	292	674	Yugoslavia 424; Italy 250.
Oxide	579	758	West Germany 597.
Metal, including alloys:			
Scrap and blue powder	744	930	Yugoslavia 335; West Germany 289; United Kingdom 103.
Unwrought	4,413	4,761	Poland 1,267; West Germany 1,126; Bulgaria 932.
Semimanufactures	r 968	851	West Germany 616; Yugoslavia 89.
Other:			
Ore and concentrate	27,126	8,280	United States 1,885; Canada 1,408; Australia 1,141.
Ash and residue containing nonferrous metals	41,980	45,140	U.S.S.R. 15,517; West Germany 4,544; Poland 4,429.
Waste and sweepings of precious metals kilograms	12	1,193	Yugoslavia 785; Hungary 367.
Oxides, hydroxides and peroxides of metals, n.e.s	1,427	3,185	Republic of South Africa 1,668; United States 1,113.
Base metals, including alloys, all forms, n.e.s	789	853	Belgium-Luxembourg 203; West Germany 145; France 118; Japan 103.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum and other natural abrasives	712	722	West Germany 456; Italy 151; Netherlands 67.
Dust and powder of precious and semi-precious stones (including diamond) kilograms	20	19	Switzerland 13; United States 5.
Grinding and polishing wheels and stones	712	624	West Germany 304; Italy 110; Belgium-Luxembourg 51.
Asbestos	39,943	39,991	Canada 21,073; Republic of South Africa 7,223; U.S.S.R. 6,904.
Barite and witherite	6,628	4,914	West Germany 2,658; Czechoslovakia 913; Italy 871.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Boron materials:			
Crude natural borates	10,025	12,606	United States 9,215; Turkey 3,292.
Oxide and acid	627	1,039	France 914; West Germany 35.
Cement	37,222	112,783	West Germany 62,307; Italy 34,159; France 6,727.
Chalk	4,072	7,806	France 6,648; West Germany 807.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Bentonite	658	602	West Germany 331; United States 150; Italy 86.
Kaolin (china clay)	55,264	70,478	West Germany 27,353; United Kingdom 24,707; Czechoslovakia 11,145.
Other	98,420	95,996	West Germany 53,877; Czechoslovakia 32,841.
Products:			
Refractory (including nonclay bricks)	15,423	15,615	West Germany 10,643; France 1,456.
Nonrefractory	147,789	235,612	Italy 141,476; West Germany 67,739; Switzerland 12,210.
Cryolite and chiolite, natural	209	345	Denmark 340.
Diamond, industrial ——thousand carats	70	NA	
Diatomite and other infusorial earth	3,300	3,761	Hungary 1,513; United States 870; Denmark 464; Italy 378.
Feldspar	r 8,749	9,577	West Germany 4,294; Italy 2,851; Sweden 1,880.
Fertilizers:			
Crude:			
Phosphatic	330,799	471,077	United States 157,777; Israel 133,891; Tunisia 60,814.
Potassic	45,937	55,288	East Germany 33,453; West Germany 21,830.
Other	2,116	2,199	West Germany 1,557; Switzerland 641.
Manufactured:			
Nitrogenous	4,783	25,097	Czechoslovakia 6,483; West Germany 4,805; Hungary 1,020.
Phosphatic	200,452	290,728	France 144,239; Belgium-Luxembourg 117,951; West Germany 27,194.
Potassic	286,978	346,865	East Germany 154,387; West Germany 114,524; U.S.S.R. 53,636.
Other including mixed	2,388	2,726	West Germany 2,414.
Fluorspar	13,701	13,367	East Germany 5,942; France 3,025; West Germany 2,325.
Graphite, natural	2,747	890	North Korea 520; West Germany 294.
Gypsum and plasters	20,827	38,586	Poland 16,296; West Germany 12,325; Switzerland 5,421.
Lime	707	1,031	West Germany 1,017.
Magnesite	r 91,335	81,373	Turkey 54,899; Greece 19,690; Italy 3,426.
Mica:			
Crude, including splittings and waste	317	398	Norway 130; West Germany 90; United Kingdom 71.
Worked, including agglomerated splittings	43	49	Switzerland 18; Belgium-Luxembourg 12; West Germany 8.
Pigments, mineral:			
Natural, crude	207	147	France 81; West Germany 38.
Iron oxides, processed	2,170	2,477	West Germany 2,476.
Precious and semiprecious stones, including diamond:			
Natural, crude ——thousand carats	91,230	110,260	West Germany 40,285; Brazil 29,370; Republic of South Africa 19,460.
Manufactured ——do	55,055	73,920	Switzerland 40,260; France 29,245.
Pyrite (gross weight)	15,128	14,614	U.S.S.R. 14,353.
Salt, including brine	458	1,179	Mainly from West Germany.
Sand and gravel:			
Gravel (including crushed rock)	82,541	83,574	West Germany 70,682; Italy 11,927.
Sand excluding metal bearing	204,647	216,592	West Germany 144,085; Czechoslovakia 43,507.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Stone, n.e.s.:			
Dimension stone:			
Crude and partly worked:			
Calcareous, including marble and limestone	10,236	12,283	Italy 8,327; West Germany 2,727.
Slate	1,275	1,334	France 663; West Germany 472.
Other	27,424	33,335	Italy 18,389; Republic of South Africa 6,127; Sweden 2,684.
Worked:			
Paving and flagstone	9,304	12,280	Yugoslavia 4,706; Romania 3,352; Italy 2,661.
Slate	415	544	Italy 253; Sweden 103; United Kingdom 47.
Other	5,303	7,880	Italy 6,896; West Germany 464.
Dolomite, chiefly refractory grade	3,131	5,349	Italy 3,135; France 654; Norway 452.
Limestone, except dimension	4,586	10,812	West Germany 10,701.
Quartz and quartzite	20,929	23,514	West Germany 16,713; Yugoslavia 4,557; Hungary 904.
Volcanic material (trass)	674	965	All from West Germany.
Sulfur:			
Elemental, all forms	131,583	129,926	Poland 95,802; U.S.S.R. 25,732; West Germany 6,615.
Sulfur dioxide	1,163	1,187	West Germany 1,111.
Sulfuric acid and oleum	31,346	82,064	Poland 66,409; West Germany 6,060; Hungary 5,918.
Talc, steatite, soapstone and pyrophyllite	1,288	1,355	Norway 633; Italy 401; Belgium-Luxembourg 138.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum, amber, and jet	76	49	France 41.
Other	36,907	40,345	West Germany 26,122; Hungary 5,492; Bulgaria 5,131.
Slag, dross and similar waste, not metal bearing	21,579	22,320	Italy 12,232; Republic of South Africa 6,080; Yugoslavia 1,155.
Oxides and hydroxides of magnesium, strontium and barium	696	926	West Germany 701; France 121; United States 93.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	683	893	Trinidad and Tobago 694; West Germany 167.
Carbon black and gas carbon	20,917	8,584	West Germany 5,124; Czechoslovakia 2,811.
Coal:			
Anthracite and bituminous, including briquets—thousand tons	2,821	2,850	Poland 1,096; Czechoslovakia 620; West Germany 312.
Lignite and lignite briquets—do	598	922	Yugoslavia 469; East Germany 240; West Germany 166.
Coke and semicoke—do	883	906	Czechoslovakia 521; Poland 145; West Germany 106.
Gas, hydrocarbon—do	1,055	1,210	U.S.S.R. 1,196.
Hydrogen, helium and rare gases—thousand cubic feet	26,356	21,320	West Germany 19,619.
Peat, including peat briquets and litter	22,253	21,939	West Germany 10,478; Poland 5,715.
Petroleum:			
Crude and partly refined oils:			
Crude—thousand 42-gallon barrels	33,401	38,696	Iraq 9,057; U.S.S.R. 6,687; Iran 6,588.
Partly refined—do	3,336	3,545	Czechoslovakia 2,421; Poland 488; Romania 377.
Refinery products:			
Gasoline, aviation and motor—do	6,045	7,151	Italy 2,972; West Germany 2,134; Hungary 1,086.
Kerosine—do	2	1	Mainly from Netherlands.
Distillate fuel oil—do	231	79	Italy 36; West Germany 30.
Residual fuel oil—do	11,433	10,613	West Germany 3,718; Poland 2,301; Hungary 1,331.
Lubricants—do	598	554	West Germany 136; Netherlands 123; Italy 81.
Mineral jelly and wax—do	90	92	West Germany 44; Hungary 22.
Other—do	2,117	2,170	West Germany 1,041; Italy 698; France 139.
Total	20,516	20,660	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	r 62,872	10,895	U.S.S.R. 5,669; West Germany 2,372; Czechoslovakia 1,130.

r Revised. NA Not available.

[1] Includes spiegeleisen, shot, powder, and sponge.

COMMODITY REVIEW

METALS

Aluminum.—Production of primary aluminum in 1973 was 89,131 tons, an increase of 6.1% over the 83,988 tons produced in 1972. The country's primary aluminum capacity remained at 92,000 tons in 1973.

Production of aluminum semiproducts in Austria rose to about 66,000 tons. There was a strong increased demand for rolled products and especially for extruded products. Imports increased, with the main suppliers being the Federal Republic of Germany, Switzerland, Sweden, and Norway. Exports went mainly to the United Kingdom, the United States, Portugal, and Scandinavia.

The new cold-rolling mill of Vereinigte Metallwerke Ranshofen-Berndorf AG (VMRB), with a capacity of approximately 30,000 tons per year, was expected to start production in early 1974. The extrusion works at Nenzing in Vorarlberg, erected by the Norwegian aluminum industry, expanded its capacities. Further expansions are planned by Salzburger Aluminium GmbH. (SAG) and VMRB.

Copper.—Austria continued to be a modest producer of copper ore, concentrate, and electrolytic copper in 1973. Output of copper (metal content of ore) was 2,742 tons, compared with 2,303 tons in 1972.

Long-range plans for developing the western area of the Mitterberg ore body call for production of 300,000 tons per year of copper ore (about 4,000 tons of copper metal content) by 1980. The cutoff grade of ore is 1.4% copper.

Montanwerke Brixlegg GmbH., which was nationalized on January 1, 1974, became a division of VMRB, Austria's aluminum processor. The Brixlegg copper smelter is being rebuilt and expanded so that its capacity will be increased from 13,000 tons to 18,000 tons per year of copper. The refinery is being expanded from 23,000 tons per year to 30,000 tons per year. About one-sixth of the feed to Brixlegg is concentrates from the state-owned Kupferbergbau Mitterberg GmbH. Scrap and Chilean blister supply the remainder of the feed.

Iron and Steel.—Iron ore output climbed to a new record high of 4.21 million tons in 1973. Pig iron production increased from 2,846,111 tons in 1972 to 3,005,689 tons in 1973. Crude steel production rose from 4,070,046 tons to 4,238,085 tons. Rolling mill production increased from 2,960,000 tons to 3,022,000 tons, including 1,390,000 tons for export as compared with 1,267,000 tons exported in 1972.

The merger of Vereinigte Österreichische Eisen- und Stahlwerke AG (VÖEST) and Österreichisch-Alpine Montangesellschaft AG (ÖAMG) ended a long-standing disagreement over VÖEST's purchasing obligations for low-grade iron ore produced by ÖAMG. Instead of the latter using predominantly its own low-grade ore and VÖEST relying on supplies from Brazil, the U.S.S.R., and North African sources, both partners will use a mix of domestic ore and imported ore, which will give the two units a more balanced cost structure.

Lead and Zinc.—Bleiberger Bergwerks-Union AG production at its Bleiberg-Kreuth workings in Carinthia reached an alltime high of 383,029 tons, surpassing the previous record of 381,732 tons set in 1971. Production in terms of the lead content of ore decreased from 6,668 tons in 1972 to 6,139 tons in 1973; production of metal content of zinc ore increased from 20,480 tons to 22,151 tons.

Other Metals.—Other metals produced in Austria in 1973 included antimony, cadmium, germanium, and silver.

NONMETALS

Cement.—Austria in 1973 produced 6,260,000 tons of cement, a decrease of 1.7% from the record high level of 6,365,000 tons reached in 1972.

In 1972, Perlmooser Zementwerke AG started operating a new kiln at the Rodaun plant with an annual capacity of 530,000 tons. Gmunder Portlandzementfabrik Hans Hatschek AG installed a kiln at its Gmunden plant with an annual capacity increase of 290,000 tons. Schretter and Cie. replaced old kilns with a new kiln, which increases their annual capacity 290,000 tons.

Clays.—Austria produced 327,168 tons of illite, 300,742 tons of crude kaolin, and 131,189 tons of other clays in 1973. Illite production was up 12.2% from the previous year's 291,538 tons. Crude kaolin production decreased 8.7% from the 1972 production of 329,336 tons.

A continuously operating plant that

manufactures cored brick of the European type and many varieties of tile for wall construction and beam and span floor construction was completed by Bauhette Leitl-Werke, Eferding, in 1970. The plant has been operating 7 days a week and 24 hours per day. Operating manpower consists of seven men per shift. The newly designed plant operates at a slower pace, resulting in less wear on the equipment and more time devoted to the production of quality ware. In the Austrian brick industry, which is comprised of private enterprises as well as government operated plants, such an efficient plant is better able to compete.[2]

Glass.—Total glass production in Austria in 1972 was 252,000 tons, from which an average 70% silica content yields an apparent consumption of 175,000 tons of glass-grade sand. It is likely that about 20% of Austria's domestic industrial sand production is used by the country's glass industry. About 50% of some 200,000 tons per year of imported industrial sand is also probably for use by the glass industry. The main glass manufacturers are Delog-Detag Flachglas AG of Fuerthby (flat glass) and Oberglas Glashuetten AG of Voitsburg (containers).

Lower Austria has in the St. Pölten area the following major producers: Ton- und Quarzsandbergber des Industriesandwerkes Hermann Frings u. Co.; Ton- und Quarzsandbergbaue der Giessereisand KG Ing. Fischer; and Quarzsandwerke Dr. Otto Hansmann GmbH, a Sibelco subsidiary. Upper Austria also produced industrial sand.

Austria exports about 30,000 tons per year of industrial sand, most of which goes to West Germany. Its imports of industrial sand in 1972 came from West Germany (150,000 tons), East Germany (30,000 tons), and Czechoslovakia (15,000 tons).[3]

Graphite.—Crude graphite production in 1973 was 17,211 tons, a decrease of 8.3% from the 18,772 tons produced in 1972.

Gypsum and Anhydrite.—Austria produced 871,001 tons of crude gypsum and anhydrite in 1973, an increase of 14.6% over the 760,007 tons produced in 1972; 144,508 tons of calcined gypsum and anhydrite was produced in 1973, compared with 101,250 tons in 1972.

Magnesite.—Output of crude magnesite in 1973 decreased slightly, from 1,429,414 tons in 1972 to 1,418,628 tons; production of sintered or dead-burned magnesite increased from 451,226 tons to 485,214 tons; caustic-calcined magnesite production of 179,508 tons remained about the same as that of 1972.

Other Nonmetals.—In 1973, Austria also produced a variety of other nonmetals including barite, diatomite, feldspar, lime, quartz and quartzite, quartz sand, salt, sand and gravel, stone, sulfur, talc, and pumice (trass).

MINERAL FUELS

Austria, a modest producer of low-rank coals, crude oil, and natural gas, is dependent on imported energy for a large and steadily increasing share of its requirements. To meet its needs, the country is engaged in drawing up a long-range energy program. Consideration is being given to the fullest possible utilization of domestic energy resources, safeguarding indispensable imports, and creation of adequate stocks. Hydroelectric capabilities and nuclear installations must be drawn upon for any major expansion of domestic energy production.

In 1973, according to preliminary figures published by the Federal Grid Authority, total electric power generation in Austria came to 31,331 million kilowatt-hours. Of this total, water power accounted for 19,164 million kilowatt hours, while thermal plants generated 12,167 million kilowatt-hours. Power imports increased to 3,256 million kilowatt-hours, and exports increased to 4,826 million kilowatt-hours. The total amount available for domestic supply, including transmission losses, production at the Ranshofen aluminum works of VMRB, and pumped storage, was 29,761 million kilowatt-hours; consumption, including transmission losses but excluding the power requirements of the Ranshofen aluminum works and pumped storage, was 27,711 million kilowatt-hours.

Austria's first nuclear powerplant, now under construction at Zwentendorf near Tulin, is likely to go onstream in the fall of 1976. It will have a 730-megawatt capacity and is expected to supply about 9% to 10% of Austria's electric energy production. Plans for a second nuclear powerplant, probably to be built in the

[2] Svec, J. J. Leitl-Werke: First Continuously Operating Plant. Brick/Clay Record, v. 163, No. 6, December 1973, pp. 23–24.

[3] Industrial Minerals. No. 77, February 1974, p. 23.

region of Enns, have been drawn up. This plant would start operating with a projected capacity of 1,200 megawatts sometime in 1981–82.

Coal.—Coal production decreased from 3,755,510 tons in 1972 to 3,634,008 tons in 1973, a decline of 3.2%.

Austria continued to depend on imported solid fuels for most of its total requirements. In 1973, imports amounted to 4,344,476 tons in standard bituminous coal equivalent. All of the higher rank coal was imported, while 19.8% of the subbituminous and lignitic coal and 38.9% of the coke was imported. Countries that supplied solid mineral fuel imports were Czechoslovakia (27.2%), Poland (26.3%), the Soviet Union (17.3%), West Germany (12.1%), Yugoslavia (9.8%), East Germany (4.5%), and other countries (2.8%). Austria has not imported coal from the United States since 1970.

Deliveries of solid mineral fuels (including coke produced from imported coal) to the domestic market in 1973 were 7.7 million tons of standard bituminous coal equivalent. The total share of solid mineral fuels in the overall energy supply declined from 19.6% in 1972 to 18.1% in 1973, despite the fact that overall energy demand in Austria increased to 33.5 million tons in standard bituminous coal equivalent or 9.6% above the level of 1972. Consumer groups showing an increase in solid fuels were as follows: Railroads, up 0.2%; district heating plants (combined with electric powerplants), up 10.1%; industry, up 2.7%; and households, up 8.5%. Consumer groups receiving less solid fuels were the coking plant of VÖEST, down 1.6%, and electric powerplants, down 1.2%.

Petroleum and Natural Gas.—Crude oil production in Austria in 1973 was 2,578,456 tons, an increase of 4.1% over that of 1972. Production of natural gas rose from 1,963 million cubic meters in 1972 to 2,270 million cubic meters in 1973, an increase of 15.6%.

Domestic consumption of petroleum and petroleum products rose from 10.2 million tons in 1972 to 11.4 million tons in 1973, an increase of 11.8%. Imports of crude oil and products increased from 8.6 million tons to 9.8 million tons, an increase of 14.0%.

Österreichische Mineralölverwaltung AG (ÖMV-AG) plans to expand the annual throughput capacity of its Schwechat refinery from 10.5 to 14.3 million tons, and to build a products pipeline from Schwechat to the Linz-Wels area in Upper Austria. The increased refinery capacity and new pipeline are scheduled for completion in 1975. The pipeline will have an initial transport capacity of 2 million tons, which will eventually be increased to 8 million tons.

The Mineral Industry of Belgium and Luxembourg

By Norman A. Matthews [1]

Industrial production continued at high levels throughout the year, sustained by record demand in Western Europe. The industrial production index increased nearly 6% in real terms compared with that of 1972, and matched the previous highest annual rate improvement achieved in 1969. The gross national product (GNP) at $44.9 billion,[2] however, increased 13.4% compared with that of 1972. The high level of industrial production was promoted by growth in business investment, public consumption, and export demand. Utilization of productive capacity reached almost 86% and approached the maximum figure of recent years.

Increases in inflationary pressures at midyear prompted government action to control consumer credit and extend price controls, limit subsidies to domestic investors, and increase the prime discount rate which reached 7.75% at yearend.

The overall index of the minerals industry declined when compared with that of 1972; nevertheless, Belgium-Luxembourg continued to increase the quantities of imported raw materials that were processed domestically in the ferrous, nonferrous, and petroleum areas. Record output volumes were achieved in all these industries and their derivatives such as fabricated metals and petrochemicals which constituted an increasing share of the industrial economy and the value of exports.

At midyear the Ministry of Public Health and Environment was granting a 60% subsidy to all private industrial installations for construction of waste water purification systems. The subsidy would apply to applications made through 1974. Subsequent applications would receive 5% less subsidy each succeeding year. With implementation of the water control plans, attention will then be devoted to similar air pollution plans. However, the time table for air emissions must now be reassessed in view of the necessity of utilizing more coal for power generation.

BELGIUM

PRODUCTION

Domestic demand combined with increased exports sustained record production rates in most industrial product lines throughout the year. Exceptions were in coal production, where scheduled mine closings continued and strikes occurred in the Campine District and in nonmetallic minerals production, where the overall index was slightly lower than in 1972.

Crude steel production and steel products shipments increased over 7% compared with those of 1972 and established new records; primary copper and copper alloys, zinc, and lead production increased 9%, 10%, and 8%, respectively. Aluminum products shipments increased 10%.

Chemical and petroleum products shipments set new records in 1973. In the chemicals sector overall, value of shipments at $4.0 billion increased 16% compared with that of 1972. Volume of plastics intermediates and final products increased 12%; substantial gains were also made in fertilizers, agrichemical products and in rubber proc-

[1] Physical scientist, Division of Ferrous Metals—Mineral Supply.

[2] Where necessary, values have been converted from Belgium francs (BF) to U.S. dollars at the rate of BF400.00=US$1.00, the official exchange rate and approximate weighted floating average for the year.

essing. Value of diesel fuel, fuel oil, and residual oil production at oil refineries increased 10.7%, and represented a volume increase of approximately 2%.

Domestic utilization of metals in fabricating end products increased substantially in all categories. The overall index of the metals fabrication industry increased 11% compared with the value of products in 1972.

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

Commodity [1]	1971	1972	1973 [p]
METALS			
Aluminum metal, secondary only	2,200	2,200	[e] 2,200
Cadmium	947	1,150	[e] 1,100
Copper:			
Blister [e]	[r] 18,000	13,000	13,000
Refined, including alloys	325,866	327,276	[e] 357,000
Iron and steel:			
Iron ore and concentrate thousand tons	93	113	122
Pig iron do	10,394	11,772	12,655
Ferroalloys do	131	123	[e] 125
Steel:			
Crude do	12,444	14,538	15,527
Semimanufactures do	10,167	[2] 11,669	[e] 13,000
Lead metal:			
Primary	79,300	92,800	97,700
Secondary	16,124	12,162	[e] 15,950
Total	95,424	104,962	[e] 113,650
Tin metal:			
Primary long tons	3,878	3,861	[e] 3,600
Secondary do	2,422	1,699	[e] 2,200
Total do	6,300	5,560	[e] 5,800
Zinc metal:			
Primary	208,012	251,869	NA
Secondary (remelted zinc)	4,700	5,500	NA
Total	212,712	257,369	[e] 282,800
Other nonferrous metals:			
Precious metals, unworked, not further specified [3] thousand troy ounces	28,102	25,467	[e] 27,100
Unspecified base metals	[4] 2,719	[4] 3,808	NA
NONMETALS			
Abrasives, natural, whetstones (crude)	12	--	NA
Cement, hydraulic thousand tons	6,931	7,090	7,042
Clays, n.e.s do	205	291	[e] 300
Fertilizer materials, manufactured:			
Nitrogenous, nitrogen content do	472	397	[e] 400
Phosphatic, gross weight:			
Thomas slag do	1,288	1,398	[e] 1,400
Superphosphate, ordinary do	142	188	[e] 250
Other do	546	534	[e] 500
Gypsum and anhydrite, calcined	96,430	105,979	[e] 137,200
Lime and dead-burned dolomite:			
Quicklime thousand tons	2,653	2,837	[e] 3,100
Dead-burned dolomite do	351	349	[e] 330
Stone, sand and gravel:			
Calcareous:			
Dolomite do	1,583	1,788	[e] 2,200
Limestone do	25,001	24,376	[e] 24,200
Marble:			
In blocks cubic meters	2,560	4,310	[e] 3,400
Crushed and other	14,751	14,644	[e] 6,700
Petit granite (Belgian bluestone):			
Quarried cubic meters	331,012	298,253	NA
Sawed do	66,242	72,986	
Worked do	17,638	11,402	
Crude and other do	300,019	238,476	
Porphyry, all types thousand tons	8,396	8,048	NA
Quartzite	427,260	506,028	NA
Sand and gravel:			
Construction sand thousand tons	8,708	10,325	NA
Foundry sand do	1,399	1,321	
Dredged sand do	703	873	
Glass sand do	1,549	1,607	
Other sand do	1,959	2,236	
Gravel (dredged) do	4,329	6,391	[e] 6,300

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
NONMETALS—Continued			
Sandstone:			
Rough stone, including crushed ---thousand tons--	2,065	2,216	
Paving and mosaic stone	1,981	1,231	NA
Other	44,181	48,676	
Slate, roofing and other	4,723	5,611	NA
Sulphur, byproduct, recovered	[r] 24,000	25,000	25,500
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Anthracite ---thousand tons--	3,371	2,955	2,502
Bituminous ---do---	7,589	7,545	6,340
Total ---do---	10,960	10,500	8,842
Coke, all types ---do---	6,783	7,239	7,809
Fuel briquets, all kinds ---do---	574	496	456
Gas, manufactured ---million cubic feet--	62,969	67,729	[e] 36,100
Petroleum refinery products:			
Gasoline ---thousand 42-gallon barrels--	31,977	38,556	[5] 26,631
Jet fuel ---do---	9,048	9,608	[5] 5,776
Kerosine ---do---	450	1,139	[5] 922
Distillate fuel oil ---do---	73,675	86,730	[5] 60,075
Residual fuel oil ---do---	70,083	89,484	[5] 60,499
Lubricants ---do---	658	686	[5] 441
Other ---do---	23,148	30,620	[5 6] 19,336
Refinery fuel and losses ---do---	12,310	12,038	NA
Total ---do---	221,349	268,501	NA

[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] Excludes finished steel castings and steel forgings.

[3] Known to include gold and silver and may include platinum-group metals.

[4] Derived by subtracting aluminum data from a reported total for unspecified base metals.

[5] Data for 8 months only; data has been extrapolated to provide an estimate for the full year 1973 owing to severe dislocations in crude oil supply in the last 5 months as a result of the Near East War. These dislocations may have substantially affected both total quantity of refinery output and the proportional distribution of that output by product classes.

[6] Includes the following petroleum refinery products: Liquefied petroleum gas—3,016; naphtha—10,107; white spirit—1,343; bitumen—4,436; other n.e.s.—434.

TRADE

Belgium and Luxembourg trade and economic statistics are consolidated and reported as statistics for the Belgium-Luxembourg Economic Union (BLEU). The record GNP in 1973 was in part sustained by substantial increases in exports and imports. A modest trade balance was maintained as exports and imports increased 12.1% and 12.5%, respectively. Western Europe, principally the countries of the enlarged European Community, accounted for approximately 75% of the exports and 72% of the imports. West Germany, France, and the Netherlands continued as the principal trading partners, accounting for over 60% of the foreign trade. Trade with the United States increased approximately 20% compared with that of 1972, with exports exceeding imports by 6% ($1.45 billion versus $1.37 billion).

Currency revaluations during 1973 slowed United States investments in Belgium-Luxembourg which had reached high levels in the preceding 5 years.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Bauxite and concentrate	27	362	All to West Germany.
Oxide and hydroxide	195	153	West Germany 77; Switzerland 9.
Ash and residue containing aluminum	1,167	1,424	West Germany 729; France 688.
Metal, including alloys:			
Scrap	13,295	17,507	France 9,346; West Germany 5,257; Netherlands 1,236.
Unwrought	5,216	8,446	Netherlands 5,810; France 1,293.
Semimanufactures	150,981	165,456	West Germany 42,768; France 31,772; United States 26,500.
Antimony metal, including alloys, all forms	15	33	NA.
Arsenic, natural sulfides	43	247	NA.
Beryllium metal, including alloys, all forms kilograms	9,000	100	NA.
Bismuth metal, including alloys, all forms	371	583	France 396; United Kingdom 123.
Cadmium metal, including alloys, all forms	1,099	1,007	West Germany 415; France 296; United States 125.
Chromium:			
Chromite	363	3,032	West Germany 1,208; Netherlands 431.
Oxides and hydroxides	75	33	NA.
Metal, including alloys, all forms	2	15	NA.
Copper:			
Ore and concentrate	29	1,944	West Germany 1,907.
Copper sulfate	9,025	7,873	Denmark 2,283; Netherlands 2,238; West Germany 891.
Ash and residue containing copper	1,937	5,268	West Germany 4,295.
Metal, including alloys:			
Scrap	12,697	10,551	West Germany 2,864; France 2,592; Italy 1,645.
Unwrought	282,805	271,594	France 114,541; West Germany 65,564.
Semimanufactures	115,040	131,169	West Germany 44,655; Netherlands 39,041; France 13,426.
Germanium metal, includes alloys, all forms kilograms	6,400	39,300	France 32,200.
Gold metal, unworked and partly worked thousand troy ounces	372	443	Switzerland 222; United Kingdom 86; West Germany 65.
Iron and steel:			
Ore and concentrate, except roasted pyrite thousand tons	75	3	NA.
Roasted pyrite do	229	158	West Germany 154.
Metal:			
Scrap do	458	394	West Germany 175; France 121; Netherlands 57.
Pig iron, including cast iron do	16	10	France 5; West Germany 2.
Sponge iron, powder and shot	214	188	NA.
Spiegeleisen	960	777	France 577.
Ferroalloys:			
Ferromanganese thousand tons	55	57	West Germany 16; France 14; Italy 14.
Other do	6	7	West Germany 3; Sweden 1.
Steel, primary forms do	1,694	2,211	France 846; West Germany 472; Netherlands 227.
Semimanufactures:			
Bars, rods, angles, shapes, sections do	5,155	5,729	West Germany 1,639; France 1,085; United States 892.
Universals, plates and sheets do	4,017	4,871	West Germany 1,360; France 1,350; Netherlands 380.
Hoop and strip do	805	848	West Germany 295; France 91; Netherlands 51.
Rails and accessories do	111	81	France 24; Italy 21; Netherlands 12.
Wire do	373	413	West Germany 90; France 52; Netherlands 39.
Tubes, pipes, and fittings do	273	312	West Germany 90; Netherlands 66; France 63.
Castings and forgings, rough do	40	43	West Germany 9; Netherlands 6; France 5.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Lead:			
Ore and concentrate	1,758	23	NA.
Oxides	5,136	4,849	West Germany 1,788; Netherlands 1,348; France 1,075.
Ash and residue containing lead	6,869	5,861	Netherlands 5,048; West Germany 745.
Metal, including alloys:			
Scrap	5,513	8,919	France 5,322; Netherlands 2,329.
Unwrought	49,255	46,596	Netherlands 19,625; France 13,806; West Germany 4,893.
Semimanufactures	5,957	6,602	Sweden 302; Algeria 296; Norway 164.
Magnesium metal, including alloys:			
Scrap	234	498	United States 338.
Unwrought and semimanufactures	104	220	Netherlands 167; Norway 51.
Manganese:			
Ore and concentrate	6,225	3,040	France 1,653; Netherlands 529; United Kingdom 336.
Metal	5	58	NA.
Mercury ——76-pound flasks	580	577	France 177; Netherlands 81.
Molybdenum:			
Ore and concentrate	1,767	1,601	West Germany 702; Italy 203; Spain 174; France 172.
Metal, including alloys, all forms	22	33	NA.
Nickel:			
Matte, speiss and similar materials	--	23	NA.
Metal, including alloys:			
Scrap	813	1,708	West Germany 663; United Kingdom 352; Japan 303.
Unwrought	576	165	West Germany 42; France 38; Netherlands 16.
Semimanufactures	674	927	NA.
Platinum-group metals, including alloys, all forms ——thousand troy ounces	954	67	West Germany 37; France 13; Netherlands 13.
Rare-earth metals, including alloys	149	394	West Germany 215; United States 52.
Selenium, elemental ——kilograms	54,700	66,700	West Germany 55,000.
Silver metal, including alloys thousand troy ounces	27,415	165,966	West Germany 152,266; United Kingdom 8,820.
Tin:			
Ore and concentrate ——long tons	725	846	United Kingdom 723; Spain 123.
Oxides ——do	186	247	France 123; Netherlands 57; West Germany 37.
Metal:			
Scrap ——do	157	88	Netherlands 29; United Kingdom 26; France 23.
Unwrought ——do	2,681	2,107	France 549; West Germany 536; Netherlands 119.
Semimanufactures ——do	81	91	West Germany 27; Italy 13; Switzerland 10.
Titanium:			
Ore and concentrate	73	648	Italy 146.
Oxides	26,628	26,670	West Germany 7,353; France 3,980; United States 3,146.
Metal, including alloys, all forms	16	35	NA.
Tungsten:			
Ore concentrate	148	163	United Kingdom 150.
Metal, including alloys, all forms	82	19	West Germany 12.
Zinc:			
Ore and concentrate	22,645	57,704	West Germany 20,570; France 12,451; Poland 11,211.
Ash and residue containing zinc	40,341	24,969	Netherlands 15,789; West Germany 4,368; France 2,380.
Metal, including alloys:			
Scrap	9,748	7,350	France 7,017.
Blue powder (dust)	32,553	28,025	West Germany 10,777; France 4,311; India 2,481.
Unwrought	126,752	192,679	West Germany 87,541; United States 19,742; United Kingdom 15,161.
Semimanufactures	10,114	8,951	West Germany 3,915; Netherlands 2,363.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Other:			
Ore and concentrate:			
Of niobium, tantalum, vanadium and zirconium	48	15	United States 10.
Of precious metals	--	10	NA.
Of base metal n.e.s	4,491	122	NA.
Ash and residue containing nonferrous metals, n.e.s	13,804	36,012	West Germany 9,149; United Kingdom 2,850.
Waste and sweepings of precious metals ----value, thousands--	$1,096	$1,118	West Germany $591; United Kingdom $391.
Oxides, hydroxides and peroxides of metals, n.e.s	3,946	4,705	West Germany 2,142; France 641.
Metal, including alloys, all forms:			
Metalloids:			
Tellurium and arsenic	73	15	France 9.
Other	236	229	NA.
Base metals, including alloys, all forms, n.e.s	8,776	11,126	NA.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc.	1,040	4,237	NA.
Dust and powder of precious and semi-precious stones, natural and manufactured, including diamond kilograms--	321	394	Israel 110; West Germany 62; United States 43.
Grinding and polishing wheels and stones	2,484	2,450	France 1,507; West Germany 353.
Asbestos	202	778	West Germany 517.
Barite and witherite	251	61	NA.
Boron materials:			
Crude natural borates	3,317	4,023	West Germany 2,955; Netherlands 636.
Oxide and acid	27	31	NA.
Bromine ----kilograms--	300	--	
Cement ----thousand tons--	1,694	1,586	Netherlands 1,186; West Germany 83; United States 16.
Chalk	96,786	98,662	Netherlands 70,446; France 5,362.
Clays and clay products:			
Crude clays, n.e.s.:			
Bentonite	47	10	NA.
Kaolin	8,478	10,981	Netherlands 7,729; Sweden 1,299.
Other	8,046	8,150	West Germany 5,088; France 250.
Products:			
Refractory (including nonclay bricks	91,645	100,443	France 57,992; Netherlands 9,999; Italy 6,926.
Nonrefractory	160,375	NA	
Cryolite and chiolite	74	1,179	NA.
Diamond (except powder):			
Gem:			
Unworked ----thousand carats--	4,496	6,151	United Kingdom 2,064; India 1,716; Israel 1,253.
Worked ----do----	2,462	2,389	United States 1,043; United Kingdom 250.
Industrial:			
Unworked ----do----	8,806	7,289	United States 2,311; United Kingdom 1,546; Netherlands 615.
Worked ----do----	11	15	France 2, West Germany 2; Hong Kong 2.
Diatomite and other infusorial earth	1,432	673	NA.
Feldspar, leucite, nepheline and nepheline syenite	4,579	639	NA.
Fertilizer materials:			
Crude:			
Nitrogenous	177	363	NA.
Phosphatic	11,525	45,421	NA.
Potassic	1,044	(1)	

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Fertilizer materials—Continued			
Manufactured:			
Nitrogenous ____thousand tons__	1,189	(2)	
Phosphatic _____do____	1,922	(3)	
Potassic _____do____	354	(1)	
Other, including mixed ____do____	1,232	1,216	France 790; Turkey 73; Denmark 36.
Ammonia _____do____	131	170	France 167.
Fluorspar	207	531	NA.
Graphite, natural	111	130	NA.
Gypsum and plaster	10,728	11,483	Netherlands 8,918.
Lime _____thousand tons__	616	687	Netherlands 547.
Magnesite	1,190	1,178	Netherlands 801.
Mica:			
Crude, including splittings and waste_	88	87	NA.
Worked, including agglomerated splittings	582	787	United Kingdom 193; United States 159; West Germany 133.
Pigments, mineral, including processed iron oxides	24,067	1,966	France 962; U.S.S.R. 200; West Germany 148.
Precious and semiprecious stones:			
Natural (except diamond):			
Unworked _____kilograms__	9,722	11,019	Italy 2,345; United States 2,108; Netherlands 2,029.
Worked:			
Gem _____do____	93	133	United Kingdom 53; Switzerland 37; United States 14.
Industrial _____do____	44	34	NA.
Manufactured (including diamond):			
Unworked _____do____	29	17	Argentina 7; Brazil 2; Greece 2.
Worked _____do____	75	5	NA.
Pyrite (gross weight)	169	5,233	NA.
Salt and brine	9,406	30,565	France 29,397.
Sodium and potassium compounds, n.e.s. thousand tons__	297	16,418	West Germany 4,919; Netherlands 3,044; Sweden 2,369.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous _____do____	1,049	909	Netherlands 772.
Slate _____do____	3	3	Netherlands 2.
Other _____do____	210	50	Netherlands 44.
Worked:			
Slate _____do____	1	1	NA.
Paving and flagstone __do____	4	3	Netherlands 2.
Other _____do____	8	10	France 2; West Germany 2; Netherlands 2.
Dolomite, chiefly refractory grade do____	970	1,112	Netherlands 576; West Germany 434.
Gravel and crushed rock _____do____	7,284	7,732	Netherlands 3,063; France 4,165.
Limestone (except dimension) __do____	588	541	NA.
Quartz and quartzite _____do____	9	7	West Germany 5.
Sand, excluding metal bearing _do____	2,852	2,826	France 812; Italy 534; Netherlands 393.
Sulfur:			
Elemental, all forms	6,983	8,991	France 3,160; Netherlands 1,305; Venezuela 446.
Sulfur dioxide	533	237	NA.
Sulfuric acid	142,343	191,469	NA.
Talc, steatite, soapstone, and pyrophyllite_	15,320	14,445	West Germany 3,333; Sweden 3,151; United Kingdom 2,242.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum, amber, jet	1,987	1,665	NA.
Lithium minerals	57	5,288	NA.
Vermiculite, perlite, chlorite	138	132	NA.
Other _____thousand tons__	239	1,513	Netherlands 1,503.
Slag, dross and similar waste, not metal bearing _____do____	2,721	3,232	Netherlands 1,538; France 948; West Germany 675.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Other nonmetals, n.e.s.—Continued			
Oxides and hydroxides of magnesium, strontium and barium	797	1,253	NA.
Halogens (other than chlorine and bromine)	49	13	Italy 4; Bulgaria 3; Israel 2.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	263,011	NA	
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	4,953	4,646	NA.
Carbon black and gas carbon:			
Carbon black	9,802	17,979	West Germany 6,996; France 821.
Gas carbon	36	1,123	NA.
Coal and briquets:			
Anthracite and bituminous coal thousand tons	543	661	West Germany 355; France 233.
Briquets of anthracite and bituminous coal do	65	90	France 40; Netherlands 39.
Coke and semicoke do	516	637	France 149; Sweden 103; West Germany 55.
Hydrogen, argon and other rare gases	9,485	6,943	France 2,734; West Germany 1,117; United Kingdom 1,028.
Peat, including peat briquets and litter	817	1,278	NA.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	190	113	Mainly to West Germany.
Refinery products:			
Gasoline do	15,623	19,935	NA.
Kerosine and jet fuel do	5,086	7,597	
Distillate fuel oil do	19,202	31,466	
Residual fuel oil do	25,295	27,079	
Lubricating oils and grease do	1,959	2,303	
Mineral jelly and wax do	11		
Other:			
Liquefied petroleum gas do	1,521		
Nonlubricating oils, n.e.s. do	22		
Pitch, pitch coke, petroleum coke do	278	10,606	NA.
Bitumen and other residues do	2,353		
Bituminous mixtures, n.e.s. do	73		
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals thousand tons	162	97	Netherlands 77.

NA Not available.

[1] 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 1971 was 197,100 tons K_2O equivalent, and total for 1972 was 197,839 tons K_2O equivalent. Principal sources in 1972 were Norway—38,662; France—36,701; the Netherlands—23,932; Japan—23,402.

[2] Manufactured nitrogenous fertilizers not reported in terms of gross weight, but rather in terms of N_2 content. Total for 1971 was 286,113 tons N_2 content, and total for 1972 was 296,330. N_2 content. Principal sources in 1972 were France—98,302; West Germany—66,949; the People's Republic of China—17,075.

[3] Manufactured phosphatic fertilizers not reported in terms of gross weight, but rather in terms of P_2O_5 content. Total for 1971 was 329,861 tons P_2O_5 content, and total for 1972 was 346,964. Principal sources in 1972 were France—148,964; West Germany—73,242; Ireland—27,014.

Table 3.—Belgium-Luxembourg: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite and concentrate	14,659	17,019	Guyana 5,181; West Germany 4,834; French Guiana 3,331.
Oxide and hydroxide	16,338	14,487	West Germany 13,112; Netherlands 598; France 494.
Ash and residue containing aluminum	931	1,520	West Germany 739; Italy 260; France 230.
Metal, including alloys:			
Scrap	6,920	12,997	Netherlands 8,624; France 1,680; West Germany 1,162.
Unwrought	194,422	209,232	Netherlands 69,003; Norway 35,374; France 28,939.
Semimanufactures	37,108	48,076	France 23,842; West Germany 20,067.
Antimony:			
Ore and concentrate	8,245	8,459	Bolivia 4,656; Thailand 1,656; United States 467.
Metal, including alloys, all forms	36	50	People's Republic of China 28.
Beryllium metal including alloys, all forms kilograms	1,600	2,100	NA.
Bismuth metal, including alloys, all forms	235	382	Bolivia 192; France 67; Canada 55.
Cadmium metal, including alloys, all forms	903	1,070	Zaire 229; Japan 208; U.S.S.R. 191.
Chromium:			
Chromite	21,989	3,032	West Germany 1,208; Netherlands 431.
Oxide and hydroxide	489	402	West Germany 223; France 138.
Metal, including alloys, all forms	50	78	West Germany 38; United Kingdom 20; France 19.
Cobalt, oxides and hydroxides—kilograms	7,100	12,800	France 10,800.
Copper:			
Ore and concentrate	37,594	25,447	Australia 5,699; Morocco 4,613; Chile 3,049.
Copper sulfate	1,177	716	France 637.
Ash and residue containing copper	8,910	12,075	France 3,057; Spain 2,006; United States 1,767.
Metal, including alloys:			
Unwrought	396,958	450,683	Zaire 257,437; France 17,617; Peru 16,182.
Semimanufactures	14,424	17,632	West Germany 9,422; France 3,128; Netherlands 2,938.
Germanium metal, including alloys, all forms	6	6	Netherlands 3.
Gold metal, unworked and partly worked thousand troy ounces	1,166	506	Switzerland 171; Netherlands 156; Zaire 130.
Iron and steel:			
Ore and concentrate, except roasted pyrite thousand tons	28,152	28,078	France 14,373; Sweden 7,691.
Roasted pyrites do.	132	135	France 88; West Germany 22.
Metal:			
Scrap do.	r 630	826	France 450; Netherlands 158; West Germany 130.
Pig iron including cast iron do.	160	159	West Germany 87; France 42.
Sponge iron, powder and shot do.	5	5	France 1; Sweden 1; United Kingdom 1.
Spiegeleisen do.	2	1	Mainly from France.
Ferroalloys do.	142	164	France 71; Norway 58; West Germany 14.
Steel, primary forms do.	851	1,057	Netherlands 330; France 261; West Germany 210.
Semimanufactures:			
Bars, rods, angles, shapes, and sections do.	586	586	France 252; West Germany 94; Netherlands 61.
Universals, plates and sheets do.	562	596	West Germany 169; Japan 110; Netherlands 98.
Hoop and strip do.	74	89	West Germany 30; France 27; Netherlands 5.
Rails and accessories do.	8	8	France 5.
Wire do.	17	29	West Germany 12; France 9; Netherlands 3.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Tubes, pipes, and fittings thousand tons	202	190	Netherlands 78; West Germany 55; France 37.
Castings and forgings, rough do	10	12	West Germany 5; France 4; Netherlands 3.
Lead:			
Ore and concentrate	96,665	113,813	Canada 28,694; Peru 24,479; Morocco 13,279.
Oxides	2,193	1,325	West Germany 715; France 229.
Ash and residue containing lead	64,991	40,935	France 10,954; United States 9,545; West Germany 5,074; Australia 5,016.
Metal, including alloys:			
Scrap	10,202	12,093	Netherlands 5,659; West Germany 3,955.
Unwrought	22,243	17,497	West Germany 4,245; France 4,235; Netherlands 3,253.
Semimanufactures	1,504	1,691	West Germany 777; Netherlands 424; France 200.
Magnesium metal, including alloys:			
Scrap	173	160	NA.
Unwrought	1,209	1,313	Norway 610; U.S.S.R. 198.
Semimanufactures	86	151	United States 44; West Germany 24.
Manganese:			
Ore and concentrate	463,347	356,520	Republic of South Africa 151,294; Zaire 133,278; India 3,348.
Oxides	771	922	Japan 776.
Metal	337	564	Republic of South Africa 200; Czechoslovakia 131.
Mercury 76-pound flasks	4,711	6,040	Netherlands 2,062; Italy 1,181; Mexico 519.
Molybdenum:			
Ore and concentrate	4,561	9,542	Canada 6,637; United States 2,515.
Metal, including alloys, all forms	170	18	NA.
Nickel:			
Matte, speiss, and similar materials	88	56	United Kingdom 22; Canada 18; Australia 7.
Metal, including alloys:			
Scrap	1,361	1,504	United Kingdom 296; Netherlands 286; United States 250.
Unwrought	2,446	2,555	United Kingdom 1,115; Republic of South Africa 284; Netherlands 258.
Semimanufactures	1,727	1,662	United Kingdom 669; West Germany 599.
Platinum-group metals, including alloys, all forms troy ounces	50,200	67,655	West Germany 23,123; United Kingdom 12,199; France 7,597.
Rare-earth metals, including alloys	176	151	France 46; Netherlands 30; Canada 20.
Selenium, elemental kilograms	14,100	5,500	Japan 1,900; United Kingdom 1,100; West Germany 1,000.
Silver metal, including alloys thousand troy ounces	20,583	14,137	Netherlands 9,583; Poland 1,164; France 470.
Tin:			
Ore and concentrate long tons	6,487	6,113	Zaire 3,666; Rwanda 1,904.
Oxides do	32	14	NA.
Metal, including alloys:			
Scrap do	12	85	West Germany 39; Netherlands 27; France 14.
Unwrought do	1,601	1,692	Zaire 1,263.
Semimanufactures do	200	199	Netherlands 116.
Titanium:			
Ore and concentrate	68,348	69,247	Canada 41,171; United States 16,720; West Germany 10,136.
Oxides	11,600	11,360	West Germany 5,845; Netherlands 2,403.
Metal, including alloys, all forms	312	454	United States 341.

See footnotes at end of table.

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

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Tungsten:			
Ore and concentrate	142	265	Zaire 154.
Metal, including alloys, all forms	95	28	West Germany 13; Netherlands 7.
Zinc:			
Ore and concentrate	529,122	554,571	Canada 355,429; Sweden 61,253.
Oxide and peroxide	7,681	7,812	France 2,222; Netherlands 2,065; United States 1,476.
Ash and residue containing zinc	74,158	51,006	West Germany 26,320; France 3,536; United Kingdom 2,439.
Metal, including alloys:			
Scrap	7,167	1,812	Netherlands 778; West Germany 577; France 247.
Blue powder	370	385	West Germany 291.
Unwrought	35,045	39,295	Zaire 12,021; North Korea 8,426; Bulgaria 3,811.
Semimanufactures	4,486	8,092	France 3,950; West Germany 3,298.
Other:			
Ore and concentrate:			
Of niobium, tantalum, vanadium, and zirconium	2,592	3,348	Australia 2,243; Canada 327.
Of precious metals—kilograms	--	34,100	Spain 24,200.
Of base metals, n.e.s	4,070	2,633	Bolivia 1,737.
Ash and residue containing nonferrous metals, n.e.s	126,679	110,926	West Germany 101,540; Hungary 4,616.
Waste and sweepings of precious metals value, thousands	$1,035	$1,664	United States $1,140; Netherlands $273.
Oxides, hydroxides and peroxides of metals, n.e.s	2,667	3,024	West Germany 1,617; Netherlands 703; U.S.S.R. 421.
Metal, including alloys, all forms:			
Metalloids:			
Tellurium and arsenic	154	93	Sweden 71.
Other	543	654	France 261; Norway 169; West Germany 131.
Pyrophoric alloys	6	23	United Kingdom 21.
Base metals, including alloys, all forms, n.e.s	11,228	12,877	NA.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc.	141,733	134,843	West Germany 130,772.
Dust and powder of precious and semi-precious stones, natural and manufactured, including diamond kilograms	1,384	1,045	United States 362; Ireland 254.
Grinding and polishing wheels and stones	r2,310	2,505	West Germany 732; France 466; Italy 341.
Asbestos	70,068	89,865	Canada 62,348; U.S.S.R. 11,531; Republic of South Africa 9,050.
Barite and witherite	6,559	8,375	France 5,938; West Germany 888.
Boron materials:			
Crude natural borates	50,591	48,381	Netherlands 41,087.
Oxide and acid	3,290	2,959	France 2,005.
Bromine—kilograms	14,400	3,019	NA.
Cement	84,105	98,614	West Germany 32,337; France 26,422; Netherlands 12,815.
Chalk	92,064	90,103	France 64,633.
Clays and clay products:			
Crude clays:			
Bentonite	10,466	13,810	West Germany 7,480; United Kingdom 2,156.
Kaolin	208,622	229,540	United Kingdom 89,748; West Germany 75,497; Netherlands 49,908.
Other	246,834	260,306	West Germany 141,940; France 45,642; Netherlands 31,539.
Products:			
Refractory (including nonclay bricks)	144,246	122,587	West Germany 63,095; France 20,053; Austria 11,323.
Nonrefractory	227,060	NA	

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Cryolite and chiolite	347	357	Denmark 325.
Diamond (except powder):			
Gem:			
Unworked ---thousand carats	9,484	12,038	United Kingdom 10,121.
Worked ---do	988	901	India 216; Israel 141; Republic of South Africa 125.
Industrial:			
Unworked ---do	8,890	8,290	United States 3,030; United Kingdom 2,165; Ireland 1,175.
Worked ---do	9	5	France 1; Sweden 1; Switzerland 1.
Diatomite and other infusorial earth	6,335	5,883	France 1,683; United States 1,677; Denmark 1,600.
Feldspar, leucite, nepheline and nepheline syenite	44,099	52,499	Norway 23,512; France 18,374.
Fertilizer materials:			
Crude:			
Nitrogenous	13,282	13,885	All from Chile.
Phosphatic ---thousand tons	2,001	2,194	Morocco 1,378; U.S.S.R. 244.
Potassic	46,692	(1)	
Manufactured:			
Nitrogenous	264,370	(2)	
Phosphatic	33,642	(3)	
Potassic ---thousand tons	837	(1)	
Other, including mixed	153,496	110,315	France 41,139; West Germany 37,224.
Ammonia	269,090	308,483	NA.
Fluorspar	14,284	12,331	France 7,044; West Germany 2,295; East Germany 1,740.
Graphite, natural	778	1,167	France 393; West Germany 298; Austria 283.
Gypsum and plasters	474,524	482,339	France 432,762.
Lime	177,716	218,774	France 175,603.
Magnesite	10,591	14,268	Brazil 6,340; Austria 1,965; Greece 1,656.
Mica:			
Crude, including splittings and waste	1,515	2,064	India 887; United Kingdom 319; Malagasy Republic 237.
Worked, including agglomerated splittings	82	71	NA.
Pigments, mineral, including processed iron oxides	7,965	7,724	West Germany 6,885.
Precious and semiprecious stones:			
Natural (except diamond):			
Unworked ---kilograms	610	10,480	Brazil 7,877; West Germany 1,113.
Worked:			
Gem ---do	7,819	1,358	West Germany 781; France 75; United Kingdom 74.
Industrial ---do	3	337	NA.
Manufactured (including diamond):			
Unworked ---do	1,087	5,068	United States 4,439.
Worked ---do	48	52	NA.
Pyrite (gross weight)	297,811	218,513	Spain 132,855; Portugal 81,932.
Salt and brine ---thousand tons	1,595	1,470	West Germany 849; Netherlands 582.
Sodium and potassium compounds, n.e.s	24,939	33,783	Netherlands 20,882.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	137,643	198,015	France 101,633; Italy 18,186 Portugal 17,496.
Worked	32,869	35,418	Italy 11,389; France 6,458; Portugal 6,084.
Dolomite	42,227	49,467	France 34,782; West Germany 8,447.
Gravel and crushed rock thousand tons	4,408	5,873	Netherlands 4,202; France 1,263.
Limestone (except dimension)	223,638	173,136	United Kingdom 124,152; West Germany 1,494.
Quartz and quartzite	82,985	124,025	West Germany 69,178; France 36,626.
Sand, excluding metal bearing thousand tons	7,391	9,507	Netherlands 9,064.

See footnotes at end of table.

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

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Sulfur:			
Elemental, all forms	429,777	610,082	United States 485,683; West Germany 743.
Sulfur dioxide	3,080	3,311	West Germany 2,996.
Sulfuric acid	285,732	63,798	West Germany 57,131.
Talc, steatite, soapstone, and pyrophyllite	26,009	28,089	United States 8,922; Australia 7,518; France 3,706.
Other nonmetals, n.e.s.:			
Crude:			
Lithium minerals	653	6,079	Mozambique 5,242.
Vermiculite, perlite, chlorite	24,397	31,246	U.S.S.R. 24,006.
Other	72,446	76,015	Netherlands 48,193; West Germany 9,962.
Slag, dross and similar waste, not metal bearing	339,356	255,323	Netherlands 98,677; France 88,594; West Germany 28,111.
Oxides and hydroxides of magnesium, strontium and barium	2,702	2,529	Netherlands 887; West Germany 516; East Germany 440.
Halogens (other than chlorine and bromine)	104	117	Japan 96; Chile 20.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s	43,413	NA	
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	20,769	8,325	Netherlands 7,476.
Carbon black and gas carbon:			
Carbon black	25,520	27,480	Netherlands 10,311; West Germany 10,376.
Gas carbon	1,564	1,652	West Germany 982; France 669.
Coal and briquets:			
Anthracite and bituminous coal thousand tons	5,542	6,285	West Germany 2,717; United States 974; Poland 923.
Briquets of anthracite and bituminous coal ——do	194	203	Netherlands 189.
Lignite and lignite briquets ——do	95	82	West Germany 80.
Coke and semicoke ——do	4,392	4,164	West Germany 3,725.
Hydrogen, argon and other rare gases	3,544	6,347	Netherlands 3,498; West Germany 2,786.
Peat, including peat briquets and litter	50,464	60,873	Netherlands 20,013; West Germany 23,292.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	r 239,020	326,047	Saudi Arabia 98,398; Netherlands 57,478; Kuwait 46,086.
Refinery products:			
Gasoline ——do	8,585	4,818	NA.
Kerosine and jet fuel ——do	2,454	1,438	NA.
Distillate fuel oil ——do	16,046	18,501	NA.
Residual fuel oil ——do	24,096	20,133	NA.
Lubricating oils and grease——do	5,583	3,059	NA.
Mineral jelly and wax	104	8,432	NA.
Other:			
Liquefied petroleum gas ——do	60,366		
Nonlubricating oils, n.e.s. ——do	14		
Pitch, pitch coke, petroleum coke ——do	598		
Bitumen and other residues ——do	205		
Bituminous mixtures, n.e.s. ——do	273		
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	95,110	96,716	Netherlands 63,887; France 18,418; West Germany 5,811.

r Revised. NA Not available.

[1] 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 1971 was 49,341 tons K_2O equivalent, and total for 1972 was 53,552 tons K_2O equivalent. Principal sources in 1972 were France—14,984; West Germany—13,364; U.S.S.R.—11,797.

[2] Manufactured nitrogenous fertilizers not reported in terms of gross weight, but rather in terms of N_2 content. Total for 1971 was 6,926 tons N_2 content, and total for 1972 was 5,959 tons N_2 content. Principal sources in 1972 were France—2,365; West Germany—1,831.

[3] Manufactured phosphatic fertilizers not reported in terms of gross weight, but rather in terms of P_2O_5 content. Total for 1971 was 1,353 tons P_2O_5 content, and total for 1972 was 1,353 tons P_2O_5 content. Principal sources in 1972 were Tunisia—389; Morocco—345; the Netherlands—307.

COMMODITY REVIEW

Metals.—*Aluminum.*—Belgium became the largest world exporter of aluminum products in 1972 and maintained this status in 1973 as production increased to 244,000 tons. The total output is derived from imported primary aluminum, principally from the Netherlands and France. Norsk Hydro a.s was constructing a new extrusion facility at Hainaut with capacity of 6,000 tons per year and startup scheduled for midyear 1974.

Zinc.—Métallurgie Hoboken-Overpelt S.A./N.V. completed a new electrolytic zinc refinery at Overpelt at yearend with a capacity of 80,000 tons per year. Belgian firms continued their search for zinc concentrate from overseas mining operations. The Société des Mines et Fonderies de Zinc de la Vieille—Montagne announced a 25 million expansion and modernization program at its zinc ore mining facilities in the Ammeber Field, south central Sweden. The company planned to increase annual production capacity from 320,000 to 600,000 tons of crude ore by 1976. The ore body grades 9% zinc and 1.5% lead; reserves are sufficient to extend operations through the year 2000.

Iron and Steel.—The Belgian steel industry produced a record 15.5 million tons of raw steel in 1973 and 12.2 million tons of products, representing an increase of over 7% compared with corresponding tonnages in 1972. Pig iron and coke production were also at record levels. Strikes in September caused a loss of at least 300,000 tons of steel production and prevented attainment of the production goal of 16 million tons established for 1973. Over 75% of the product tonnage was exported. France, West Germany. and the Netherlands were the largest customers for steel products.

With installation of an ore sintering plant for consolidating ore fines and improving blast furnace performance, S.A. Sidérurgie Maritime (SIDMAR) completed the current investment program at its modern coastal steel plant near Ghent. S.A. Forges Thy-Marcinelle et Monceau announced plans for a basic oxygen melting shop and continuous-casting plant at its Marcinelle division and a second basic-oxygen melting shop at its Charleroi plant. Completion of the two basic oxygen melting facilities will essentially complete the replacement of open-hearth steel melting facilities in Belgium. Current expansion of the S.A. Forges de Clabecq plant will be completed with startup of a slab casting machine late in 1974. S.A. Cockerill-Ougrée-Providence et Espérance-Longdoz, announced it will modernize its wire rod facilities at Seraing by installing a new mill and enlarging capacity to 600,000 tons per year. Startup date had not been announced at yearend.

Manganese.—The Sedema group of Société Générales des Minerais S.A. announced plans to essentially double the capacity of its manganese dioxide plant at Tertre to 20,000 tons per year. The expansion project is to be completed late in 1974.

Other Metals.—The Belgian company Union Minière S.A. formed a new exploration subsidiary, Astruminera S.A., in association with Asturiana de Zinc S.A.. and Fina Iberica S.A. of Spain, to explore for nonferrous metals in mining concessions held in Spain by the Spanish partners.

Nonmetals.—The nonmetallic minerals industry production index declined slightly in 1973 compared with that of 1972. Limestone production at 24.2 million tons declined 1% compared with record levels in 1971 and 1972. Marble quarried declined substantially whereas the quantity of blue stone (granite) quarried increased 9% compared with that of 1972. Brick production for buildings and pavements recovered sharply from the depressed levels associated with a low index of building construction in 1972. Total sand production for construction, foundry and glassmaking purposes increased 8% to a record 17.5 million tons; dredged gravel production maintain the high level achieved in 1972. Cement production at 7.0 million tons declined slightly compared with that of 1972. The firm of Ciments d'Obourg S.A. completed installation of a new kiln at the Obourg plant with a capacity of 3,000 tons per day.

Value of chemical industry shipments at $4.0 billion increased 16% in 1973 compared with that of 1972. Value increases were greatest in plastic intermediates and final products, fertilizers, agrichemical products, and rubber processing.

At yearend chemical and allied industries investment projects in Belgium remained at the highest proportionate level among the Western European countries, and totaled $950 million. The Hainaut and Antwerp Areas predominated as the focus for new production facilities. Since many

of these new projects depend upon petroleum feed stocks, some may be delayed or cancelled because of the change in crude petroleum prices.

The Belgian diamond-processing business had declined in recent years in relation to total world volume. However, because of higher prices, total revenue increased markedly in 1973 compared with that of prior years. The U.S.S.R. established a Belgian-U.S.S.R. company, Russalmas Ltd., in Antwerp at midyear to export all polished and industrial diamonds originating in the U.S.S.R.

Mineral Fuels.—Coal production at 8.8 million tons declined 15.8% compared with that of 1972 as less efficient mines were phased out of production and strikes in the Campine District reduced output. Consumption increased as a result of record demand for coke in steelmaking. Electrical energy consumption at 39,390 gigawatt hours increased 9.3% compared with that of 1972. Ninety eight percent of the energy was provided by mineral fuels. Of the mineral fuels portion, 50% came from petroleum products, 36% from natural gas, and 14% from coal.

At yearend plans were underway to convert many of the older powerplants back to coal. Also domestic coal production was to be increased in 1974 with a goal of 10 million tons. Increased consumption would involve greater coal imports, principally from Poland. The increased use of coal would effect a short-term savings of up to 1 million tons of imported crude oil. Longer range conversion plans that would increase coal utilization to 30% of the total fuel consumed at powerplants, were under consideration at yearend.

Imports of crude petroleum and utilization of petroleum residual fuels for power generation and as feed stock for petrochemicals reached new highs in 1973. With the advent of sharply higher crude petroleum prices following the lifting of the partial embargo late in December, the complexion of projections for the Belgium economy changed materially.

It is expected that most of the petroleum refinery projects well underway, such as the Albatross expansion and the new Esso Belgium N.V. refinery in the Antwerp Area, will be completed. Other plans, such as the refinery with 60,000- to 100,000-barrel-per-day capacity near Liège, to be constructed in collaboration with the Iraq National Oil Co. (INOC), are subject to review. The Petrola Hellas plan for a new refinery and products plants on the old Shell refinery site in the Antwerp Area will also be reviewed carefully. Belgium refinery operations have been highly profitable in recent years, promoting rapid relative growth of the industry and in downstream industries such as petrochemical derivatives. With the substantial increase in crude petroleum prices, the established petroleum refining interests must now review the merits of expanding or sustaining operations in Belgium in comparison to other West European countries.

Crude oil at prevailing prices constitutes the largest single item affecting trade balances. The Belgium-Luxembourg Governments will be reviewing means of reducing overall imports at the same time providing essential feed stocks for the petrochemical industry.

To further reduce crude oil requirements for fuel uses, steps will be taken to speed the construction and commissioning of large nuclear power stations. Three units will go into operation within the next 12 to 18 months and efforts will be exerted to insure commissioning on time of the additional reactors scheduled to be operable by 1980 totaling 2,400 megawatts of power capacity.

LUXEMBOURG

The steel industry, which dominates the industrial economy of Luxembourg, operated at capacity throughout 1973. Iron ore production, from mines in south Luxembourg totaled 3.78 million tons. The balance of ore requirements were imported from captive mines operated by Aciériés Réunies de Burbach-Eich-Dudelange S.A. (ARBED) across the French border, and from Sweden. Coke for steelmaking was imported principally from captive coke ovens in West Germany.

Total steel production of 5.93 million tons in 1973 represented an 8% increase over that of 1972 and established a record. Shipments of steel products approximated 4.7 million tons. The growth in volume and the increase in value of steel

shipments were mainly responsible for the 7.5% increase in real gross national product (GNP).

Steel labor settlements at yearend, involving a 14% wage increase over a 2-year period, were considered inflationary. The labor cost increase together with the substantial rise in fuel costs were of concern in maintaining the competitive position of the steel industry. No substantial new investment programs were announced during the year.

The Government passed a new economic expansion law in 1973 which continues the policy of encouraging direct foreign investment by granting various incentives including interest subsidies, loan guaranties, capital subsidies, tax incentives and promotional assistance. The existing labor shortage will favor manufacturing industries with a high degree of automation and value turnover per employee.

Table 4.—Luxembourg: Production of mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Iron ore and concentrate	4,507	4,116	3,782
Pig iron (including blast furnace ferroalloys)	4,588	4,671	5,101
Steel:			
Crude	5,241	5,457	5,924
Semimanufactures	4,092	4,302	4,697
NONMETALS			
Cement, hydraulic	262	309	[e] 320
Fertilizers, manufactured, phosphatic, Thomas slag, gross weight	841	908	[e] 1,000
Gypsum and anhydrite, crude ---metric tons--	5,351	4,890	[e] 5,000
Quartz, quartzite and glass sand ---do---	8,625	36,825	NA
Stone, sand and gravel, n.e.s.:			
Sand:			
Molding	15	5	NA
Other, industrial	742	612	NA
Stone:			
Building stone:			
Rough cut ---thousand cubic meters--	7	15	NA
Facing ---thousand square meters--	53	1	
Cut stone, crude ---cubic meters--	198	195	
Crushed stone	609	566	
Dolomite, n.e.s	200	129	
Limestone, n.e.s	249	NA	
Paving blocks ---thousand pieces--	27	51	
Slate slabs ---thousand square meters--	13	13	
MINERAL FUELS AND RELATED MATERIALS			
Manufactured gas ---million cubic feet--	97,786	90,370	NA

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

[1] In addition to the commodities listed, Luxembourg also produces refractory clays and manufacutred 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 9.5% to the gross domestic product (GDP) in 1973, the same as in 1972. Petroleum and natural gas accounted for 2.8% of the GDP. The mineral industry provided 67% and petroleum and natural gas provided 20% of the total value of Bolivia's exports.

Empresa Nacional de Fundiciones (ENAF) announced intentions to bolster its smelting and refining capacity through construction over the next 4 years of 13 new processing facilities. New plants are needed to increase the value of Bolivia's mining production by bringing into the country an extra $27 million[2] through smelting and refining of concentrates. ENAF has assigned first priority to expansion of the existing metallurgical complex at Vinto, just outside of Oruro. The construction of an antimony smelter at Vinto will permit increased antimony exports. Further expansion plans call for more than tripling production at the tin smelter. Three other projects also under study at Vinto are a low-grade tin smelter which would permit ENAF to treat minerals currently rejected at the Vinto complex, a sulfuric acid plant, and a lead-silver smelter.

A second center is planned for the Lake Titicaca area, presently a center of copper, zinc, and lead mining. Studies were underway for construction of an electrolytic zinc refinery and a sulfuric acid plant. The latter installation will permit construction of an electrolytic copper refinery. A feasibility study was being made on the construction of a ferroalloy treatment center and a tungsten treatment plant at the Altiplano metallurgical center.

A third metallurgical complex will be formed by the construction of a second antimony smelter, a zinc smelter in Potosi, and a lead-silver smelter.

The Bismuth Institute, devoted to the development of new uses for bismuth, officially selected La Paz as its headquarters.

A list of the more important Supreme Decrees (S.D.), Supreme Resolutions (S.R.), and Decree Laws (D.L.) passed in 1973 affecting the mining and smelting industries follows:

S.D. 10670, January 12, 1973: Creates the iron and steel national company, Empresa Siderúrgica Boliviana S.A. (SIDERSA) under the Ministry of Mining and Metallurgy. The stockholders are wholly public or state enterprises, the major ones being Corporación Minera de Bolivia (COMIBOL), 30%; Yacimientos Petrolíferos Fiscales Bolivianos (YPFB), 20%; and Development Corporation of the Armed Forces, 20%.

S.D. 10802, April 6, 1973; Decrees that all mineral exporters except COMIBOL pay export commissions on the gross value of the mineral to the Mining and Metallurgical Institute and obligates all private mining concerns to use the services of the Institute in preference to other metallurgical consulting firms.

S.D. 11144, October 26, 1973: Fixes export taxes on lead and zinc so that the producer pays a 16% tax on the difference between the price over 20 cents per pound and the price at which the producer pays no export tax (12 cents) for lead, and a 14% tax on the difference between the price over 22 cents per pound and the price at which the producer pays no export tax (15 cents) for zinc.

[1] Physical scientist, Division of Nonferrous Metals—Mineral Supply.

[2] Because of fluctuating exchange rates, a meaningful conversion from Peso Boliviana ($b) to U.S. dollars is impractical. At yearend, however, the exchange rate was 20$b = US$1.00.

S.R. 168136, July 17, 1973: Approves the transportation from Hamburg, West Germany, to Oruro of equipment and machinery to build an antimony smelter at Oruro.

S.R. 170586, September 28, 1973: Approves contract between ENAF and Empresa Constructora Ingenieros Asociados for the construction of roads and buildings for the installation of the antimony smelter at Oruro.

D.L. 10998, July 26, 1973: Gives South American Placers Inc. (SAPI) until January 26, 1974, to present to the Ministry of Mining SAPI's planned investments and projects to work its gold-bearing concessions of approximately 12,470 hectares. If SAPI does not comply with the requirements of this decree, all its concessions for which no projects and investments are planned will revert to the State on January 26, 1974.

D.L. 10999. July 26, 1973: Allows the Ministry of Mining and Metallurgy to grant concessions to nationals or foreigners for exploration and exploitation of gold and other mineral deposits in the national reserve area. The grantee may export 50% of the gold production after first deducting the royalty due to the Government.

D.L. 11240, December 13, 1973: Approves the dissolution of Empresa Metalúrgica Boliviana S.A. (EMBOSA).

PRODUCTION

Of the 12 metals mined in Bolivia in 1973, 8 showed increases. Of the major metals, the largest gains were reported for gold, 78%; zinc, 21%; antimony, 11%; and silver, 2%. Mine output of tin was down 4%. Of the nonmetals, crude gypsum decreased 60%, but elemental sulfur increased 210%. Natural gas production continued its upward trend with a 25% increase over that of 1972. Crude oil production reached an alltime high of 17,266,000 barrels.

Table 1.—Bolivia: Approximate production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS [2]			
Antimony:			
Mine output, metal content	11,878	13,338	14,852
Metal [3]	--	NA	19
Bismuth:			
Mine output, metal content	682	587	646
Metal [3]	--	439	499
Cadmium, mine output, metal content [4]	[r] 82	139	169
Copper, mine output, metal content	7,512	8,307	8,154
Gold, mine output, metal content [5] ---troy ounces--	22,193	20,145	35,949
Iron ore, gross weight	[3] 5,970	[e] 52,000	[3] 1,591
Lead:			
Mine output, metal content	20,600	20,504	20,985
Metal, including alloys	18	[e] 30	50
Manganese ore, gross weight	713	93	641
Silver, mine output, metal content ---thousand troy ounces--	5,369	5,581	5,707
Tin:			
Mine output, metal content [6] ---long tons--	29,533	30,986	29,827
Metal, including alloys [7] ---do---	7,116	6,405	[e] 7,700
Tungsten, mine output, metal content	2,090	2,247	1,934
Zinc, mine output, metal content	45,077	42,068	50,989
NONMETALS			
Cement, hydraulic ---thousand tons--	206	151	166
Fluorspar [3]	--	17	--
Gypsum, crude [3]	2,000	2,308	900
Stone:			
Calcite [3]	63	32	105
Quartz [3]	750	--	--
Sulfur, elemental [3]	10,487	18,214	56,392
MINERAL FUELS AND RELATED MATERIALS			
Gas, natural:			
Gross production ---million cubic feet--	[r] 82,451	120,965	151,199
Marketable production [e] ---do---	1,427	36,917	57,857
Natural gas liquids:			
Natural gasoline ---thousand 42-gallon barrels--	46	67	76
Liquefied petroleum gas ---do---	48	51	48

See footnotes at end of table.

Table 1.—Bolivia: Approximate production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]		1971	1972	1973 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued				
Petroleum:				
Crude	thousand 42-gallon barrels	[r] 13,446	15,967	17,266
Refinery products:				
Gasoline	do	[r] 2,170	2,107	2,266
Jet fuel	do	115	129	148
Kerosine	do	845	923	990
Fuel oil, distillate and residual	do	[r] 1,640	1,847	1,890
Lubricants	do	[r] 47	59	58
Other:				
Liquefied petroleum gas	do	[r] 47	70	94
Unspecified	do	[r] 5	[8]	3
Refinery fuel and losses	do	[r] 64	59	67
Total	do	[r] 4,933	5,194	5,516

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

[1] In addition to the commodities listed, salt and a variety of construction materials such as clays, stone, and sand and gravel are produced, but information is inadequate to make reliable estimates of output levels.

[2] Unless otherwise specified, data shown represent the sum of production by COMIBOL and exports by medium and small mines.

[3] Total national exports.

[4] Contained in zinc concentrates produced by COMIBOL.

[5] Sum of placer production, COMIBOL production (in ores and concentrates of other metals) and medium and small mines' exports (in ores and concentrates of other metals).

[6] Total of COMIBOL output, COMIBOL purchases from lessees operating in COMIBOL mines, sales to ENAF by medium and small mines, and exports by medium and small mines.

[7] Production by ENAF, Pero, and Metabol smelters.

[8] Less than ½ unit.

TRADE

Preliminary figures indicated an export value of $154 million f.o.b. for minerals and $67 million for petroleum and natural gas in 1973. This is an increase from 1972 figures of $8 million for minerals and $25 million for petroleum and natural gas. Greater exports of petroleum to Brazil, Paraguay, and the United States and of natural gas to Argentina were responsible for the gain.

In 1973 the private mining sector exported minerals valued c.i.f. at approximately $74 million, up $18 million from the $56 million in 1972. COMIBOL's exports amounted to $114 million, up $21 million from the $93 million in 1972.

The value of all exported mineral commodities except gypsum and calcite increased in 1973. Bolivia's total tin exports declined to 27,950 long tons. In addition, lower quantities of copper, gold, and gypsum were exported, but for the first time in its history Bolivia exported cement. Tin accounted for 58% of the total mineral export value in 1973 compared with 65% in 1972. The tin portion of the total export market decreased to 39% from 46% in 1972.

The relation of mineral trade to total trade for 1971–73 is shown in the following tabulation:

	Value (million dollars)	
	Mineral commodity trade	Total commodity trade
Exports (f.o.b.):		
1971	[r] 135	[e] 181
1972	[r] 146	[e] 203
1973 [p]	154	268
Imports (c.i.f.):		
1971	NA	[r] 159
1972	NA	172
1973	NA	[p] 256

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

Table 2.—Bolivia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1971
METALS			
Antimony in ore and concentrate and as metal (including alloys)	11,673	13,149	United States 6,376; Japan 3,464; Switzerland 1,693.
Bismuth in ore and concentrate	677	480	Peru 487; Belgium 149.
Cadmium in ore and concentrate	87	51	All to United States.
Copper in ore and concentrate	7,809	8,430	Japan 5,299; United States 1,746; Peru 535.
Gold ——troy ounces	638	164	Belgium 148.
Iron in ore and concentrate	3,618	1,021	All to Argentina.
Lead:			
In ore and concentrate	23,336	19,189	United States 9,930; United Kingdom 7,995; Netherlands 2,264.
Metal, including alloys	--	140	
Manganese in ore	214	28	All to Argentina.
Silver in ore and concentrate thousand troy ounces	5,530	4,604	United States 2,733; United Kingdom 1,222; Netherlands 739.
Tin:			
In ore and concentrate ——long tons	r 22,585	23,402	United Kingdom 15,579; United States 7,301; U.S.S.R. 1,719.
In smelter products ——do	r 7,212	6,453	
Tungsten in ore and concentrate	2,092	2,181	United States 2,016.
Zinc in ore and concentrate	45,412	39,702	United States 23,951; Japan 21,265.
NONMETALS			
Fluorspar	--	17	
Gypsum	2,000	2,308	All to Brazil.
Stone:			
Calcite	63	32	All to Japan.
Quartz	750	--	All to Brazil.
Sulfur, elemental	r 10,487	18,214	Chile 10,457.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum, crude thousand 42-gallon barrels	8,447	10,945	Argentina 3,902; Peru 2,915; Chile 832.

r Revised.
[1] All data on metal exports are in terms of metal content of material shipped.

Source: State Department Airgrams A-76, LaPaz, April 3, 1971, and A-186, LaPaz, September 21, 1973.

Table 3.—Bolivia: Exports of tin by grade, group and company, 1973[1]

(Kilos of contained tin)

Grade	COMIBOL	Medium mines	BAMIN (small)	Other	Total
0–10	81,984	--	--	--	81,984
10–15	14,329	48,045	4,059	20,114	86,547
15–20	1,274,479	259,359	150,545	90,114	1,774,497
20–25	1,237,022	222,269	627,218	3,686	2,090,195
25–30	353,578	693,932	166,843	--	1,214,353
30–35	582,894	734,754	265,461	--	1,583,109
35–40	1,347,177	473,173	34,772	212,045	2,067,167
40–45	2,423,580	269,443	176,319	--	2,869,342
45–50	2,550,257	427,945	1,058,784	--	4,036,986
50–55	4,183,809	468,473	15,065	--	4,667,347
55–60	524,380	347,549	--	--	871,929
60–65	12,726	115,015	--	13,847	141,588
65–70	13,024	59,841	--	52,674	125,539
Over 99	--	--	--	6,798,983	6,798,983
Total	14,599,239	4,119,798	2,499,066	7,191,463	28,409,566

[1] Final data supplied by Ministerio de Mineria y Metalurgia; totals may not be identical to totals shown for preliminary data in table 4.

Table 4.—Bolivia: Exports of tin, by group

(Long tons of contained tin)

Group	1971	1972	1973 p
Tin in concentrates:			
Corporación Minera de Bolivia (COMIBOL)	r 13,987	15,587	14,368
Medium Miners Association	4,936	4,378	4,302
Banco Minero de Bolivia (BAMIN)	3,662	3,437	2,355
Smelter products:			
Refined metal and solder	r 6,706	6,355	6,757
Volatilization products	506	98	168
Total	r 29,797	29,855	27,950

p Preliminary. r Revised.

COMMODITY REVIEW

METALS

Antimony.—The Chilcobija mine was equipped with a new 120-ton-per-day ball mill and other devices which enabled it to operate on a continuous basis. The rate of mine output in 1973 was 210 tons per month of concentrate.

Empressa Minera Unificada S.A. (EMUSA) installed new equipment at the Chilcobija mine which should increase its output by 50% in 1974. Reserves were estimated to be sufficient for 20 years based on a production rate of 210 tons per month of 60% concentrate. Production at the company's Caracota mine was expected to fall while production at the Espiritu Santo mine should double.

Work began in January at Oruro for the installation of an antimony smelter to be fabricated by SKODAEXPORT of Czechoslovakia. Annual capacity is 5,000 tons of antimony, 1,000 tons of antimony trioxide, and 1,000 tons of antimony alloys. The plant will use about 45% of Bolivia's annual ore production.

Banco Minero de Bolivia (BAMIN) and the Regional Chamber of Mines of Tupiza planned to install three antimony concentrating plants. The Rudarsky Institute of Belgrade, Yugoslavia, made a study of reserves around Tupiza and determined the existence of 550,000 tons of ore containing 7% antimony. Total throughput of the plants would be 37,000 tons per year to produce 5,900 tons of concentrate.

Gold.—A Canadian company, Camino Gold Mines Ltd., was formed to explore placer gold deposits in the Tipuani Valley. Camino sent in a team of metallurgists and geologists to sink test pits on the optioned property. All material recovered from the program will be processed in a pilot plant on the site.

SAPI operated on only 700 hectares of its 14,000 hectare concession in the Teoponte Area, reportedly because of low gold content in the alluvial concessions.

Iron Ore.—A trial shipment of about 18,000 tons of hematite mineral from Mutún was barged down the Paraguay and Panama Rivers by the Argentine Navy for testing at Argentina's San Nicolas steel mill. About 30,000 to 40,000 tons remained at Puerto Busch, Bolivia. Tests will be made to determine the degree of concentration required to make the ore commercially attractive to Argentina.

Tin.—Of the 29,827 long tons of tin-in-concentrates produced in 1973, COMIBOL contributed 20,515 long tons, the medium miners 6,775 long tons, and the small miners 2,537 long tons.

Total tin exports were 27,950 long tons, down 6% from the previous year's level. ENAF increased its metallic tin exports from 6,158 long tons in 1972 to 6,754 long tons in 1973. ENAF sold 300 long tons of electrolytic tin to Argentina, which ENAF felt may open the door to an expanded Argentine market for Bolivian tin metal.

COMIBOL estimated its cost to produce and market its tin at $2.11 per pound, up from $1.64 in 1972. Mining and depreciation costs were $1.04, export taxes were 28 cents, a net earnings tax was 10 cents, and handling, transportation, insurance, and smelting was 69 cents.

ENAF obtained a loan from West Germany for plant equipment and machinery to expand capacity at the Vinto smelter from 7,400 to 10,800 long tons. The first stage was scheduled for completion by mid-

1975 with final expansion to 19,700 long tons to be completed by mid-1976.

Following the liquidation of the Williams, Harvey Ltd., smelter, which had been smelting the bulk of Bolivia's high-grade tin concentrate, the Bolivian Government contracted with Capper Pass & Son, Ltd., in the United Kingdom and the Texas City, Texas smelter to take some of the excess concentrate. COMIBOL agreed to ship about 6,000 long tons of tin-in-concentrate per year for the next 3 years to Capper Pass and about the same amount to Texas City. Bolivia accepted a penalty readjustment in smelting fees as compensation for atmospheric contamination and another penalty for arsenic content. Overall, it is expected that smelting under the new contract will cost Bolivia about $1.3 million more each year than the old contract. In addition, Bolivia can expect to collect only half of the $8.25 million debt owed by the Williams, Harvey smelter. Other smelters of Bolivian ore are located in the United States, Brazil, Mexico, Spain, and West Germany.

COMIBOL announced that its output of tin should reach 28,000 long tons by 1980. Most of the increase is expected to come from more efficient recovery by extensive use of volatilization plants and new preconcentrating plants and techniques.

W. R. Grace & Co. sold its 75% interest in Estalsa S.A., which operated a tin dredge and two washing plants, and its 57% interest in the International Mining Co. which operated an underground tin-tungsten mine. Tin production from these operations has been in the 2,000- to 2,300-long-ton range.

Zinc.—COMIBOL planned to increase production at Matilde to about 8,000 tons of concentrate per month from the 4,000- to 5,000-ton level at which the mine broke even. At the previous rate, profits were barely sufficient to cover the annual compensation payments to the former owners, Philipp Brothers Corp. and United States Steel Corp.

MINERAL FUELS

Petroleum and Natural Gas.—Total crude petroleum production increased from 15,967,272 barrels in 1972 to 17,265,582 barrels in 1973, an increase in 1973 of 8.1% over that of 1972. The increase was the result of greater world demand for petroleum products. Total petroleum exports in 1973 were 11,844,136 barrels. The well-head value of the petroleum exported was reported by YPFB to be $4.12 per barrel, a 42% increase over that of 1972.

Crude petroleum processed in 1973 was at the rate of 15,160 barrels per day or 6.4% above the 14,250 barrels per day processed in 1972. The Cochabamba refinery accounted for 65% of total daily processing, Santa Cruz for 18%, and Sucre for 10%. YPFB signed contracts with three U.S. companies for the expansion of the first two refineries and the construction of a lubricant plant.

YPFB's drilling operations declined from a total of 111,019 feet (revised) drilled in 1972 to 110,845 feet drilled in 1973. Nine development wells and five exploration wells were completed compared with six development wells and eight exploration wells in 1972.

Table 5.—Bolivia: Crude petroleum production by YPFB, by field

(Thousand 42-gallon barrels)

Field	1972	1973 p
Monteagudo	3,583	3,465
Rio Grande	3,529	4,856
Caranda	3,172	2,625
La Peña	2,132	2,770
Colpa	1,899	1,892
Camiri	806	695
Tatarenda	552	445
San Alberto	114	83
Bermejo	80	66
Toro	61	60
Camatindi	26	28
Tigre	12	7
Caigua	--	273
Total [1]	15,967	17,266

p Preliminary.
[1] Data may not add to totals shown because of independent rounding.

Source: Yacimientos Petrolíferos Fiscales Bolivianos.

In addition to the $101,098,961, which was the amount agreed upon for payment at no interest to Gulf Oil Co. for nationalization of its property, Bolivia and YPFB owed Gulf a separate amount of $15,289,187 for the gas cleaning and reinjection plants at the former Gulf developed fields and for other old debts. On the old debt, about $7.5 million was paid back to Gulf through 1972. Beginning January 1, 1973, Bolivia agreed to pay Gulf 25% of the value of hydrocarbon exports from former Gulf fields to cover payments on the new debt, but the payments are taxed at 22%,

which amount would be returned to YPFB, leaving a net debt of $78,622,171. In 1973, YPFB paid Gulf $5,292,000 from petroleum exports after taxes, and $3,530,000 from natural gas exports which made a total net payment of $8,822,000. On December 31, 1973, therefore, the net of taxed debt to Gulf amounted to $69.8 million. Payment on the old debt in 1973 was $4.5 million, leaving a balance of about $3.3 million to be paid to Gulf on that debt.

YPFB produced considerably more petroleum from the former Gulf fields than it exported. The reason being, with Gulf's agreement and by Supreme Decree No. 09381 of September 10, 1970, YPFB may use any amount of petroleum from former Gulf fields that Bolivia needs for internal consumption with no payment to Gulf. The former Gulf fields provided 2,438,620 barrels for internal consumption, or about 44% of the total.

Table 6.—Bolivia: Consumption [1] of petroleum refinery products

(Thousand 42-gallon barrels)

Product	1972	1973
Jet fuel	121	146
Gasoline, aviation [2]	112	106
Gasoline, motor	1,888	1,983
Kerosine	884	958
Diesel oil	721	818
Fuel oil	765	749
Lubricants	65	e62
LPG	115	163

e Estimate.
[1] Figures refer to actual civilian and military consumption through sales to consumer, and including YPFB consumption.
[2] Imports.

Natural gas exports to Argentina in 1973 amounted to more than 55.4 billion cubic feet. Prices were renegotiated with Argentina and were raised from $0.22 to $0.35 per thousand cubic feet of dry natural gas. Argentina pays Bolivia an extra amount depending on the content and value of propane and butane in the natural wet gas. Total natural gas production was 151,199 million cubic feet compared with 120,965 million cubic feet in 1972.

Gas reserves have not been adequately measured. However, based on successful exploratory drilling of various structures several producing horizons were indicated in the Santa Rosa, Yapacani, Palometas, and other fields north of the city of Santa Cruz, and YPFB stated that the indicated natural gas reserves were about 4 trillion cubic feet.

Several foreign oil companies obtained operations contracts with YPFB in 1973 to explore and, if successful, to produce petroleum and gas. Each company has contracted to turn over roughly 50% of their hydrocarbon production to YPFB and export to the buyer of their choice the other 50%. The operations contracts are good for 30 years from the date of signing. These oil-gas exploration contracts are the first in Bolivia in the past 20 years. The U.S. companies involved are Union Oil Co. of California, Marathon Oil Co., Cities Service Oil Co., Occidental Petroleum Co., Phillips Petroleum Co., American Oil Co., Amerada Hess Corp., Lone Star Gas Co., Mono Power Co., Anschutz Corp., and Sun Oil Co.

Each company or group of companies must spend a minimum of $4 million within the first 3 years of the contract. At the end of 3 years there are three options: (1) Withdraw completely; (2) over the next year put in an additional 50% of the original 3 year investment if it is decided to continue exploring to 100% of the area of the contract block; or (3) over the next year put in an additional 25% if only 80% of the original area is to be retained. The balance of the area reverts to YPFB in all cases. If the company or group wants to continue exploring beyond the 4 years, it must drill at least one hole every 9 months during the following 3 years. Once production on a block has begun, one half of the block reverts to YPFB. All pipelines constructed are to belong to YPFB which will charge pipeline transport fees to each producer.

As a result of increasing petroleum prices much of the petroleum which at one time was thought to be economically unrecoverable may now be recovered at a profit. This factor and the discovery of the Caigua Field near Villamontes have contributed to evaluating reserves at an estimated 177 million barrels of petroleum. Proven former Gulf-field reserves were estimated to be about 134 million barrels and the La Pena Field reserves developed by YPFB were estimated at 28 million barrels on January 1, 1973. On the same date YPFB was credited with having about 20 million barrels of economically questionable extractable reserves, which were no longer so regarded at yearend. The Caigua Field reportedly added 12 million barrels to these

reserves which would then total 194 million barrels. Subtracting approximately 17 million barrels production for 1973, total petroleum reserves at yearend were estimated to be 177 million barrels.

Petrochemicals.—The project by Bolivia and Peru to build a binational petrochemical plant at the border town of Desaguadaro has been virtually discarded because of Peru's insistence on building it on their coastline.

The construction of the pesticide-insecticide plant by Bolivia and Argentina near the town of Oruro reportedly now depends on financing by the Andean Development Corporation.

The Mineral Industry of Brazil

By F. W. Wessel [1]

In Brazil's rapidly developing economy, the mineral industry continued to be a major source of strength. Gross national product growth at 10.4% exceeded 10% for the fifth consecutive year, with mining outperforming the economy as a whole. Iron ore exports of $363 million, 56% greater than in 1972, aided in decreasing the negative trade balance by 24% to $602 million.[2] While iron and manganese ores continued to be major and growing foreign exchange earners during the year, the basis for substantial increases in production and export of bauxite, aluminum, chromium, nickel, tin, and titanium was being established. Cia. Vale do Rio Doce S.A. (CVRD), the governmental iron mining company, became involved in development of mineral deposits other than those of iron and began assuming the appearance of the Government's agency for mineral development.

Brazil's political and financial climate continued to attract overseas investment; for example, in development of the Trombetas bauxite deposit, in further construction of iron ore pelletizing capacity, and in continued expansion of steelmaking facilities. Venture capital in various forms became available during the year from the United States, Japan, West Germany, and other nations of Western Europe, and at least two international financial institutions.

About midyear action was taken by the Carteira de Comercio Exterior do Banco do Brasil (CACEX) to suspend exports of a number of metallic items of which Brazil is a net importer. These included pig iron, ferrous scrap, and secondary nickel, copper, aluminum, magnesium, lead, zinc, and tin.

Electric power generation increased 12.4% in 1971 the most recent year for which data are available; the trend continued throughout 1972 and 1973. Brazil's plans to meet national power needs in future years called for generation capacities, in megawatts, as follows:

Year	Hydro-electric	Thermal	Nuclear	Total
1970	8,828	2,405	--	11,233
1975	16,426	3,533	--	19,959
1980	24,761	4,235	600	29,596
1985	39,361	5,307	1,600	46,268
1990	51,141	9,681	11,850	72,672

The projections did not indicate the mix of coal and oil making up the thermal capacity. A key unit in these plans is the Itaipú (Sete Quedas) hydroelectric project, planned to generate 8,000 megawatts. A treaty creating Itaipú as a binational enterprise was concluded with Paraguay on April 26. Power output was scheduled for 1981.

The final link of a paved highway from Porto Alegre, Rio Grande do Sul, westward to the Argentina border, was opened in January. More effective distribution of petroleum products from the refinery at Porto Alegre, and easier access to the State's coal regions were immediate benefits.

Army construction battalions continued work on the Cuiaba-Santarem highway, for which the topographic survey was completed late in the year. Other government programs of direct or indirect mineral interest included an airborne magnetometer and gamma-ray survey of Rio Grande do Sul, a joint Argentina-Brazil study of the Uruguay River and Pepirí Guazŭ River basins, and feasibility studies of further hydroelectric development of the Tocantins River. with the implication of power supply to the Trombetas bauxite and the Carajás iron ore developments.

[1] Physical scientist, Division of Nonferrous Metals—Mineral Supply.

[2] Where necessary, values have been converted from Brazil New Cruzeiros (NCr$) to U.S. dollars at the rate of NCr$6.22=US$1.00.

PRODUCTION

The value of Brazil's mineral industry production in 1973 was estimated at $850 million. Commodities achieving substantially increased production in 1973 included aluminum, iron ore, steel, ferroalloys, lead, tin, zinc, asbestos, barite, and cement; production of pyrochlore more than doubled. Natural gas withdrawals decreased 5%, salt production decreased 15%, and there were smaller declines in production of beryl, copper, tantalite, and zircon.

Table 1.—Brazil: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Aluminum:			
Bauxite, gross weight (dry basis)	430,800	485,600	537,809
Alumina	166,800	192,027	230,948
Metal, primary	80,647	97,636	111,444
Antimony [2]	2	(3)	--
Arsenic, white	148	164	69
Beryllium, beryl concentrate, gross weight [4]	r 2,501	1,551	1,210
Chromium, chromite, gross weight	218,788	384,347	5 114,000
Columbium and tantalum, ore and concentrate, gross weight:			
Columbite [4]	63	65	130
Tantalite [4]	290	299	
Pyrochlore	6,094	9,635	19,426
Copper:			
Mine output, metal content	r 5,418	4,455	6,088
Metal, smelter (blister) [6]	5,100	4,800	4,200
Gold [7] troy ounces	r 164,483	203,771	161,107
Iron and steel:			
Iron ore and concentrate thousand tons	37,486	46,471	56,000
Pig iron, excluding ferroalloys do	4,686	5,300	5,479
Ferroalloys:			
Ferrochromium	10,186	11,641	15,756
Ferrocolumbium	r 1,196	2,782	6,094
Ferromanganese	r 71,972	72,918	77,333
Ferronickel	10,524	10,193	9,507
Ferrosilicon	r 13,466	23,917	37,436
Silicomanganese	r 18,747	17,271	23,247
Other	r 451	670	1,258
Total	r 126,542	139,392	170,631
Steel, crude, excluding castings thousand tons	6,011	6,518	7,150
Steel semimanufactures [8] do	4,554	5,132	5,570
Lead:			
Mine output, metal content	r 27,836	29,880	51,697
Metal, smelter, primary	r 25,737	25,007	34,797
Manganese ore and concentrate (marketable), gross weight thousand tons	2,602	2,058	e 2,157
Nickel:			
Mine output, metal content	3,271	3,398	e 3,500
Ferroalloy, nickel content	2,587	2,702	e 2,800
Rare earth, monazite concentrate, gross weight	r 2,280	2,089	1,457
Silver thousand troy ounces	624	320	327
Tin:			
Mine output, metal content long tons	2,065	2,769	3,234
Metal, smelter, primary do	3,370	3,526	3,660
Titanium:			
Ilmenite concentrate, gross weight	r 11,198	3.791	4,172
Rutile concentrate, gross weight	117	412	42
Tungsten, mine output, metal content	r 1,356	1,141	951
Zinc:			
Mine output, metal content e	16,920	17,780	e 29,000
Metal, smelter	16,266	15,557	22,256
Zirconium concentrate, gross weight:			
Zircon	4,168	4,578	3,079
Baddeleyite-caldesite	328		
NONMETALS			
Abrasives, natural, n.e.s., corundum and emery	e 3,000	r e 3,500	4,038
Asbestos, fiber	19,262	32,883	47,000
Barite [9]	42,659	45,442	62,789
Cement, hydraulic (including pozzolanic) thousand tons	r 9,803	11,381	13,398
Clays, n.e.s.:			
Bentonite	27,773	38,185	e 40,000

See footnotes at end of table.

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

Commodity	1971	1972	1973 p
NONMETALS—Continued			
Clays, n.e.s.—Continued			
Kaolin:			
Crude	245,730	542,718	NA
Beneficiated	NA	102,566	e 142,500
Other:			
Crude	846,014	1,695,496	NA
Beneficiated	NA	664,158	e 730,570
Diamond: [10] e			
Gem—thousand carats	160	150	150
Industrial—do	160	160	150
Total—do	320	310	300
Diatomite	4,370	[11] 893	e 980
Feldspar	44,669	67,373	74,110
Fertilizer materials:			
Crude phosphates, phosphate rock (includes apatite):			
Gross weight	212,422	299,930	286,000
P_2O_5 content	r 74,300	103,940	e 100,000
Manufactured:			
Nitrogenous (nitrogen content)	r 69,850	88,493	e 135,000
Phosphatic (P_2O_5 content)	233,000	277,624	NA
Fluorspar	r e 45,000	70,974	70,705
Graphite, all grades	2,733	3,570	e 3,900
Gypsum and anhydrite, crude	233,978	237,964	e 240,000
Lime e—thousand tons	2,000	2,000	2,000
Lithium minerals [4]	[12] 6,348	NA	NA
Magnesite	233,042	276,673	e 308,000
Mica, all grades [4]	r 2,543	2,581	1,673
Precious and semiprecious stones, except diamond:			
Agate, rough [4]	791	1,032	NA
Other stones, uncut [4]	1,073	751	NA
Quartz, crystal, all grades [4]	4,588	3,405	4,352
Salt, marine—thousand tons	1,477	2,168	1,855
Stone, n.e.s.:			
Dimension stone, marble	33,493	45,816	e 45,000
Crushed and broken:			
Dolomite	460,543	885,791	e 490,000
Limestone—thousand tons	17,724	19,519	e 22,500
Sulfur, elemental, byproduct	9,200	9,200	2,478
Talc	41,651	88,733	e 57,000
Vermiculite e	4,500	4,500	4,000
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	57,100	e 60,000	e 65,000
Coal, bituminous (washed)—thousand tons	2,491	2,491	2,516
Coke:			
Metallurgical—do	1,345	1,670	1,790
Gashouse—do	e 162	45	37
Gas:			
Manufactured, all types—million cubic feet	13,349	11,021	15,490
Natural:			
Gross withdrawal—do	41,565	43,861	41,668
Marketed production e—do	8,300	8,500	8,300
Natural gas liquids—thousand 42-gallon barrels	1,373	1,497	1,423
Petroleum:			
Crude—do	62,000	61,088	62,118
Refinery products:			
Gasoline—do	64,306	72,088	79,113
Jet fuel—do	5,670	6,400	8,071
Kerosine—do	4,501	4,214	6,410
Distillate fuel oil—do	44,555	54,382	62,834
Residual fuel oil—do	62,354	73,815	87,812
Lubricants—do	16	76	565
Other—do	6,332	24,025	27,620
Refinery fuel and losses—do	6,154	4,077	13,576
Total—do	193,888	239,077	286,001

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

[1] In addition to the commodities listed, molybdenite, bismuth, and a variety of crude construction materials (sand, gravel, and additional unlisted varieties of stone) are also produced, but output is not reported and available information is inadequate to make reliable estimates of output levels.

[2] Includes a small quantity of metal contained in antimonial lead.

[3] Revised to zero.

[4] Exports.

[5] Concentrate.

[6] Includes secondary metal.

[7] Officially reported and estimated. Much placer gold produced eludes statistical coverage.

[8] Excludes castings and forgings.

[9] Includes both ore and concentrate.

[10] By far the larger part of Brazil's diamond production is not reported statistically; hence the estimates tabulated are based only on very general marked information.

[11] Partial figure.

[12] 1971—petalite exported.

TRADE

Again in 1972 the United States and West Germany were Brazil's first and second trading partners as to both imports and exports. The leading mineral export, iron ore, was valued at $232 million in 1972, $363 million in 1973, and $289 million for the first 7 months of 1974.

Exports of iron ore decreased 1.6% and exports of manganese ore and concentrates declined 35% in 1972. Exports of chromite, pyrochlore, copper, pig iron, ferro-manganese, ferrochromium, steel semimanufactures, platinum, silver, and zinc increased greatly, and there were modest increases in the export of ferronickel tin, cement, bauxite, and fluorspar. Exports of tungsten concentrate, barite, gem and industrial diamond, magnesite, and dolomite decreased, and exports of beryl and of lead ore ceased entirely.

In 1972 imports of gold and of silver increased 177% and 39% respectively; zinc imports were 7% greater than in 1971, and imports of lead and copper were essentially unchanged. Imports of unwrought aluminum increased 74%, and there were sharp increases in imports of bismuth and cadmium. Imports of titanium ores increased 82%, but imports of titanium pigment declined to 18% of the 1971 figure. Imports of ferroalloys were 60% less than in the previous year.

In the nonmetallic area increases were posted by borates, bromine, fertilizer materials, worked mica, and elemental sulfur. Imports of asbestos and cement were down 17% and 12% respectively, and there were no imports of caustic soda in 1972.

Imports of crude oil increased 22%, but imports of petroleum products declined 3%. Reflecting heavy steel industry demand, imports of coal and coke rose 8% and 60% respectively.

Table 2.—Brazil: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Bauxite and concentrate	4,005	4,430	Uruguay 1,700; Argentina 1,430.
Oxide (alumina) and hydroxide	2,979	[1] 1,361	Argentina 905; Mexico 448.
Metal, including alloys:			
Unwrought	94	157	All to Uruguay.
Semimanufactures	96	150	Paraguay 93.
Antimony metal, crude	3	108	United States 65.
Beryl ore and concentrate	2,501	--	
Chromium:			
Ore and concentrate	5,750	37,196	Japan 37,186.
Metal	(2)	--	
Columbium, tantalum, and pyrochlore, ore and concentrate:			
Columbite	63	4	All to United States.
Tantalite	290	164	United States 109.
Pyrochlore	1,640	4,884	West Germany 1,221; United States 955; United Kingdom 745.
Other	5	15	West Germany 10.
Copper metal, including alloys, all forms	824	2,240	Japan 888; United States 489; Uruguay 261.
Iron and steel:			
Ore and concentrate --thousand tons--	31,020	30,512	Japan 8,886; West Germany 7,621.
Scrap	--	24	Netherlands 20.
Pig iron and similar materials	112,919	255,712	United States 140.546; Argentina 35,425.
Sponge iron, powder and shot	180	66	All to Venezuela.
Ferroalloys:			
Ferromanganese	6,361	22,720	United States 8,015.
Ferroaluminum	192	--	
Ferrosilicon	--	3,780	West Germany 2,100; Japan 1,525.
Ferrochrome	2,109	6,704	United States 5,755.
Ferronickel	5,572	7,195	Japan 3,026.
Other ferroalloys	6,646	3,006	United States 1,685.
Steel:			
Primary forms	89,071	79,881	Argentina 37,554; Japan 15,560; Ecuador 13,427.
Semimanufactures	179,253	345,280	United States 127,121; Argentina 38,734; Uruguay 12,061.
Lead:			
Ore and concentrate	5,750	--	
Metal, including alloys, all forms	9	22	United States 20.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Manganese:			
Ore and concentrate --thousand tons--	1,797	1,175	United States 467; Norway 236; United Kingdom 105.
Metal, including alloys, all forms	(2)	(2)	All to Bolivia.
Nickel metal, including alloys, all forms	11	17	Paraguay 6; Colombia 6.
Platinum-group metals and silver:			
Platinum group --troy ounces--	6,719	19,097	Spain 8,970; Belgium-Luxembourg 7,202.
Silver --do--	69,092	414,800	France 374,813.
Rare-earth metals:			
Ore and concentrate, except monazite	1,605	1,379	Austria 750; Italy 362.
Metal, ferrocesium --kilograms--	8,000	(2)	Mainly to Bolivia.
Tin:			
Ore and concentrate --long tons--	10	30	United States 15; West Germany 10.
Metal, including alloys, all forms --do--	1,032	1,366	United States 752; Argentina 266.
Titanium oxide	(2)	--	
Tungsten:			
Ore and concentrate	2,268	1,725	Switzerland 648; Netherlands 450.
Metal, including alloys, all forms --kilograms--	4,450	1	Mainly to Argentina.
Zinc:			
Ore and concentrate	101	--	
Metal, including alloys, all forms	6	1,654	Netherlands 1,589.
Other:			
Ore and concentrate, n.e.s	[3] 7,415	196	Mexico 100; Portugal 46.
Ash and residue containing nonferrous base and precious metals	32	--	
NONMETALS			
Abrasives, natural:			
Crude emery, corundum, and pumice	14	8	Argentina 7.
Grinding and polishing wheels and stones	230	167	Chile 56; Peru 35; Colombia 24.
Asbestos	400	200	All to Argentina.
Barite and witherite	25,495	21,916	Trinidad and Tobago 9,175; Venezuela 7,541; Libya 5,200.
Cement	1,124	1,374	Paraguay 1,116.
Clays and clay products:			
Crude clays:			
Bentonite	10	20	All to Argentina.
Kaolin	2,180	2,511	Uruguay 1,111; Argentina 700; Chile 700.
Other	32	18	Italy 10.
Products:			
Refractory	6,604	32	Argentina 26.
Nonrefractory	4,142	4,401	Paraguay 3,807; Bolivia 319.
Diamond:			
Gem, uncut and cut, but unset --carats--	35,315	20,440	Netherlands 15,095; United States 3,350; Japan 1,550.
Industrial --do--	25,705	24,790	Netherlands 22,715; United States 1,220.
Diatomite and other infusorial earth	(2)	--	
Fertilizer materials:			
Crude, phosphatic	1	3	All to Peru.
Manufactured	59	8,230	Paraguay 8,140.
Fluorspar	22,095	26,835	U.S.S.R. 16,250; Japan 10,350.
Lithium minerals	(3)	[4] 22	Chile 17.
Magnesite	40,595	38,245	Belgium-Luxembourg 6,600; Spain 6,200; Argentina 5,750.
Mica, all forms	2,543	2,581	Norway 1,300; United States 505.
Precious and semiprecious stones, except diamond:			
Crude and worked, except dust and powder:			
Agate --kilograms--	793,706	1,031,637	United States 390,410; Japan 396,713; West Germany 97,069.
Amethyst --do--	253,627	242,665	Japan 66,162; West Germany 55,169; United States 37,482.
Aquamarine --do--	3,511	10,828	Switzerland 6,142; West Germany 2,319.
Cat's eye --do--	20	28	Japan 26.
Citrine --do--	15,116	30,148	West Germany 19,706; Japan 5,357.
Emerald --do--	12,946	7,398	India 3,058; United Kingdom 1,188.
Garnet --do--	4,580	1,069	West Germany 604.
Opal --do--	359	473	West Germany 264.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Precious and semiprecious stones, except diamond—Continued:			
Crude and worked, except dust and powder—Continued:			
Ruby ----------kilograms--	9,508	--	
Sapphire ----------do----	(2)	169	All to Japan.
Topaz ----------do----	4,774	7,568	United States 5,915.
Tourmaline ----------do----	8,272	6,888	West Germany 3,241; United States 1,149.
Turquoise ----------do----	(2)	2	All to Libya.
Other ----------do----	767,548	444,922	West Germany 115,309; United States 75,063; Japan 59,067.
Dust and powder, not further identified ----------do----	NA	1,788	All to United States.
Quartz crystal:			
Electronic and optical grade ----------	98	80	Japan 55.
Other ----------	4,491	3,179	West Germany 963; France 697; Japan 318.
Salt ----------	18	1,406	Nigeria 1,363.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked --------	17,259	11,377	Italy 6,596; Japan 2,506.
Worked ----------	958	1,925	Japan 894; United States 704.
Dolomite ----------	1,413	858	Argentina 535; Colombia 322.
Gravel and crushed stone ----------	27	--	
Quartz and quartzite ----------	136	146	Belgium-Luxembourg 144.
Sand, excluding metal bearing ------	46	98	Chile 50; Bolivia 47.
Sulfuric acid ----------	(2)	30	Paraguay 19; Chile 11.
Talc, steatite, soapstone, and pyrophyllite--	251	101	Colombia 50; Argentina 20.
Vermiculite ----------	30	332	Portugal 300.
Other nonmetals, n.e.s.:			
Slag and similar waste from the manufacture of iron and steel ------	60	10	All to Argentina.
Unspecified ----------	--	25	Do.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural ----------	--	(2)	All to Bolivia.
Carbon black ----------	338	366	Uruguay 324.
Coal, coke, and lignite ----------	6	68	Argentina 60.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels--	6,342	7,599	Bahamas 3,626; Netherlands Antilles 2,730.
Refinery products:			
Gasoline ----------do----	9	101	Peru 63; Paraguay 38.
Jet fuel ----------do----}	391	43	Peru 39.
Kerosine ----------do----}		346	Uruguay 242; India 97.
Distillate fuel oil ---------do----	1,261	7,320	United States 2,616; Uruguay 1,670; Japan 1,005.
Residual fuel oil ----------do----	2,177	995	All to United States.
Lubricants ----------do----	(2)	--	
Other:			
Liquefied petroleum gas do----	--	151	Uruguay 133.
Mineral jelly and wax--do----	4	6	Peru 1.
Naphtha ----------do----	2	71	All to Uruguay.
Unspecified ----------do----	134	1	Mainly to Dominican Republic.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ----------	r 13,340	6,447	All to Argentina.

r Revised. NA Not available.
[1] Includes alumina gel.
[2] Less than ½ unit.
[3] Lithium minerals apparently included in ore and concentrate, n.e.s.
[4] Data are for lithium hydroxide only.

Table 3.—Brazil: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite and concentrate	--	4,040	Mainly from Guyana.
Oxide (alumina) and hydroxide	1,378	1,705	West Germany 1,228; United States 238; France 137.
Metal:			
Scrap	(1)	781	NA.
Unwrought	25,436	44,378	NA.
Semimanufactures	3,802	5,257	NA.
Antimony:			
Ore and concentrate	374	600	Bolivia 167; Chile 159; Peru 118.
Metal, including alloys, all forms	286	136	People's Republic of China 25; Taiwan 25; Mexico 25.
Arsenic, trioxide and regulus	319	1,491	France 349; West Germany 201; Sweden 162.
Bismuth metal, including alloys, all forms kilograms	12,999	21,324	Belgium-Luxembourg 13,839; West Germany 4,618.
Cadmium metal, including alloys, all forms do	89,591	101,066	Mexico 48,000; Belgium-Luxembourg 17,500.
Chromium:			
Chromite	16,688	4,737	Philippines 3,000; Republic of South Africa 976.
Metal, including alloys	16	16	United Kingdom 7; Japan 6.
Cobalt:			
Oxide and hydroxide	63	82	United Kingdom 42; Belgium-Luxembourg 34.
Metal, including alloys, all forms	96	144	West Germany 109.
Columbium and tantalum metal	(1)	(1)	Mainly from United States.
Copper metal:			
Scrap	325	24	Mainly from Bolivia.
Unwrought:			
Refined, unalloyed	70,437	71,858	Zambia 42,750; United States 9,205.
Alloys	477	108	Canada 104.
Master alloys	20	13	United States 5; West Germany 4.
Semimanufactures	1,052	330	West Germany 236; Switzerland 44.
Gold metal, unworked or partly worked troy ounces	135,162	374,909	United States 231,196; United Kingdom 75,297; West Germany 35,797.
Iron and steel:			
Ore and concentrate	4	4	All from United States.
Metal:			
Scrap	229	31,873	Mainly from United States.
Sponge iron, powder, and shot	3,703	4,849	United States 3,724; Japan 707.
Ferroalloys	23,025	9,218	United States 1,785; Canada 1,776; France 1,485.
Ingots and semimanufactures thousand tons	1,181	1,027	Japan 237; United States 168; West Germany 107.
Lead:			
Oxides	424	541	Mexico 485.
Metal, including alloys, all forms	8,325	8,476	Mexico 4,688; Peru 2,863.
Magnesium metal, including alloys, all forms	6,820	7,583	United States 5,858.
Manganese:			
Ore and concentrate	4,353	4,437	Gabon 4,200.
Oxide	1,555	832	Japan 365; United States 311.
Metal	170	448	Japan 308.
Mercury 76-pound flasks	3,443	3,333	Mainly from Mexico.
Molybdenum:			
Ore and concentrate	291	461	Canada 258; United States 203.
Metal, including alloys, all forms	13	16	United States 7; Netherlands 6.
Nickel metal:			
Matte, speiss, and similar materials	1	(1)	Mainly from West Germany.
Unwrought	849	2,369	United States 570; France 218.
Semimanufactures	660	861	Canada 450; France 178.
Platinum-group metals, including alloys, all forms:			
Platinum [2] troy ounces	2,283	3,215	West Germany 2,090; United States 772.
Other thousand troy ounces	26	1,989	United States 1,975.
Rare-earth metals kilograms	7	2,754	Mainly from United States.
Selenium, elemental do	10,307	11,739	Canada 4,200; United States 3,374.
Silicon metal	1,891	2,381	Norway 1,102; France 611.
Silver metal, including alloys thousand troy ounces	1,942	2,704	West Germany 751; Peru 674; United States 480.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Sodium metal ----------kilograms--	10,987	13,950	West Germany 12,463; France 1,140.
Tellurium, elemental ----------do --	305	344	Peru 336.
Tin:			
Ore and concentrate -----long tons--	1,400	297	Bolivia 172.
Oxides ----------do----	70	11	United Kingdom 6; West Germany 4.
Metal, including alloys, all forms do----	11	39	Argentina 26; United States 9.
Titanium:			
Ore and concentrate, rutile and ilmenite ----------	12,889	23,483	Australia 22,750.
Oxides ----------	16,946	3,047	West Germany 899; Belgium-Luxembourg 457; United Kingdom 419; Finland 412.
Metal, including alloys, all forms ----	31	55	Italy 20; United States 15; Japan 10.
Tungsten ----------	20	15	United States 7.
Uranium and thorium, isotopes and compounds ----------kilograms--	57	55	Israel 41; West Germany 8.
Vanadium metal, including alloys, all forms ----------	10	25	All from United States.
Zinc:			
Oxide ----------	166	332	Netherlands 152; West Germany 102.
Metal:			
Unwrought ----------	50,557	54,133	Peru 20,178; Mexico 16,453.
Semimanufactures ----------	141	147	United States 78; United Kingdom 37.
Zirconium and hafnium:			
Ore and concentrate ----------	5,083	5,635	Australia 3,724; United States 1,456.
Metal, including alloys, all forms ----	14	(1)	Mainly from West Germany.
Other:			
Ash and residue containing nonferrous metals ----------	138	798	United States 401; Republic of South Africa 161.
Metal, including alloys, all forms ----	3	8	United Kingdom 3; United States 2.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice ----------	1,127	1,278	Mainly from Italy.
Grinding flints ----------	232	394	West Germany 142; United States 78; Italy 58.
Dust and powder of precious and semiprecious stones -------grams--	87,000	77,000	United States 46,000.
Asbestos ----------	23,614	19,689	Canada 13,075; Republic of South Africa 3,089.
Barite ----------	63	59	United States 53.
Boron materials:			
Crude, natural borates ----------	6,702	11,045	Netherlands 4,164; United States 4,306.
Oxide and acid ----------	1,456	2,613	Netherlands 1,066; United States 656.
Bromine ----------kilograms--	35,660	37,666	Israel 37,464.
Cement ----------	279,195	244,335	U.S.S.R. 53,700; Uruguay 51,950; Colombia 31,000.
Chalk, natural ----------	2,337	2,312	France 1,286; Belgium-Luxembourg 400.
Clays and products:			
Crude, n.e.s.:			
Bentonite ----------	12,916	11,822	United States 6,491; Argentina 5,280.
Fire clay ----------	230	11	West Germany 6; United Kingdom 4.
Kaolin ----------	6,947	6,362	United States 6,157.
Other ----------	1,763	2,573	United States 2,238.
Products, refractory ----------	17,606	16,779	Japan 10,739; United States 4,601.
Cryolite, natural ----------	919	645	All from Denmark.
Diamond:			
Gem, not set or strung ------carats--	5,000	15,000	United States 10,000.
Industrial ----------do----	90,000	145,000	Belgium-Luxembourg 45,000; Ireland 35,000.
Diatomite and other infusorial earth ----	625	937	United States 504; West Germany 247; Mexico 160.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Fertilizer materials:			
Crude:			
Nitrogenous	23,692	24,842	All from Chile.
Phosphatic, phosphate rock	611,467	858,473	United States 711,587; Morocco 80,853.
Manufactured:			
Nitrogenous	624,260	902,927	United States 297,979; Netherlands 267,465; West Germany 229,560.
Phosphatic:			
Thomas slag	9,205	17,743	West Germany 10,456.
Other	277,371	692,194	United States 443,865.
Potassic	584,307	765,228	United States 327,294; West Germany 163,809; Canada 128,636.
Other, including mixed	300,024	515,897	United States 459,932.
Ammonia	7,451	30,762	United States 15,396; Trinidad and Tobago 8,000.
Graphite, natural	106	131	West Germany 80; Malagasy Republic 26.
Gypsum and plasters	2,333	2,224	Bolivia 2,076.
Iodine ——kilograms	45,885	43,483	Chile 37,200.
Lithium minerals, spodumene ——do	--	8,845	All from United States.
Magnesite ——do	7,045	16,237	West Germany 12,500.
Mica:			
Crude, including splittings and waste ——do	45,525	295	All from United States.
Worked ——do	17,811	26,914	United States 14,966; Switzerland 5,432.
Phosphorus, elemental	132	104	Netherlands 54; West Germany 22; East Germany 7.
Pigments, mineral, including processed iron oxides	r 2,331	2,336	West Germany 1,807; Spain 454.
Precious and semiprecious stones, except diamond ——kilograms	2,993	1,242	West Germany 555; Switzerland 347; Republic of South Africa 100.
Pyrite, gross weight	163	126	All from West Germany.
Salt	6	28	United Kingdom 17.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	85,931	--	
Caustic potash	1,464	1,815	France 591; United States 458; East Germany 197.
Soda ash	27,156	22,582	France 11,000; Romania 9,000.
Sodium sulfate	52,859	55,136	Mexico 35,981; Chile 9,543.
Stone, sand and gravel:			
Dimension stone, marble	668	306	Romania 122; United States 121.
Dolomite	2,302	1,917	All from Italy.
Quartz and quartzite	69	218	Spain 100; West Germany 67.
Other	112	780	Mainly from United States.
Silex or flint	201	475	United States 413.
Sulfur, elemental, all forms	360,968	372,858	United States 213,356; Canada 107,571.
Talc, soapstone, and pyrophyllite	29	90	United States 65; Norway 10.
Other nonmetals	r 248	(1)	Mainly from West Germany.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	862	733	United States 618; Argentina 115.
Carbon black	6,525	8,368	Argentina 4,345; United States 1,813; West Germany 1,020.
Coal, all grades, including briquets ——thousand tons	1,721	1,862	United States 1,725.
Coke and semicoke	116,389	186,739	West Germany 142,486.
Petroleum:			
Crude ——thousand 42-gallon barrels	r 138,260	169,358	Saudi Arabia 74,427; Iraq 35,819.
Refinery products:			
Gasoline ——do	704	929	Netherlands Antilles 830.
Kerosine ——do	142	185	All from Netherlands Antilles.
Distillate fuel oil ——do	1,341	--	
Residual fuel oil ——do	2,890	563	Saudi Arabia 276; United States 170; Netherlands Antilles 117.
Lubricants ——do	2,317	2,519	United States 1,789; Trinidad and Tobago 357.
Other:			
Liquefied petroleum gas ——do	4,634	4,223	Venezuela 2,823; Saudi Arabia 396.
Naphtha ——do	13,867	16,570	Saudi Arabia 3,085; Trinidad and Tobago 2,612; Kuwait 2,296.

See footnotes at end of table.

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

Commodity	1971	1972	Principal sources, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued:			
Refinery products—Continued:			
Other—Continued.			
Mineral jelly and wax thousand 42-gallon barrels	78	76	East Germany 19; West Germany 8; United States 5.
Asphalt and bitumen ---do---	r 23	7	United States 6.
Petroleum coke ------do---	242	384	United States 365.
Unspecified ----------do---	107	131	United States 129.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ----------	152,855	148,290	United States 45,755; Venezuela 44,245; Netherlands Antilles 36,269.

r Revised. NA Not available.
1 Less than ½ unit.
2 Excludes jewelry and other ornamental items.

COMMODITY REVIEW

METALS

Aluminum.—Construction of additional smelter capacity at Poços de Caldas, Minas Gerais, began at midyear. Cia. Mineira de Alumínio S.A. (Alcominas) planned to increase annual capacity of its smelter from 30,000 to 60,000 tons by 1976. The supporting alumina plant will be more than doubled, to provide for sales to the chemical, refractory, and glass industries. Alcominas is owned by the Aluminum Co. of America (50%), Hanna Mining Co. (30%), and Brazilian interests (20%).

Cia. Brasileira de Alumínio S.A. (CBA), a Votorantim-group company operating a 40,000-ton-per-year smelter at Sorocaba, near São Paulo, planned to expand its annual output to 100,000 tons. To this end, CBA contracted with Pechiney Aluminium S.A. for the latter's technical assistance, particularly in the field of electrode technology.

Late in 1972 an agreement was signed by CVRD and Alcan Aluminium, Ltd., of Canada which provided for joint reactivation of bauxite exploration in the Trombetas area northwest of Obidos. Completed at midyear, the study indicated a scale of operations of 3 million tons of bauxite per year. In December, agreement on equity was reached among the 10 participants. CVRD, with CBA and Aluminio S.A. Extrusã e Laminação (ASA), will hold 51% of the shares, and Alcan, Reynolds Metals Co., Rio Tinto Zinc Corp. Ltd., Norsk Hydro A.S., A/S Årdal og Sunndal Verk (ÅSV), Billiton International Metals, N.V., and Instituto Nacional de Industria (INI) will hold 49%. The project, at the indicated scale, was expected to require a capital investment of $120 million. Construction was scheduled to begin in mid-1974. Alcan's share of production will be 40%, or 1.2 million tons per year when full production is achieved; INI will receive 400,000 tons per year.

Sumitomo Chemical Co. Ltd., and ASA conducted feasibility studies for a 100,000-ton-per-year aluminum smelter near Recife, Pernambuco. In August the company decided to construct a 56,000-ton-per-year plant by 1976, with subsequent expansion to 168,000 tons. The smelter will use alumina from a refinery of 1 million- to 1.5 million-ton capacity, which in turn will be based on Trombetas bauxite. Aluminum Resources Development Co. (Ardeco), a joint company of Japan's five largest aluminum producers, including Sumitomo, sent a mission to survey the Trombetas deposits and establish a resource base for such a refinery. Japanese interests were expected to participate in mining bauxite as a joint venture with CVRD. Ardeco and CVRD also began feasibility studies for a large smelter and supporting powerplant in the lower Tocantins River basin.

Empresa Santa Rita de Mineração, Ltda., a subsidiary of Ethyl Corp., reported discovery of large bauxite deposits in Amapá.

Chromium.—Six Japanese companies—Showa Denko K.K., Japan Metals & Chemicals Co., Ltd., Nippon Denko Co., Ltd., Nippon Kokan K.K., Awamura Metal Industry, and Mitsui & Co., Ltd.—agreed with Cia. de Ferro-Ligas da Bahia, S.A. (Ferbasa), to build a ferrochromium smelter at Pojuca, north of Salvador in Bahia. Beginning in 1976, the new plant will use a

22,000 kilovolt-ampere furnace to produce 35,000 tons of high-carbon ferrochromium annually. Most of the production will be exported to Japan.

Iron Ore.—Preliminary figures showed a 21% increase in production over that of 1972. Total shipments reached 60.2 million tons. Exports were estimated at 43.5 million tons, a 43% increase.

The examination report on the iron deposits of the Serra dos Carajás was submitted by Amazônia Mineração, S.A., and approved by the Ministry of Mines and Energy. Resources at Carajás were estimated, on the basis of 121,000 feet of core-drill hole, at 16 billion tons averaging 66.7% iron, 2.2% alumina plus silica, 0.05% phosphorus, and no sulfur or other deleterious components. About 12% of the resources were considered proven reserves. The company, jointly owned by CVRD (51%) and Cia. Meridional de Mineração, a United States Steel Corp. subsidiary, (49%), began designing $800 million worth of mining plant, railroad, and port facilities. The proposed railroad will extend from the mine through Maraba, where it will cross the Transamazonica highway, to the port site near São Luis, Maranhão, on St. Mark's Bay, a total distance of over 900 kilometers across difficult terrain. The railroad will be able to move 90,000 to 120,000 tons daily. First exports of ore may appear in 1978. Under the terms of the agreement, United States Steel may purchase up to 50% of the annual Carajás production at current prices; the remainder will be marketed by CVRD. At yearend, Japanese steel interests were considering the benefits of joining CVRD and Meridional in developing Carajás.

Mineração Brasileiras Reunidas, S.A. (MBR), shipped its first trainload of iron ore from the Aguas Claras mine on July 1. This and subsequent shipments established the company stockpile of ore on Guaiba Island, in Sepetiba Bay west of Rio de Janeiro, from which on November 27 the first vessel was loaded with 156,000 tons of sinter feed for the Nippon Steel Corp. in Japan.

By midyear MBR had completed a 22-kilometer railroad spur linking the mine to the Brazilian Government railroad, Rede Ferroviaria Federal. The railroad rehabilitated much of its 640-kilometer main line to Sepetiba Bay.

Ore reserves at Aguas Claras were estimated at 370 million tons containing 64% to 68% iron. At full production, the mine will be operated at 11.5 million tons annually, 1.5 million tons of which will be fines. Production from other mines will bring the company total to more than 13 million tons. Japanese steelmakers contracted to buy 7 million tons annually over a 16-year period and an additional 3 million tons per year has been sold on long-term contracts.

S.A. Mineração da Trindade (Samitri) produced 4,378,491 tons of iron ore, of which 3,584,751 tons was exported, principally to Europe. Samitri worked during the year to increase output at the Alegria mine; the production goal is an eventual 20 million tons. Samitri was also engaged in a joint venture with Marcona International S.A., under the name Samarco Mineração S.A., to develop the Germano mine in Minas Gerais. Reserves were estimated at 280 million tons. The ore will be beneficiated and pumped as a slurry 387 kilometers to Ponta Ubá, in Espírito Santo south of Vitória. At this point the concentrate will be settled, drained, and eventually reclaimed by the Marconaflo system for direct export or transfer to a pellet plant to be built at Ponta Ubá. The project, to be operative late in 1977, was estimated to cost $353 million. Production levels of 10 million tons of concentrate and 5 million tons of pellets were planned.

Ferteco Mineração S.A., produced 3,561,529 tons of iron ore in 1973, all of it exported. Late in the year an $85 million expansion program began, aimed at an annual production of 5 million tons by 1976. Additional beneficiation facilities and a 2.5-million-ton pellet plant will be installed.

The Government's Cia. Siderúrgica Nacional (CSN) began a $60 million expansion program at its Casa da Pedra mine, from which output is to be increased from 3 million to 7 million tons by 1978. A 10-million-ton per year beneficiating capacity is to be installed. A contract for engineering services was executed with Kaiser Engineers, Inc.

Brazil's production of iron ore pellets from ore fines, already large, was the subject of plans for new installations at a number of locations. CVRD and Brazil's three largest steel companies, CSN, Cia. Siderúrgica Paulista (COSIPA), and Usinas

Siderúrgicas de Minas Gerais (USIMINAS), will jointly build a 3-million-ton-per-year plant in the Paraopeba Valley, near Congonhas de Campo in Minas Gerais. Startup was planned for late 1975 or early 1976, with 3 million tons of further expansion by 1980. Cost was estimated at $50 million. Finsider International, the Italian steel firm, and CVRD will build a 3-million-ton plant at Tubarão, CVRD's third such plant there, with startup scheduled for 1976. The plant will also use ore fines from CVRD's mines in Minas Gerais. Negotiations between CVRD and the British Steel Corp. concerning a fourth pellet plant at Tubarão were underway. Cia. Nippon Brasileira Peletização, a joint-venture company of CVRD and six Japanese steel companies, will be created in 1974 to build two 3-million-ton pellet plants at Tubarão to be onstream in December 1976; the product will be exported to Japan.

Brazilian authorities decided not to assist in the exploitation of Bolivia's Mutún iron deposit, but will provide technical aid and equipment to a Bolivian steel plant based on the Mutún ores.

Iron and Steel.—The steel industry accomplished further production increases during 1973. Raw steel production was 10% greater than in 1972, pig iron gained 3%, and rolled steel products were up 16%.

While there was no actual shortage of steel in Brazil during the year, consumer inventories were low and the supply situation was tight. Previous plans for production of 20 million tons by 1980 were revised upward to 25 million or possibly 30 million tons. The Conselho Nacional de Siderúrgica (CONSIDER) sought during the year to encourage production of nonflat shapes. A 3-million-ton mill at Tubarão was approved, and construction of two mills in the Paraopeba Valley, Minas Gerais, was being considered.

The Brazilian Government created Siderúrgica Brasileira S.A. (SIDERBRAS), as a holding company to coordinate the operations of steel companies in which there is government control or significant government participation. The National Bank for Economic Development (BNDE) loaned two of these companies funds with which to expand production. USIMINAS and COSIPA will increase ingot production to 2.4 million and 2.3 million tons, respectively.

SIDERBRAS and Kawasaki Steel Co. of Japan signed an agreement to create a pilot company which will conduct, in association with Finanziaria Siderúrgica of Italy, a feasibility study regarding a steel plant at Tubarão. Plans called for 3 million tons of slab steel annually, and production was to start in 1978. The product will be divided equally between Brazil, Italy, and Japan.

COSIPA placed an order for a plate mill plant, of 960,000-ton capacity, with Mitsubishi Heavy Industries, Ltd. The plant, to be operational by July 1976, will cost $24.5 million.

One of the steel mills proposed for the Paraopeba Valley was to reach 1-million-ton capacity by 1978 and 2 million tons by 1980. Nippon Steel Corp., C. Itoh & Co. Ltd., and Mitsui & Co. jointly will hold a one-sixth share in the enterprise, the remainder being held by various Brazilian interests.

Nippon Steel began feasibility studies for a steel plant at Itaqui, near São Luis, Maranhão, while SIDERBRAS will coordinate a similar study on the necessary infrastructure and raw material supply.

British Oxygen Co. established a joint venture with Cia. Siderúrgica Hime to produce at least 200 tons per day of oxygen. The plant will be built near the Hime steel works in the Belo Horizonte vicinity, and its product will primarily be used in the steel industry.

Announcement of a Midrex-process reduction plant for Fi-El Aços e Metais at São Jose dos Campos, east of São Paulo, was made in November. The plant will be exceptional in its use of liquid hydrocarbons for reduction; other plants use natural gas. A second electric-arc furnace will be added to melt the sponge iron. The plant will eventually produce 500,000 tons annually of rod, wire, and reinforcing bar.

Because of prohibitive freight costs, August Thyssen-Hütte abandoned its plans for a similar plant at Tubarão, but Swindell-Dressler Co. continued construction of an HyL direct reduction plant in Bahia.

The Governments of Brazil and Bolivia concluded an agreement by which Bolivia would erect a direct-reduction plant and a rolling mill in Bolivia, based on Mutún ore while Brazil would provide financing and equipment and would guarantee a market for 105,000 tons of sponge and

100,000 tons of laminated shapes annually. The plants will begin operation in 1979, with expansions planned for 1983.

Brazil also announced plans to help Paraguay build a 100,000-ton-per-year steel plant, with Brazil supplying technical assistance, financing, and raw materials as well as marketing the products.

In October a letter of intent was signed by CVRD, C. Itoh & Co. Ltd., Kord Industrie u. Handel (West Germany), and the Tunisian Government for a direct reduction plant of 1-million-ton-per-year capacity to be built at Gabes, Tunisia.

Manganese.—Production of manganese increased about 5% in 1973, including about 55,000 tons of pellets, made at the world's first manganese pelletizing plant at the port of Santana on the Amazon River in Amapá. The company, Industria e Comercio de Minerios S.A. (ICOMI), began commercial production of the pellets about midyear. The plant will make 210,000 tons of pellets annually from gravity concentrates produced at the Serra do Navio mine, 121 miles north of Santana.

A sales organization, Caemi International, Inc., was formed to market manganese ore from Amapá and Ghana as well as iron ore, chromite, and barite from various sources, and specialty steels from Aços Anhanguera, S.A., of Brazil.

Japanese ferroalloy producers were studying manganese deposits at Urucum, Mato Grosso, and the Moro da Mina mine at Lafaiete, Minas Gerais. Nippon Kokan K.K., Marubeni Corp., and Electro Siderúrgica Brasileira, S.A. (SIBRA), agreed that Nippon Kokan K.K. would supply two 24,000-kilovolt-ampere furnaces to SIBRA to increase the latter company's production of ferromanganese to 125,000 tons annually and that Marubeni would invest $1 million in a 20% share of SIBRA and provide a sales organization. The new facilities will be built beside the present 35,000-ton plant at Salvador, Bahia.

Nickel.—Pilot-plant studies having proved favorable, Cia. Niquel Tocantins, a subsidiary of Industrias Votorantim, S.A., began building a plant at Niquelândia, Goiás, for production of 11 million pounds of cathode nickel per year. Plant cost was estimated at $170 million, with production expected early in 1975.

At Barro Alto, also in Goiás, preliminary studies showed reserves of lateritic nickel ore of 100 million tons at an average grade of 1.8% nickel. International Nickel Co. of Canada Ltd. (INCO), Metallgesellschaft AG, and Exploration u. Bergbau, GmbH, agreed to participate with Baminco Mineração e Siderúrgica, S.A., in a feasibility study for development of the deposits. Pilot-plant studies will be conducted at Port Colborne, Ontario, Canada.

Tin.—Cassiterite production in Brazil during 1973 was 31% greater than in 1972, and smelter production of primary tin, using about 50% imported concentrate, more than doubled. Cia. Industrial Amazonense began operations late in the year at its smelter at Manaus, Amazonas. The company began shipping 160 tons of concentrate monthly from its mines in Rondônia and also contracted to buy some concentrate from Paranapanema, S.A. The smelter has a capacity of 80 tons per month.

W. R. Grace & Co. sold its 50% share in Mineração Brasiliense, S.A. (Mibrasa), to Brazilian interests in August. Mibrasa produced about 750 tons of concentrate per year from its dredge operation in the Rondônia District.

Discovery of a cassiterite deposit at Cavalcanti, Goiás, was reported in October.

Titanium.—CVRD, Ishihara Sangyo Kaisha, and C. Itoh & Co. Ltd., joined in conducting feasibility studies for mining anatase at Araxá, Minas Gerais, and with Cia. Brasileira de Technologia Nuclear (CBTN), for mining ilmenite from beach sands in Espírito Santo. Blended anatase and ilmenite may be used as feed for a synthetic rutile plant.

Zinc.—The electrolytic plant of Cia. Mineira de Metais continued successfully to process ore from the company's mine at Vazante, Minas Gerais, and also zinc concentrate purchased from Peru and the United States. The company proposed to expand production from 20,000 to 50,000 tons per year by mid-1976.

NONMETALS

Cement.—Production of all forms of cement in 1973 totaled 13,397,576 tons, an increase of 18% over 1972 output. Common portland cement accounted for 11,858,232 tons, or 88.5% of the 1973 total.

Four cement plants began operations during the year, adding 690,000 tons to the supply, and three more plants were ex-

pected onstream in 1974, for an additional 695,000 tons of capacity. At yearend 13 cement plants were under construction and scheduled for operation at various times in 1975–78; these will increase the national capacity by 8.1 million tons per year for a total Brazilian potential of 27.2 million tons annually.

Fertilizer Materials.—Preliminary figures show that production of nitrogen in nitrogenous fertilizer materials increased 53% over 1972 output. Anhydrous ammonia amounted to 140,292 tons, or 61% of the gross production.

Natural phosphatic fertilizer output reached 286,000 tons, a decrease of 5% from 1972 levels. São Paulo (74%) and Minas Gerais (26%) were again the two producing states.

A governmental exploration team drilled extensively in Sergipe. The potash deposits, first discovered in 1965 by Petróleo Brasileiro, S.A. (PETROBRÁS), the Government oil monopoly, have not as yet been exploited. About midyear, however, Kalium Minerações, S.A., obtained government approval to mine and process the carnallite deposits in Sergipe; a 500,000-ton-per-year refinery was contemplated.

Power-Gas. Ltd., contracted with industrias Luchsinger Madorin, S.A., to build a large fertilizer complex at Rio Grande in southernmost Brazil. Among the products will be triple superphosphate and diammonium phosphate. Plant capacity was estimated at 170,000 tons of triple superphosphate and 450,000 of various granulated fertilizers. Startup was scheduled for late 1974.

Fluorspar.—Production was 8% less than in 1972. Crude ore production was reported at 88,650 tons; from this quantity, at the crude-to-product ratio of the previous year, 64,348 tons of metallurgical fluorspar was made. The remaining 17,040 tons was an off-grade concentrate not further beneficiated. Most of Brazil's fluorspar was mined in the Ciricúma District of Santa Catarina. In addition to metallurgical fluorspar, three flotation mills operated with a combined capacity of 35,000 tons per year. The largest mill, with a capacity of 25,000 tons, was built by Cia. Nossa Senhora do Carmo, and came onstream in mid-1972.

MINERAL FUELS

Coal.—Production of raw coal in 1973 was 6% less than in 1972, but production of washed coal was up 1%. In Santa Catarina, of the raw coal produced only 34% was recovered as washed coal. Production data by state follow:

State	Production (thousand metric tons)			
	1972		1973	
	Run-of-mine	Washed	Run-of-mine	Washed
Paraná	343	200	321	190
Santa Catarina	4,600	1,415	4,314	1,476
Rio Grande do Sul	978	876	931	850
Total	5,921	2,491	5,566	2,516

Brazil plans to triple steel production by 1980, and therefore the demand for coking coal should show similar growth. Four new mines are to be developed in Santa Catarina in the near future, but Brazil's coal is of poor quality and the mines are of low capacity. Negotiations for coal were underway with Colombia in an effort to develop new sources of supply.

Natural Gas.—Gross withdrawal in 1973 decreased 5% to 41,668 million cubic feet, and production of natural gas liquids similarly decreased 5%.

CCBE-Rossi-Servix Enginharia, S.A., an engineering firm specializing in pipeline construction and under contract to PETROBRÁS for several construction jobs including a 130-kilometer natural gas line in Sergipe, announced in January its intention to seek a U.S. firm as a partner in its operations.

Negotiations between Brazil and Bolivia concerning a natural gas pipeline, first made public in April, continued through the year. The provisions of the proposal called for a pipeline capable of carrying from 250 million to 300 million cubic feet per day of natural gas from the gasfields near Santa Cruz, Bolivia, to Corumbá, Brazil. A branch line is to supply gas to a direct-reduction iron plant in Mutún, and use of some gas in cement and fertilizer plants to be built in the Puerto Suarez area is likely. The pipeline will parallel a railroad and a highway. Brazil will build its section of the line from the Bolivian border at Puerto Suarez to the São Paulo Area, and perhaps also to Belo Horizonte.

Petroleum.—Crude oil production, at 62.1 million barrels, was 1.7% greater than in 1972. The Bahia fields accounted for 72% of domestic production, and Alagoas and

Sergipe for the remainder. Production from the Continental Shelf increased from 6% of the national total in 1972 to 11% in 1973. Yearend reserves were estimated at 774 million barrels.

PETROBRÁS spent $133 million on exploration and expected to spend substantially more in 1974. The first test well in the offshore Campos Field gave positive results and drilling near Macau. Rio Grande do Norte, yielded similarly promising showings. The Camorim Field off the Sergipe coast was expanded as was an onshore field, Coqueiro Seco, in Sergipe. Full production from these fields is expected by 1977. Drilling activities of PETROBRÁS are summarized as follows:

	1972	1973
Wells drilled:		
Exploratory:		
Oil	11	17
Gas	2	
Dry	67	62
Total	80	79
Development:		
Oil	68	25
Gas	1	1
Dry	26	[1] 22
Total	95	48
Grand total	175	127
Total footage drilled (thousand feet)	906	781

[1] Includes service wells.

PETROBRÁS operated nine refineries during 1973, accounting for 98% of the nation's refining capacity. Throughput reached 734,000 barrels per day, a 13% increase over 1972.

Refineries operated included Duque de Caxias, near Rio de Janeiro; Presidente Bernardos, at Cubatão, near Santos; Landulfo Alves, at Mataripe, Bahia; Alberto Pasqualini, at Canoas, near Porto Alegre; Gabriel Passos, at Betim, near Belo Horizonte; Planalto, at Campinas, west of São Paulo, and three smaller installations. Under construction was a refinery of 200,000 barrels daily capacity at São José de Campos, east of São Paulo, and a second plant of 126,000 barrels daily capacity at Araucaria, Paraná. Expansion of five of the refineries was underway: Mataripe from 80,000 to 130,000 barrels per day, both Alberto Pasqualini and Gabriel Passos from 70,000 to 140,000 barrels per day, the Duque de Caxias from 200,000 to 270,000 barrels per day, and the União (Capuava) from 20,000 to 60,000 barrels per day. Expansion of Copam (Manaus) to 50,000 barrels per day was being considered.

The PETROBRÁS oil shale extraction pilot plant at São Mateus do Sul, Paraná, began operations on January 1. Based on a shale containing 8% oil, the plant will eventually produce 1,000 barrels per day and remove 17 tons per day of usable sulfur. Shale is crushed to 2-inch size and fed to a continuous retort; effluent gases are burned to supply heat to the retort. Capacity production is expected by early 1975. Extraction costs were estimated at $4 to $6 per barrel.

Petrobrás Internacional S.A. (BRASPETRO), the foreign activity division of PETROBRÁS, entered into a joint venture with the Egyptian General Petroleum Corp. to explore a 12,500-square-kilometer area in the northern part of Egypt for petroleum. A similar exploration program was under negotiation with the Algerian Société Nationale pour la Recherche, la Production, le Transport la Transformation, et la Commercialisation des Hydrocarbures. An agreement for exploration in the Malagasy Republic was concluded with Chevron Overseas Petroleum Corp.

Venezuela and Brazil agreed, in separate actions, to create joint companies to explore the Orinoco Basin for oil, and to move oil from Venezuela to Brazil in return for oil tankers built in Brazilian shipyards.

On April 23 PETROBRÁS and Petroleo del Perú signed a 3-year contract, effective January 1974, for sale to Brazil of 4,000 barrels of crude oil per day, to be barged down several rivers to Manaus.

Petrochemicals.—The Brazilian Government released $250 million to Cia. Petroquímica do Nordeste (COPENE), a division of PETROBRÁS) for construction of the core units of a petrochemical complex at Camaçari, Bahia. The nine units of the core plant will include one to make ammonia and urea. Besides the PETROBRÁS Mataripe refinery, operating plants in the complex include: (1) A plant of Conjunto Petroquímica da Bahia (COPEB), 100% owned by Petroquisa), making 200 tons of ammonia and 250 tons of urea per day, and beginning a 4-fold expansion; (2) a plant of Cia. de Carbonos Coloidais (a 50%-owned subsidiary of Phillips Petroleum Co.), which makes 23,000 tons of carbon

black annually and plans to double its output before yearend 1974; and (3) Paskin Industrias Petroquímicas, which produces 18,000 tons of ammonium sulfate and 33,000 tons of sulfuric acid annually. A number of other plants were operating, under construction, or had governmental approval to build. To serve the Bahia complex, a deep-water port was under construction at Aratú.

The Dow Chemical Co. was planning a chlor-alkali plant in the Bahia complex that would use locally produced salt. Production of caustic soda and chlorine at the respective annual rates of 250,000 and 200,000 tons is expected early in 1974 when the plant of Salgema Industrias Quimicas (owned 45% by E.I. du Pont de Nemours & Co., Inc.) comes on line.

The Mineral Industry of Bulgaria

By Boteo Tachkov [1]

Deposits of low-rank coals and some nonferrous metal ores comprise the bulk of Bulgaria's mineral wealth. Since nationalization in 1947, the Government has been following a policy of accelerated industrialization and intensified prospecting for additional mineral resources. The total annual capital investment in industry grew from 115 million leva in 1949 to 1,499 million leva in 1973.[2] Bulgaria is still investing more national income per capita in mineral exploration than any other member of COMECON.[3] As a result, substantial reserves of lead, zinc, and copper were discovered, making Bulgaria one of the leading countries in per capita production of lead (11.5 kilograms), zinc (8.5 kilograms), and copper (4.5 kilograms).

In 1973, industrial production rose 10.6% over that of 1972. However, the mineral industry lagged behind, expanding only 6% to 8%. The production of electrical power, crude oil, coal, and iron ore fell below 1972 levels. As a whole, the industrial development program was behind schedule, and essential projects could not be put into operation. Among them were the Chemical Combinat Devnya, the thermoelectric plant and the Bobovdol coal mine, and the expansion of iron and steel combines Kremikovtsi and Lenin. However, improvements in 1973 were recorded for pig iron and steel, rolled products, and steel pipe production. Improvements were also reported in the output of phosphate fertilizers.

As Bulgaria approached labor and mineral resource limitations during the year, new emphasis was placed on the efficient use of available resources. Following establishment of a national and local departmental material-technical supply system in 1972, a Council on Norms Standards was established in 1973. For the first time, the plan for material and technical supply incorporated a broad system of norms and standards for the consumption of raw materials. In the process, the expenditures for over 10,000 materials was reviewed and over 500 of them were substantially lowered.

Government policy for 1974 and 1975, the last 2 years of the current 5-year plan, was to continue to emphasize strong growth of heavy industry. The Government declared 1974 the year for maximum economic use of raw materials. Special programs were introduced for utilizing generally poorer indigenous minerals with the assistance of companies from countries with market economies. Capital investment in 1974 will be concentrated on a few large projects in order to insure timely completion; a larger share of available funds will be supplied for the modernization of existing facilities.

According to the policy of economic integration with other COMECON countries, particularly the U.S.S.R., Bulgaria specializes in the production of 400 machines and 160 chemicals. It is hoped that the integration of Bulgaria into the other countries with centrally controlled economies will supply needed fuel and power for Bulgaria. As a result of coordination in capital investments, plans have been made for new large-scale production capacity in these specialized areas in Bulgaria.

Nonferrous mining in Bulgaria is generally characterized by low-quality ores and difficult mining and geologic conditions.

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[1] Mineral specialist, Division of Fossil Fuels—Mineral Supply.

[2] Because of fluctuating exchange rates, a meaningful conversion to U.S. currency is impractical. At yearend, however, the exchange rate was L1 = US$1.17.

[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.

Mining costs are high. In 1966, nonferrous metallurgy reportedly accounted for 4.7% of the total value of industrial production, but used 4.8% of the total labor force, 14.6% of the total electrical energy consumed, and 9.4% of the total fixed capital in industry. Since then, the conditions continued to deteriorate. The declining metal content in mined ore is evident from the following tabulation, in percent:

Year	Lead	Zinc	Copper
1965	2.26	2.06	0.67
1970	2.11	1.75	.47

Source: Statisticheski Godishnik (Sofia). 1971, p. 163.

To compensate for declining metal content, the Government developed more mines. Indigenous nonferrous minerals supply all of Bulgaria's requirements and provide for comparatively large exports. A substantial part of the Bulgarian electric-equipment manufacturing owes its existence to the availability of indigenous nonferrous minerals.

PRODUCTION

Lead, zinc, and copper production in Bulgaria in 1973 was sufficient to supply indigenous demand and relatively large exports. Although Bulgaria does not publish official statistics on nonferrous minerals, other sources of information indicate that the annual production of lead-zinc ore has stabilized at about 180,000 tons (metal content) and copper production at about 46,000 tons (metal content).

All lead-zinc ore is deep-mined, whereas 80% of Bulgarian copper ore is surface-mined. The Gorubso mines account for 70% of the total national lead-zinc production, and the Medet mines account for 75% of the total copper production. A program for greater concentration of productive capacity and mechanization of mines was underway in 1973. The program was directed toward maintaining the current production level despite the deteriorating metal content of the ores.

Coal production continued to decline, reaching 26.7 million tons in 1973, 2% below 1972 production. There was a marked decline in crude oil production as output fell to 190,000 tons in 1973, 23% below that of 1972. The depletion of resources was given as a factor in the declining output. Iron ore production dropped to 2.8 million tons compared with 3.2 million tons in 1972. Indigenous oil and iron ore production in 1973 was inadequate and required the importation of relatively large quantities of these commodities.

Despite increased production, the iron and steel industries experienced serious problems in 1973. Among the most important were the low quality of local ores; uneconomic transportation of imported iron ore, coke, and energy; obsolete equipment; and excessive use of metal in machine construction. Bulgarian industrialization thus far has emphasized quantity and was accomplished largely by greater inputs of labor and capital, rather than by advancing technology. As a consequence, Bulgaria had the highest material and energy cost of production in metallurgy of all COMECON countries in 1973. For each ton of open-hearth steel, Bulgaria consumed 1,205 tons of metal, compared with the world average of 1,120 tons. Iron and steel products lose about 28% to 30% of the metals input in the manufacturing process. In 1973, labor was still being underutilized. According to one study, 50% of those employed are engaged in supporting services rather than in direct production work. These and other problems led to a broad modernization program, which included assistance from appropriate enterprises in market-economy countries.

The addition of new productive capacity continued in 1973 and included 450 megawatts of electric-power-generating facilities, 100,000 tons of annual coal production capacity, and facilities for the annual output of 100,000 tons of cement. Among the most important projects scheduled for 1974 were construction of seven new electropower complexes, modernization of the Lenin and Kremikovsti metallurgical plants, expansion of the Bobovdol and Maritsa coal mines, expansion of the Burgas petrochemical combine, expansion of the Pirdop copper combine, construciton of the U.S.S.R.-Bulgaria gas pipeline, and construction of the Kozloduy nuclear power station.

Table 1.—Bulgaria: Production of mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity [1]		1971	1972	1973 [p]
METALS				
Cadmium, smelter output [e]	metric tons	200	200	200
Copper:				
Mine output, metal content	do	[r] 42,400	[e] 44,000	[e] 46,000
Blister, including secondary	do	45,000	[e] 45,000	[e] 45,000
Refined electrolytic, including secondary [e]	do	[r] 39,500	41,000	42,000
Iron and steel:				
Iron ore and concentrate		3,001	3,207	2,773
Pig iron, including blast furnace ferroalloys		1,378	1,562	1,610
Crude steel		1,947	2,129	2,246
Semimanufactures		1,888	2,024	2,088
Lead:				
Mine output, metal content	metric tons	100,000	[e] 100,000	[e] 100,000
Smelter, including secondary	do	[r] 102,000	[e] 102,000	[e] 102,000
Manganese:				
Gross weight		41	30	38
Metal content		12	9	[e] 11
Molybdenum mine output, metal content [e]	metric tons	140	140	140
Zinc:				
Mine output, metal content	do	79,920	[r e] 80,000	[e] 80,000
Smelter, including secondary	do	78,400	[e] 80,000	[e] 80,000
NONMETALS				
Asbestos	do	2,900	1,500	[e] 1,500
Cement, hydraulic		3,880	3,910	4,180
Clays, kaolin		138	142	[e] 150
Fertilizer materials, manufactured:				
Nitrogenous:				
Gross weight		1,473	1,416	1,409
Nitrogen content		562	523	519
Phosphatic:				
Gross weight		415	396	397
Phosphorus pentoxide content		146	130	135
Gypsum and anhydrite:				
Crude		131	171	165
Calcined		22	28	[e] 27
Lime (quicklime)		940	950	[e] 950
Pyrite:				
Gross weight [e]		150	150	150
Sulfur content [e]		[r] 63	[r] 63	63
Salt, all types		93	104	110
Sulfur, elemental, recovered	metric tons	5,773	6,673	[e] 7,200
MINERAL FUELS AND RELATED MATERIALS				
Coal (marketable):				
Anthracite		160	155	128
Bituminous		228	229	223
Lignite and brown		26,620	26,894	26,331
Total		27,008	27,278	26,682
Coke		1,091	1,190	1,230
Natural gas, marketed production	million cubic feet	11,560	7,786	[e] 8,000
Petroleum:				
Crude oil:				
As reported		305	248	190
Converted [e]	thousand 42-gallon barrels	2,227	1,810	1,387
Refinery products:				
Gasoline	do	[r] 10,838	[e] 11,475	NA
Kerosine	do	[e] 1,008	[e] 1,054	NA
Distillate fuel oil	do	[r] 15,830	[e] 17,770	NA
Residual fuel oil	do	24,782	26,360	NA
Lubricants	do	903	455	NA
Asphalt, including natural	do	927	1,200	NA
Total	do	[r e] 54,288	[r e] 58,314	NA

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

[1] In addition to the commodities listed, bismuth, chromite, gold, silver, barite, fluorspar, magnesite, palladium, platinum, and tellurium are also produced, but information is inadequate to make reliable estimates of output levels.

TRADE

Foreign trade turnover (exports plus imports) in 1973 rose 11.3% to exceed 6 billion leva. Exports were valued at 3.2 billion and imports at 3.1 billion leva. About 79% of the foreign trade was with countries with centrally controlled economies, 53% of which was with the U.S.S.R. Only 21% of the trade was with market-

economy countries. More than 25% of the trade with centrally controlled economy countries consisted of fuels, minerals, and metals. The major trade partner, the U.S.S.R., was also the major supplier of raw material imports. In 1973, the U.S.S.R. supplied Bulgaria with 9.6 million tons of crude oil and products, 2.6 million tons of bituminous coal, 3.3 million tons of anthracite, and 375,000 tons of coke. Imported fuels supplied 70% of energy consumption.

Bulgarian trade reflects the established policy of economic integration of the economies of the U.S.S.R. and COMECON countries. Bulgaria has been participating in joint projects by supplying manpower and capital in the construction of a fertilizer combine in Kingisepp, the Kursk metallurgical plant, and Lebedinsk ore-processing center. In the future, Bulgaria expects to receive nearly 1.5 million tons of metal annually from the Kursk combine.

In 1973, Bulgarian enterprises built with Soviet assistance provided 95% of the national output of ferrous metals, 85% of the nonferrous metals, 30% of the products in the oil-refining and petrochemical industry, and 60% of the electric power. According to agreements, Bulgaria is to supply COMECON countries with goods from its machine-building and metal-processing industries in exchange for mineral fuels and technology.

Bulgarian trade and production cooperation with market economy countries has been increasing. Established business contacts involve over 30 West German, 50 French, and a number of Italian, Japanese, United States, and other companies. Bulgaria has been interested in complete projects built by these companies in return for future exports of the products of the projects. Bulgaria thus may import new highly-productive equipment and production experience and obtain access to foreign markets without foreign exchange expenditures.

Table 2.—Bulgaria: Exports of selected mineral commodities [1]
(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum and alloys:			
Scrap	771	--	
Unwrought and semimanufactures	r 2,575	7,066	Yugoslavia 4,799; Japan 2,267.
Cadmium metal, all forms	577	--	
Copper and alloys:			
Scrap	37	401	All to West Germany.
Unwrought and semimanufactures	r 5,401	3,801	West Germany 2,024; Italy 1,001.
Iron and steel:			
Scrap	r 2,623	34,391	Italy 11,766; Poland 11,156; Yugoslavia 10,141.
Pig iron [2]	25,900	30,700	NA.
Ferroalloys	r 6,108	11,473	Italy 3,925; Switzerland 3,705; Belgium-Luxembourg 2,906.
Steel, primary forms thousand tons	169	143	Italy 77; Belgium-Luxembourg 28; West Germany 20.
Semimanufactures: [3]			
Bars, rods, sections do	135	154	U.S.S.R. 59; Yugoslavia 42; Poland 26.
Plates and sheets do	522	703	Italy 198; U.S.S.R. 130; Finland 80.
Hoop and strip do	2	4	Greece 2; Iran 1.
Wire do	3	4	All to U.S.S.R.
Pipes and tubes do	69	84	Poland 24; Yugoslavia 24; U.S.S.R. 17.
Total do	731	949	
Lead:			
Oxides	353	1,531	Italy 928; France 370; West Germany 233.
Metal and alloys, unwrought and semimanufactures	r 13,607	16,360	U.S.S.R. 6,681; Yugoslavia 3,274; Italy 2,397.
Nickel and alloys:			
Scrap	--	188	All to West Germany.
Unwrought (including matte) and semimanufactures	23	306	Austria 206; West Germany 100.
Silver and alloys, unworked and partly worked thousand troy ounces	1,511	(4)	(4)

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Zinc:			
Oxides	NA	--	
Metal and alloys, unwrought and semimanufactures	r 34,760	29,475	United Kingdom 11,409; Belgium-Luxembourg 3,811; Romania 3,700.
Other:			
Ash and residue containing nonferrous metals	9	29	All to Italy.
Metals, including alloys, all forms	185	215	West Germany 104; United Kingdom 66.
NONMETALS			
Asbestos	NA	1,063	All to Poland.
Barite	24,800	74,300	All to U.S.S.R.
Cement [2] thousand tons	71	138	Yugoslavia 75; Libya 43.
Clays and products:			
Crude clay, kaolin	r 12,879	12,149	Italy 8,349; Romania 3,800.
Products, nonrefractory	28,213	31,401	All to Yugoslavia.
Diamond, industrial value, thousands	$56	NA	
Fertilizer materials:			
Manufactured, nitrogenous	196,024	131,092	Greece 24,670; Syria 533.
Ammonia	3,409	4,456	All to Yugoslavia.
Fluorspar	NA	NA	
Salt	NA	NA	
Sodium and potassium compounds:			
Caustic soda [2]	500	2,000	North Vietnam 500.
Soda ash [2]	r 76,867	59,058	U.S.S.R. 26,047; Hungary 12,710; Czechoslovakia 10,561.
Stone, dimension	5,262	3,629	All to West Germany.
Sulfur, sulfuric acid [2]	21,203	25,246	Romania 15,509; East Germany 6,375.
Talc	18,900	6,500	All to U.S.S.R.
Other, crude, n.e.s	5,482	12,853	West Germany 7,685; Austria 5,168.
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades	5,017	NA	
Coke, metallurgical	--	93,200	All to Romania.
Petroleum:			
Crude thousand 42-gallon barrels	181	156	Do.
Refinery products:			
Gasoline, motor do	183	NA	
Distillate and residual fuel oil do	106	49	NA.
Lubricants [2] do	r 27	113	Poland 96; Yugoslavia 8.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	3,599	350	All to West Germany.

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, 1971 and 1972 ed., 1972 and 1973.

[4] Value only reported at US$2,238,000, of which $1,296,000 was shipped to West Germany and $641,000 to the Netherlands.

Source: Official trade returns of Bulgaria, Poland, Romania, and the U.S.S.R. for 1971 and 1972; United Nations Statistical Office, Supplement to the World Trade Annual, 1971 ed., v. 1, 1974; United Nations Statistical Office, World Trade Annual, 1972 ed., vs. 1, 2, and 3, 1974; United Nations Economic Commission for Europe, Statistics of World Trade in Steel, 1971 and 1972 ed., 1972 and 1973.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Oxide	678	1,511	All from West Germany.
Metal and alloys, unwrought and semimanufactures [2]	25,130	30,513	U.S.S.R. 22,638; Hungary 1,983.
Antimony	411	100	All from U.S.S.R.
Copper:			
Ore and concentrate	--	3,775	All from Ireland.
Metal and alloys, unwrought and semimanufactures	2,795	4,281	U.S.S.R. 2,305; Austria 994.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Iron and steel:			
Iron ore [2] ____ thousand tons	1,192	1,460	Mainly from U.S.S.R.
Metal:			
Scrap ____ do	--	5	All from Poland.
Pig iron [2] ____ do	280	307	Mainly from U.S.S.R.
Ferroalloys ____ do	13	12	All from U.S.S.R.
Semimanufactures: [3]			
Bars, rods, sections do	411	426	U.S.S.R. 361; Poland 23.
Plates and sheets do	299	278	U.S.S.R. 187; Italy 40.
Hoop and strip do	r 18	17	West Germany 8; Italy 5; Belgium-Luxembourg 4.
Railway materials do	64	55	U.S.S.R. 44; Yugoslavia 7.
Wire do	11	19	U.S.S.R. 8; Austria 4.
Pipes, tubes, fittings do	110	135	Italy 59; U.S.S.R. 47.
Castings and forgings do	1	1	Mainly from Poland.
Total do	r 914	931	
Lead:			
Ore and concentrate	--	1,897	All from Sweden.
Metal and alloys, unwrought and semimanufactures	--	170	All from Yugoslavia.
Manganese:			
Ore and concentrate	110,000	103,000	All from U.S.S.R.
Oxide	142	220	All from Japan.
Mercury ____ 76-pound flasks	261	--	
Nickel and alloys, unwrought and semimanufactures	r 124	249	West Germany 184; United Kingdom 65.
Platinum-group metals value, thousands	$4	$80	All from West Germany.
Tin:			
Oxides ____ long tons	18	23	All from Belgium-Luxembourg.
Metal and alloys, unwrought and semimanufactures ____ do	25	382	United Kingdom 308; Spain 74.
Titanium oxides	1,300	1,280	Italy 1,050; West Germany 230.
Zinc:			
Ore and concentrate	r 51,483	42,356	All from Yugoslavia.
Oxide	r 55	--	
Other and unspecified:			
Ore and concentrate	10	20	All from Spain.
Metal and alloys:			
Metalloids	--	836	All from Yugoslavia.
Scrap	--	139	All from Spain.
Unwrought and semimanufactures	2,492	2,757	U.S.S.R. 2,598.
NONMETALS			
Abrasives, natural, n.e.s. value, thousands	$30	$110	All from Belgium-Luxembourg.
Asbestos	22,800	19,700	All from U.S.S.R.
Cement ____ thousand tons	158	166	U.S.S.R. 117; Romania 49.
Clays and products:			
Crude	601	729	All from United Kingdom.
Products, refractory and nonrefractory	42,824	26,349	U.S.S.R. 22,200; Yugoslavia 2,622.
Diamond, industrial value, thousands	$171	$175	All from Belgium-Luxembourg.
Feldspar	957	--	
Fertilizer materials: [4]			
Crude:			
Phosphatic (apatite concentrates)	342,500	395,000	All from U.S.S.R.
Potassic (salts)	84,300	130,900	Do.
Manufactured:			
Phosphatic	r 272,463	220,061	U.S.S.R. 178,400; Yugoslavia 37,611.
Mixed	2,098	9,304	All from Yugoslavia.
Fluorspar	235	--	
Gypsum	99	--	
Magnesite	256	--	
Pigments, mineral, iron oxide	83	319	All from Japan.
Salt	75,500	123,500	All from Romania.
Sodium sulfate	6,294	10,693	All from East Germany.
Sulfur	2,963	6,029	All from U.S.S.R.
Other crude nonmetals	428	396	All from Netherlands.

See footnotes at end of table.

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

Commodity	1971	1972	Principal sources, 1972
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [2]	14,269	14,780	U.S.S.R. 12,225; Romania 1,144.
Coal, all grades ----- thousand tons	5,981	5,699	All from U.S.S.R.
Coke [2] ---------- do ----	355	395	U.S.S.R. 327; Czechoslovakia 40.
Petroleum:			
Crude oil thousand 42-gallon barrels	55,093	60,755	U.S.S.R. 46,783.
Refinery products:			
Gasoline ---------- do ----	5	12	All from Romania.
Distillate fuel oil ---- do ----	130	486	Do.
Residual fuel oil ------ do ----	r 544	621	Do.
Lubricants ---------- do ----	35	74	Poland 21; Romania 15; United Kingdom 12.
Other ---------- do ----	8	7	Mainly from United Kingdom.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ------	17,531	13,223	Mainly from U.S.S.R.

r Revised.
[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] Official import statistics report the receipt of only 413,000 tons in 1971 and 376,000 tons in 1972, but these represent receipts of only a select few categories of semimanufactures. Because of the incomplete nature of these data, export statistics of trading partner countries have been used for the entire steel semimanufacture section.
[4] Official import statistics report the receipt of 995,000 tons of all types of fertilizers in 1971 and 1,058,000 tons in 1972, quantities which considerably exceed the totals for the commodities listed below, which are derived from trading partner export statistics. However, official import statistics do not break down the totals by type. Among the source countries listed in official import statistics, but not not covered by trading partner export data, was Tunisia, which reportedly supplied 210,000 tons in 1971 and 118,000 tons in 1972, all of which was presumably phosphate rock.

Source: Official trade returns of Bulgaria, Poland, Romania and the U.S.S.R. for 1971 and 1972; United Nations Statistical Office, Supplement to the World Trade Annual, 1971 ed., v. 1, 1974; United Nations Statistical Office, World Trade Annual, 1972 ed., vs. 1, 2, and 3, 1974.

COMMODITY REVIEW

METALS

Aluminum.—Construction of the first aluminum processing plant started in 1973. The first section was expected to be completed by the end of 1975. When in full capacity by 1977, the plant will produce 48,000 tons of rolled semifinished products, enough to supply indigenous needs. The plant is located near Shumen City and was designed jointly by Soviet and Bulgarian specialists. The equipment and aluminum ingots will be supplied by the U.S.S.R.

Copper.—In 1970, when the last data on copper was published in Bulgaria, 8.9 million tons of ore and 38,300 tons of refined copper were produced. According to Bulgarian sources, goals were to increase refined copper production to 44,000 tons by 1975. Production for 1973 was estimated at 46,000 tons of mine output, metal content; 45,000 tons blister, including secondary; and 42,000 tons of refined electrolytic copper, including secondary.

Bulgaria's largest mine and concentrator at Medet is a surface mine that has a daily capacity of 24,000 tons of ore with a content of 0.36% Cu. The rest of the mines and concentrators range in capacity from 300 tons to 2,500 tons per day. The deposits are dispersed over a wide mountainous area with the largest concentration near the Turkish border. Copper mining is conducted at depths reaching 700 meters. In 1964, total ore reserves were reported at 305.5 million tons, or 1.1 million tons of metal, sufficient to supply national requirements for about 25 years. The quality of the ore has been deteriorating consistently. In 1960, 1 ton of concentrate (20% Cu) was obtained from 22.5 tons of ore; in 1965, 45 tons of ore was needed to supply the same quantity of concentrate. In 1980, the same yield of concentrate is expected to require 51 tons of ore.

The largest underground copper mine in Bulgaria, Chelopech, was reportedly under construction in 1973. The ore body is irregular and varies in grade from 0.5% to 1.5% Cu. By 1975, the mine was expected to develop an ore-mining capacity of 500,000 tons annually.

Iron Ore.—The production of iron ore is concentrated in Kremikovtsi, north of the capital of Sofia. In 1973, production was 2.8 million tons of 28% to 30% Fe ore compared with 3.2 million tons in 1972. The ore is surface-mined, largely with Soviet equipment. An unresolved problem is the separation of undesirable components in the ore. To reach the desired quality level, local iron ore is blended with an equal amount of imported ore.

Iron and Steel.—The steel industry has been one of the fastest growing industries in the Bulgarian economy. From an insignificant production level after World War II, output expanded rapidly to reach 2.2 million tons of steel and 1.6 million tons of pig iron in 1973. Despite the expansion, output is still well below requirements. In 1973, about 30% of the consumption was imported.

There are two major iron and steel plants, both built by the U.S.S.R. after World War II. The larger plant at Kremikovtsi produces 73% of the steel output, 87% of the pig iron, and 75% of the rolled products.

In 1973, the Kremikovtsi plant was still expanding. A new tinplate works with annual capacity of 10,000 tons started production during the year. A new type 1,200, five-unit, cold-rolling mill was under construction in 1973. Planned tinplate, chromium plating, and plastic coating facilities to process 550,000 tons of sheet metal annually were reportedly 3 months behind schedule and were not expected to be completed during 1973. In a continued expansion, the first lines for galvanized sheet and plastic-coated sheet metal were expected to be in operation by the end of 1975. By 1980, the pig iron and steel plants are planned to be reconstructed. The arc furnaces are to be equipped with more powerful transformers, and the use of natural gas in ore reduction is to be introduced. By 1975, Kremikovtsi was expected to produce 1.6 million tons of pig iron, 2.0 million tons of steel, and over 2.3 million tons of rolled products.

The Lenin iron and steel plant built in 1954 is also located near Sofia. The plant, which has been under reconstruction since 1972, was to increase its production of high-grade steel first to 20% and finally to 30% of the total output. A rolling mill for 4- to 30-millimeter sheet metal, as well as a mill for thin-sheet rolling and coating, were under construction. In 1973, the plant had two blast furnaces. After reconstruction, the plant is to have six 70-ton, and one 140-ton open hearths.

Early in 1973, Bulgaria had five blast furnaces with a total volume of 3,559 cubic meters. The utilization of the furnace volume was rated at about 85%. Specific coke consumption averaged 670 kilograms per ton of pig iron. Bulgaria's seven open-hearth furnaces produced a daily average of about 5.21 tons of steel per cubic meter of volume. The iron and steel industry (including ore extraction) employed about 30,000 persons with a average annual salary of about 2,000 leva.

Lead and Zinc.—In 1970, the officially reported production of lead-zinc ore was 173,000 tons (metal content). The production of smelter lead was reported at 98,600 tons (including secondary), and smelter zinc at 76,100 tons (including secondary).

In 1973, the production was estimated at 102,000 tons of smelter lead (including secondary) and 80,000 tons of smelter zinc (including secondary).

All lead and zinc ore is mined by underground methods. The ore beds are opened by shafts or adits, and workings do not exceed 400 meters in depth. The concentrate is processed in the smelters at Kurdjali, Plovdov, and Kurilo. The total annual capacity of the smelters is reported at more than 100,000 tons of lead and 80,000 tons of zinc.

NONMETALS

Fertilizer Materials.—Fertilizer production totaled 654,000 tons (content), an increase of 0.2% over that of 1972. Nitrogen fertilizers constituted 79% and phosphorus 21% of the total production. Because nitrogen production exceeded requirements, 154,000 tons was exported. However, the production of phosphate fertilizers was inadequate and necessitated imports in 1973. Bulgarian estimates of phosphate fertilizer requirements in 1975 were placed at 530,000 tons. In 1973, the only operating phosphate fertilizer plant was located at Dimitrovgrad and had a capacity of 130,000 tons per year. A new 300,000-ton-annual-capacity plant was under construction at Polyanovo in 1973. Bulgaria is also participating in the construction of a plant in the U.S.S.R. from which annual deliveries of 50,000 tons of

phosphate are expected after 1976. Thus, Bulgaria is expected to import about 50,000 tons per year of phosphate fertilizer in the future.

In 1973, the fertilizer industry was in the process of modernization. The first plants at Dimitrovgrad (1951) and Stara Zagora (1963) used lignite as feedstock, whereas the plant in Vratsa (1967) utilized natural gas. The plants in Dimitrovgrad and Stara Zagora have already been converted to naphtha. The new plant at Polyanovo is to use natural gas feedstock.

MINERAL FUELS

Total energy consumption in Bulgaria in 1973 reached an estimated 27.1 million tons of standard fuel equivalent, 2.6% higher than the 26.4 million tons consumed in 1972. Indigenous production of all fuels amounted to 8.1 million tons of standard fuel equivalent or 30% of the national energy consumption. Virtually all of the petroleum, and about 50% of the energy derived from coal was imported in 1973.

In 1973, 49% of the total primary energy consumption was derived from coal, and 47% from petroleum. The small balance was made up of natural gas, hydroelectric power, and imported electric power.

Although total Bulgarian primary energy consumption has been increasing, the rate of increase is expected to accelerate as industrialization continues to be emphasized as a national economic policy. The supply of electric energy in the future is expected to come from new plant construction.

In 1973, Bulgarian electric power stations had a reported power capacity of 5,000 megawatts and a total output of 22 billion kilowatt-hours of electric power. About 88.3% of the total electric power generation came from thermoelectric plants and 11.7% from hydroelectric power. A national consumption of 25 billion kilowatt-hours in 1973 required imports of 3 billion kilowatt-hours, most of which was supplied by the U.S.S.R. Electric power imports from the U.S.S.R. are expected to increase to 7.7 billion kilowatt-hours by 1980, according to published plans.

Table 4.—Bulgaria: Total primary energy balance 1972 and 1973
(Million tons of standard fuel equivalent)

	Total primary energy	Coal	Crude oil	Natural gas	Hydro-power	Imported electrical energy
1972:						
Production	8.4	7.5	0.3	0.3	0.3	--
Imports	18.0	6.1	11.8	--	--	0.1
Exports	--	--	--	--	--	--
Apparent consumption	26.4	13.6	12.1	.3	.3	.1
1973:						
Production	8.1	7.4	.2	.2	.3	--
Imports	19.0	6.0	12.6	--	--	.4
Exports	--	--	--	--	--	--
Apparent consumption	27.1	13.4	12.8	.2	.3	.4

Source: Data for 1972: Statisticheski Godishnik, (Sofia), 1973.
Data for 1973: Statisticheski Izvestja, (Sofia), 1974; and Statisticheski Spravochnik, (Sofia), 1974.

Coal.—Bulgaria's 6 major coalfields produced a reported 26.7 million tons of coal, consisting of 20.4 million tons of lignite, 5.9 million tons of brown coal, 223,000 tons of bituminous, and 128,000 tons of anthracite. Due mainly to the decrease in lignite coal production (548,000 tons), total coal production was 596,000 tons below 1972 production.

Total coal resources were reported as 5.3 billion tons, of which 4.4 billion were lower rank coals (lignite). The most significant lignite field is Maritsa East, south of Stara Zagora. The coal deposit is estimated to contain 2.8 billion tons to a depth of 45 to 80 meters and over an area of about 240 square kilometers. The lignite occurs in three seams, the first of which is 1 to 2 meters thick; the second, 18 to 20 meters thick; and the third, 2 to 5 meters thick. The middle seam contains about 22% ash; the ash content of the other two seams ranges up to 45%. The moisture content ranges from 55% to

60%, and the caloric value from 1,350 to 1,700 kilocalories per kilogram (2,500 Btu per pound to 3,100 Btu per pound). According to published plans, the development of Maritsa on completion in 1980 will have 6 open pit mines with a total annual capacity of 54 million tons, and 6 thermoelectric stations with a total capacity of 3,500 megawatts, which are expected to produce 22 billion kilowatt-hours annually. The project is also to include a briquet plant with an annual capacity of 1,800 tons of briquets. Three of the mines have already been developed: Trojanovo No. I, with 11 million tons of capacity per year; Trojanovo No. II, 15 million tons capacity; and Trojanovo No. III, 8 million tons capacity. By 1980, Maritsa East is expected to provide about 93% of all lignite produced in Bulgaria.

In the development of the Maritsa East project, the U.S.S.R., Czechoslovakia, and East Germany are providing substantial technical help. East Germany supplied 29 bucket excavators, 14 dump trucks, over 100 electric locomotives, and 16 rail track-laying machines. The scheduled delivery of bucket wheel excavators is to take place in 1974. By 1977, Bulgaria is to have 5 machines capable of moving 5,000 cubic meters per hour of overburden. Hard and brown coal production in 1973 was below national requirements and large quantities were imported. Most of the production came from 23 mines, which reported a deterioration in the quality of the coal produced. The ash content ranges from 20% at the Pirin mine to over 40% at Bobov dol mine. The following major mines were operating at the average depths indicated: C. Dimitrov mine, 103 meters; Bobov dol, 64 meters; Marbas, 88 meters; and Pirin, 176 meters.

In underground mines, 44% of the transportation and 72% of coal cutting were mechanized. Production in open pit mines was totally mechanized.

Natural Gas.—Despite continued drilling, no significant discoveries have been announced. The trend of increased production continued in 1973 reaching an estimated 8,000 million cubic feet compared with 7,786 million cubic feet in 1972. In 1972, Bulgaria was expected to start importing natural gas from the U.S.S.R. through a 628-kilometer, 1,020-milimeter-diameter gas pipeline. The pipeline was expected to supply 106 billion cubic feet of gas by 1975, and by 1980, the annual imports are expected to increase to 350 billion cubic feet.

Petroleum.—Bulgarian output of crude petroleum in 1973 was estimated at 190,000 tons. This was a significant decline from the record 499,000 tons produced in 1967 and from the reported output of about 305,000 tons in 1971. The 1973 output of crude oil was relatively unimportant compared with estimated oil imports of about 10 million tons. In expectation of even greater crude oil imports, Bulgaria planned to increase its tanker fleet from the reported total deadweight tonnage of 400,000 in 1973 to 850,000 in 1975. Plans were to build 18 new tankers in the 70,000- to 100,000-deadweight class. A new oil terminal to accomodate 1,000 tankers of 100,000-deadweight capacity annually has been completed.

Bulgarian refineries provided all of the domestic demand for diesel fuel and 70% of fuel oil. The 6-million-ton annual capacity of the Burgas refinery is expected to be doubled by 1976. The 1-million-ton-annual-capacity refinery at Pleven has been expanded, and a new refinery of 6-million-ton annual capacity was reportedly under construction at the same place. Pleven refineries are to be supplied by a 150-mile pipeline from the Black Sea. By 1980, the total Bulgarian annual capacity is planned to reach about 20 million tons. The U.S.S.R. has been virtually Bulgaria's only oil supplier. Recently, however, Bulgaria has been attempting to import oil from the Middle East. A credit of $12 million was given to Iraq to be repaid in oil. Reportedly, arrangements have also been made for petroleum purchases from Libya and Iran. A new hope is that offshore areas of the Black Sea may be rich in hydrocarbons, and Bulgaria has been signing joint exploration agreements with other countries. Japan has shown some interest in these joint ventures. Bulgaria also has substantial oil shale resources that may be developed by open pit mines.

Energy.—*Nuclear Power.*—Bulgaria is reportedly building its first nuclear power station on the Balkan Peninsula. A planned 440-megawatt Novo-Vovronesh reactor using U-235 for fuel has been reported under construction. A second 440-megawatt reactor is planned for later commissioning. Nuclear powerplant construction is managed by Interatomenergo, a multinational

organization within the COMECON countries. Another nuclear power station has been considered for the distant future.

Hydroelectric Power.—Bulgaria has limited resources and 50% of the economically useful hydraulic potential has already been developed. The reported production of hydroelectricity in 1973 was 2,574,000 kilowatt-hours, 11.7% of the total national output of electricity.

Construction of two major hydroelectric projects continued in 1973. The Belmeken-Sestrimo Cascade in the Rila Mountains, has a four-stage system of hydroelectric power stations with a total capacity of 800 megawatts. The system will be the largest on the Balkan Peninsula. Completion was expected by the end of 1974.

The second hydroelectric project, Antonivanoutsi, is in the Rodope Mountains. The first dam is 1,200 meters above sea level. Both projects will be supplied with Pelton turbines made in Czechoslovakia. Since 1947, Czechoslovakia shipped 38 hydraulic turbines of all types to Bulgaria.

The Mineral Industry of Burma

By Donald C. Wininger [1]

Burma's mineral industry had a disappointing year during 1973. Ore production from the Bawdwin nonferrous metal mine near Lashio recorded a substantial increase over 1972 output; however, production of refined lead and silver from this mine again declined owing to the continuing decline in the ore grade. Production of tin and tungsten increased over that of 1972. A 53% increase in output from the Mawshi tin-tungsten mine accounted for much of the increase.

The Burmese Government's decision to invite foreign participation in offshore oil exploration, on a profit-sharing basis, was the highlight of 1973. At yearend, a decision was expected shortly on which firms would be awarded contracts. Meanwhile Myanma Oil Corp. (MOC) continued its own exploratory drilling program, drilling four more holes offshore without any finds.

In July, new commodity and project agreements were signed with Japan. The project agreement provided for a long-term loan of $26.9 million [2] to finance construction of a new oil refinery at Syriam with a throughput capacity of about 1 million tons per year. This would roughly double existing Burmese refining capacity.

The Government reorganization of April 1972 provided for six agencies under the Ministry of Mines as follows: Myanma Oil Corp. (MOC); Myanma Bawdwin Corp. (MBC), to operate Bawdwin and other mines producing lead, zinc, and silver; Myanma Tin and Wolfram Corp.; Myanma Mineral Development Corp. (MDC), to supervise production of copper, antimony, and other minerals not falling under the previous two agencies; Mineral Industrial Raw Materials Corp., to produce limestone, barite, industrial clays, and related items; and the Geological Survey and Exploration Department. These agencies are responsible for general control and supervision of the mining sector, as well as direct operation of the larger and more productive mines. Smaller, mainly tin, mines operate on a tribute system, with miners, registered by the Government, working largely by hand and delivering their output to government purchase depots at fixed prices. In practice, however, much of the output is probably smuggled into Thailand, where it can be sold more conveniently and usually at higher prices.

Minerals occupy a prominent place in Burmese economic planning. However, the mineral sector has not received a corresponding share of capital investment. In fiscal year 1972–73 (October through the following September) 6.1% of the Government capital expenditure was designated for the mining sector as follows: MOC, $14.7 million; MBC, $3.5 million; and MDC and others, $5.4 million.

PRODUCTION

According to official Burmese national budget estimates,[3] "mineral" output totaled $46.9 million in fiscal year 1971–72 and probably about the same level in 1972–73. Crude oil and limestone are included, but not the value added from mineral and metal processing. Thus, products like salt, cement, refined oil, and processed metals are excluded either totally or in part.

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[2] Where necessary, values have been converted from Burma Kyat (K) to U.S. dollars at the rate of K4.8138 = US$1.00. In the open market, the Kyat is worth much less.

[3] Ministry of Planning and Finance. Report to the People by the Government of the Union of Burma on the Financial, Economic and Social Conditions for 1973–74.

Table 1.—Burma: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Antimony, mine output, metal content	128	131	143
Copper:			
Mine output, metal content [e]	80	80	75
Matte, gross weight	175	179	165
Iron and steel: [e]			
Crude steel	21,000	20,000	20,000
Semimanufactures	25,000	30,000	30,000
Lead:			
Mine output, metal content [e]	9,000	[r] 9,000	10,500
Smelter:			
Refined lead	[r] 8,774	8,431	9,902
Antimonial lead (18%–20% antimony)	309	331	279
Manganese ore, gross weight	112	279	279
Nickel:			
Mine output, metal content	24	26	21
Speiss, gross weight	94	104	83
Silver, mine output ——thousand troy ounces	685	587	754
Tin, mine output:			
Metal content of tin concentrate ——long tons	345	319	351
Metal content of tin-tungsten concentrate ——do	327	265	405
Total ——do	672	584	756
Tungsten, mine output:			
Metal content of tungsten ores	154	266	218
Metal content of tin-tungsten concentrate	228	184	282
Total	382	450	500
Zinc, mine output, metal content	[r] 4,004	4,017	3,993
NONMETALS			
Barite	22,963	25,970	15,850
Cement, hydraulic ——thousand tons	197	214	226
Clays:			
Ball clay	[2] 13,506	14,428	10,343
Bentonite	[2] 347	1,305	841
Fire clay	[2] 1,411	[3] 2,477	[3] 2,708
Industrial white clay	[2] 1,431	3,505	3,018
Pottery clay	2,256	NA	NA
Feldspar	[2] 713	799	311
Fluorspar	[2] 201	225	[e] 200
Graphite	152	217	183
Gypsum	12,193	14,895	15,647
Precious and semiprecious stones:			
Jadeite ——kilograms	2,444	2,750	6,973
Rubies and sapphires ——carats	18,000	NA	NA
Unspecified ——do	NA	NA	52,528
Salt ——thousand tons	161	158	193
Sand:			
Glass sand, brown	[2] 4,822	3,093	6,300
Glass sand, white	[2] 2,279	4,491	
Stone:			
Dolomite	[2] 654	[2] 914	1,207
Limestone, crushed and broken ——thousand tons	609	596	599
Quartz	[2] 274	221	55
Talc and related materials, soapstone	215	[e] 220	128
MINERAL FUELS AND RELATED MATERIALS			
Coal	19,711	21,456	14,450
Gas, natural: [2]			
Gross production ——million cubic feet	[e r] 8,600	11,300	[e] 12,000
Marketed production ——do	2,333	3,900	5,400
Petroleum:			
Crude ——thousand 42-gallon barrels	6,652	7,466	7,514
Refinery products:			
Gasoline ——do	1,414	1,480	1,395
Jet fuel ——do	243	234	249
Kerosine ——do	2,246	1,623	1,678
Distillate fuel oil ——do	2,226	2,180	1,962
Residual fuel oil ——do	1,609	1,500	1,550
Other ——do	709	679	267
Refinery fuel and losses ——do	193	790	1,125
Total ——do	8,640	8,486	8,226

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

[1] In addition to the commodities listed, Burma also produces 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 year ending June 30 of that stated.

[3] Includes fire clay powder.

TRADE

Burma's overall foreign trade increased from $238 million in fiscal year 1971–72 to about $240 million in 1972–73. Although total exports showed a slight increase, total imports declined somewhat. In fiscal 1971–72, Burma exported $5.9 million in base metals and ores and $0.8 million in silver. In 1972–73, base metal exports were $5.3 million, and silver exports were about $1.2 million.

Burma's imports of mineral and related products dropped somewhat from the $18 million in 1971–72. The largest item has been base metals and manufactures. Coal and coke imports showed the greatest change in 1972–73.

The latest specific commodity data on mineral exports and imports are shown in the 1972 Minerals Yearbook preprint on Burma.

COMMODITY REVIEW

METALS

Antimony.—Until 1970, the only antimony produced in Burma had been a few hundred tons of antimonial lead annually, analyzing 18% to 20% antimony, by the lead smelter in Namtu. Early in 1970, small-scale extraction of antimony ore and concentrate was resumed, due primarily to extremely high prices and government assistance by MDC. An intensive search for antimony led to the discovery of various deposits. A refining plant was constructed and placed into operation near Moulmein by MDC during 1973.[4]

Copper.—Full-scale geophysical prospecting at the Monywa copper mine was scheduled to begin in January 1973, by the Metallic Minerals Exploration Agency of Japan. Preliminary prospecting indicated reserves might be on the order of 50 to 60 million tons of ore averaging 0.7% to 1.5% copper. In 1973, 165 tons of copper matte was produced as a byproduct of refined lead from the Bawdwin mine.

Iron and Steel.—The small Ywama steel plant, which has an electric furnace and rolling mills, remained the country's only steel producer. Scrap iron for furnace feed came from domestic sources, but a shortage seemed imminent. The steel plant, rated at 40,000 tons of products annually, has been running at about half capacity. Bars and rods were the main products, followed by wire nails, galvanized iron, and barrel sheets. Plans have been made to build additional facilities for wire netting, roller extension, tubes, and sheets, although funds were not in sight. Burma also had plans to build an integrated steel industry, a project which was even more uncertain.

Lead, Zinc, Copper, Silver, and Nickel.—The Government-owned Bawdwin enterprise in northern Shan, operated by MBC, continued to be Burma's sole significant producer of nonferrous metals. The zinc concentrate produced was sold as such, mostly to Japan, whereas lead and other materials were sent to Namtu for smelting before marketing abroad.

The average grade of ore at Bawdwin apparently continued to decline. Output of ore from the mine increased; however, the quantity of lead and silver recovered declined. The old Namtu smelter with surplus capacity reportedly produced 9,902 tons of refined lead in 1973, indicating a 17% increase over that of 1972.

The small Bawsaing mine in the Taunggyi District, also under MBC, was being expanded to produce about 1,000 tons each of sulfide lead ore, carbonate lead ore, and lead slag annually. In January 1973, a team of Austrian experts arrived to assist with exploration for additional lead deposits around Bawsaing. Preliminary reports indicate that the region probably has large reserves of cerussite (lead carbonate) ore.[5]

The new Yadana Theingi mine in the Nawnghkio District, northern Shan State, was being expanded to produce over 40,000 tons of silver-lead-zinc ore annually. A powerplant, a mill, and a 32-mile road from the mine to Ohnmathi on the Mandalay-Lashio highway have been constructed.

Tin and Tungsten.—MDC continued to control most of the country's tin and tung-

[4] World Mining. V. 26, No. 3, March 1973, p. 114.

[5] U.S. Embassy, Rangoon, Burma. State Department Airgram A-85 (1973 Minerals Industry Report—Burma), July 16, 1973, pp. 1–16.

sten mines. Concentrates were produced separately or in mixed form, and combined annual output of the two related minerals has been less than 2,200 tons of concentrates during the last 5 years. Although statistics are conflicting, Burma has been producing, in terms of metal content, approximately 400 to 760 tons of tin and 300 to 500 tons of tungsten yearly. Most production has come from the Tavoy and Mergui Districts in the Tenasserim Division near the Thai border. In 1973 the Mawshi tin-tungsten mine probably accounted for about half of the total production. The Government mining corporations are supposed to supply the small miners with implements and provide technical assistance, but few services are actually available. The Government also buys concentrates at relatively low prices, an action which probably causes much of the production to be smuggled into Thailand.

Under the 4-year technical assistance agreement between MDC and the Soviet Union to rehabilitate the Mawshi tin-tungsten lode mine, a Soviet team of experts began work on the production stage, but the project was delayed during 1973 by security problems in the area.

NONMETALS

Cement.—Burma's two cement plants are operated by the Industrial Development Corp. The Thayetmyo plant, has two wet-process rotary kilns and an annual capacity of about 180,000 tons. The Kyangin plant has a capacity of about 800 tons per day. A third plant with a capacity of 240,000 tons yearly was under construction in Kyangin.

Fertilizer Materials.—Burma has two urea plants located near the Chauk oilfields in central Burma where they can utilize the local natural gas deposits. Total output of urea in 1973 was 112,000 tons, or about 85% of capacity. Power constraints have hindered greater output. A portion of the output was exported.

Gem Stones.—Uncut Burmese jade continued to be of importance in world jewelry circles. Annual output usually ranges from 52,300 to 93,300 kilograms of uncut jadeite. Since many mines are in insurgent territory near the border, additional jade presumably was produced and smuggled out of the country. Burma also produces ruby, sapphire, spinel, other "precious stones," and cultured pearls. The pearl industry was nationalized in 1964, when the Japanese part of a joint venture was dissolved. Jade and precious stone producers were first required to sell to MDC. By 1970, both these industries had become totally nationalized.

Both the Ninth Annual Gem, Jade and Pearls Emporium held in February 1973 and a special emporium held in August had record sales, mainly of jade, far in excess of those at any previous auction held in Burma. The increase primarily reflected soaring world prices for jade, rather than an increase in the quantity or quality of jade or precious stones available. Gems were not included in the special emporium. Jade sales at the Ninth Emporium totaled $4.3 million, more than twice the previous record set in 1971. Pearl and gem sales, though not records, reflected a considerable improvement over the three previous auctions, and totaled $1.2 million and $281,000 respectively. At the special emporium in August, jade sales totaled $5.3 million; however, pearl sales were again disappointing at only $470,000.[6]

Salt.—Burma produces all the salt it needs, which amounted to about 193,000 tons during 1973. Early in 1970 Burma Salt Industries, the sole operator harvesting salt from brine pits located along the Indian Ocean coast, started a modernization program. The company has placed a $1 million order with Allis-Chalmers Manufacturing Co. for tractor scrapers, crawler dozers, and graders to build pits, dikes, and channels, which will displace the elephants and bullocks formerly employed.

MINERAL FUELS

Coal.—The Kalewa coalfield in the northwest, sole producer in Burma, produced only 14,450 tons of low-grade coal during 1973, compared with 21,456 tons during 1972. Burma's imports of coal are about 200,000 tons annually.

Petroleum.[7]—Burma decided in April to begin negotiations with foreign oil companies for their participation in offshore oil exploration on a profit-sharing basis. The Burmese offshore area was divided

[6] U.S. Embassy, Rangoon, Burma. The 1973 Burma Gem, Jade, and Pearl Emporia. State Department Airgram A-115, Sept. 18, 1973, pp. 1-2.

[7] U.S. Embassy, Rangoon, Burma. State Department Airgram A-012 (Annual Petroleum Report—Burma), Feb. 1, 1974, pp. 1-8.

into 25 blocks averaging 3,853 square miles each, and by the close of discussions in early July, 38 companies or groups of firms had submitted formal proposals covering all 25 blocks. In October, representatives of 19 companies and groups were invited back to Rangoon for further discussions. MOC provided revised terms and conditions and a draft of a proposed contract, asking for final proposals from the companies in December.

Crude production continued to rise but was again wholly attributable to the Mann Field near Minbu, which now accounts for roughly half Burma's total crude production. All the other fields continued to decline. Natural gas production rose slightly, but since neither of the two gas turbine power stations under construction has yet come into service, the major increase in demand for natural gas has not yet materialized.

Output of refined products was essentially the same as in fiscal year 1971–72. The cutoff of crude imports, as well as production difficulties at the two old refineries, held production well below the 1970–71 level. Even with the import of nearly 200,000 tons of refined products, there were frequent local shortages. A contract was signed with the Mitsui group (Toyo Engineering Corp.) for the construction of an addition to the Syriam refinery. The new refinery, to be financed by a Japanese Government loan, is to have a capacity of about 30,000 barrels per day, more than double that of the two existing refineries. By the end of 1973, construction had not yet started except for preliminary site work.

Offshore exploration was carried on by MOC during the year using Reading & Bates' catamaran drilling ship, *E. W. Thornton*. Four more holes were sunk during 1973, but none showed anything more than natural gas traces. A fifth hole was lost at 6,000 feet before completion.

MOC also continued an active onshore exploration program during the year, but made no new finds. Test wells in the Rangoon area produced no petroleum, and another at Mozee Island, on the Arakan coast not far from the Bangladesh border, had no better success, as the formation sought proved to be below the 9,000-foot level which the drilling rig could reach.

The Mineral Industry of Canada

By John A. Rathjen [1]

During 1973, total output of the Canadian mineral industry, including metallics, nonmetallics, structural materials, and mineral fuels reached a record level of $8.2 billion [2] compared with $6.4 billion a year ago. This was a record 28% increase over the 1972 total. The value of mineral production has continued to grow at an average of approximately 9% per year, with metal and mineral fuels growing at much higher rates than the other minerals. Canada continued to maintain its position as the leading world producer of asbestos, nickel, zinc, potash, and silver. The largest value gains were made in the mineral fuels sector where an increase of 38% over that of 1972 was indicated. Mineral fuels contributed 39% of the total value of Canadian mineral production. The metals group, with an increase of 28% during the year, contributed 46% of the total minerals production value. Nonmetallics showed an increase of approximately 15% and provided 8% of the total mineral value. Structural materials showed an increase of 7% for the year and provided 7% of the total.

In terms of gross national product (GNP), Canadian mineral production provided approximately 8.2% of the total, estimated to be $119 billion. This compares with a contribution of 6.2% during 1972. During 1973, the per capita value of mineral production rose by $79.20 to $372.90, an all-time record, and one of the highest in the world.

The Canadian index of real domestic product (1961=100), which is a measure of overall production in Canada, was up in 1973 to a level of 196.6 compared with 184.3 a year ago.

Capital investment and repair expenditures in the mining industry were up in most categories during 1973 compared with those of 1972. Investment in mineral fuels during 1973 reached a level of $1.1 billion, and was 14.4% higher than the comparable 1972 figure. Nonmetal mine expenditures were up $261 million, an increase of 6.4% over those of the prior year, however, metal mine expenditures decreased about 6.4% to $848 million. In the area of smelting and refining, investment in petroleum and coal products again was the leader. Expenditures of $399 million in 1973 represented a 35.5% increase compared with that of 1972. Primary metals registered a $777 million investment representing a 4.8% increase; the nonmetallic sector expended $267 million, an increase of 2.3% over the prior year.

In the first 9 months of 1973, compared with the corresponding period for 1972, exports of mineral commodities in both crude and fabricated form increased approximately 30.3% to $5,129.6 million. Mineral fuels maintained their high level of exports, but there also were sharp increases in most nonferrous metals and in sulfur. There were slight declines in exports of aluminum and molybdenum. The combined value of fuel exports came to $1.6 billion, a weighted average increase of approximately 33% over the 1972 figures. Nonferrous metals exports reached a record level of $2.2 billion, a gain of about $456 million (approximately 26%) over the 1972 period. Ferrous minerals were also up, recording sales of $759 million or a gain of 28% over the comparable period of 1972. Nonmetallics showed an increase of $542 million or approximately 24% over the comparable 1972 period. It was expected

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[2] Because of fluctuating exchange rates a meaningful conversion to U.S. currency is impractical. At yearend 1973, however, the exchange rate was Can$0.9958=US$1.00, the ratio of which has been used to convert to U.S. currency.

that exports for the balance of 1973 would continue at a rate equal to the first 9 months, and that the total value of shipments would exceed $6.8 billion.

Canada reported production of 62 mineral commodities during 1973. Of these, 10 minerals represented 83.2% of total production value or approximately $6,862 million. In 1973, the minerals ranked as follows, in terms of value and percent of total: Petroleum $2,246.1 million (27.3%); copper $1,147.6 million (13.9%); nickel $785.2 million (9.5%); zinc $653.0 million (7.9%); iron ore $613.1 million (7.4%); natural gas $482.2 million (5.9%); natural gas byproducts $341.1 million (4.1%); asbestos $241.0 million (2.9%); cement $228.1 million (2.8%); and lead $124.6 million (1.5%). In addition to the aforementioned minerals, but excluded from official mineral production statistics, Canada also produced primary aluminum metal from imported bauxite and alumina. The value of the 1973 aluminum production was estimated to be in excess of $500 million.

In 1973, there were increases in the value of mineral production in all the Canadian Provinces and Territories. As in recent years, all contributed to Canada's mineral production with over 77% of the value coming, in decreasing order, from Alberta, Ontario, British Columbia, and Quebec. Slightly more than half of the total was produced in Alberta and Ontario. About 95% of the value of Alberta's output resulted from crude petroleum, natural gas, and natural gas byproducts, whereas 83% of Ontario's output resulted from the production of metallic minerals and their byproducts. Of $8.2 billion produced in 1973, the contribution of the 10 Provinces and two Territories was as follows in percent: Alberta 33.3%, Ontario 21.6%, British Columbia 12.0%, Quebec 10.9%, Saskatchewan 6.1%, Manitoba 4.9%, Newfoundland 4.6%, Northwest Territories 2.1%, New Brunswick 1.9%, The Yukon Territory 1.8%, and Nova Scotia and Prince Edward Island each less than 1%.

Uncertainty as to Provincial and Federal legislation in the mining sector continued to hamper exploration and development throughout the mining industry. Work continued at the Polaris mine of Arvik Mines Ltd., jointly owned by Cominco Ltd., and Bankeno Mines Ltd., on Little Cornwallis Island in the Arctic. During 1973, 3,600 tons of high-grade ore, containing 35% to 40% lead-zinc that had been stockpiled from development work, was shipped for metallurgical testing. Mineral Resources International completed a feasibility report that recommended its Strathcona Sound zinc-lead-silver deposit on Baffin Island be put into production at a rate of 1,500 tons per day. There was also an important drilling program in the Gays River area about 30 miles northeast of Halifax operated by Imperial Oil Enterprises, on ground owned by Cuvier Mines Ltd. Oil and gas exploration continued in the Arctic, the MacKenzie Delta, and on Sable Island with several substantial new discoveries, which added an undetermined amount to the overall Canadian petroleum and natural gas reserves. Accelerated energy demands throughout the world also stimulated the search for and development of new sources of coal. Exploration programs in Alberta, Saskatchewan, and Nova Scotia during 1973 were directed toward the expansion of coal production in those Provinces.

PRODUCTION

Mineral production in Canada was reported from all 10 Provinces, and the two Territories. A brief review of the value contribution, and principal minerals of each is given below in order of descending importance.

Alberta maintained its position as the leading Canadian mineral-producing Province in 1973. Its value of mineral output increased about 42% over that of 1972 to a total of $2.7 billion. Crude petroleum, natural gas, natural gas byproducts, and elemental sulfur accounted for 95.9% of the value, with the balance coming from coal and structural materials.

The value of Ontario's mineral production increased by $244.5 million in 1973 reaching a total of $1.8 billion. During 1973, nickel and copper accounted for 51.7% of the total value. The balance was attributed to production of zinc, iron ore, gold, silver, structural materials, and platinum.

In 1973, the value of mineral production in British Columbia reached a record $990.9 million, a gain of 48% over that of

1972. Copper continued to be the leading commodity providing 45.6% of the total; following, in descending order of importance, were coal, structural materials, zinc, petroleum, natural gas, molybdenum, and lead.

The production value of minerals in Quebec rose by 15.4% to $903 million during 1973. Copper continued to be the dominant commodity, and its value provided 21.9% of the total. This was followed by asbestos 20.5%, structural materials 16.6%, and iron ore 14.2%. The balance was attributed to zinc, gold, titanium dioxide, and remelt iron.

Saskatchewan's mineral production reached $499.1 million in 1973, an increase of 19% over that of 1972. Minerals produced in declining order of importance were crude petroleum 56.2%, potash 30.3%, copper 2.7%, structural materials 2.5%, with the balance attributed to natural gas, coal, and zinc.

Manitoba's mineral production reached $404.9 million in 1973, an increase of 31% over that of 1972. The two leading commodities, nickel and silver, accounted for 75.8% of total mineral value. Other minerals which contributed to the total included structural materials, zinc, crude petroleum, gold, cobalt, and tantalum.

Newfoundland's total mineral production was valued at $377.2 million in 1973, an increase from $290.6 million in 1972. Iron ore accounted for 86.4% of the total value. Other minerals produced in Newfoundland during 1973 were asbestos, structural materials, copper, zinc, and lead.

In the Northwest Territories, mineral output increased in value to $170.3 million from $120.3 million in 1972. Metallic minerals accounted for almost all the production, with zinc and lead the leading commodities and comprising 73.8% of the total. They were followed by gold, silver, a small quantity of natural gas, and crude petroleum.

The mineral output of New Brunswick is closely related to the production of zinc and its coproducts. In 1973, the total value of mineral production increased substantially by 30.6% from the previous year to a total of $156.6 million. Zinc along with its coproducts, lead, copper, silver, bismuth, and gold, represented 84.2% of the overall mineral value. The Province also produced structural materials and coal.

Mineral production in the Yukon increased during 1973, reaching a level of $145.6 million. Approximately 90% of the value of production came from the metallic sector, most of which was from the output of zinc and lead. These were followed by silver, asbestos, and copper.

Nova Scotia's mineral output valued at $62.5 million in 1973, represented an increase of 16% from the 1972 figure. Most of the total production was provided by structural materials, fuels, and nonmetallic minerals. Structural materials accounted for approximately 32% of the total, followed by coal with 26.4%, gypsum 25.1%, salt 14.4%; small quantities of barite and peat moss provided the balance.

Production on Prince Edward Island historically has been confined to structural materials, specifically sand and gravel. The total value of production in 1973 increased 9.4% to $1.2 million, as compared with $1.1 million in 1972.

Table 1.—Canada: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Aluminum:			
Alumina, gross weight ---thousand tons--	1,140	1,149	e 1,156
Metal, refined ---do---	1,017	919	930
Antimony [1]	r 147	213	859
Arsenic, white	45	27	--
Bismuth [2]	123	125	41
Cadmium [3]	1,843	1,936	1,944
Calcium ---kilograms--	161,137	212,906	279,866
Cobalt:			
Mine output, Co content [4]	1,961	1,520	1,790
Metal [5]	1,092	1,200	1,040
Columbium and tantalum:			
Columbium concentrate (pyrochlore) ---gross weight e--	2,218	3,518	2,603
Tantalum concentrate, gross weight e	r 382	35	97

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS—Continued			
Copper:			
Mine output, recoverable Cu content	654,470	719,673	815,990
Blister and anode	462,300	473,732	494,998
Refined	477,543	495,945	497,581
Gold ---thousand troy ounces	2,261	2,079	1,931
Iron and steel:			
Iron ore ---thousand tons	42,957	39,653	48,955
Pig iron ---do	7,816	8,495	9,535
Ferroalloys ---do	193	227	201
Crude steel ---do	11,040	11,860	13,386
Rolled steel ---do	8,997	e 9,669	e 10,000
Lead:			
Mine output, Pb content	392,964	376,257	385,750
Refined, primary	168,333	186,860	183,705
Magnesium, primary	6,562	5,374	5,290
Mercury ---76-pound flasks	6 18,500	14,637	12,408
Molybdenum	10,280	12,924	12,451
Nickel:			
Mine output, Ni content 7	267,022	234,949	243,949
Smelter	165,300	131,700	161,800
Platinum-group metals ---troy ounces	475,169	406,048	288,000
Selenium, refined ---kilograms	325,879	264,018	271,248
Silver ---thousand troy ounces	46,024	44,792	48,843
Tellurium, refined ---kilograms	11,108	20,706	20,411
Tin, mine output, Sn content ---long tons	142	157	125
Titanium:			
Ilmenite, gross weight	2,546,476	2,048,859	2,082,191
Sorel slag (70–72% TiO_2)	773,829	834,973	855,209
Tungsten, mine output, metal content	1,664	1,600	2,084
Uranium (U_3O_8)	3,726	4,428	4,231
Yttrium (Y_2O_3) shipments ---kilograms	NA	--	--
Zinc:			
Mine output, Zn content	1,133,739	1,128,667	1,236,175
Refined, primary	371,973	476,168	e 530,700
NONMETALS			
Asbestos ---thousand tons	1,483	1,530	1,791
Barite	109,556	70,090	88,904
Cement, hydraulic 8 ---thousand tons	8,225	9,050	9,874
Clays and products 9 ---value, thousands	$48,583	$52,348	$57,995
Diatomite (shipments)	e 455	NA	--
Feldspar (shipments)	9,774	10,600	--
Fluorspar e	72,600	120,000	130,000
Gypsum and anhydrite ---thousand tons	6,080	7,348	7,544
Lime ---do	1,450	1,570	1,657
Magnesite and brucite ---value, thousands	$2,673	$2,929	$3,100
Nepheline syenite	469,187	507,555	522,539
Potash (shipments), K_2O equivalent ---thousand tons	3,628	3,495	4,021
Pyrite and pyrrhotite:			
Gross weight	r 288,438	114,212	19,958
Sulfur content e	r 130,000	51,400	9,000
Salt ---thousand tons	5,028	4,914	4,833
Sand and gravel ---do	193,494	204,293	206,838
Sodium sulfate	437,190	460,192	476,272
Stone 10 ---thousand tons	66,692	72,759	77,564
Strontium minerals, celestite e	54,000	59,000	59,000
Sulfur, elemental byproduct: 11			
From smelter gases	561,082	615,837	673,131
From processing of crude oil, natural gas and nickel matte	2,856,980	3,298,190	4,123,156
Talc, soapstone and pyrophyllite (shipments)	59,470	73,433	99,790
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	84,500	89,000	117,000
Coal:			
Bituminous and subbituminous ---thousand tons	13,728	15,808	16,854
Lignite ---do	2,994	2,981	3,652
Coke, high temperature ---do	4,631	4,724	5,370
Natural gas:			
Gross production ---million cubic feet	2,825,904	3,316,153	3,587,000
Marketed production ---do	2,499,024	2,913,537	3,152,410
Natural gas liquids:			
Gross production:			
Butane ---thousand 42-gallon barrels	r 15,807	19,766	23,055
Propane ---do	r 24,399	30,431	34,208

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Natural gas liquids—Continued			
Gross production—Continued			
Pentanes plus ---------- thousand 42-gallon barrels--	r 46,005	59,601	61,469
Condensate ----------do----	r 893	1,073	1,430
Total ----------do----	r 87,104	110,871	120,162
Production returned to formation, all types ------do----	543	1,276	NA
Peat moss ----------thousand tons--	306	341	354
Petroleum:			
Crude ----------thousand 42-gallon barrels--	492,739	561,977	649,868
Refinery products:			
Gasoline ----------do----	168,161	183,724	202,126
Jet fuel ----------do----	16,766	17,804	21,279
Kerosine ----------do----	22,399	23,141	26,236
Distillate fuel oil ----------do----	138,924	146,620	163,843
Residual fuel oil ----------do----	89,631	107,498	114,438
Lubricants ----------do----	2,726	2,976	3,415
Other ----------do----	39,736	42,872	45,173
Refinery fuel and losses ----------do----	31,226	39,771	37,446
Total ----------do----	509,569	564,406	613,956

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

[1] Antimony content of antimonial lead alloys, flue dust and dore slag.

[2] Refined metal and bullion plus recoverable bismuth content of concentrate exported.

[3] Refined metal from domestic ores plus cadmium content of some exported ores and concentrates.

[4] Actual output not reported; figure represents cobalt content of all products including cobalt in nickel sinter shipped to the United Kingdom by International Nickel Co., for further processing and cobalt in nickel-copper matte shipped to Norway by Falconbridge.

[5] Total cobalt content of all products produced less the amount of cobalt metal reported as produced in Norway. Thus, this figure includes cobalt content of cobalt oxide produced in Canada for sale as such as well as cobalt content of intermediate products shipped to the United Kingdom for processing to cobalt metal and/or chemicals.

[6] Output by Cominco Ltd. only, excludes production (if any) by other producers.

[7] Refined nickel plus nickel content of oxide produced plus recoverable nickel in matte exported.

[8] Cement shipped and/or used by producers.

[9] Includes value of bentonite and products from common clay, stoneware clay, fire clay, and other types of clays.

[10] Crushed, building, ornamental, paving and other similar uses.

[11] Shipments; actual output (not officially reported) is considerably higher.

TRADE

According to United Nations commodity trade statistics, Canadian foreign trade in 1973 showed a substantial increase in value compared with value in 1972. Total exports increased about 25% to $25.2 billion and imports gained 23% to $23.3 billion. Exports in the minerals sector, including metals, nonmetals, and fossil fuels, amounted to $7.4 billion, approximately 29% of the total value of all commodity exports, an increase of $1.8 billion over 1972. All major categories of mineral exports increased in value in 1973. As in 1972, the largest gains were in the fuels sector, the value of which increased about $730 million to $2.4 billion in 1973. The principal markets for mineral exports other than the United States were the United Kingdom, the European Economic Communities (EC) countries, and Japan in descending order of importance. Imports during 1973 continued to reflect strong Canadian demand, with growth recorded in all major trading areas. The minerals sector accounted for $2.9 billion or approximately 12% of the total value of commodity imports. Crude petroleum accounted for the largest part of the mineral total with imports again exceeding $1 billion. Iron and steel was again second with $665 million and the remainder was spread over other mineral and metal commodities. The principal import sources in declining order of value were the United States, the EC, Japan, and the United Kingdom.

Table 2.—Canada: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Alumina (excluding abrasive grades, Al content)	19,224	22,069	United States 16,173; France 2,619; Italy 1,191.
Metal:			
Scrap	43,740	53,998	United States 41,119; Italy 4,681; Japan 3,392.
Unwrought	806,441	698,670	United States 442,351; United Kingdom 73,050; Japan 69,745.
Semimanufactures	18,042	20,308	Portugal 6,296; United States 4,487; Mexico 2,212.
Cadmium	653	1,026	United States 585; United Kingdom 279; Netherlands 115.
Calcium ----kilograms--	69,354	114,804	West Germany 56,971; United States 26,444; Belgium-Luxembourg 19,958.
Cobalt:			
Metal	340	390	United States 367.
Oxides and salts, gross weight	1,119	732	United Kingdom 627; United States 104.
Columbium concentrate[1] ----kilograms--	154,782	29,483	All to United States.
Copper:			
Ore and matte, Cu content	203,988	270,339	Japan 208,296; Norway 23,552; West Germany 18,782.
Slag, skimmings and sludge, Cu content	272	132	United States 79; Spain 34; United Kingdom 18.
Metal:			
Scrap, unalloyed	16,537	19,030	United States 7,005; West Germany 2,890; Japan 2,728.
Scrap, copper alloys	13,916	16,297	United States 10,304; Japan 3,544; Italy 1,221.
Unwrought, unalloyed	283,371	293,421	United States 121,381; United Kingdom 107,682; West Germany 27,952.
Semimanufactures, unalloyed	33,485	38,553	United States 19,115; United Kingdom 3,018; Norway 2,667.
Semimanufactures, copper alloys	13,820	14,958	United States 13,522.
Iron and steel:			
Iron ore ----thousand tons--	34,164	29,275	United States 18,437; United Kingdom 3,553; Netherlands 1,945.
Pig iron and related materials -do--	516	651	United States 380; Netherlands 81; Italy 70.
Ferroalloys:			
Ferromanganese	346	2,067	United States 1,925.
Ferrosilicon	47,017	44,292	United Kingdom 23,062; United States 11,034; West Germany 4,520.
Other	3,083	2,630	United States 1,023; East Germany 500; Brazil 229.
Steel ingots and other primary forms thousand tons--	183	117	United States 90; Brazil 20.
Semimanufactures ----do--	1,371	943	United States 646; United Kingdom 54; U.S.S.R. 25.
Lead:			
Ore and concentrate, metal content	180,815	162,001	Japan 98,200; United States 23,722; West Germany 18,899.
Metal:			
Scrap, including alloy scrap	5,305	11,165	West Germany 7,036; United States 1,094; Netherlands 1,014.
Unwrought, unalloyed	124,179	127,769	United States 68,404; United Kingdom 44,790; Netherlands 5,647.
Semimanufactures	3,408	6,210	United States 6,142.
Magnesium metal	2,647	2,606	United States 1,114; United Kingdom 1,085.
Mercury[1] ----76-pound flasks--	r 18,198	13,803	All to United States.
Molybdenum ore and concentrate, Mo content	10,408	14,211	Belgium-Luxembourg 6,323; United Kingdom 2,690; Netherlands 1,856.
Nickel:			
Ore, matte and speiss, Ni content	101,700	100,998	United Kingdom 47,355; Norway 42,562; Japan 11,002.
Oxide, Ni content	38,690	33,236	United States 25,269; Belgium-Luxembourg 3,909; United Kingdom 1,933.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Nickel—Continued			
Metal:			
Scrap	1,867	1,934	United States 1,537; Japan 231.
Unwrought	113,725	109,678	United States 85,965; United Kingdom 8,520; People's Republic of China 5,614.
Semimanufactures	2,288	4,143	United States 2,571; Netherlands 506; Italy 279.
Platinum-group metals:			
Concentrates, residues and matte, metal content—troy ounces	213,481	556,279	United Kingdom 541,193.
Metal:			
Scrap—do	27,324	39,033	United States 22,954; United Kingdom 16,079.
Other—do	11,315	886	United States 832.
Selenium metals and salts, Se content—kilograms	259,227	228,973	United States 156,217; United Kingdom 61,008.
Silver:			
Ore and concentrate, Ag content—thousand troy ounces	25,183	22,199	United States 14,141; Japan 4,319; West Germany 1,637.
Metal, refined—do	18,201	19,825	United States 18,174; Belgium-Luxembourg 1,191; Trinidad and Tobago 205.
Tin ore and concentrate, Sn content—long tons	213	140	United Kingdom 90; United States 50.
Titanium:			
Ilmenite and ilmenite sand[1 2]	r174,571	191,753	All to United States.
Titanium slag, 70% TiO_2[1 2]	r136,248	153,611	Do.
Uranium and thorium concentrates—value, thousands	$17,687	$39,496	United States $23,039; United Kingdom $16,456.
Zinc:			
Ore and concentrate, Zn content	785,870	695,087	Belgium-Luxembourg 172,938; United States 137,775; Japan 136,286.
Metal:			
Scrap, dross and ashes	5,381	8,975	United States 3,225; Netherlands 2,136; Belgium-Luxembourg 1,482.
Unwrought	283,247	370,412	United States 247,551; United Kingdom 67,342; India 10,907.
Semimanufactures	6,294	6,601	United States 5,435.
NONMETALS			
Abrasives:			
Fused alumina, crude grains	122,650	160,001	United States 153,464.
Silicon carbide, crude and grain	85,148	94,291	All to United States.
Asbestos:			
Crude	104	50	Japan 15; United States 15; Italy 13.
Milled fiber, all grades—thousand tons	1,411	1,450	United States 648; Japan 101; United Kingdom 90.
Barite, crude	67,022	18,314	All to United States.
Cement, portland	805,440	1,137,554	United States 1,136,536.
Clays and clay products: value, thousands	$11,250	$11,799	United States $8,409.
Fertilizer materials:			
Nitrogenous—thousand tons	733	835	United States 825.
Potassic—do	5,451	5,750	United States 4,233.
Mixed—do	810	846	United States 688.
Gypsum, crude—do	4,568	5,410	United States 5,366.
Lime	257,403	268,650	United States 267,987.
Nepheline syenite	366,720	397,714	United States 378,776.
Salt—value, thousands	$7,029	$4,987	United States $4,909.
Sand and gravel—thousand tons	703	632	Mainly to United States.
Sodium sulfate	111,151	118,988	United States 118,980.
Stone:			
Limestone, crude, crushed and refuse—thousand tons	1,433	1,552	All to United States.
Quartzite—do	91	125	Do.
Rough building and crude, n.e.s—do	224	626	United States 624.
Sulfur, crude and refined—do	2,402	2,584	United States 908; Australia 286; India 198; People's Republic of China 191; Taiwan 184.
Talc and soapstone[1]	7,280	17,126	All to United States.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous ---------thousand tons--	7,016	7,723	Japan 7,550.
Coke from coal ----------	288,272	238,478	United States 154,950; Netherlands 67,885.
Fuel briquets, coal and coke ----------	28,829	37,377	All to United States.
Natural gas ----------million cubic feet--	903,051	1,007,054	Do.
Petroleum:			
Crude ---thousand 42-gallon barrels--	270,771	341,253	Do.
Refinery products:			
Gasoline ----------do----	221	487	United States 477.
Distillate fuel oil ---------do----	2,454	4,232	United States 3,773; St. Pierre-Miquelon 454.
Residual fuel oil ----------do----	12,141	32,178	United States 30,130.
Lubricants ----------do----	8	11	St. Pierre-Miquelon 4; United States 3.
Liquefied petroleum gas ---do----	23,503	31,323	United States 28,235; Japan 3,083.
Asphalt ----------do----	449	424	United States 416.
Petroleum coke ----------do----	r 61	5	All to United States.
Petroleum and coal products, n.e.s -do----	2,177	3,929	United States 2,963; Puerto Rico 945.

r Revised.
1 Partial figures; data given are United States imports for consumption only.
2 Largely if not all used in the production of heavy aggregate.

Table 3.—Canada: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite ----------thousand tons--	2,463	2,623	Guyana 1,597; Sierra Leone 350; Surinam 307.
Alumina ----------do----	925	673	United States 248; Australia 217; Jamaica 207.
Metal:			
Scrap, including alloys ----------	5,819	7,420	United States 7,416.
Unwrought ----------	15,900	34,746	United States 15,666; United Kingdom 10,262; Ghana 4,954.
Semimanufactures (including tubes, wire and cable) --------	96,835	98,084	United States 90,342.
Antimony oxides and salts, Sb content ---	268	467	United Kingdom 352; People's Republic of China 70.
Chromium ore and concentrates, Cr content ----------	29,679	22,433	United States 11,550; Philippines 3,090; Mozambique 3,069.
Copper:			
Ores, concentrates and scrap, Cu content ----------	23,257	19,632	United States 18,367.
Oxides and sulfate ----------	1,996	1,780	United States 1,144.
Metal:			
Unalloyed:			
Unwrought ----------	19,866	16,185	United States 15,684.
Semimanufactures ----------	4,001	4,833	United States 2,853; Japan 660; Chile 527.
Alloys, unwrought and semimanufactures ----------	10,612	14,007	United States 9,809; Netherlands 1,022; Sweden 1,012.
Iron and steel:			
Iron ore ----------thousand tons--	1,384	1,753	United States 1,497; Sweden 162.
Scrap ----------do----	1,077	1,111	United States 1,110.
Pig iron ----------	608	3,742	United States 2,723; Brazil 1,019.
Ferroalloys:			
Ferrochrome ----------	36,202	13,793	Republic of South Africa 10,345; United States 2,856.
Ferromanganese ----------	19,557	17,141	Republic of South Africa 11,083; United States 3,124.
Silicomanganese ----------	1,624	15,093	United States 7,648; Norway 6,299.
Ferrosilicon ----------	9,417	8,676	United States 4,892; Norway 3,309.
Ferrotungsten ----------	101	115	United Kingdom 111.
Ferrovanadium ----------	90	105	Austria 54; United Kingdom 28; Belgium-Luxembourg 20.
Other ----------	4,920	12,558	United States 6,690; Brazil 2,148.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Iron and steel—Continued			
Steel ingots and equivalent primary forms	251,162	243,294	United States 236,860.
Iron and steel semimanufactures:			
Castings and forgings	117,456	108,742	United States 105,097.
Rolled steel, including structurals and rails	1,549,744	1,711,920	Japan 577,665; United States 416,706; West Germany 200,251.
Pipes, tubes, wires and cables	318,176	311,991	Japan 124,494; United States 85,028; United Kingdom 41,551.
Lead:			
Oxide	2,748	2,160	Mexico 1,456; United States 562.
Unwrought and semimanufactures	4,539	10,745	United Kingdom 8,302; United States 2,409.
Magnesium metal	1,657	4,043	United States 2,945; U.S.S.R. 998.
Manganese:			
Ore and concentrate, Mn content	100,593	89,065	Brazil 30,094; Gabon 27,417; Zaire 13,118.
Metal	3,196	2,957	Republic of South Africa 2,651; Japan 228.
Mercury ——76-pound flasks	1,605	2,295	Mexico 893; Spain 745; United States 300.
Molybdenum, molybdic oxide, gross weight	29	12	All from United States.
Nickel, unwrought and semimanufactures, including alloys	15,004	20,041	West Germany 16,262.
Platinum-group metals ——troy ounces	53,608	47,719	United Kingdom 31,508; Republic of South Africa 15,300.
Silver ——thousand troy ounces	723	1,117	United States 1,116.
Sodium metal	7,966	8,164	United States 8,136.
Tin, blocks, pigs and bars ——long tons	5,012	5,906	Malaysia 3,966; United States 621; People's Republic of China 575.
Titanium:			
Dioxide, pure and extended	10,584	6,427	United States 3,175; Belgium-Luxembourg 1,481; West Germany 830.
Metal	160	202	United States 190.
Tungsten ore and concentrate, W content	70	109	United States 100.
Zinc metal:			
Pigs, slabs, blocks, anodes	3,632	11,337	Netherlands 8,640; Belgium-Luxembourg 1,839.
Bars, plates, sheets, disks, shells	468	433	West Germany 231; United States 127; United Kingdom 49.
Fabricated materials	524	823	United States 729; United Kingdom 48.
Dust and granules	1,205	1,216	United States 1,141; Norway 74.
NONMETALS			
Barite, ground	10,280	19,779	United States 19,729.
Bentonite, clay and drilling mud	314,612	277,804	United States 215,145; Greece 62,659.
Cement, hydraulic, all types	50,688	39,220	United States 20,771; United Kingdom 8,256; Belgium-Luxembourg 5,405.
Clays, ground or unground	301,166	324,381	United States 279,195; United Kingdom 45,156.
Cryolite, natural	2,149	828	Denmark 778.
Diamond:			
Gem, unset ——thousand carats	90	104	Israel 36; Belgium-Luxembourg 34; Netherlands 6.
Industrial stones ——do	777	866	United States 696; United Kingdom 73; Ireland 42.
Dust ——do	389	384	United States 372.
Diatomaceous earth	27,483	31,196	All from United States.
Fertilizer materials:			
Nitrogenous, natural and manufactured	70,591	62,299	United States 51,244; Chile 7,563; West Germany 3,011.
Phosphatic:			
Phosphate rock —thousand tons	2,580	2,729	United States 2,723.
Manufactured	93,655	98,126	United States 97,409.
Potassic, manufactured	13,815	26,157	All from United States.
Fluorspar	204,201	65,236	Mexico 46,334; United Kingdom 9,585.
Fuller's earth	9,659	6,372	All from United States.
Gypsum, crude	95,965	56,593	Mexico 49,895; United States 6,590.
Lime	23,990	26,017	United States 25,966.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Magnesium compounds:			
Dolomite, calcined	3,444	1,585	All from United States.
Magnesia dead burned	47,342	50,747	United States 36,698; Greece 13,534.
Mica, crude	4,757	4,700	United States 4,697.
Salt and brine	836,436	928,876	United States 558,766; Mexico 266,241.
Sand and gravel—thousand tons	613	969	United States 968.
Silica sand—do	1,288	1,242	United States 1,220.
Sodium sulfate and Glauber's salt	19,322	24,458	United States 16,506; United Kingdom 4,558.
Stone:			
Crushed, including stone refuse thousand tons	48	62	United States 60.
Cut	25,944	24,476	United States 14,103; Republic of South Africa 6,636; Italy 1,701.
Sulfur, elemental	27,925	25,494	United States 20,505; Mexico 4,989.
Talc and soapstone	30,619	36,746	United States 35,567.
Vermiculite, crude	32,354	33,286	United States 28,128; Republic of South Africa 5,158.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bituminous materials, crude value, thousands	$343	$469	United States $431.
Coal:			
Anthracite—thousand tons	367	344	All from United States.
Bituminous and subbituminous—do	15,997	17,031	Do.
Coke from coal, excluding briquets—do	586	462	United States 345; West Germany 116.
Fuel briquets, coal and coke	7,572	8,771	All from United States.
Natural gas—million cubic feet	16,010	15,760	Do.
Petroleum:			
Crude—thousand 42-gallon barrels	244,972	281,664	Venezuela 136,073; Iran 35,893; Saudi Arabia 28,214.
Refinery products:			
Gasoline—do	4,799	3,204	United Kingdom 1,173; Leeward and Windward Islands 758; Netherlands Antilles 602.
Jet fuel—do	1,675	2,216	Netherlands Antilles 1,037; Venezuela 802; Bahamas 196.
Kerosine and distillate fuel oil:			
Kerosine and gas oil—do	135	339	Netherlands Antilles 338.
Other distillate fuel oil—do	14,780	14,881	Venezuela 6,559; Netherlands Antilles 4,450; Bahamas 1,917.
Residual fuel oil—do	29,724	26,618	Venezuela 11,657; Netherlands Antilles 6,043; United States 4,307.
Lubricants—do	1,250	1,457	United States 1,112; Trinidad and Tobago 340.
Liquefied petroleum gas—do	59	83	United States 82.
Other—do	7,212	3,185	Mainly from United States.
Other petroleum and coal products	134,298	110,458	United States 62,929; Australia 15,845; West Germany 15,405; United Kingdom 15,344.

COMMODITY REVIEW

METALS

Aluminum.—Smelter production of primary aluminum ingot during 1973 totaled 934,000 tons as compared with 907,000 tons in 1972. Output in both years was affected by labor disputes. In 1972, production was curtailed due to a 10-week strike at the Baie Comeau smelter of Canadian Reynolds Metals Co. Ltd. During the summer of 1973, the Quebec smelters of Aluminum Co. of Canada Ltd. (Alcan), experienced several brief strikes and a general work slowdown, which resulted in a loss of about 45,000 tons of production. At yearend, both producing companies were striving for maximum metal production, but it appeared that operations were only at 89% of capacity. The pattern of production remained the same as that in 1972. Alcan operated four smelters in Quebec and one in British Columbia, and Canadian Reynolds continued operating one smelter

in Quebec. The 1973 production capacity for primary aluminum by company and location was as follows:

Smelter location	Annual capacity
Aluminum Co. of Canada Ltd. (Alcan):	
Quebec:	
Arvida	416,000
Isle-Maligne	118,000
Shawnigan	86,000
Beauharnois	47,000
British Columbia: Kitimat	272,000
Total Alcan capacity	939,000
Canadian Reynolds Metals Co. Ltd.:	
Quebec: Baie Comeau	159,000
Total Canadian capacity	1,098,000

Raw materials in the form of bauxite and alumina were imported because Canada has no economic bauxite deposits. During 1973, Canada imported about 2,486,000 tons of bauxite for conversion to alumina at Alcan's Arvida plant. This raw material came essentially from Guyana, 1,334,000 tons; Surinam, 380,000 tons; and Sierra Leone, 336,000 tons. The balance of 436,000 tons came from other sources including the new Boke operation in Guinea, which is expected to become an important Canadian supplier in the future.

In addition, approximately 816,000 tons of alumina was imported from the United States, Jamaica, and Australia. The alumina was utilized at Alcan's Kitimat smelter and Canadian Reynolds Baie Comeau smelter.

Domestic consumption of primary aluminum in 1973 rose significantly to 308,000 tons, an increase of 14% over the 1972 total. The continuing increase in domestic consumption resulted in several announcements of expansion and new construction that will substantially increase industry capacity and versatility. Alcan has started construction at its Arvida smelter, which will add about 35,000 tons per year to its current capacity. Alcan's subsidiary, Alcan Canada Products Ltd., opened the La-Pointe rod mill at Arvida late in 1973. Alcan Canada Products Ltd. also announced expansion of its Kingston, Ontario works, doubling sheet and plate capacity to 110,000 tons per year. Reynolds Aluminum Co. of Canada Ltd., a Canadian Reynolds Metals subsidiary, expects to complete expansion of the rolling mill at Cape-de-la-Madeleine in 1975. Aluminum Co. of America (Alcoa) is planning to build a smelter in the Valleyfield Area of Quebec. Its production is expected to be about 60,000 tons per year beginning in 1976.

Exports of primary ingot in 1973 were down slightly from the 1972 total, reaching a level of 680,000 tons for the year. Value of shipments to the United States and the United Kingdom were lower owing to currency adjustments; however, this was somewhat offset by exports to Japan and other countries where currency evaluation favored Canada.

Columbium and Tantalum.—The sole producer of columbium in Canada continues to be the St. Lawrence Columbium & Metals Corp. near Oka, Quebec. In 1973, the company shipped about 2,450 tons of columbium pentoxide (Cb_2O_5) with a value in excess of $4 million, compared with 1,770 tons valued at approximately $3 million in 1972.

The high level of world industrial activity, particularly in the steel industry where columbium is used in manufacturing high-strength low alloy (HSLA) steel, has increased demand. HSLA is used principally in the production of pipeline and structural steels. Anticipation of new pipeline systems and the high level of construction in 1973 resulted in maximum output, which fell short of overall demand, and the company was obliged to limit shipments of ferrocolumbium.

The pricing structure was confused during 1973 owing to currency adjustments between producing and consuming countries. In March, St. Lawrence Columbium raised the price of Cb_2O_5 by $0.05 to $1.44 per pound where it remained for the balance of the year.

Copperfields Mining Corp. Ltd. completed an exploration program in the area of Chicoutimi, Quebec, establishing an ore body with indicated reserves of 40 million tons of 0.76% Cb_2O_5. A 1,500-ton-per-day mill is planned. Firm sales contracts have been negotiated for delivery of more than 50% of the concentrate to the European market.

Tantalum Mining Corp. of Canada Ltd. (Tanco), is the only producer of tantalum in Canada from its Bernic Lake mine in Manitoba. Because of excessive inventories and inadequate market prices, production was discontinued on April 1, 1973, but it was resumed in December. The quantities of tantalum ore milled and concentrate produced in 1973 were below those of 1972.

Ore reserves are adequate for 8 to 10 years at the 1973 rate of production.

Copper.—Production of copper from Canadian mines continued to rise during 1973 setting a new record of 816,000 tons, which was 96,000 tons or 13% higher than the 1972 output. This was the fifth consecutive year of expansion in the copper industry. The value of production was in excess of $1.1 billion, about $341 million more than 1972, reflecting not only increased production but also rising prices in both domestic and foreign markets. The indicated average price for the year was Can$0.64 per pound. The Canadian producer price rose consistently throughout the year, opening at Can$0.5050 and advancing to Can$0.53 on January 10. The price was raised to Can$0.56 on February 16, Can$0.60 on March 1, Can$0.67 on July 26, and finally to Can$0.74 on October 2, where it remained for the balance of the year.

During 1973, refined copper output reached a total of 498,000 tons, an increase of approximately 1,600 tons from 1972. Domestic shipments of refined copper by producers rose 23,000 tons to 231,000 tons. Exports of refined copper also rose during 1973 to about 286,000 tons, a marked change from 1972 when exports were on the decline. In contrast, exports of copper in the form of blister, concentrate, and matte continued to rise in the traditional pattern, with approximately 300,000 tons shipped compared with 270,000 in 1972.

Most of the copper exported went to Japan in the form of concentrates; the balance went essentially to the United States and Western Europe.

British Columbia moved into position as the leading copper producer accounting for 39% of the national total. Copper production in British Columbia increased 110,000 tons over the 1972 total. Ontario contributed 31% to the national total, registering a decline in production for the second consecutive year. The balance of mine production came from Quebec, 17%, Manitoba, 8%, and 5% combined from Saskatchewan, New Brunswick, Newfoundland, and the Northwest Territories.

The large increase in production registered by British Columbia can be attributed to mines that were placed in production during 1971–72 and are now approaching peak capacity. Among these are Gibraltar Mines Ltd., Lornex Mining Corp. Ltd., Noranda Mines Ltd., at Babine Lake, Similkameen Mining Co. Ltd., and Utah Mines Ltd. The decline in Ontario during 1973 was mainly the result of a 2-month strike at the Manitouwadge operation of Noranda Mines, and further curtailment of production at nickel properties, where copper is a byproduct.

During the year, the mine-mill-smelter expansion at Gaspé Copper Mines Ltd., was completed. A new 22,500-ton concentrator at the mine will triple its productive capacity. A new roaster and acid plant at the smelter have been connected increasing its capacity from 65,000 to 90,000 tons of blister copper per year. The continuous smelting process reactor at the Noranda smelter was placed onstream, providing an additional 55,000 tons per year of productive capacity. Previously announced plans by Canadian Refiners, Ltd. (CCR), to expand smelting facilities at its Montreal East copper refinery progressed satisfactorily and was to be operational in early 1974. When completed, the capacity will be about 435,000 tons of refined copper per year, making it one of the largest copper refineries in the world.

Sherritt Gordon Mines Ltd., and Cominco Ltd., have jointly announced plans to build a pilot plant at Fort Saskatchewan, Alberta. The process is designed to recover copper hydrometallurgically in a pollution-free system. Completion was scheduled for late 1974.

Gold.—Production of gold in Canada declined for the 12th consecutive year. Output during 1973 was estimated at 1.9 million troy ounces, a decline of approximately 7% from the 1972 total. Total output was valued at Can$186 million based on an average free market gold price for the year of Can$96.40 per troy ounce. Despite the fact that 1973 production was lower due to mining lower grade ores, the net realization was about Can$66 million above that received in 1972. This disproportionate comparison reflects the continuing rise in the free market price of gold.

The most significant event for the gold mining industry in 1973 was the record-breaking increase in the gold price on the open market. The low price for the year was established on the London market January 18 at US$63.90 per troy ounce. The high for the year of US$127 per troy ounce was recorded on June 5 and again on July

6. The market fluctuated during the balance of the year with an upward trend appearing in December. The yearend closing figure was US$112.25 per troy ounce.

All of the gold produced was sold on the open market, and as a result, no mines were eligible for assistance under the provisions of the Emergency Gold Mining Assistance Act, which was extended to June 30, 1976, by Royal Assent on April 18, 1973. The floor price guarantee during 1973 was about Can$52.50 per troy ounce.

Lode gold mines accounted for 70% of the total gold production during 1973 compared with 78.6% in 1972. Gold recovered as a byproduct from base-metal mining accounted for 29.8%, and placer mining 0.2%.

Ontario continued as the largest producer of gold, accounting for 47% of the total, followed by Quebec 25%, the Northwest Territories 13%, and British Columbia 10%. The remaining 5% was spread over the other Provinces and Territories.

The following are the principal Canadian lode gold producers by region and company:

Producers	1972 Production (troy ounces)
Quebec:	
Agnico-Eagle Mines Ltd.[1]	--
Camflo Mines Ltd	100,101
East Malartic Mines Ltd	69,288
Lamaque Mining Co. Ltd. (Lamaque Div.)	81,815
Marban Gold Mines Ltd	27,266
Sigma Mines (Quebec) Ltd	85,614
Ontario:	
Campbell Red Lake Mines Ltd	196,855
Dickenson Mines Ltd	52,728
Dome Mines Ltd	146,242
Hollinger Mines Ltd. (Ross)	24,227
Kerr Addison Mines Ltd	135,860
Madsen Red Lake Gold Mines Ltd	37,696
McIntyre Porcupine Mines Ltd	86,638
Pamour Porcupine Mines Ltd. (No. 1, 2, and 3)	147,174
Robin Red Lake Mines Ltd	33,669
Willroy Mines Ltd. (Macassa Div.)	68,213
Northwest Territories:	
Cominco Ltd. (Con. & Rycon)	106,293
Giant Yellowknife Mines Ltd	128,272
Lolor Mines Ltd	33,471
Supercrest Mines Ltd	39,443

[1] Opened in 1973.

Iron Ore, Pig Iron, and Steel.—The Canadian iron ore industry recovered from the decline of 1972 and established an all-time high for shipments during 1973. Shipments reached a level of 49 million tons or 9 million tons more than the 1972 total. The strong upsurge can be attributed to several major new facilities that were brought onstream along with the high rate of production achieved at most of the established mines. In contrast to 1972, when protracted labor strikes reduced production at Canada's three largest mines, in 1973 there were few strikes. Domestic shipments were estimated to be 10.5 million tons, another record high, exceeding the previous record of 1972 by about 0.4 million tons. The pattern of iron ore production remained basically the same in 1973 as in earlier years. Fifteen companies produced ore at 16 locations. Of these, nine operations were in Ontario, two in British Columbia, two in Quebec, two in Newfoundland (Labrador), and one in Quebec, Labrador. The Iron Ore Company of Canada (IOC) completed its 10-million-ton-per-year concentrator at Carol Lake as well as its 6-million-ton-per-year pellet plant at Sept Isles. Total IOC iron ore capacity was thereby raised to 64 million tons, of which 31.5 million tons was pellet capacity. In 1973, all of the producing Provinces registered gains over 1972, with the largest being Newfoundland where an increase of about 5.2 million tons was reported. It was followed by Quebec with an increase of 2.8 million tons, and Ontario with 1 million tons. British Columbia raised its production by approximately 235,000 tons.

Construction of the Mt. Wright concentrator in Quebec by Quebec Cartier Mining Co. (QCM) continued through 1973 with several components completed. The target date for startup is early 1975 and when onstream the complex will employ 1,500 persons and produce about 16 million tons of concentrate for export. QCM is also developing the Fire Lake mine. Located about 50 miles from Gagnon and close to the Mt. Wright spur line, it is planned to ship the ore to the Gagnon concentrator for treatment.

Exports of iron ore in 1973 totaled 38.5 million tons compared with 29.3 million tons in 1972, an increase of about 30%. The United States continued as the prime market, accounting for about 57% of the total with the balance going to European Communities (EC), countries, Japan, and others.

Production of pig iron in 1973 continued to rise with 9.5 million tons produced compared with 8.5 million tons in 1972. This represents the second consistent annual gain

of about 12%. The bulk of the pig iron was used in Canada as charge material for blast furnaces, and about 582,000 tons was exported. This was a slight decline from 1972 when 586,000 tons were shipped. The pig iron was exported to 10 countries, primarily the United States 58%, the Netherlands 22%, Italy 8%, Japan 4%, and the United Kingdom 4%.

The Canadian steel industry established another record in 1973, producing 13.4 million tons of crude steel, a gain of 1.5 million tons over 1972 production. Domestic consumption rose to 14.1 million tons, exceeding production by about 900,000 tons. The deficit was satisfied by reducing inventories and import-export adjustments. Imports in 1973 were about the same as those in 1972; however, exports were heavily curtailed in an effort to meet the strong Canadian demand. The increase in production was shared by all major steel companies. The Sidney Steel Corp. lagged slightly behind the general increase due to major repairs necessary on one of its blast furnaces. In spite of the loss of 2 months' production, the company exceeded the disappointing results of 1972 when they were hampered by labor difficulties. Capital and repair expenditures in 1973 totaled $513 million, about $82 million more than the corresponding 1972 figure.

The Algoma Steel Corp. Ltd. brought its second basic oxygen steelmaking plant into production in April 1973 on schedule, which raised the company's raw steel capacity to over 4 million tons per year. Algoma continued with construction of its new (No. 7) blast furnace which was scheduled for production late in 1974. The furnace will produce 5,000 tons of pig iron per day.

Dominion Foundries & Steel Ltd. (Dofasco) began a program of expansion which will increase its capacity to 6 million tons per year from the current level of 3 million tons per year. The company's No. 1 blast furnace, which was shut down in 1971, will be rebuilt. When it comes on-stream in 1975 it will increase Dofasco's pig iron capacity by 22% to 2.3 million tons.

The Steel Company of Canada Ltd. (Stelco) announced that it will begin an expansion program in 1974, which will increase its steelmaking capacity by 1.2 million tons in 1978.

Lead.—Canada returned to its position as the second largest mine producer of lead in 1973, recording a production of some 386,000 tons compared with 376,000 tons in 1972. The total potential was reduced somewhat due to labor strikes at American Smelting and Refining Co. at Buchans, Newfoundland, and Noranda Mines Ltd., Geco Div., in Ontario.

Lead was produced in seven Provinces and two Territories. The Northwest Territory and the Yukon each provided 29% of the total, British Columbia contributed 26%, and New Brunswick 10%. The balance was divided among Newfoundland, Nova Scotia, Quebec, Ontario, and Manitoba.

Exports of lead in ores and concentrates were approximately 193,412 tons during 1973, an increase of 31,000 tons over the 1972 total. The principal market was Japan, which consumed about 64% of the total; followed by West Germany with 12% and the United States with 11%. The balance was divided among Belgium-Luxembourg, Brazil, Italy, India, and Finland, in declining order of importance.

Refined lead metal exports in the form of pigs, blocks, and shot dropped to 114,000 tons compared with 128,000 tons shipped in 1972. The principal markets were the United Kingdom (44%) and the United States (42%). The remaining 14% was shipped to 19 countries throughout the world.

Output of primary lead in 1973 decreased to 184,000 tons, about 3,000 tons less than the 1972 production. The loss was mainly the result of the national railroad strike, which forced the temporary closure of one primary smelter.

The lead refinery of Cominco, at Trail, British Columbia, and that of Brunswick Mining & Smelting Corp. Ltd. at Belledune, New Brunswick, continued as the only producers of primary lead in Canada. The conversion of facilities at Belledune from the Imperial Smelting Process (ISP) to a conventional lead blast furnace was completed by yearend, and the smelter was approaching its rated capacity of 55,000 tons of lead per year.

During 1973, Cominco reopened the H.B. mine in British Columbia and reached its capacity of 1,000 tons per day by March. A feasibility study was completed by Mineral Resources International, and recommendations were made to place the Strathcona Sound property on Baffin Island into production at the rate of 1,500 tons per day. Nigadoo River Mines Ltd.

began dewatering the New Brunswick mine and production is expected to commence early in 1974.

Molybdenum.—Production of molybdenum in Canada during 1973 was an estimated 27.5 million pounds valued at approximately $39 million. This represents a decrease of about 1 million pounds from 1972 production when 28.5 million pounds, at a value of $44 million, was reported.

The continued high rate of production in the iron and steel industry throughout the world contributed to the strong demand for molybdenum where about 80% of the total Canadian production is consumed. The principal consumers were Belgium-Luxembourg, Japan, and the United Kingdom accounting for over 91% of the production. Canada maintained its position as the second largest world producer with 15% of the total, following the United States with 72% and leading Chile, which produced 10%.

Domestic consumption accounted for about 10% of Canadian production, with the balance available for sale in foreign markets. The principal recipients of exports were Belgium-Luxembourg (33%), Japan (31%), the United Kingdom (18%), West Germany (6%), and France (3%), with the balance shipped to other countries throughout the world.

In 1973 about 80% of Canadian production was provided by two principal producers: Endako Mines Ltd., a division of Placer Development Ltd., and Brenda Mines Ltd. Both operations are located in British Columbia. The remainder came essentially from four large-tonnage copper mines as a byproduct.

Placer Development Ltd. returned to full production at the Endako mine during 1973, reaching a level of about 15 million pounds of molybdenum per year contained in molybdenum (MoS_2) concentrate, and molybdic oxide (MoO_3). The Endako Division announced plans to enlarge its roasting capacity, thereby providing for an increase in molybdic oxide production from 9.5 million pounds to 14.5 million pounds per year.

Production of coproduct molybdenum concentrate by Brenda Mines at its copper-molybdenum mine near Peachland, British Columbia, was estimated to be about 8.3 million pounds of contained molybdenum. Production was hampered by a 40-day strike at the mine.

Lornex Mining Corp. Ltd.'s open pit copper mine in the Highland Valley area of British Columbia reached full production in 1973 with an estimated output of about 3.6 million pounds in byproduct molybdenite concentrate.

Gibraltar Mines Ltd., a subsidiary of Placer Development, Ltd., completed its first full year of production in 1973. Output at the molybdenum concentrator was approximately 60 tons per month, assaying 54% MoS_2.

Noranda Mines reopened its Bass Mountain Division mine in December 1973. Full production at a rate of 3 million pounds of molybdenum per year was expected to commence in January 1974.

In Quebec, Gaspé Copper Mines continued to recover molybdenite as a byproduct of its copper mining operations near Murdochville on the Gaspé Peninsula.

Nickel.—The continued buoyancy of the world iron and steel industry, served to stimulate nickel production in Canada during 1973. Production of nickel from Canadian mines was about 244,000 tons valued at $785 million. This represents an increase of about 4% in volume and 9% in value when compared with 1972 figures.

Nickel was produced in four Provinces and in the Yukon Territory: Ontario contributed 72% of the total, followed by Manitoba with 27%, and the small balance from the Yukon, British Columbia, and Quebec in declining order of importance.

The price of class 1 nickel products (minimum 98% pure) was maintained through 1973 at $1.39 per pound, the level which had been established in September 1972. Class 2 products such as nickel oxide sinter and ferronickel experienced a modest increase in July, moving up on the average of $0.03 to $0.04 per pound of nickel contained in the various classifications.

The International Nickel Co. of Canada, Ltd. (Inco), completed several new projects during 1973. The Shebandowan mine and concentrator complex near Thunder Bay, Ontario, was officially opened in June. Shebandowan is a particularly unique operation since it is in the heart of a popular resort area and required very careful planning as to construction and operation to protect the surrounding environment. In October, Inco formally opened the Copper Cliff Mining Ltd.'s nickel refinery. Annual capacity will be 45,000 tons of nickel pellets

and 11,000 tons of nickel and iron nickel powders.

Falconbridge Nickel Mines Inc. began major changes at the Ontario smelter in an effort to conform with Provincial environmental regulations.

Sherritt Gordon Mines reported reduction in production at its Fort Saskatchewan refinery due to reduced production at the Lynn Lake, Manitoba, mine, and less available material from outside sources for conversion on a purchase or toll basis. The company arranged for intake of additional raw material and expected to restore production of refined nickel to about 14,500 tons per year.

Two small mines began production in 1973. The Langmuir mine near Timmins, Ontario, began shipments to the Copper Cliff smelter at midyear. The mine is owned by Noranda Mines Ltd. (51%), and Inco (49%). Startup by Konichee Mining Inc., near Temagami, Ontario, commenced in the fall of 1973 with the concentrates being shipped to the Falconbridge smelter.

The Wellgreen mine of Hudson–Yukon Mining Co. Ltd., which began production in 1972, was shut down in 1973 due to unanticipated geological complications.

Union Minière Explorations & Mining Corp. Ltd. (Umex) announced development of the Thierry property in the Pickle Lake region of Ontario. Indicated ore reserves amount to 10 million tons assaying 1.6% copper and 0.20% nickel.

Silver.—Mine production of silver continued to set records with a production of 48.8 million troy ounces, an increase of some 4.1 million troy ounces from the 1972 total. Preliminary figures indicate that Canada will again be the world's largest mine producer of silver.

Silver was produced in eight Provinces and two Territories. The 1973 mine output and percentage was as follows:

Province	Output (thousand troy ounces)	Percent
Ontario	19,938	40.8
British Columbia	8,671	17.8
Yukon Territory	6,156	12.6
Northwest Territories	5,520	11.3
New Brunswick	3,688	7.6
Quebec	2,970	6.1
Manitoba	1,061	2.2
Saskatchewan	451	.9
Newfoundland	362	.6
Nova Scotia	26	.1
Total	48,843	100.0

Refinery output of silver during the first 9 months of 1973 was 18.1 million ounces compared with 16.2 million ounces refined during the similar period in 1972.

Primary silver mined in Canada continued to be recovered as a byproduct or coproduct of base metal mining operations, particularly lead, zinc, and copper. During 1973, more than 85% of the silver produced came from base metal mining. The major portion of the remaining 15% came from mining silver-copper and silver-cobalt ores produced near Port Radium in the Northwest Territories and the cobalt district of northern Ontario. A small portion of the total is also recovered as a byproduct from treatment of lode and placer gold ores.

Exports of silver in ores and concentrates during 1973 totaled in excess of 26 million ounces. The largest market was the United States, which accounted for 51.5% of the shipments. Japan received 23.5%, West Germany 12.5%, Belgium-Luxembourg 8%, with the small balance going to the Netherlands, Italy, and Norway.

Silver exports in the form of refined metal amounted to 22.9 million ounces in 1973, and was distributed to 11 countries. The United States purchased 85.1% of the total, followed by the United Kingdom with 7%. The balance was shipped to various other countries.

The largest silver-producing mine in Canada continued to be the Kidd Creek property near Timmins, Ontario, of Ecstall Mining Ltd. Its reported production for the year was 13.1 million ounces or approximately 27% of the entire Canadian production.

The overall increase in silver production during 1973 was generally attributed to greater output at base metal mines where silver occurs as a byproduct. An important contributor to the 1973 total was Mattabi Mines Ltd., which completed its first full year of production at its zinc-copper-lead-silver property in the Sturgeon Lake area of northern Ontario.

Dolly Varden Mines Ltd. continued exploration work at its silver-zinc-lead property near Alice Arm in northwestern British Columbia. Ore reserves have been reported to be 1.7 million tons averaging 9.52 ounces of silver per ton, 0.82% zinc and 0.53% lead. A 1,000-ton-per-day underground mill has been planned if adequate financing can be arranged to bring the property onstream.

Cominco continued diamond drilling in the Hackett River area, District of MacKenzie on the Arctic coast. Drilling in the "A" zone indicated a large mineralized deposit assaying 8.5% zinc, 1.4% lead, 0.25% copper, 7.0 ounces of silver, and 0.05 ounce of gold per ton.

Uranium.—Production of uranium in Canada remained static during 1973 with about 4,231 tons produced as compared with 4,428 tons reported in 1972. Approximately 4,228 tons of uranium oxide (U_3O_8) was shipped during the year. About 85% of this tonnage was from the Elliot Lake Area in Ontario.

Denison Mines Ltd. operated the Elliot Lake mill at about 4,000 tons of ore per day during 1973. It was limited to this level of operation due to a shortfall in leaching capacity. Plans have been completed and construction begun to alleviate this situation. The new design capacity will provide for treatment of some 6,400 tons of ore per day by the end of 1974. Underground development also continued through 1973, including a 25-foot diameter ventilation raise to Ronan Island in Quirke Lake, and the acquisition of the adjoining Stanrock property which will provide long-term flexibility.

Rio Algom Mines Ltd. operated the Quirke mill at full capacity of 4,500 tons per day most of the year. The grade of ore milled during 1973 was slightly higher than 1972, however, production was somewhat lower due to a slowdown in underground ore production and a shutdown of the mill during April for labor negotiations.

Eldorado Nuclear Ltd., a Crown company, operated its mill near Uranium City, Saskatchewan, at about 50% of its rated 1,800-tons-per-day capacity. The bulk of the mill feed came from the Fay mine although significant tonnages were received from the Hab mine, some 7 miles to the northeast.

Gulf Minerals Canada Ltd. continued to develop the Rabbit Lake deposit in the Wollaston Lake area of northern Saskatchewan, in partnership with Uranerz Canada Ltd. By yearend, the mill building was completely enclosed and installation of equipment had begun. When the project comes onstream in 1975, it will produce at a rate of 4.5 million pounds of U_3O_8 per year.

Exploration continued at a low level in 1973. The Atomic Energy Control Board (AECB) issued six new exploration permits during the year. After revocations, only about 30% of the 200 permits issued since 1966 were still in force. Of these, about half are still active.

Zinc.—Canada continued in its position as the world's largest zinc producer with an output of 1.24 million tons, a slight increase from the 1.13 million tons reported in 1972. The value of this production was $653 million compared with $502 million in 1972. Although Canadian mine output increased modestly in 1973, there were several shifts in production. Ontario reported a much higher mining rate, reversing the 1972 trend, and several of the other Provinces posted small increases. Zinc production came from seven Provinces and two Territories as indicated by the following:

	Quantity (tons)	Value (thousands)
Ontario	406,305	$214,619
New Brunswick	182,820	96,570
Northwest Territories	169,892	89,741
Quebec	141,391	74,685
British Columbia	137,551	72,657
Yukon Territory	114,603	60,536
Manitoba	62,404	32,963
Saskatchewan	12,093	6,388
Newfoundland	9,129	4,822
Total	1,236,188	652,981

Exports of zinc in concentrates during 1973 increased about 144,000 tons above those of 1972 to a level of 839,000 tons. The principal markets were Belgium-Luxembourg, Japan, West Germany, the United States, and the Netherlands, in declining order of importance.

Exports of refined zinc in the form of blocks, pigs, and slabs were 421,000 tons during 1973, an increase of about 12% over the 1972 total. The United States was the largest consumer, receiving 75% of the total, followed by the United Kingdom with about 15%, and the balance was distributed among 27 other countries.

Zinc smelter production in Canada increased from 476,000 tons in 1972 to an estimated 531,000 tons in 1973. This represents a very high utilization of capacity at all four of the operating zinc plants. The new zinc plant of Ecstall Mining Ltd. at Timmins, Ontario, operated satisfactorily and reached near capacity output by mid-1973. Hudson Bay Mining & Smelting Co. Ltd. completed construction of an 825-foot exhaust stack at its Flin Flon, Mani-

toba, smelter as part of a $6 million project to improve air quality in the region. Canadian Electrolytic Zinc Ltd. operated at 100% of capacity during 1973. Construction was started that was to increase capacity to 225,000 tons per year. Cominco announced plans to increase zinc refining capacity by constructing a 110,000-ton-per-year refinery near Teeside, England. At the close of 1973, there were four zinc smelters with a rated capacity of about 576,000 tons, as follows:

Company	Location	Annual capacity (tons)
Canadian Electrolytic Zinc Ltd	Valleyfield, Quebec [1]	127,000
Cominco Ltd	Trail, British Columbia	268,000
Hudson Bay Mining & Smelting Co. Ltd	Flin Flon, Manitoba	72,000
Ecstall Mining Ltd	Timmins, Ontario [2]	109,000

[1] Expansion in progress to 204,000 tons (1973–75).
[2] Expansion in progress to 136,000 tons (1974).

Domestic consumption of primary zinc increased to 127,000 tons, a considerable gain from the 114,000 tons reported in 1972. The bulk of the upturn in usage was attributed to the diecasting industry, where consumption was estimated to be 17% higher than 1972.

Exploration for zinc throughout 1973 was fairly extensive. Preliminary studies are underway with respect to the Daniel Harbor zinc deposit of Newfoundland Zinc Mines Ltd., which is controlled by Teck Corporation Ltd. and American Metal Climax Inc. Early drilling reports indicated one section containing about 3.8 million tons of ore, grading 11.39% zinc. In Nova Scotia, the Gays River deposit was under active exploration by Imperial Oil Ltd. and Cuvier Mines Ltd. It was announced that about 27.6 million tons of ore assaying 2.75% lead and 3.39% zinc have been delineated. At the Arvik Mines Ltd., Polaris deposit on Little Cornwallis Island in the Arctic, Cominco completed the first phase of underground exploration, shipping 3,600 tons of high-grade ore (35% to 40% lead-zinc combined) for metallurgical testing. Reports indicated that there is possibly 25 million tons of ore grading over 20% combined lead and zinc. The complicated logistics of Arctic Ocean shipping were being studied prior to putting the mine in full production. Mineral Resources International and Texasgulf, Inc. were also studying a property on the north shore of Baffin Island. It has been estimated that this deposit will contain in excess of 7 million tons of ore, assaying about 16% combined lead and zinc. The problem of Arctic shipping is also of concern in this instance.

NONMETALS

Asbestos.—Production of asbestos in Canada during 1973 was approximately 1.8 million tons, with a value of about $241 million. This is an increase of approximately 300,000 tons from the amount recorded in 1972, or approximately 17% greater. The pattern of production during 1973 continued basically the same as in 1972. Nine mines in Quebec produced 83% of the total production, one mine in British Columbia produced 6%, one in the Yukon 5%, and one in Newfoundland 4%; the remaining 2% came from two mines in Ontario.

Exports of asbestos from Canada exceeded 90% of the total production. Shipments were made to more than 70 countries. The major consumers were the United States, Japan, and the United Kingdom, followed by West Germany and France, which in aggregate accounted for approximately 70% of total exports. The balance was spread widely throughout the world. Canadian Johns-Manville Co. Ltd. completed expansion of its mining-milling complex at Asbestos, Quebec. It was officially opened in July and has a rated capacity in excess of 600,000 tons of fiber per year. Asbestos Corp. Ltd. increased shipments of partially milled fiber from Putuniq (Asbestos Hill), but it did not reach capacity; however, it was expected to do so in 1974. Shipments continued to be shipped to the refining facility at Nordanham, West Germany.

United Asbestos Inc., announced plans to place its property located 17 miles south west of Mapachewan, Ontario, into production by 1975. Drilling indicated about 31

million tons of ore averaging about 9% fiber content. The Abitibi Asbestos Mining Co. continued underground sampling and pilot plant studies at its Amos, Quebec, property. Proven ore reserves are estimated to be approximately 100 million tons assaying 4% fiber content.

Evaluation of the McAdam Mining Corp. Ltd. property near Chibougamau, Quebec, continued through 1973. The property is under option to Rio Algom Mines Ltd. and has been calculated to contain more than 186 million tons of asbestos with a fiber content above 3.5%.

Potash.—Production of potash during the fertilizer year ending June 30, 1973, was about 3.8 million tons compared with 3.9 million tons for the year 1971–72. The general shortage of food throughout the world placed great demands on the agricultural sector to produce more high-protein crops, resulting in a very strong market for potash produced in Canada. Beginning in June 1973, sales were increased, and by yearend, they were about 18.5% above those of the previous year. The potash conservation regulations (1969) have been revised to permit producers to operate at approximately 68% of capacity during the 1973–74 fertilizer year, compared with a 49% operational regulation in the preceding year.

Canada uses slightly less than 5% of its potash output; about 68% went to the United States, and the remaining 27% was exported.

Canpotex Ltd., formed in 1970, has been very successful in developing offshore markets for the production of Saskatchewan potash. Among the long-term sales contracts negotiated by Canpotex and reflected in greater production allowables are two contracts with the Chinese National Import Export Corp. by which the People's Republic of China (PRC) was to have received 150,000 tons of potash between January and June 1974, and 170,000 tons between July and December 1974; these orders were valued at $8 and $9 million, respectively. A new agreement, replacing a previous 5-year contract with Japanese interests, was completed between Canpotex and three Japanese fertilizer importers. This new agreement provides for shipment of 3.25 million tons of potash valued at between $140 and $150 million. An additional order for approximately 450,000 tons valued at $20 million will be shipped to India, representing about 50% of its total annual consumption.

Exploration continued near Sussex in New Brunswick where potash was discovered in 1971. The Potash Co. of America (PCA), a division of Ideal Basic Industries, Inc., was granted exploration rights for potash over a 222–224-square-mile area of King County. During 1973, a 2-year exploration, drilling, and development program was begun.

A total of 10 mines operated during 1973, all located in the Province of Saskatchewan.

Sulfur.—Production during 1973 totaled approximately 7.2 million tons; of this amount over 6.5 million tons was elemental sulfur produced from the refining of sour gas and petroleum; the balance was recovered from smelter gases and pyrite in the form of sulfuric acid. With shipments totaling only 4.8 million tons (see table 1), some 2.4 million tons of sulfur were added to the already large producers inventories.

During 1973, export sales rose an unprecedented 25% over the 1972 figure to a new record of 3.7 million tons. The U.S. market, which had declined in 1971, continued at approximately the same level as in 1972; however, offshore sales were increased by over 50%. The Asian market, already established as a substantial outlet for Canadian sulfur, continued strong and was expanded significantly by a sale of 186,000 tons of Canadian sulfur during the early months of 1973. This was the second consecutive year of purchase by the PRC, which became established as an important customer for the years ahead. The balance of international trade continued along traditional patterns. The principal markets were the United States, India, Australia, Taiwan, the United Kingdom, New Zealand, and the Republic of Korea.

During 1973, 45 plants, with a combined annual capacity of about 9 million tons, produced 6.5 million tons of elemental sulfur. Two plants were located in British Columbia, one in Saskatchewan, and the remainder in Alberta.

Inventories of elemental sulfur at the end of 1973 was at the expected 12-million-ton level. However, no significant discoveries of sour gas have developed, and it is not expected that production of elemental sulfur will continue at the high rate experienced in the recent past. An inventory of 20 million tons is anticipated for the year 1980.

Prices remained relatively unchanged during 1973, at the $5- to $6-per-long-ton level f.o.b. Alberta. This followed an uninterrupted decline from the high price of $37 per long ton in mid-1968.

MINERAL FUELS

Coal.—Production of all types of coal in Canada—bituminous, subbituminous, and lignite—continued at a record level of approximately 20 million tons. This represented an increase of approximately 5% over 1972 when 19 million tons were produced. Value of production in 1972 was $163.4 million. The increase in value of $23.6 million in 1973 to approximately $177 million reflects both increased production and higher prices that prevailed throughout the period. Canadian coal is used primarily for coking and thermal applications. Virtually all of the coking coal is for export. The largest customer during 1973 was Japan, which purchased over 10 million tons. Other important export markets include Belgium-Luxembourg, Chile, and the United States, in declining order of importance.

During the year, about 15.4 million tons of thermal coal was delivered to power stations for generating electricity, whereas about 7.6 million tons was delivered to coking plants to make approximately 5.6 million tons of coke for steel production. Imports of coal during 1973 declined somewhat to 15.9 million tons compared with 17.5 million tons recorded in 1972. All of this coal was imported from the United States. Of this total, approximately 300,000 tons was anthracite, virtually all of which went to Quebec and Ontario for industrial purposes. The balance was bituminous, which was delivered to Ontario for coke manufacture, and ultimate consumption by the steel industry.

In 1973, coal was mined in five Provinces, the largest contributor was Alberta with approximately 7.6 million tons of coal produced during the year. Output in Alberta was divided evenly between middle- and low-volatile bituminous coal and subbituminous coal. The former was used as a source of thermal power within the Province. British Columbia was second in rank with approximately 6.7 million tons mined, all of which was low-volatile bituminous coal that was shipped to Japan. Saskatchewan was third with 3.3 million tons mined, all of which was consumed domestically for thermal power generation. Nova Scotia ranked fourth with 1.1 million tons of high-volatile bituminous coal, most of which was consumed for generation of power within the Province. New Brunswick followed with approximately 390,000 tons of bituminous coal, all of which was consumed by the New Brunswick Electrical Power Commission. The year 1973 was one of expansion for the Canadian coal industry as new efforts were initiated to meet the increased demand for domestic power generation and contract commitments for export to Japan. Exploration activity increased after the slack period in 1972 following a renewed interest by Japanese steel companies for Canadian coking coal. One new contract was signed in 1973 for additional shipments to Japan by Cardinal River Coals Ltd., and it is anticipated additional contracts will be negotiated in the near future.

Increased energy requirements throughout Canada will undoubtedly require additional thermal power generation, and higher production rates of fuel from Alberta, Saskatchewan, and Ontario can be anticipated. Production of coking coal from Kaiser Resources Ltd. mine at Sparwood, British Columbia, reached record levels during 1973. Both conventional and hydraulic mines were operated with a maximum of efficiency, and for the first time since startup, the complex reached a profitable level. After its first full year of production, Fording Coal Ltd. at Elkford (about 40 miles north of Sparwood, British Columbia), was still experiencing startup problems at the mine and preparation plant. As a result, shipments to Japan did not reach the contract quantity of 3 million tons during 1973. Crows Nest Industries Ltd. and Enkay Canada Natural Resources Ltd. continued substantive development work on their properties in the East Kootenay region of British Columbia. Both companies were seeking markets for coal that they are prepared to produce.

In the Sukunka River area of northeastern British Columbia, Coalition Mining Ltd. continued exploration and development of the Brameda Resources Ltd. coking coal property; in the same area, Denison Mines Ltd. and its partners, Alco Standard Corp. of the United States, had entered into an agreement with two Japanese companies to carry out an exploration program and feasibility study covering approximately 47,000 acres of coal lands in northeastern British Columbia. In Alberta, four mines produced coking coal through 1973; the largest was the property operated by McIntyre Porcupine Mines Ltd. at Grande Cahe where 1.4 million tons was produced. Production at Cardinal River Coals Ltd.'s Luscar mine was 1.2 million tons. The other producers of coking coal in Alberta were Coleman Collieries, Ltd., at its Coleman mine, which produced approximately 70,800 tons, and Canmore Mines Ltd., at the Canmore mine, which produced 200,000 tons. All of the coking coal from Alberta was exported to Japan. The balance of coal production in Alberta, amounting to about 425,000 tons, was subbituminous and was consumed within the Province for generating electrical energy. Exploration for coking coal in Alberta was concentrated in the northwestern part of the Province at the Denison Mines Kakwa property, and in the Brazeau area west of Reddear, where Consolidation Coal Co. of Canada had developed a potential producing coal property. In Saskatchewan development work on the Boundary Dam mine of the Manitoba and Saskatchewan Coal Co. Ltd. continued. When complete in 1974 this mine will supply the Saskatchewan Power generating station with about 1.6 million tons of lignite per year. Nova Scotia had a moderate decline in production during 1973 compared with 1972 production; however, production is expected to increase when the Lingan mine, which is being activated by the Cape Breton Development Corp. (DEVCO) is completed in early 1974. It is expected that the mine will produce from 1.5 to 2 million tons of coal annually. In addition, the Provincial Government of Nova Scotia has sponsored a coal exploration program to investigate properties in the region near Spring Hill.

Petroleum and Natural Gas.—Canadian production of crude oil, natural gas, and natural gas liquids, continued at record-breaking levels through 1973, registering a substantial $1 billion gain. This increase reflected the sharp rise in producer prices for petroleum products. Production of oil, including natural gas liquids and synthetic products was above 2.1 million barrels per day compared with 1.8 billion barrels per day in 1972. Production of natural gas rose about 9% during 1973 to 8.7 million cubic feet per day. This reduction in growth rate, compared with those of previous years, is due to a combination of pricing policies and Federal export control. As in past years, the bulk of production came from the Provinces of Alberta, Saskatchewan, and British Columbia, which accounted for over 98% of the total production. Small quantities were also produced in Manitoba, Ontario, and the Northwest Territories as well as New Brunswick. Of the 2.1 billion barrels per day produced in Canada, approximately 1.0 million barrels per day was consumed in the western Provinces of Canada. The balance of 1.1 million barrels per day was exported to the United States with the bulk of the material going to refineries east of the Rocky Mountains. However, there was a very substantial export to the Puget Sound area, which averaged approximately 250,000 barrels per day. For the second consecutive year Canada was a net exporter of crude oil and products; in 1973, exports exceeded imports by about 117 million barrels, or 322,000 barrels per day. Developments throughout the world, which led to rising prices and supply shortages, directly increased the demand for Canadian crude oil by U.S. refiners. This in turn led to the imposition of export and price controls by the Canadian Government in order to avert anticipated shortfalls in supply to Canadian consumers. By yearend, a system of absolute quotas had been established, and the Government had levied a $2.20-per-barrel export tax to bring Canadian crude oil production in line with world pricing. Canadian refinery capacity reached a record level of 2.5 million barrels per day in 1973, an increase of 175,000 barrels per day over 1972. This increase was due to the addition of one large new refinery in Newfoundland and incremental increases in capacity at some existing plants. Completion of the new complex at Come By Chance in Newfoundland, by the Newfoundland Refining Co.

Ltd., added approximately 100,000 barrels per day to the overall Canadian output and increased the number of refineries to 41 operating in 10 Provinces.

The search for gas in shallow formations continued as a priority exploration target in southern Alberta. A large part of this activity was centered in an area called the British Block, which was formerly reserved for military testing. Approximately 8,000 square miles was made available for exploration, and considerable drilling was commenced. The area was estimated to contain more than 4 trillion cubic feet of gas. The first 27 test wells of the scheduled 50-well drilling program have been drilled, and all were reported successful. Offshore drilling continued near Sable Island, 175 miles east of Halifax, Nova Scotia. An announcement of a new oil discovery was made in mid-1973 by the team of Mobile Oil, Canada, and Texas Eastern Transmission Corp. This completed a total of four significant discoveries since 1966 when drilling began in this area. In the MacKenzie Delta, moderate exploration continued through 1973, with announcements of several new finds of both oil and gas.

In the Arctic Islands, exploration continued at a moderate pace, and several new gas finds were made during 1973. There were still not enough proven reserves to warrant the building of a pipeline; however, drilling was to continue through 1974.

The availability of several excellent potential deepwater harbor sites in the Maritime Provinces, combined with the growing market for refined petroleum products, prompted several proposals for the construction of major new refineries in that region. Probably the most important of these is a 200,000-barrel-per-day facility on Canso Strait, which will be constructed by Shaheen Natural Resources Inc., of New York. Preliminary plans called for a completion date of 1975, and the plant was expected to process crude oil from Kuwait and Iran.

Exploration and development in 1973 leveled off in the frontier areas, but there was revival of industry activity in the traditional producing areas. Most of the activity was centered in the Prairie Provinces, where drilling footages and wells completed increased over the 1972 results. Most of this increase was due to expanding drilling programs in Alberta. Despite the increased activity, no large oil discoveries were made in 1973.

The Mineral Industry of Chile

By George J. Coakley [1]

The political and economic upheaval in Chile during 1973 resulted in increased inflation and a sharp rise in the foreign debt. The lack of foreign exchange delayed the purchase of urgently needed mining and smelting equipment and spare parts. Combined with a nationwide transportation strike and a series of labor strikes in the copper industry, these factors led to an overall decrease in production throughout the mineral industry.

On September 11, 1973, the Government of President Salvador Allende was overthrown by a military coup and succeeded by a four-man military junta headed by General Augusto Pinochet. Following the change of government, a sharp fourth-quarter increase in copper and iron ore mine production allowed these two commodities to show a 3% to 9% increase for the year in comparison with 1972 figures.

Copper exports continued to account for over 80% of Chilean foreign exchange earnings. Decreased smelting and refining output in Chile in 1973 contributed significantly to the world shortage of copper, with increased demand raising the world market price on the London Metal Exchange to a 1973 high of $1.20 per pound (cash wirebar) in December, compared with 48 cents per pound in January 1973. To increase copper production, the military junta upgraded the management and technical personnel in the copper industry and sought foreign credits to complete planned mine and smelter expansions.

While reaffirming that the major copper mines will remain nationalized, the new government indicated its willingness to renegotiate the payment of compensation for expropriated investments. The resolution of litigation over compensation between Chile and three separate multinational corporations, The Anaconda Company, Kennecott Copper Corp., and the Cerro Corp., would improve the marketing of Chilean copper, hindered since 1971 by trade restrictions and delivery embargoes in the United States and Europe.

With 1973 crude petroleum production the lowest since 1961, Chile relied on imports for approximately 70% of its petroleum consumption. The full impact of the world refined petroleum shortage and price escalation was expected to be felt when supply contracts with three of the major international oil companies expired at the end of 1974. In anticipation of reduced access to world oil supplies, the Empresa Nacional del Petróleo (ENAP) gave top priority to increasing domestic oil and gas exploration and production during 1974.

PRODUCTION

Lower production rates were recorded in nearly all mineral commodities in 1973 than in 1972. Smelter and refinery outputs of copper dropped 6% and 10%, respectively. Production of coal remained steady, and natural gas and crude petroleum each decreased 9%. On the other hand, mine production of copper and iron ore rose 2% and 9%, respectively. An increase in potassium nitrate production failed to offset a decrease in sodium nitrate production, and total output of nitrates dropped 2% while iodine production increased 5%.

[1] Physical scientist, Division of Nonferrous Metals—Mineral Supply.

Table 1.—Chile: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Copper:			
Mine output, metal content [2]	[r] 708,300	716,800	735,400
Metal, copper content:			
Smelter [3]	[r] 629,000	630,600	589,900
Refined: [4]			
Fire	[r] 74,600	97,800	78,200
Electrolytic	[r] 333,900	363,600	336,600
Gold, mine output, metal content ——— troy ounces	64,179	94,571	97,995
Iron and steel:			
Iron ore and concentrate ——— thousand tons	11,228	8,640	9,402
Pig iron ——— do	458	486	458
Ferroalloys ——— do	13	14	[e] 14
Crude steel [5] ——— do	654	631	549
Semimanufactures (hot rolled) ——— do	506	491	435
Lead, mine output, metal content	881	626	256
Manganese ore and concentrate	23,838	16,085	14,434
Mercury ——— 76-pound flasks	502	640	798
Molybdenum, mine output, metal content	6,321	5,885	4,843
Silver ——— thousand troy ounces	2,729	4,689	5,035
Vanadium, mine output, metal content [e]	600	650	962
Zinc, mine output, metal content	1,982	1,162	1,602
NONMETALS			
Barite	1,282	5,902	4,696
Borates, crude, natural	NA	2,250	1,532
Cement, hydraulic ——— thousand tons	1,368	1,404	1,368
Clays:			
Kaolin	57,434	67,056	44,753
Other (unspecified)	93,473	95,294	123,209
Diatomite	800	4,863	886
Feldspar	900	2,196	530
Fertilizer materials, crude:			
Nitrates:			
Sodium	642,097	565,049	544,085
Potassium, enriched	186,828	142,371	152,424
Phosphates, guano	13,075	15,272	12,976
Gem stones, lapis lazuli ——— kilograms	6,090	15,450	7,844
Gypsum:			
Crude	116,410	127,667	88,554
Calcined	46,332	49,895	67,096
Iodine, elemental	2,212	2,097	2,211
Pigments, natural mineral, iron oxide	14,900	21,065	23,762
Pozzolan	145,840	158,605	142,415
Quartz:			
Common quartz	161,253	169,913	139,589
Glass sand	17,271	10,502	7,700
Salt, all types ——— thousand tons	426	437	345
Stone:			
Limestone ——— do	2,433	2,289	2,112
Marble	2,250	2,658	785
Sulfates, sodium:			
Natural, mined	6,888	4,941	4,773
Anhydrous, coproduct of nitrate industry	40,338	37,138	35,950
Sulfur:			
Native, other than Frasch:			
Refined, sulfur content	32,428	16,145	8,273
Unrefined, sulfur content	74,070	62,090	22,835
Sulfur content of acid derived from pyrite and industrial gases	2,699	18,088	15,945
Talc	1,758	1,833	1,758
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous and lignite ——— thousand tons	1,623	1,427	1,425
Coke, coke oven ——— do	313	308	NA
Gas, natural:			
Gross production ——— million cubic feet	[r] 282,035	285,094	260,497
Marketed ——— do	[r] 126,253	144,070	144,938
Natural gas liquids, gross production: [6]			
Condensate ——— thousand 42-gallon barrels	1,220	1,031	949
Natural gasoline ——— do	681	1,128	1,126
Liquified petroleum gases [7] ——— do	1,812	2,825	2,973
Total ——— do	3,713	4,984	5,048

See footnotes at end of table.

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

Commodity [1]		1971	1972	1973 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued				
Petroleum:				
Crude	thousand 42-gallon barrels	12,882	12,527	11,429
Refinery products: [6]				
Gasoline:				
Aviation	do	97	197	143
Other	do	11,183	11,579	10,466
Jet fuel	do	573	880	715
Kerosine	do	3,562	3,829	3,852
Distillate fuel oil	do	5,649	5,127	5,532
Residual fuel oil	do	9,996	9,818	9,793
Other:				
Liquefied petroleum gas	do	2,158	2,689	1,999
Naphtha	do	404	577	529
Asphalt, refinery	do	139	45	46
Unspecified	do	731	707	621
Refinery fuel and losses	do	2,036	2,269	1,783
Total	do	36,528	37,717	35,479

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

[1] In addition to the commodities listed lime, pyrites, and selenium are produced but available information is inadequate to make reliable estimates of output levels.

[2] Data given are the nonduplicative copper content of ores, concentrates, precipitates, metal, and other copper-bearing products measured at the least stage of processing reported in available sources.

[3] Figures presented are total blister and equivalent copper output including that blister subsequently refined in Chile and copper which is produced by electrowinning. Material produced for refining at Ventanas smelter is included.

[4] Figures presented are total refined output, distributed into two classes according to method of refining; output of Ventanas refinery is included.

[5] Excluding castings.

[6] Manantiales natural gas liquids plant also processes a limited amount of crude oil. Crude oil refined in this facility and products derived therefrom are included under refinery products in this table, except for such liquefied petroleum gas as may have been produced from crude oil. Production of such material is not reported separately from output of liquefied petroleum gas derived from natural gas, and the total production of liquefied petroleum gas from Manantiales has been included under natural gas liquids, because the bulk of the output was derived from natural gas rather than crude oil.

[7] Data apparently represent net plant output for consumption, presumably excluding quantities reinjected, as follows in thousand 42-gallon barrels: 1971—15; 1972 and 1973—not available.

Major labor strikes at Chuquicamata and El Teniente mines prevented the five major copper producers under Corporación del Cobre (CODELCO), the national copper corporation, from increasing its 1973 annual output above 615,000 tons, far short of earlier expectations. However, data for December 1973 for all copper producers showed the industry under the new government to have raised copper output to an annual rate of 970,000 tons. The sharp drop in copper smelter and refinery output was attributed to inadequate smelter design at El Teniente and a shortage of converter capacity at the Chuquicamata smelters. A lack of spare parts and difficulty in obtaining the necessary imported raw materials to manufacture refractory brick for use in the reverberatory furnaces were major problems at Chuquicamata.

TRADE

Copper export revenues were $1 billion for 1973, compared with $657 million [2] in 1972, and this mineral commodity continued to contribute to over 80% of Chile's foreign exchange earnings. While West Germany, the United Kingdom, the United States, and Italy maintained their places as chief importers of Chilean blister and refined copper, the People's Republic of China (PRC) and other East European centrally planned economy countries bought 43% of the blister copper output in 1973 versus 28% in 1972. Japan remained a major trading partner with 1973 purchases of $140 million in copper, chiefly in the form of ores and concentrates, and $52 million in iron ore.

According to Chile's Superintendent of Customs, exports of nitrate fertilizer com-

[2] Because of fluctuating exchange rates, a meaningful conversion of Chilean Escudos (CEsc) to U.S. currency is impractical. At yearend, however, the exchange rates were CEsc130–340=US$1.00 for Bankers Spot Rates and CEsc780=US$1.00 for Brokers Spot Rates.

modities totaled 435,700 tons valued at $19,633,000 in 1972 and 419,000 tons valued at $23,638,000 in 1973. Shifts in the $6.2 million export market for mixed sodium-potassium nitrate showed Taiwan (57%) and Cuba (35%) taking the major share of the output in 1973, compared with 1972 export deliveries of 32% to the PRC and 23% to the United States. Sodium nitrate exports in 1973 went to the traditional markets of the Netherlands ($3.8 million), the United States ($3.2 million), Spain ($1.7 million), and Brazil ($1.7 million), about the same levels as in 1972. A major change in 1973, however, showed sales to Taiwan at $2.7 million versus none in 1972, while trade in sodium nitrate with the PRC dropped from $1 million in 1972 to less than $0.5 million in 1973.

Overall Chilean exports of copper, nitrates, paraffin, and other mineral products to the PRC rose from $23 million in 1972 to approximately $95 million in 1973.

In 1973 Chile imported 26 million barrels of petroleum valued at $120 million; 53% came from the Middle East and 43% from Venezuela, Ecuador, and Bolivia. It was anticipated that in 1974 Chile would be required to import 30 million barrels of petroleum at a cost of $315 million, representing an increase of 162% over the 1973 value.

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

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum metal, including alloys, all forms	16	(1)	All to Bolivia.
Chromium ore and concentrate	(2)	1,118	All to Netherlands.
Copper:			
Ore and concentrate [3]	78,801	23,414	Mainly to Sweden.
Copper sulfate	r 1,691	818	Mainly to Brazil.
Metal, including alloys:			
Scrap	r 170	78	All to West Germany.
Unwrought	584,449	557,470	West Germany 84,237; United Kingdom 74,399; Japan 62,999.
Semimanufactures	r 9,523	14,364	Italy 3,700; Taiwan 2,250; People's Republic of China 2,250.
Gold ore and concentrate [4]	87,956	37,671	West Germany 26,121; Sweden 10,005; United Kingdom 1,250.
Iron and steel:			
Ore and concentrate thousand tons	r 10,304	7,027	Mainly to Japan.
Metal:			
Ferroalloys	2,315	838	Sweden 177; Italy 136; Brazil 107.
Steel, primary forms	39,791	4,773	All to Equador.
Semimanufactures	22,075	737	Mainly to Brazil.
Lead metal, including alloys, all forms	r 141	583	All to Belgium-Luxembourg.
Manganese ore and concentrate	(2)	2,134	All to Netherlands.
Mercury 76-pound flasks	--	20	Brazil 12; Colombia 8.
Molybdenum metal, including alloys, all forms	5,185	7,353	Netherlands 2,864; West Germany 1,576; Sweden 1,060.
Selenium, elemental kilograms	--	900	Netherlands 500; Argentina 400.
Silver:			
Ore and concentrate [5]	150,483	181,642	Japan 119,866; West Germany 51,770; Republic of Korea 10,006.
Metal, including alloys	79	7,162	All to West Germany.
Other:			
Ore and concentrate:			
Of molybdenum, tantalum, titanium, vanadium	550	--	
Of base metals, n.e.s	1,829	--	
Ash and residue containing nonferrous metals	452	3,844	West Germany 2,284; United States 1,308; Japan 216.
Oxides, hydroxides, peroxides of metals, n.e.s	4,037	3,335	West Germany 1,624; United Kingdom 1,179; Australia 128.
NONMETALS			
Boron materials, crude natural borates	535	--	
Clays and clay products:			
Crude clays, n.e.s	1	(1)	All to United States and West Germany.
Products	7	(1)	All to Peru.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Diamond, worked and unworked kilograms	--	7,000	All to West Germany.
Fertilizer materials:			
Crude:			
Nitrogenous	472,966	348,567	United States 97,275; Netherlands 83,441; Japan 41,915.
Phosphatic	(1)	--	
Potassic	8	121	All to Argentina.
Manufactured:			
Nitrogenous	3,164	--	
Potassic	--	(1)	All to United States.
Other, including mixed	r 90,907	87,014	People's Republic of China 25,188; United States 24,106; Cuba 10,500.
Iodine	r 2,403	4,394	Brazil 2,175; Japan 1,165; Netherlands 610.
Precious and semiprecious stones, worked and unworked kilograms	4,800	700	All to Italy.
Salt	r 286,033	278,249	Mainly to United States.
Stone, sand and gravel, dimension stone, crude and partly worked	23	102	Mainly to Argentina.
Sulfur, sulfuric acid	12	--	
Other, slag, dross, similar waste, not metal bearing	--	21,772	All to United States and United Kingdom.
MINERAL FUELS AND RELATED MATERIALS			
Coal	600	1,000	All to Bolivia.
Petroleum:			
Crude 42-gallon barrels	146	--	
Refinery products:			
Gasoline, motor do	113	--	
Other, liquefied petroleum gas do	371,844	964,577	Argentina 700,524; United States 237,498; Angola 14,952.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	(1)	--	

r Revised.
1 Less than ½ unit.
2 Not reported separately in 1971. Chromium and manganese listed under other ore and concentrate of base metals, n.e.s.
3 Additional copper ore and concentrate included in the silver and gold figures, not reported separately.
4 Reported as gold, silver, and copper, not exclusively gold.
5 Reported as silver and copper, not exclusively silver. Additional silver ore and concentrate reported in gold figure, not reported separately.

Table 3.—Chile: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Bauxite and concentrate	2,950	2,303
Oxide and hydroxide	146	163
Metal:		
Scrap	1	69
Unwrought	3,608	3,999
Semimanufactures	869	1,925
Antimony:		
Ore and concentrate	--	2
Metal, including alloys, all forms	63	139
Arsenic:		
Trioxide, pentoxide, acids	130	153
Metal, including alloys, all forms	11	(1)
Bismuth metal, including alloys, all forms kilograms	25	109
Cadmium metal, including alloys, all forms	3	5
Chromium:		
Chromite	238	3,200
Oxide and hydroxide	68	80
Metal, including alloys, all forms	62	(1)
Cobalt:		
Oxide and hydroxide	10	9
Metal, including alloys, all forms kilograms	273	156
Copper metal, including alloys, semimanufactures	140	278

See footnote at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS—Continued		
Gold metal, unworked or partly worked ____ troy ounces __	12	2,884
Iron and steel:		
Ore and concentrate	--	11
Metal:		
Scrap	6,005	9,832
Pig iron, cast iron, spiegeleisen	332	518
Sponge iron, powder, shot	328	297
Ferroalloys:		
Ferrochromium	610	658
Ferrosilicon	8	217
Other	183	21
Steel, primary forms	29,880	45,933
Semimanufactures:		
Bars, rods, angles, shapes, sections	8,602	14,163
Universals, plates, sheets	136	40
Hoop and strip	323	300
Rails and accessories	5,736	2,097
Wire	1,335	1,320
Tubes, pipes, fittings	10,447	11,747
Castings and forgings, rough	2,713	2,768
Ingots and semimanufactures of high carbon and alloy steel	7,039	5,416
Lead:		
Oxides	2	4
Metal, including alloys:		
Unwrought	2,650	4,091
Semimanufactures	118	17
Magnesium metal, including alloys, all forms	1	2
Manganese:		
Ore and concentrate	10	63
Oxides	94	136
Metal	14	1
Mercury ____ 76-pound flasks __	26	3
Molybdenum metal, including alloys, all forms	(1)	2
Nickel:		
Matte, speiss, similar materials	22	3
Metal, including alloys:		
Scrap	(1)	--
Unwrought	213	259
Semimanufactures	763	51
Platinum-group, including alloys, all forms _ troy ounces __	442	114
Rare-earth metals:		
Oxides	1	3
Metals, including alloys ____ kilograms __	12	161
Selenium, elemental ____ do ____	101	51
Silver metal, including alloys ____ thousand troy ounces __	261	142
Tellurium, elemental ____ kilograms __	612	4
Thorium:		
Thoria ____ do ____	--	227
Elemental ____ do ____	--	1,820
Tin:		
Oxides ____ long tons __	5	2
Metal, including alloys, all forms ____ do ____	564	668
Titanium:		
Oxides	3,134	3,077
Metal, including alloys, all forms	(1)	2
Tungsten metal including alloys, all forms ___ kilograms __	793	499
Uranium:		
Oxide ____ do ____	2	--
Metal, including alloys, all forms ____ do ____	--	105
Vanadium:		
Oxides	8,763	50
Metal, including alloys, all forms ____ do ____	128	--
Zinc:		
Oxide ____ do ____	102	9
Metal, including alloys:		
Scrap and blue powder	40	60
Unwrought	5,027	5,372
Semimanufactures	19	86
Zirconium:		
Ore and concentrate	148	369
Metal, including alloys, all forms ____ kilograms __	9	--
Other:		
Ore and concentrate:		
Of molybdenum, tantalum, titanium, vanadium ____	10	48
Of base metals, n.e.s	154	154
Ash and residue containing nonferrous metals ____	3	1

See footnote at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS—Continued		
Other—Continued		
Oxides, hydroxides, peroxides of metals, n.e.s	52	55
Metal, including alloys, all forms:		
Alkali, alkaline earth, rare-earth metals, kilograms	747	1,933
Pyrophoric alloys, do	1,132	41
Base metals, including alloys, all forms, n.e.s	1	10
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	50	57
Dust and powder of precious and semiprecious stones (including diamond), kilograms	27	2
Grinding and polishing wheels and stones	400	247
Asbestos	14,829	7,250
Barite and witherite	25	27
Boron materials, oxide and acid	19	168
Bromine	3	1
Cement	28,477	30,825
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s.:		
Bentonite	5,153	3,162
Kaolin	1,045	1,374
Other	355	381
Products:		
Refractory (including nonclay brick)	18,183	10,403
Nonrefractory	1,037	464
Cryolite and chiolite	5	25
Diamond, industrial, carats	5,995	5,010
Diatomite and other infusorial earth	273	330
Feldspar	--	18
Fertilizer materials, crude and manufactured:		
Nitrogenous	30,100	35,953
Phosphatic	180,666	76,021
Potassic	41,944	31,653
Other, including mixed	11,271	12,427
Fluorspar	1,206	942
Graphite, natural	83	92
Gypsum and plasters	50	1
Iodine, kilograms	12	45
Lime	30	150
Magnesite	16,945	6,596
Mica:		
Crude, including splittings and waste	97	40
Worked, including agglomerated splittings	3	5
Pigments, mineral, processed iron oxides	175	130
Precious and semiprecious stones, except diamond:		
Natural, carats	813,500	143,820
Manufactured, do	2,965	14,765
Salt	38	27
Sodium and potassium compounds, n.e.s.:		
Caustic soda	5,377	13,452
Caustic potash, sodic, potassic peroxides	74	131
Stone, sand and gravel:		
Dimension stone	77	2
Dolomite, chiefly refractory grade	25,134	34,677
Gravel and crushed rock	139	36
Quartz and quartzite	46	21
Sand, excluding metal bearing	228	58
Sulfur:		
Elemental, all forms	68,292	75,035
Sulfur dioxide	(1)	11
Sulfuric acid	9	13
Talc, steatite, soapstone, pyrophyllite	682	638
Other:		
Crude	543	370
Slag, dross, similar waste, not metal bearing	158	189
Oxides and hydroxides of magnesium, strontium, barium	135	129
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	24	8
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	608	406
Carbon black and carbon gas:		
Carbon black	4,872	5,882
Carbon gas	(1)	--
Coal, all grades, including briquets	210,652	381,365
Coke and semicoke	5,625	39,182
Hydrogen, helium, rare gases	89	48

See footnote at end of table.

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

Commodity		1971	1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Peat, including peat briquets and litter		40	45
Petroleum:			
Crude	thousand 42-gallon barrels	21,163	25,586
Refinery products:			
Gasoline, motor	do	460	47
Kerosine	do	276	88
Distillate fuel oil	do	450	233
Residual fuel oil	do	2,596	1,734
Lubricants:			
Oil	do	415	293
Grease	do	3	2
Other:			
Liquefied petroleum gas	do	1,174	205
White spirits	42-gallon barrels	247	295
Naphtha	do	322	411
Mineral jelly and wax	do	64,824	82,888
Nonlubricating oils, n.e.s	do	9,734	10,424
Bitumen and other residues	do	610	3,425
Bituminous mixtures, n.e.s	do	632	73
Petroleum coke	do	12	84
Pitch	do	124	94
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals		644	1,573

[1] Less than ½ unit.

COMMODITY REVIEW

METALS

Copper.—Four interrelated factors impacted strongly on the copper industry in Chile in 1973; namely, the change in government, the change in CODELCO management and policies, the depressed national economy, and the massive and prolonged labor strikes.

The first two factors are best treated together. As one of the instruments of implementation of strong state control of industry, CODELCO, under the Allende Government, had attempted to centralize the administration and production of all the copper operations, including both the Gran Mineria and Empresa Nacional de Minera (ENAMI). As a result many of the mines and smelters reportedly experienced serious abuses of maintenance and safety procedures and labor relation practices that adversely affected all production levels.

After the military coup in September, the new junta began to denationalize many of the smaller businesses. While the major mines remained under government control, Chile will renegotiate the question of compensation for Anaconda, Cerro, and Kennecott properties. Until the compensation issue is settled, the respective parties will not discuss terms for possible future participation in the Chilean mineral industry by these large multinational mining companies. In any case, under present government policy, private participation in the future would probably be restricted to technical management contracts or to minority-share joint-venture development of new mines and processing facilities.

Following the September coup, CODELCO was restructured as a coordinating holding company, and each of the big five mining operations was established as an autonomous profit center, operated by a general manager responsible for the total operation of his company. CODELCO handled the marketing and sales of copper from its own operations and continued to have a liaison sales policy with ENAMI. CODELCO stressed that ENAMI remained completely independent and would maintain control of all of its own production, expansion, and construction, and had the freedom to acquire investments and make contracts independently.

The third factor, the depressed national economy, was responsible for the shortage or even complete lack of raw materials and spare parts needed to maintain smelter and mining operations. The high inflation rate and the short supply of many foodstuffs and consumer goods helped provoke the demands for higher wages and the ensuing strikes.

The major strike, which involved 13,000 workers and lasted for 76 days, was at El

Teniente and ended in early July. Mine production for June (2,600 tons of copper content) and July (9,900 tons) was far below the average monthly output of 15,000 to 20,000 tons. Nonstriking smelter workers at Caletones and electrical workers at the Coya-Pangal power station kept refined copper output at normal levels during the early period of the strike, using stockpiled concentrates; however, striking truckers and train loaders refused to handle the output which accumulated in the smelter yards at a rate of 555 tons per day of blister and fire-refined copper.

A series of partial strikes at Chuquicamata, in the first 6 months of 1973 culminated in a 3-week-long strike by 70% of the white collar and skilled professional employees in June 1973. For the first 10 days in June pit production was down by 30%, concentrate output by 40%, and electrolytic refined copper output by 80%.

Losses created by the strikes, which CODELCO estimated to run at $1 million per day, included 20,000 tons in electrolytic copper from Chuquicamata, 12,000 tons of blister copper from El Teniente and 56,500 tons of fire-refined copper from El Teniente. The strikes led to a declaration of "force majeur" by CODELCO on all deliveries from Chuquicamata for July and from El Teniente for both June and July.

Mine production data, shown in table 4, highlighted the extent of strike-related losses incurred by the El Teniente and La Disputada las Condes mines. Disputada reported no mine output for 7 months of 1973 and was forced to process ore that had been laid aside to assure production during the winter when snows impede mining.

Table 4.—Chile: Copper mine production, 1972–73
(Metric tons unless otherwise specified)

	1972	1973	Change, percent
CODELCO:			
Chuquicamata	234,300	265,300	+13
El Salvador	82,900	84,000	+1
El Teniente	190,300	178,100	−6
Exótica	31,200	31,800	+2
Andina	53,900	56,100	+4
Total	592,600	615,300	+4
Medium and small mines:			
Mantos Blancos	29,800	28,900	−3
ENAMI	58,200	73,300	+26
Disputada	28,800	8,400	−71
Others	7,400	9,500	+28
Total	124,200	120,100	−3
Grand total	716,800	735,400	+3

Source: Corporación del Cobre—Chile. Indicadores del Cobre y Sub-Productos. Boletin Estadistico Anual, 1973.

In other developments at individual mines in 1973, as reported in various company annual reports, trade journals, and government publications, Chuquicamata smelters and refineries produced 166,100 tons of electrolytic copper and 193,600 tons of blister copper, down 7% from the 178,800 tons of electrolytic copper and 6% from the 205,700 tons of blister copper produced in 1972. A copper sulfate process introduced at Chuquicamata during the year was expected to increase smelter capacity but instead caused the rapid deterioration of converter refractory brick linings. The shortage of replacement lining material prevented the full implementation of the process.

The practice of removing old benches to keep production up created benches 24 meters wide by 24 meters high. At the Chuquicamata pit this created dangerous working conditions and serious slope instability problems which the new mine management tried to correct. The backstripping of bench ore can be related to a February report by CODELCO that reserves of copper oxide at Chuquicamata were practically exhausted, at least in the present stage of mine development and exploitation.

A new reverberatory furnace was scheduled to be operative at Chuquicamata by January 1974, but in order to raise output capacity to 850 to 900 tons per day from the present average of 700 tons per day, a new converter, refining furnace, and casting wheel were required.

El Teniente production of fire refined copper decreased from 72,000 tons in 1972 to 52,800 tons in 1973; all of the production losses were attributed to strike action at the Caletones refinery. An additional 39,500 tons were refined from El Teniente feed at the Ventanas refinery during 1973. Blister copper production from El Teniente feed dropped 6% to 177,900 tons, compared with 189,200 tons in 1972. Kennecott's innovation of oxygen enrichment of converter air has not been successfully utilized at El Teniente, although it has met success elsewhere. A new furnace, capable of processing 900 tons per day of copper ore, was scheduled to go into operation in the Caletones smelter in early 1974. With the third furnace in operation total capacity will increase to 240,000 tons of copper per year.

At the El Salvador operation, British credit of $40 million from Lloyd and Bolsa International was approved for construction of a new 200,000-ton-per-year smelter-refinery complex. The credit was contingent on a guarantee of insurance coverage by the United Kingdom Government's Export Credit Guarantee Department. In 1973 El Salvador produced 63,500 tons of electrolytic copper and 84,000 tons of blister copper, a 1% decrease from 1972 electrolytic output of 64,100 tons and a 1% gain over 1972 blister production of 82,900 tons.

Production at Exótica declined 2% to 30,500 tons of electrolytic copper from the 31,200 tons produced in 1972. Britain's Davy Power Gas Ltd. signed an agreement with CODELCO to build a copper solvent extraction plant at Chuquicamata to improve recovery of ore from the Exótica mine. The commercial plant would boost recovery from the Exótica ores by 200 tons per day of cathode copper. The plant will cost between $24 million and $45 million and was expected to nearly triple Exótica's copper output by 1977.

Mine production problems at Andina during the early part of the year were caused by excessive humidity left by melted ice and by the rock mechanics of the block caving mining system. Until August 1973 Andina refined 25% of its output at Las Ventanas. Subsequently all concentrates were sold directly to Sumitomo Metal Industries, Ltd. in Japan. As reported in the December 17, 1973, Metals Week, observers believed that Andina had to free refinery capacity for Chuquicamata, whose concentrates are hard to sell because of the arsenic content.

ENAMI, the Government-controlled consortium of medium- and small-size mines, continued to expand its acquisition and development program in 1973. Plans were announced to acquire 36 small copper mines north of Santiago and to open a new pit encompassing several of the small mines. The proposed pit will have a capacity of 20,000 tons of copper ore per day. With financial assistance from West Germany, ENAMI will invest $110 million for a new mine and a 30,000-ton-per-day concentrator at Andacolla, with production to start by 1976. The deposits were estimated to contain 280 million tons of copper ore.

Updated results of two major exploration projects were announced during the year. The Los Pelambres porphyry copper deposit located in the high Andes Mountains, 280 kilometers north of Santiago, was reported by a joint ENAMI-United Nations technical assistance group to contain over 400 million tons of 0.8% copper with significant gold, silver, and molybdenum.[3] The San Jose del Abra (El Abra) deposit, located 32 miles north of Chuquicamata, was reported, based on over 8,000 meters of exploratory drilling, to contain reserves of 1.5 billion tons grading between 0.8% and 1.0% copper. Detailed studies at El Abra showed the mineral deposit, discovered in 1965, to form a 3,000-foot-diameter outcrop with 80 to 150 meters of enriched copper oxides underlain by primary sulfide mineralization extending to a depth of at least 500 meters. Tentative plans disclosed by CODELCO in October 1973 required a $450 million investment for a 330,000-ton-per-year copper facility to be placed in operation about 1980.[4]

[3] Metals Sourcebook. No. 9. May 7, 1973, p. 2. Sillitoe, R. H. Geology of the Los Pelambres Porphyry Copper Deposit, Chile. Econ. Geol., v. 68, No. 1, January 1973, pp. 1–10.

[4] Mining Journal. El Abra: Chile's Next Mine? Nov. 9, 1973, p. 386. Metals Week. V. 44, No. 53, Dec. 31, 1973.

Fire-refined-copper output at Mantos Blancos in 1973 was 23,200 tons, down 3% from the 1972 production of 23,900 tons. Over 1,000 tons of ferrous scrap per month was used in the Mantos Blancos refined copper recovery process. By October, scrap supplies were nearly exhausted while the company awaited import of 6,000 tons of ferrous scrap from the United States.

The Minera Sagasca, S.A., copper operations, run by a consortium of Chilean, Japanese, and U.S. companies, has been plagued with stoppages since it started operations a year ago. Capacity of the mine and leaching plant is 26,000 tons per year of copper, but 1973 production was only 18,000 tons of copper.

Iron Ore.—Production of iron ore totaled 9,402,000 tons, 9% greater than in 1972. The average grade of the ore and concentrate produced was 63%. Shipments of iron ore by Compañía de Acero del Pacífico, S.A. (CAP), from its three mining operations increased 17% to a record high. Increased shipments were reported from all mines with El Romeral accounting for the largest increase—51%. Japan continued as the principal recipient with 86% of the total shipments—20% more than in 1972. Shipments to the United States were 21% less than in 1972, and deliveries to the Huachipato steel complex for domestic consumption were virtually the same as in 1972. Domestic and foreign shipments by mine are shown in table 5.

Table 5.—Chile: Iron ore shipments by CAP in 1973
(Metric tons)

Mine and product	Quantity
Santa Barbara-Santa Fe Division:	
Run-of-mine ore to Japan	2,913,496
Blast furnace ore to United States	200,782
Open hearth furnace ore to United States	29,500
Total	3,143,778
Algarrobo Division:	
Blast furnace ore to Japan	1,921,879
Fines to Japan	1,069,107
Total	2,990,986
Romeral Division:	
Run-of-mine ore to Japan	86,364
Blast furnace ore to Japan	995,541
Fines to Japan	1,102,259
Blast furnace ore to United States	15,752
Blast furnace ore to Argentina	9,789
Blast furnace ore to West Germany	154,329
Blast furnace ore to CAP steel mill	934,122
Total	3,298,156
Total shipments by destination:	
Japan	8,088,646
United States	246,034
West Germany	154,329
Argentina	9,789
CAP steel mill	934,122
Total	9,432,920

Source: Skillings' Mining Review. V. 63, No. 9, Mar. 2, 1974, p. 10. (Original data in long tons converted at factor of 1 long ton equal 1.01605 metric tons.)

Scheduled completion dates for the CAP long-term expansion program were delayed for a year owing to lack of foreign investment for most of 1973. Total cost of the program was estimated at about $600 million, with about one-half needed in foreign currency for imported equipment and services. The plans included development of the Bogueron Chanar mine, a concentrating plant at El Algarrobo to treat low-grade ores, a pellet plant, and expansion of port facilities at Guacolda.

Iron and Steel.—Production of steel ingot was adversely affected by a 12-day work stoppage at the Huachipato steel mill in April. Output totaled 549,000 tons, 13% less than in 1972. CAP, which accounts for about 93% of total output, produced 508,100 tons, compared with 580,100 tons in 1972. Finished steel mill

products manufactured by CAP totaled 419,400 tons, 9% less than the 461,500 tons produced in 1972. Semifinished steel production was 14,700 tons compared with 19,500 tons in 1972. Total domestic steel shipments were 447,600 tons.

Plans to increase capacity at the Huachipato plant were delayed by 1 year. It is expected that the first phase of the expansion will be completed to 750,000 tons in early 1975 and to 1 million tons following installation of continuous-casting equipment in late 1975 or early 1976. Port facilities at the plant will be enlarged to accommodate ships up to 40,000 tons by mid-1975.

Other Metals.—Molybdenum production was 4,843 tons of metal contained in 8,729 tons of concentrate. Output fell 18% from that of 1972 and represented the second consecutive drop in production. Total production was recovered as a byproduct of copper production at the Chuquicamata, El Salvador, and El Teniente plants. CODELCO began construction on a new 18-million-pound-per-year molybdenum plant at Chuquicamata which will have a treatment capacity of up to 30 million pounds of molybdenum per year equivalent in molybdenum concentrates. Chilean molybdenum production was planned to be expanded to over 27 million pounds by 1976, which will also make Chile an important producer of rhenium.

Production from a 3,300-pound-per-year rhenium plant was expected to begin in 1974–75. The plant, located at Concepción, will recover rhenium as a salt or as perrhenic acid from molybdenum. It was reported that the ores of the El Abra deposit, under consideration for development, contain high rhenium values. Inceased concern for air pollution control, particularly in the United States, gave added importance to rhenium's major use as a bimetallic platinum-rhenium catalyst for refining unleaded, high-octane gasoline.

Gold production increased 4% to 97,995 troy ounces in 1973. Gold and silver ores accounted for 41% of the total output, and 59% was recovered as a byproduct of copper production. Production from gold ores rose 19% over that in 1972, more than offsetting a 5% decline in gold recovery from copper ores.

Production of silver rose 7% to over 5 million troy ounces. Nearly 98% of the output was a byproduct of copper production. Lead-zinc ores and gold-silver ores each contributed about half of the remaining output. In late 1973 Corporación de Fomento de la Producción (CORFO) and ENAMI reported a joint venture for a long-term rehabilitation project at the Chanacillo silver mine in Atacama Province. As a short-term venture, it was planned to recover 16 million ounces of silver from 2.5 million tons of waste material at the mine. No decision was made on whether to transport the ore to the leach plant near the Paipote smelter or to install leach facilities at Chanacillo.

NONMETALS

Iodine.—Production of iodine rose 5% in 1973 to 2,211 tons. Iodine was recovered as a byproduct of nitrates at three plants owned by Sociedad Química y Minera de Chile S.A.

Nitrates.—Nitrate production in 1973 included 544,085 tons of sodium nitrate and 152,424 tons of potassium nitrate. Output of potassium nitrate was 7% greater than in 1972, but sodium nitrate production decreased 4%. Exports of sodium nitrate totaled 349,608 tons, compared with 348,567 tons in 1972. Of the total, 23% was shipped to the Netherlands, 22% to the United States, and 13% to Taiwan. Shipments of potassium nitrate (30 tons) were all to Argentina (121 tons, all to Argentina, in 1972). Nitrates are likely to become increasingly important to Chile's mineral industry in the next few years due to two factors. First, due to the energy crises natural nitrates may be expected to be more competitive with synthetic nitrates produced from petroleum. Second, there is a world shortage of fertilizers, caused in part by the tremendous decline in the anchovy catch from Peru and Chile. To capitilize on these events, the Chilean Government encouraged the reopening of old nitrate workings and the expansion of nitrate processing plants.

Salt.—In 1973 the shipments of salt produced by Cía. Minera Santa Andriana, S.A., a Marcona Corp. subsidiary in northern Chile, aggregated 219,267 tons. Exports totaled 93,293 tons, while the remaining 125,974 tons was shipped for domestic consumption in Chile. Total salt

production in Chile in 1973 of 345,000 tons represented a 21% decrease from 437,000 tons in 1972.

MINERAL FUELS

Coal.—Production of coal in 1973 totaled 1,425,000 tons, at the same level as in 1972. Receipts of metallurgical coal by CAP, Chile's largest steel producer, were 187,000 tons of domestic and 252,500 tons of imported coking coal, compared with 257,000 tons and 205,000 tons, respectively, in 1972.

Petroleum and Natural Gas.—ENAP completed 404 killometers of reflectivity seismic exploration profiles in 1973, compared with 333 kilometers of reflectivity and 64 kilometers of refractivity profiles in 1972. Drilling activity was the lowest since 1966. Sixty-five holes with a cumulative length of 136,216 meters were drilled, compared with 67 holes and 148,880 meters in 1972. Magallanes Province accounted for 58 holes and 128,646 meters of the total drilled; the remainder were in the south-central zone. The type of holes drilled and drilling results follow:

Type of well	Number of completions			
	Petroleum	Gas	Dry	Total
1972:				
Exploration	4	2	22	28
Extension	1	--	--	1
Development	19	2	17	38
Total	24	4	39	67
1973:				
Exploration	1	2	17	20
Extension	--	1	3	4
Development	12	6	23	41
Total	13	9	43	65

Gross withdrawals of natural gas by ENAP totaled 260,497 million cubic feet, 9% less than in 1972. Mainland fields supplied 61% of the total, and Tierra del Fuego the remainder. Posesión Field (mainland) continued as the largest producing field with 32% of the total, followed by Daniel (mainland) 12%, and Tres Lagos and Cullen (both on Tierra del Fuego) with 9% each. Of the total gas withdrawn, 44% was reinjected; 64% of the total withdrawn at Posesión was reinjected, 48% at Daniel, 58% at Cullen, and 70% at Calafate. A total of 145 trillion cubic feet of natural gas was marketed or consumed by oil and gas production facilities.

Production of natural gas liquids totaled 5,048,000 barrels, 1% above that in 1972. Exports declined to 337,100 barrels from 1,117,700 barrels in 1972, and imports were 434,200 barrels compared with 70,700 barrels in 1972.

Crude petroleum production decreased 9% to 11,429,000 barrels, the lowest since 1961. Mainland Fields produced 58% of the total production, and fields on Tierra del Fuego the remainder. All of the principal producing fields recorded decreased output except Tres Lagos, where production rose 23%. Production by field for 1972 and 1973 follow:

Location and field	Production (thousand 42-gallon barrels)	
	1972	1973
Mainland:		
Daniel	2,271	2,008
Daniel Este	1,738	1,656
Posesión	1,605	949
Cañadón	985	726
Other	524	1,313
Total	7,123	6,652
Tierra del Fuego:		
Calafate	1,766	1,378
Cullen	1,107	1,012
Tres Lagos	685	844
Other	1,845	1,543
Total	5,403	4,777
Grand total	12,526	11,429

Source: Empresa Nacional del Petroleo, Chile. Boletin Estadistico, Seccion Technica, 4°Trimestre y Anual, v. 62, 72 pp.

Imports of crude petroleum received at refineries totaled 24,421,000 barrels, 4% less than in 1972. Imports supplied 69% of the total petroleum refined in 1973, compared with 68% in 1972. Receipts of foreign crude petroleum comprised 82% of the total refined at the Concón refinery and 59% at the Concepción refinery. No imports were received at the Manantiales plant. Exports, all to the United States, totaled 434,600 barrels.

Refined petroleum production was 35,479,000 barrels compared with 37,717,000 barrels in 1972. The Concón refinery processed 15,750,000 barrels, Concepción 17,673,000 barrels, and Manantiales 514,000 barrels of which 273,000 barrels were credited to crude petroleum re-

fining. Production at the Concón and Concepción refineries was as follows:

Commodity	Net production (thousand 42-gallon barrels)		
	Concón	Concepción	Manantiales
Gasoline, aviation	143	--	--
Gasoline, motor	4,866	5,459	141
Jet fuel	451	264	--
Kerosine	1,631	2,201	20
Distillate fuel oil	2,945	2,475	112
Residual fuel oil	4,250	5,543	--
Other:			
Liquefied petroleum gas	599	1,400	(1)
Naphtha	529	--	--
Asphalt refinery	46	--	--
Unspecified	290	331	--
Total	15,750	17,673	273

[1] Although, Manantiales reports a production of liquefied petroleum gas, it is not included here as a product of crude oil refining, because the bulk of this material clearly was derived from natural gas processing.

Consumption of petroleum in Chile has increased rapidly since the mid-1960's. In 1973, 37.5 million barrels was consumed, compared with 17.3 million barrels in 1965. Production decreased 9% from 1972 to 11.4 million barrels in 1973, and the share of consumption supplied by imports rose from 21% in 1965 to 67% in 1973. Currently, about 70% of Chile's imports are received under 5-year contracts with three international oil companies. These contracts will expire at yearend 1974. One new agreement was reportedly reached with British Petroleum Corp. for petroleum during 1975 but at probably lower quantities than in previous years. Exxon Corp. reported that it will not be prepared to discuss a new contract until late 1974, and Gulf Oil Corp. is said to have informed Chile it will not be able to supply any oil in 1975.

A number of projects are under consideration to expand the petroleum industry in Chile and to reduce its dependence on foreign crude oil. Top-priority projects of ENAP are the development of a production and distribution system for liquid natural gas (LNG) and opening the offshore crude oil pond in the Straits of Magellan. Bids received for the LNG project from U.S. and French companies are now under study by ENAP engineers. A loan of $75 million to cover all import needs, except tankers, has been requested from the International Development Bank. Development of the 200-million-barrel reserves under the Straits of Magellan has been hampered by shortage of offshore equipment and financing. According to ENAP one exploration and two or three drilling platforms are needed, together with $40 million to $50 million cash, during the first 4 years of exploration and production.

ENAP completed studies of a new refinery with a tentative location at Concón. Construction is planned to begin after realization of the LNG and crude oil projects. In early 1974, ENAP expected to open bidding for a gas turbine electric generator to be powered by flue gas from the Concón refinery, and it planned to install a topping unit at the Magallanes refinery for completion in 1976. The basic lubricants plant project was suspended as a result of the break in relations between Chile and the U.S.S.R.

Three projects are under study by ENAP: A port to be located in Concepción; expansion of petroleum storage facilities in Concón, Concepción, and Maipu; and enlargement of liquefied petroleum gas (LPG) storage facilities at the Maipu terminal, equipment to handle LPG at the Quintero port. Estimated cost of the projects is $11 million.

The new government has returned to The Dow Chemical Co. the control of Petroquimica-Dow, S.A., manufacturing facilities (70% owned by Dow) at Concepción and Dow Quimica Chilena, S.A. (100% owned by Dow). Dow reported the plants, which were seized in 1972 by the Allende Government, to be operational but to need maintenance and renovation, which has begun.[5]

[5] The Dow Chemical Co. 1973 Annual Report. P. 4.
U.S. Embassy, Santiago, Chile. State Department Airgram, A-219, Nov. 13, 1973. 4 pp.
———. State Department Airgram, A-63, Mar. 13, 1974. 5 pp.

The Mineral Industry of The People's Republic of China

By John E. Shelton [1]

Industrial growth in the People's Republic of China (PRC) continued at about a 10% annual rate in 1973. Following similar annual growth for 1971 and 1972 the gross national product (GNP) was estimated to be over $125 billion. Industrial production is reportedly on schedule for the fourth 5-year plan initiated in 1971.

Priorities for industrial production in 1973 were little changed from those in 1969. Agriculture was the basic activity which received a significant share of labor and industrial resources. Light industry received its share of attention for growth so as to provide capital for heavy industry which in turn was to provide technology for modernization of the PRC's agriculture.

Despite floods, droughts, and pests, agricultural production in 1973 was about 240 million tons, essentially the same as in 1972. Industrial production was up about 10% nationwide. However, growth was mixed, with output up in some provinces and down in others. Output also varied by commodity sectors. Fertilizer and crude petroleum production were up about 23% and 19%, respectively, whereas some consumer products showed little or no gain.

In foreign relations, exchange of delegations continued particularly in regards to industrial trade, air and shipping discussions, and cultural exchanges. Liaison offices were set up between the United States and the PRC in 1973 indicating increased potential for trade with the United States.

The PRC's foreign trade in 1973 was about $9 billion. A significant part of imports by the PRC has been of modern technology for agriculture and industry. Contracts were completed for erection of fertilizer plants, petrochemical works, artificial fiber and steel mills, and imports of modern mining machinery. The PRC also was interested in obtaining up-to-date technology in many fields but particularly for the drilling and recovery of oil. In keeping with the PRC's policy of self-reliance, imports of plants and technology will be paid largely by export earnings. Also payments for plants will be on a delayed basis.

Japan continued to be the PRC's leading trading partner with total two-way trade of about $2 billion, a sharp increase of 83% over that of 1972. Japan's exports to the PRC were slightly over $1 billion of which more than 50% were in steel and other metal products. Imports from the PRC by Japan, just under $1 billion, included such items as raw silk and textile products and crude oil. The PRC's trade with Western countries in the first half of 1973 totaled more than $2.8 billion, an increase of about 65% over the comparable period of 1972. The PRC also concluded contracts for imports of such things as fertilizer and synthetic fiber plants totaling almost $1 billion.

A continuing problem in the PRC is the transportation network. Because of the lack of roads only about 35% of the villages could be reached by motor vehicles. The shortage of motor vehicles further hampered internal commercial trade. The rail-

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way system is better. It is reported the PRC has 36 railway facilities and more than 100 rolling stock enterprises. The PRC produces about 1,000 locomotives and more than 10,000 passenger coaches and freight cars annually.[2]

PRODUCTION

The PRC has become one of the world's leading producers and consumers of minerals, metals, and fuels. Although little is known by the rest of the world about China's mineral resources, it can be assumed from historical data, occasional detailed reports of industrial output, trade missions, and availability on world markets that production of some commodities are important by world standards.[3]

There were a few reports of national production data from the PRC. The most significant was the report by Premier Chou En-Lai that the PRC's output of crude oil had reached 50 million tons in 1973. Iron ore production was reportedly up 2.8 times and iron and steel production more than doubled since 1965. Steel production was estimated at 25 million tons, with many plants and provinces reporting increased production of more than 10%. With more than 2,400 plants, cement production was up about 8%. Output of chemical fertilizer was reported to be 23% higher in 1973. With completion of 10 new fertilizer plants scheduled for 1977, production may be up another 10% over the next 2 to 3 years. National coal production may be up 8% as indicated by reported increases in major coal producing provinces.

[2] Far Eastern Economic Review (Hong Kong). Asia. 1974 Yearbook. 1974, p. 139.

[3] Shelton, J. E. Review of the Mineral Industry of China. Article in Mining Annual Review, 1974. Min. J. (London), June 1974, pp. 401–405.

Table 1.—People's Republic of China: Estimated production of mineral commodities
(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973
METALS			
Aluminum:			
Bauxite, gross weight [2]	550,000	550,000	600,000
Alumina, gross weight	r 270,000	270,000	300,000
Metal, primary, refined	140,000	140,000	150,000
Antimony, mine output, metal content	12,000	12,000	12,000
Bismuth, mine output, metal content	250	250	250
Cadmium, smelter production	100	100	100
Copper:			
Mine output, metal content	100,000	100,000	100,000
Metal, smelter	100,000	100,000	100,000
Metal, refined	100,000	r 110,000	120,000
Gold, mine output, metal content ____ troy ounces	50,000	50,000	50,000
Iron and steel:			
Iron ore, gross weight [3] ____ thousand tons	55,000	60,000	66,000
Pig iron and ferroalloys ____ do	27,000	30,000	33,000
Crude steel ____ do	[4] 21,000	[4] 23,000	25,000
Rolled steel ____ do	16,000	18,000	20,000
Lead:			
Mine output, metal content	100,000	100,000	100,000
Metal, refined	100,000	100,000	100,000
Magnesium metal, primary	1,000	1,000	1,000
Manganese ore, gross weight ____ thousand tons	1,000	1,000	1,000
Mercury, mine output, metal content _ 76-pound flasks	26,000	26,000	26,000
Molybdenum, mine output, metal content	1,500	1,500	1,500
Silver, mine output, metal content thousand troy ounces	800	800	800
Tin:			
Mine output, metal content ____ long tons	20,000	20,000	20,000
Smelter ____ do	20,000	20,000	20,000
Tungsten, mine output, metal content	7,000	r 7,500	8,000
Zinc:			
Mine output, metal content	100,000	100,000	100,000
Refined	100,000	100,000	100,000
NONMETALS			
Asbestos	160,000	160,000	160,000
Barite	140,000	155,000	165,000
Cement, hydraulic ____ thousand tons	r 19,000	r 23,000	25,000

See footnotes at end of table.

Table 1.—People's Republic of China: Estimated production of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973
NONMETALS—Continued			
Fertilizer materials:			
Natural, crude phosphate rock ___ thousand tons __	1,700	2,000	2,300
Manufactured, nitrogenous, N content [5] ___ do ____	[6] 1,230	[7] 1,650	[7] 2,030
Fluorspar	250,000	250,000	250,000
Graphite	30,000	30,000	30,000
Gypsum	550,000	600,000	630,000
Magnesite ____ thousand tons __	1,000	1,000	1,000
Pyrite:			
Gross weight ____ do ____	2,000	2,000	2,000
Sulfur content ____ do ____	900	900	900
Salt ____ do ____	16,500	18,000	18,000
Sulfur, elemental:			
From sulfur ore	130,000	130,000	130,000
Byproduct elemental	120,000	120,000	120,000
Total	250,000	250,000	250,000
Talc	150,000	150,000	180,000
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Anthracite ____ thousand tons __	20,000	20,000	20,000
Bituminous and lignite ____ do ____	370,000	380,000	410,000
Total ____ do ____	390,000	400,000	430,000
Coke, all types ____ do ____	22,000	24,000	26,000
Gas, natural:			
Gross production ____ million cubic feet __	r 185,000	r 215,000	260,000
Marketed production ____ do ____	80,000	90,000	100,000
Petroleum:			
Crude (including crude from oil shale) thousand 42-gallon barrels __	r [4] 268,000	r 314,000	375,000
Refinery products ____ do ____	r 240,000	r 280,000	330,000

r Revised.
[1] In addition to the commodities listed for which quantitative estimates of output have been made, the People's Republic of China is known or is believed to have produced the following commodities for which no estimates, even of order of magnitude, have been prepared, owing to a paucity of general information upon which to base an estimate: arsenic, chromite, nickel, titanium minerals, uranium, boron minerals, various clays (including kaolin), feldspar, lime, mica, various industrial and dimension stones, sand, gravel, and carbon black. Other unlisted commodities also may be produced.
[2] Mostly diasporic bauxite; data shown include only bauxite for aluminum manufacture; in addition 100,000 to 200,000 tons was believed to be produced each year for making refractories.
[3] In terms of equivalent 50% Fe ore.
[4] Officially reported.
[5] Data are for year ended June 30 of that stated.
[6] U.S. Bureau of Mines estimate based on United Nations' combined estimate for the People's Republic of China and Taiwan minus British Sulphur Corp. reported figure for Taiwan alone.
[7] British Sulphur Corp. Ltd. Statistical Supplement No. 8, November–December 1973, pp. 14–15.

TRADE

The PRC's total foreign trade value was about $9 billion in 1973, up from $5.7 billion (revised) in 1972. The real expansion of trade is difficult to judge owing to the sharp rise in commodity prices and the devaluation of the U.S. dollar.

PRC exports were valued at over $4 billion, up 40%, while imports, up 70% in value from those of 1972, totaled about $4.5 billion. About 85% of the trade was with countries having noncentrally planned economies. Over 20% of the trade, or more than $2 billion, was with Japan and about 9% with Hong Kong. The United States ranked a close third with $750 million in trade. Trade with the countries having centrally planned economies was up about 5%, the U.S.S.R. and Romania being the principal trading partners.

Imports of machinery including mining equipment doubled compared with those of 1972 but the PRC's main imports in 1973 were grain and cotton which also more than doubled compared with the previous year. Imports of metals and chemicals were led by those of steel, which was up 80% in 1973. Imports of steel and steel products were about 3½ million tons valued at $760 million. About two-thirds of the steel was imported from Japan.

Reflecting price increases, the import value of chemical fertilizers was up 19%

even though the total import volume was down as the result of increased PRC production. In 1973 Japan exported about 900,000 tons of fertilizer (nitrogen content) to the PRC. Nonferrous metals were imported primarily from Chile, Peru, and Zambia under long-term contracts, and from Japan.

With the increase in the PRC's output, exports of crude oil were 1 million tons to Japan and 1 million tons to North Korea and North Vietnam. Negotiations under way in 1973 could result in Japan importing 5 million tons of crude oil in 1974. Antimony, tin, and tungsten exports were up in 1973. Exports of barite, fluorspar, salt, and talc increased in 1973, the bulk of each going to Japan.

Table 2.—People's Republic of China: Apparent exports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Bauxite and concentrate	29,004	68,777	West Germany 42,968; France 13,211; Italy 10,530.
Oxide and hydroxide	5,318	3,000	All to Finland.
Antimony metal, unwrought	450	150	All to U.S.S.R.
Arsenic oxide and acids	1,039	1,548	Japan 901; Italy 647.
Copper metal, including alloys, all forms	r 482	152	All to Belgium-Luxembourg.
Iron and steel metal:			
Steel, primary forms	1	NA	
Semimanufactures:			
Bars, rods, angles, shapes, sections	913	NA	
Universals, plates, sheets	r 120	NA	
Rails and accessories	1	NA	
Tubes, pipes, fittings	r 592	554	Italy 211; Australia 207; United Kingdom 136.
Wire	7	NA	
Total	r 1,633	NA	
Manganese ore and concentrate	45,948	42,359	Japan 39,379.
Mercury 76-pound flasks	r 3,510	1,450	All to U.S.S.R.
Molybdenum concentrate	r 200	--	
Platinum-group metals and silver, waste and sweepings value, thousands	$35	NA	
Tin metal, including alloys, all forms:			
Scrap long tons	15	--	
Unwrought do	r 5,978	6,467	France 1,506; Netherlands 1,176; West Germany 857.
Titanium oxides	242	701	All to Japan.
Tungsten:			
Ore and concentrate	r 7,291	8,485	U.S.S.R. 5,249; West Germany 961; Austria 744.
Metal, including alloys, all forms value, thousands	$53	--	
Zinc metal, including alloys, unwrought and semimanufactures	137	--	
Other:			
Ore and concentrate, n.e.s.[2]	4,002	2,257	Japan 2,182.
Nonferrous metal scrap, n.e.s	r 37	--	
Oxides, hydroxides, peroxides of metals, n.e.s	243	157	Sweden 79; West Germany 78.
Nonferrous metals, including alloys, all forms, n.e.s.[2]	r 1,008	2,187	West Germany 685; France 524; Canada 297.
NONMETALS			
Abrasives, natural, n.e.s	713	611	All to Japan.
Barite and witherite	45,612	63,281	West Germany 26,975; Japan 12,550; Poland 5,937.
Boron materials, oxide and acid	1,048	795	Australia 470; Japan 325.
Clays and clay products:			
Crude clays n.e.s	60,507	30,224	Japan 28,208; West Germany 2,016.
Nonrefractory products	171	--	
Diamond:			
Gem, not set or strung value, thousands	$36	--	
Industrial do	$577	$121	All to Belgium-Luxembourg.

See footnotes at end of table.

Table 2.—People's Republic of China: Apparent exports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Feldspar and fluorspar:			
Fluorspar	23,786	50,164	U.S.S.R. 40,200; Poland 9,964.
Undifferentiated	108,158	107,370	All to Japan.
Fertilizer materials, crude value, thousands	$33	--	
Graphite, natural	5,657	6,243	West Germany 4,316; United Kingdom 1,261; United States 666.
Magnesite	18,471	15,457	United Kingdom 6,530; West Germany 3,930; Netherlands 3,048.
Mica, crude	1,196	925	All to United Kingdom.
Precious and semiprecious stones, except diamond value, thousands	$1,121	$2,529	Japan $1,956; United States $500.
Salt thousand tons	r 1,114	6,874	All to Japan.
Sodium and potassium compounds, n.e.s., caustic soda	220	NA	
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	3,983	4,189	All to Japan.
Worked	r 1,411	3,777	Japan 3,421.
Gravel and crushed rock	4,191	4,181	All to Japan.
Quartz and quartzite	3,184	6,161	Do.
Unspecified	230	288	Do.
Sulfur	36	NA	
Talc, steatite, soapstone, pyrophyllite	115,998	153,995	Japan 132,458; United Kingdom 11,332; West Germany 5,571.
Other nonmetals, n.e.s.:			
Crude	2,066	1,958	Austria 999; Italy 959.
Slag, dross, and similar waste, not metal bearing, from iron and steel manufacture	9,500	11,935	All to Japan.
Oxides and hydroxides of magnesium, strontium, and barium	1,005	--	
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	2,000	NA	
Coal	344,353	250,222	All to Japan.
Petroleum refinery products:			
Mineral waxes thousand 42-gallon barrels	75	85	Italy 33; Finland 14; Australia 12.
Nonlubricating oils, n.e.s. do	2	--	
Petroleum coke do	308	335	All to Japan.
Total do	385	420	

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, and Yugoslavia.

[2] Source do not give details on metals included in this category but presumably the figure consists chiefly of antimony, bismuth, and molybdenum.

Source: For Poland, the U.S.S.R., and Zambia—official import statistics of the respective country; for all other countries—Statistical Office of the United Nations. 1971 Supplement to the World Trade Annual. V. 5 (Far East), Walker and Co., New York, 1974, pp. 109–124, and the 1972 edition of the World Trade Annual. V's. 1, 2, and 3, Walker and Co., New York, 1974.

Table 3.—People's Republic of China: Apparent imports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Oxide and hydroxide	147	578	All from Japan.
Metal, including alloys:			
Unwrought	32,339	61,519	Australia 20,560; Norway 14,133; France 9,652.
Semimanufactures	2,176	(2)	Mainly from Japan.
Chromium, oxide and hydroxide	470	--	
Columbium and tantalum metal, including alloys, tantalum	1	2	Japan 1; Austria 1.
Copper:			
Ore and concentrate	4,121	--	
Metal, including alloys, all forms	57,535	18,493	Zambia 16,062.

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	1971	1972	Principal sources, 1972
METALS—Continued			
Iron and steel metal:			
Scrap ---------- thousand tons --	273	163	Canada 79; Japan 41; United Kingdom 32.
Pig iron, ferroalloys, similar materials ---------- do ----	487	474	Japan 275; Australia 186.
Steel, primary forms ---- do ----	r 40	9	Japan 6.
Semimanufactures:			
Bars, rods, angles, shapes, sections ---------- do ----	r 508	370	Japan 272; Italy 24.
Universals, plates, sheets do ----	1,015	1,181	Japan 799; West Germany 106.
Hoop and strip ----- do ----	25	34	Japan 27.
Rails and accessories - do ----	47	37	West Germany 22.
Wire ---------- do ----	25	33	Japan 21.
Tubes, pipes, fittings - do ----	471	470	Japan 289.
Castings and forgings, rough do ----	4	1	Mainly from Japan.
Total ---------- do ----	r 2,095	2,126	
Lead metal, including alloys, unwrought	6,196	7,277	United Kingdom 6,027; Canada 1,050.
Magnesium metal, including alloys, unwrought ----------	NA	301	All from United Kingdom.
Molybdenum metal, including alloys, all forms ----------	6	4	All from Japan.
Nickel metal, including alloys, all forms	3,077	7,775	Canada 5,614; Norway 1,010.
Platinum-group metals, including alloys, all forms ------ value, thousands --	$1,748	$9,300	United Kingdom $6,940; Japan $2,276.
Silver metal, including alloys - do ----	--	$6,399	All from West Germany.
Tungsten metal, including alloys, all forms ----------	11	14	All from Japan.
Zinc metal, including alloys, all forms -	673	NA	
Other metals, including alloys, all forms:			
Metalloids, n.e.s -- value, thousands	$26	NA	
Base metals, n.e.s ----------	67	25	All from Japan.
NONMETALS			
Abrasives, natural, n.e.s., grinding and polishing wheels and stones value, thousands --	$34	NA	
Clay products, refractory ----------	161	NA	
Diamond:			
Gem, not set or strung value, thousands --	$14,357	$12,131	All from United Kingdom.
Industrial ---------- do ----	$1,119	$818	Belgium-Luxembourg $524; West Germany $294.
Fertilizer materials, manufactured:			
Nitrogenous ---- thousand tons --	2,557	2,962	Japan 1,758; Italy 316; Netherlands 144.
Potassic ---------- do ----	5	21	Canada 14; Belgium-Luxembourg 5.
Other, including mixed -- do ----	29	31	Greece 15; West Germany 12; Japan 3.
Unspecified ---------- do ----	42	15	All from Norway.
Potassium compounds, n.e.s., caustic potash, sodic, potassic peroxides ----	1,880	3,241	All from Japan.
Stone, dimension, crude and partly worked ----------	177	NA	
Other nonmetals, n.e.s., halogens (excluding chlorine) ----------	359	80	All from West Germany.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black ----------	2,574	1,846	All from Japan.
Petroleum refinery products:			
Mineral jelly and wax thousand 42-gallon barrels --	1	NA	
Undifferentiated -------- do ----	21	105	All from Poland.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals --------	7,561	13,991	All from West Germany.

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, Poland, Portugal, Spain, Sweden, Switzerland, the U.S.S.R., the United Kingdom, Yugoslavia, and Zambia.

[2] Quantity was not reported for 1972. Total value in 1971 was $1,877,000 and $931,000 in 1972.

Source: For Poland and the U.S.S.R.—official export statistics of the respective country; for all other countries—Statistical Office of the United Nations. 1971 Supplement to the World Trade Annual. V. 5 (Far East), Walker and Co., New York, 1974, pp. 125–134, and the 1972 edition of the World Trade Annual. V's. 1, 2, and 3, Walker and Co., New York, 1974.

COMMODTIY REVIEW

METALS

Aluminum.—In 1973, aluminum metal production was estimated at 150,000 tons. About 100,000 tons came from Fushun in Liaoning Province, 20,000 to 30,000 tons from Sanmen Gorge in Kansu and from smaller facilities at Changling in Kirin, Wuhan in Hupeh, Hofei in Anhwei, and Nanning in Kwangsi Province. Additional plants of about 40,000-ton capacity may be under construction at Kweiyang in Kweichow and Sian in Shensi. Imports of aluminum in 1972 totaled about 100,000 tons, and were from Australia, Canada, France, and Japan. The PRC also purchased, bauxite from Guyana. This bauxite possibly was sent to some other country for refining.

Although much of the aluminous ore in the PRC is offgrade diasporic material, resources of aluminous shale and bauxite are sizable. Reserves have been reported in Chekiang, Fukien, Honan, Hopeh, Kwangsi, Kweichow, Liaoning, Shantung, and Yunnan Provinces.

Antimony.—The PRC with a production of about 12,000 tons of antimony was a major world producer. Japan imported 3,014 tons of antimony concentrate and 1,089 tons of unwrought antimony metal, and the United States imported 157 tons of metal and 258 tons of antimony oxide from the PRC in 1973. The major world resources for antimony were the Hsikwangshan mine near Hsin Hua in Hunan Province. Reserves also were found in Kwangsi, Kwangtung, Kweichow, and Yunnan Provinces.

Bismuth.—Production in 1973 was about 250 tons, the same as in the past several years. Although China is a significant world producer, little was exported indicating possible stockpiling or a sizable domestic consumption. Bismuth was recovered as a byproduct of tungsten and nonferrous refining operations.

Copper.—The demand for copper was estimated to be two or three times the 100,000 tons of domestic production. Contracts were made for Zambia to supply 50,000 tons annually over a 4-year period beginning in 1972. Chile exported 55,000 tons of copper valued at $90 million to the PRC in 1973.

Little information has been made available concerning copper resources. Extensive porphyry copper deposits were reportedly found several years ago but they remain undeveloped because of the low grade and the need to develop processing technology. The domestic source of copper is from several small mines plus a concerted effort to collect scrap. Copper mines that reportedly operated in the past are the Tunghua in Kirin with 2,500 to 3,000 tons of copper production per year and at Hungtoushan in Liaoning with an output of 2,500 to 3,000 tons of low grade ore per day. Prospecting for metals and minerals has resulted in an increase in reserves and higher production at such mines as Huatung in Liaoning, Tungkuanshan in Anhwei, and the "No. 3 mine" in Yunnan. Production also has been reported at Tayeh, Hupeh, and Lanchow in Kansu. There apparently are two copper processing facilities of fair size consisting of a smelter and refinery at Shenyang in Liaoning and a refinery at Shanghai. Smaller refineries, mostly to process scrap, are located at Chungtiaoshan in Anhwei, Foochow in Fukien, Wuhan in Hupeh, Chuchow in Hunan, Kunming, Hochiochum, and Wuwei in Kansu, Taiyuan in Shansi, and Chungking in Szechwan. A copper smelter in Fukien Province went onstream in 1972.

Iron and Steel.—Primary steel production was about 25 million tons in 1973. It is estimated that more than 18 million tons was produced at the major steel centers. Production at small and medium-size plants was up more than 18% in 1973. All provinces except Tibet now have small and medium-size plants. In 1973, more than 11 million tons of scrap was collected throughout the PRC.

Production in Anhwei Province was up 34% for steel and 6% for iron, and production in Fukien Province was up 32% for steel and 10% for iron. Steel production in Hopeh Province was up more than 14%; Kansu, over 8%; Kiangsu, 30%; Kwangsi, 15%; and Shanghai, 11%. Plants reporting increased steel production were Maanshan, Taiyüan, Talien, Tayeh, Tangshan, Tinetsin, and Wuhan.[4]

In addition to improving efficiency of operation and increasing furnace capacity

[4] New China News Agency (Peking). Dec. 31, 1973, and Jan. 4, 1974.

at the larger plants, emphasis also was on diversifying product capability. Many new types of steel products are now being produced in many of the large plants. A strong effort has been made to develop and exploit new iron ore resources. In Kiangsu Province a fairly large open pit iron mine has been developed. Since early 1972 more than 2 million tons of overburden have been stripped, and a big ore dressing plant, designed to handle more than 1 million tons of iron ore per year, has been completed. A new mine has been developed in Peking which will make the city self-sufficient in iron ore requirements.

Capacities of major PRC steel plants are as follows:

Plant	Province	Blast furnace units (number)	Steel furnaces [1] (number)	Capacity (metric tons per year)
Anshan	Liaoning	10	25 OH	7,000,000
Wuhan	Hupeh	3	6 OH	2,500,000
Shanghai	Shanghai	8	Various	2,000,000
Taiyuan	Shansi	5	BOF and electric	1,500,000
Peiping	Peiping	3	Oxygen converter	1,500,000
Maanshan	Anhwei	13	OH and oxygen	1,000,000
Canton	Canton	3	OH and BOF	1,000,000
Penhsi	Liaoning	2	OH and electric	1,000,000
Paotou	Suiyüan	1	2 OH and oxygen	800,000
Chungking	Szechwan	3	2 OH	800,000

[1] OH—Open-hearth furnace; BOF—Basic-oxygen furnace.

The PRC has been negotiating with the Federal Republic of Germany for a fully automated cold and hot-rolling mill. Installation of the German mill with an annual capacity of 4 million tons would increase the PRC's rolled-steel capacity by about 25%. In addition negotiations are underway with Japan for a similar mill.

Despite the increase in output of steel, China was still dependent upon imports to meet requirements. Imports of steel and steel products were over 3 million tons in 1973, of which about 2.3 million tons were from Japan. The Federal Republic of Germany was the second largest supplier. Exports of steel scrap from the United States to China in 1973 were 387,000 tons valued at $23.7 million.

Lead and Zinc.—China's production of lead and zinc continued at approximately 100,000 tons per year for each. The largest mine was the Shin-kou-shan in Hunan. In Liaoning the Hsiuyen mine produced lead and the Ching-ching mine produced lead and zinc. Other mines were in Anhwei, Fukien, Hunan, Kiangsi, Kwangtung, Kweichow, and Yunnan Provinces. The Imperial Smelting Process plant at Shaokuan, Kwangtung Province, was in operation during 1973. Although rated capacity was about 18,000 tons of lead and 35,000 tons of zinc per year, production may be lower because of shortages of raw materials. In addition, intermediate smelters were located at Chu-chou, Hunan and K'un-ming in Yunnan. There also were eight small smelters.

Manganese.—Production of manganese continued at about 1 million tons. There are rich manganese reserves in provinces south of the Yangtze River. These sedimentary deposits range in grade from 20% to 40% manganese. There are major manganese mines in Fukien, Hunan, Kiangsi, Kwangsi, Kwangtung, and Kweichow Provinces. Mines north of the Yangtze River are in Kansu and Liaoning Provinces.

Mercury.—Production of mercury was about 26,000 flasks as the PRC continued to rank among the world's major mercury producers. Production was primarily from Kweichow and Hunan Provinces with some from southwest Kwangtung Province. Reserves of mercury, principally in Kweichow Province, are adequate to maintain the current rate of production. The PRC has not offered much mercury in the world markets in the last few years. It is possible that production is stockpiled or used in China's nuclear program. Exports to the U.S.S.R. were renewed after a lapse of a few years and totaled 2,900 flasks in 1971 and 1,450 flasks in 1972. In 1973 exports of mercury to Japan were 150 flasks.

Tin.—Tin reserves have been estimated at 1.5 to 2 million tons of tin content. Exploration and development have opened up more reserves. The new reserves probably have offset depletion by normal mining operation. Production has been esti-

mated at 20,000 long tons annually for several years. Output is primarily from Yunnan and Kwangsi Provinces. In Yunnan the ore is mainly from lode deposits. Although the ore contains 2% to 4% tin, impurities present refining problems. The placer deposits in Kwangsi are clean and are probably the source of high-grade tin metal ingot. Exports of tin from China in 1973 are estimated at 8,400 long tons, up from 6,500 long tons exported in 1972. Imports by the United States totaled 1,227 long tons in 1973, up from 163 tons in 1972. Japan's tin metal imports were 640 long tons during the first 11 months. China's consumption is estimated to be about 6,000 long tons annually.

Titanium.—The PRC has adequate reserves of titanium ore to meet current needs. It is believed the PRC produced titanium dioxide which probably is used as white pigment for paint. There was no evidence of facilities to produce titanium metal.

Tungsten.—It is estimated that the production of tungsten was in the order of 15,000 tons of concentrates or 8,000 tons of tungsten metal in 1973. There are large reserves of wolframite and some scheelite totaling probably over 100 million tons of 1% to 2½% ore. Several mines in Kiangsi Province produce 500 to 2,000 tons of wolframite concentrate annually. Scheelite from Hunan Province has become a major factor in overall production. Exports of tungsten have been rising in the last few years. According to Soviet sources imports by the U.S.S.R. from the PRC were 4,792 tons of concentrates in 1971 and 5,249 tons in 1972. Reported imports by other countries in 1973 were more than 3,000 tons. Inasmuch as a thousand tons may have been imported by countries who made no reports, the total tungsten exports by the PRC may have been as much as 9,000 tons in 1973.

Uranium.—Production of uranium ore presumably was from Chushan in Kiangsi Province and Weiyüan in Kwangtung Province among other places. There is a gaseous diffusion plant at Lanchou in Kansu Province for use in nuclear testing. China exploded a hydrogen bomb in the atmosphere on June 27, 1973, in the Lop Nor Region. This is the fifteenth known nuclear device thas has been exploded by the PRC since 1964.

NONMETALS

Asbestos.—The PRC produced about 160,000 tons of asbestos to continue to be among the top five world producers. Both long and short fiber chrysotile type asbestos output was principally from the high-grade deposit at Shihmien in Szechwan Province.

Barite.—Production of barite was estimated at 165,000 tons in 1973. Japan imported about 30,000 tons, up from 12,500 tons in 1972. Use of barite in China is principally for oil-well-drilling mud and production is dependent upon the level of drilling. With increased exploration for oil the output of barite probably will increase.

Boron Minerals.—Extensive deposits of boron-bearing materials are known to occur in the Iksaydam area of Tsinghai Province. Little is known about production but it is believed that output exceeds demand.

Cement.—Production of cement in the PRC was estimated at 25 million tons in 1973 compared with a revised estimate of 23 million tons in 1972. About two-thirds of the more than 2,000 counties have small cement plants. The 2,400 small plants produced about half of the total production.[5] While these small plants are not highly efficient, they met the need for cement in widespread parts of China and reduce transportation needs. Raw materials were available for cement production throughout China. A small plant with an annual capacity of 30,000 tons can be easily installed where needed. Some of the raw materials used included shale, lime, coral, slag, and calcium carbonate residues. The remaining one-third of the cement production was from about 60 plants whose annual capacity was between 100,000 and 1 million tons. Some of the larger known cement plants in the PRC are as follows:

Plant name	Province	Capacity (metric tons per year)
Hantan	Hopeh	1,000,000
Yao Hsien	Shensi	1,000,000
Huahsin	Hupeh	1,000,000
Kwangchow	Kwangtung	700,000
Yungteng	Kansu	600,000
Fushun	Liaoning	550,000
Chungking	Szechwan	550,000
Tatung	Shansi	500,000
Ch'ihsin	Liaoning	400,000
Mutanchiang	Kirin	400,000
Tungfanghung	Klangsu	400,000
Kunming	Yunnan	330,000
Kweiyang	Kweichow	300,000

[5] New China News Agency (Peking). Sept. 26, 1973.

Diamond.—The only known producing diamond mine in the PRC is the Changte mine in western Hunan Province. Deposits also have been reported in Kweichow and Shantung Provinces. Synthetic diamonds were reportedly being produced at Tsingtao in Shantung Province. The Institute of Physics of the Chinese Academy of Sciences reportedly has produced synthetic diamond powder and formed synthetic diamond crystals larger than 1 millimeter by the explosion method.[6]

Fertilizer and Chemical Materials.—Production of chemical fertilizer materials reportedly increased by 23% in 1973. The state plan was completed 38 days ahead of schedule. Small fertilizer plants scattered throughout all provinces in the PRC provided 54% of the total synthetic ammonia produced. More than 100 small plants went into production in 1973.[7]

Although the small and medium-size plants are inefficient and wasteful they were built near agricultural areas to meet local needs, thereby reducing transportation costs and other problems. These small plants use local charcoal or coal as a raw material for production of nitrogenous fertilizer. In addition some ammonia is recovered from coking operations at small iron and steel plants. Some of the larger known fertilizer plants are located at Nanking and Yangchow in Kiangsu, Taiyüann in Shansi, Chuchow and Liling in Hunan, Kunming in Yunnan, Hofei in Anhwei, Tsinan in Shantung, Lanchou in Kansu, and in Kirin Provinces. Large plants were reportedly being built at Lunan in Shantung, Anyang in Honan, Changsha in Hunan, and in Hsüanwei in Yunnan. Fertilizer plants are also being constructed near various petroleum refineries.

The PRC is the world's third largest consumer of nitrogenous fertilizer. Despite the fact that production is increasing and new plants are being constructed the PRC still needed to import considerable quantities of chemical fertilizers to meet their demand. The largest supplier was Japan which furnished 596,100 tons of ammonium chloride (26% nitrogen), 531,000 tons of ammonium sulfate (21% nitrogen), and 1,395,000 tons of urea (45% nitrogen), or a combined total of 893,250 million tons of nitrogen content. Sizable imports also came from Kuwait and two large consortiums called NITREX AG and ANIC. Near the end of 1972 the PRC signed a 3-year agreement to buy urea from Venezolana de Nitrogen (NITRO VEN) for approximately $23 million during the second half of 1973. Approximately 14,000 tons of diammonium phosphate valued at almost $2 million was sold by an American company to the PRC. Also, approximately $1 million of chemically compounded fertilizers were sold by a New York firm. Spain is expected to export 20,000 tons of superphosphates to the PRC under a new contract arrived at early in 1973. Chile exported 70,100 tons of sodium nitrate valued at $3.7 million to the PRC in 1973.

In efforts to increase chemical fertilizer production capacity, the PRC has contracted with the M. W. Kellog Co. of the United States, through its Netherlands affiliate, to construct three ammonia plants with a capacity of 1,000 tons per day and three urea plants with a capacity of 1,620 tons per day. The urea plants use the Stamicarbon stripping process. The first of the three plants is scheduled to start up in about 3 years, followed by startup of the other two plants at 3-month intervals. In addition a combine of four Japanese companies have signed a contract with the PRC to build a fertilizer complex consisting of a 1,000-ton ammonium plant and a 1,620-ton-per-day urea plant.[8]

Production of pyrite was estimated at 2 million tons for 1973. The recovered sulfur was utilized primarily as sulfuric acid for manufacture of fertilizers.

Extensive bedded phosphate rock deposits were discovered at Kunyang in central Yunnan Province some time ago. Production from this deposit has not yet been reported. Production of phosphate rock in 1973 was about 2.3 million tons or about 1.0 million tons of P_2O_5. Much of this output was from a mine at Chinghsiang in Hupeh Province (with a capacity of 600,000 tons per year), Kaiyang in Kweichow, Paotou in Inner Mongolia, and Tunghaihsien and Haichow in Kiangsu. Other phosphate production came from Kansu, Kwangsi, and Szechwan Provinces. Imports of phosphate rock may have been 1 million tons mainly from Morocco and some from

[6] New China News Agency (Peking). Sept. 3, 1973.
[7] New China News Agency (Peking). Dec. 27, 1973.
[8] Chemical Age International. V. 107, No. 1, July 13, 1973, p. 17.
European Chemical News. V. 23, No. 572, Feb. 23, 1973, p. 13.

North Vietnam. About 3,000 tons of mixed phosphate and 2,000 tons of superphosphate fertilizer were exported to the PRC from Japan.

China purchased over $2.5 million worth of potash from Canada late in 1972 which probably was destined for delivery in 1973. Although no facts were available it is reasonable to assume that the PRC may have potash deposits similar to other major world deposits in the Tarim Basin in Sinkiang Uighur Autonomous Region and the Tsaidam Basin in Tsinghai Province.

Fluorspar.—The PRC produced about 250,000 tons of fluorspar in 1973, ranking among the top 10 world producers. Major sources of fluorspar production were in Chekiang, Hopeh, and Kwangsi Provinces. A new fluorspar mine has been developed at Taolin in Hunan Province. Nationwide production exceeded the needs of Chinese steel and aluminum industries for fluorspar and provided exports of up to 200,000 tons. Japan imported 158,000 tons in 1973. Other exports from the PRC may have gone to the Federal Republic of Germany, Poland, and the U.S.S.R. Sodium fluosilicate was recovered as a byproduct of the phosphate industry.

Quartz Crystal.—Both natural and synthetic crystals were produced for use in the PRC electronic industry but very few facts or data are known about the industry.

Salt.—With a production of about 18 million tons of salt, the PRC was the second largest world producer. The principal source of salt was the solar evaporation of sea water in Hainan, Hopeh, Kiangsu, Liaoning, and Shantung Provinces. The Luta Field in Liaoning Province, The Tang Ku Field in Hopeh Province, and the Chilantai Field in Ningsia, Hui Provinces, with capacities of over 1 million tons of salt annually, were expanded. Improvements were reported at other fields such as Tientsin and Hanku in Hopeh, Yunchang in Kiangsi, Peimu in Kwangsi, and Chengkou, Shoukuang, and Tsingtao in Shantung. Production also was from bedded deposits in Hunan, Kiangsi, and Yunnan Provinces. Sinkiang Province reported 15 mines and the construction of a new refinery. In addition to about 300,000 tons of salt production, the Hsiangli mine in Hunan Province also produced Glauber salt.

In Szechwan, salt was recovered from brine which also contained potassium salts, bromine, iodine, and boron. The largest operation, Tzukung, produced 500,000 tons, about half of Szechwan's total output. The Iksaydam Lake deposit in Tsinghai Province produced other elements and compounds in addition to salt.

Since salt production in the PRC was more than adequate to meet internal needs for food and industrial consumption, a considerable quantity was available for export. Japan imported 925,000 tons of salt from the PRC in 1973.

Steatite and Talc.—Steatite and talc were produced at Taling in Liaoning Province. Japan imported 72,000 tons of steatite and 101,000 tons of talc from the PRC in 1973.

Vermiculite.—Vermiculite was produced from more than 20 operations in Linshu County in Shantung Province. A factory has been put into operation for making heat insulating boards, bricks, and pipe using vermiculite with cement as a binder.

MINERAL FUELS

Coal.—Reports from some coal producing provinces indicated that the national output of coal was up about 8% in 1973. Anhwei Province reported a 40% increase in 1973.[9] It was estimated that production was 430 million tons of mine run coal and 350 million tons of washed coal. About 60 large coal mine complexes accounted for about two-thirds of this output.

The largest complexes, Fushun and Fuhsin in Liaoning, followed by Huainan in Anhwei and Kailan in Hopeh produced in the 20-million-ton range. Combines in the 10- to 20-million-ton range were Tatung in Shansi and Hokang and Chihsi in Heilungkiang. Seven large coal combines with several mines each supplied over 10 million tons per year. In the 5- to 10-million-ton range were Pingtingshan in Honan, Fengfeng in Hopeh, Peking, Tzupo in Shantung, and Yangchuan in Shansi. About 50 additional combines produced from 1 to 5 million tons. Of these the more important were Chiaotso (Honan), Shuangyashan (Heilungkiang), Huaipei (Anhwei), Penhsi and Peopiao (Liaoning), Tsaochuang (Shantung), Hopi and Ima (Honan), Chinghsing (Hopeh), Tungchuan (Shensi), Tunghua (Kirin), Luan (Shansi), Shihchuaishan (Ningsia), Mei-

[9] New China News Agency (Peking). Jan. 4, 1974.

tien (Kwangtung), Pinghsiang (Kiangsi), Hsuchou (Kiangsu), and Hsishan (Shansi). In Ningsia, anthracite production capacity has been increased 30%.

The remaining one-third of the production was from small and medium-size local mines which produce 100 to 1,000 tons per day. Because of transportation problems, these local mines are important in supplying provincial agriculture and small industries. Efforts are being made to modernize many of these mines and improve efficiency. Many new mines have been opened such as two in Fukien with a capacity of 420,000 tons each per year and those in Te-fa, Paotao, Pingtingshan, Meihsien, and Fengcheng.[10] Many of these new mines are fairly large and will become new bases for the coal industry.

With the development in the last few years of mines in Sinkiang and Tibet, which reported an increased production of 40% in 1973, there is now production in all provinces. Many remote areas in the southwest have become self-sufficient in coal. China continued exploration to develop new deposits and expand the small and medium-size mines.

Petroleum and Natural Gas.—Crude Petroleum production in 1973 was estimated on the order of 50 million tons, an increase of about 25% over the 40 million tons in 1972. Two-thirds of this output was from the north and northeast provinces: at the Taching oilfield in Heilungkiang, the Liaoning, and Kirin Fields, at Shengli in Shantung Province, and at Takang in Tientsin Province. Other producing areas, most of them small, are located in Hupeh, at Karamai in Sinkiang, at Lenghu in the Tsaidam Basin of Tsinghai Province, Yumen in Kansu, Szechwan, and Shensi Provinces. A small amount of oil shale was produced in Kwangtung and Liaoning Provinces. Earlier estimates of China's petroleum production may have understated its rate of growth since the mid-1960's. Estimates of the PRC's petroleum production in million tons are shown in the following tabulation: [11]

1957	1963	1965	1969	1970	1971	1972	1973
1.46	6.4	10.8	20.3	28.5	36.7	43.0	e 53.7

e Estimate.

A new oil district has reportedly increased capacity at the Taching oilfield by 64%. Output of crude oil and processed products rose 19% and 18%, respectively, in 1973.[12] Reportedly the PRC intends to construct a 24-inch-diameter pipeline from Taching to the Port of Darien.

The Takang oilfield which was opened during the cultural revolution has reportedly overfilled state goals each year between 1967 and 1973. The increase in output has averaged 60.9% annually.[13]

Shengli is the PRC's other new oilfield. Although little information was published, Shengli was an important part in the increase in output in the last few years.

Strong efforts have been made to increase capacity of oil refineries including the Taching Petrochemical Complex, Lanchow Refinery, Peking Petrochemical Works, Fushun No. 1 Petrochemical Works, Talien No. 7 Petrochemical Works, and Shanghai Refinery.

In efforts to increase oil production, the PRC has opened the door to Romania, Japan, Western Europe, and the United States for exhibiting equipment and technology. However, the PRC opposes joint ventures with other countries. U.S. oil companies have been invited to the PRC to discuss sale of equipment and technology and training of personnel. A polyethylene plant of 180,000 tons per year is to be built by a Japanese firm. It is believed that this plant will be part of a 300,000-ton-per-year ethylene complex to be built by another Japanese firm. A new petrochemical complex at Shenyang (Mukden), Liaoning, will be built under a $300 million contract by two French companies. Included will be a naphtha cracker with an annual ethylene capacity of 73,000 tons.

The PRC exported about 1 million tons of crude oil to Japan and another 1 million tons to North Korea and North Vietnam. Discussions were held with a view to increasing the PRC's oil exports to Japan to 4 or 5 million tons in 1974.

The principal natural gas producing area is in Szechwan Province. The reserves are being developed to increase availability for industrial and home consumption. Production of natural gas in Liaoning Province increased more than 30% in 1973.

[10] Federal Broadcast Information Service. V. 1, No. 210, Oct. 31, 1973, p. B/11.
[11] U.S. Consulate, Hong Kong. State Department Airgram A-156, June 19, 1974. 11 pp.
[12] New China News Agency (Heilungkiang). Apr. 6, 1974.
[13] New China News Agency (Peking). May 15, 1974.

The Mineral Industry of Colombia

By Ronald F. Balazik [1]

Colombia's mineral industry exhibited an overall upward trend during 1973, although crude oil production declined for the third consecutive year. The output of most other mineral commodities increased or remained at about the same level, compared with that of 1972. Petroleum, natural gas, coal, and lime continued to rank as the country's most valuable mineral products. Colombia was the 10th largest gold producer in 1973, and was one of the few producers of platinum. The country also remained the world's principal exporter of emerald, despite the halt of emerald mining at midyear.

The following government actions, directly affecting Colombia's mineral industry, were initiated during 1973: (1) The Ministry of Mines sought to nationalize the country's largest gold, silver, and platinum mines, (2) government-owned emerald mines were closed in June, and (3) the Ministry of Mines began reevaluation of its petroleum pricing policy to encourage additional oil production.

During 1973, the Government also formulated a plan designed to accelerate and diversify the mining industry and achieve virtual mineral self-sufficiency by 1980. Principal objectives of the plan included establishment of a financing policy that would attract domestic and foreign capital, a guarantee of remunerative prices to encourage more petroleum exploration, and new development of coal, nickel, copper, iron, phosphate, and asbestos deposits. The plan establishes a legal framework to control foreign investment in natural gas production similar to that embodied in petroleum regulations. The Government also planned to secure long-term foreign financing to develop the mining of precious stones. Total investment required to develop the mining industry as planned was estimated at over $1 billion.[2]

In November 1973, the Government revised the basic Colombian export controls relating to the mineral industry. Four classes of goods were distinguished: (1) those goods prohibited from export, (2) those requiring export approval from the Foreign Trade Institute, (3) those restricted for export only to certain countries, or requiring clearance from government agencies, and (4) goods without export controls. The prohibited exports included lead, zinc, and certain iron and steel forms. Goods requiring government approval prior to export included fertilizers, copper bars, and hydrocarbons. Goods in the third category included portland cement, which could be exported only by producers. The modified controls were devised to meet domestic consumption needs and promote processing of basic materials prior to export.

The United Nations Development Program (UNDP) and the Colombian Government signed a $5 million contract for a prospecting program seeking nickel, gold, and platinum in the States of Tolima, Huila, Cauca, Valle, and Nariño. The contract also called for intensification of exploration for emerald in the State of Boyacá. The UNDP will finance 60% of the project, and the Government will provide the remaining funds required.

Colombian and Venezuelan diplomats met in Rome during 1973 to negotiate long-standing disputes between the two countries concerning delimitation of international boundaries in the potentially oil-rich Gulf of Venezuela. Although some points of agreement were reached, settlement of the dispute was not achieved. Additional talks were scheduled to open in Caracas late in the year amid reports that the dispute could be placed before the Court of International Justice for arbitration.

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[1] Geographer, Division of Fossil Fuels—Mineral Supply.

[2] Where necessary, values have been converted from Colombian pesos (Col$) to U.S. dollars at the exchange rate of Col$22.0 = US$1.00.

PRODUCTION

Production of most metallic minerals increased in 1973, but output of commodities in the mineral fuels and nonmetallic mineral sectors varied. Substantial increases were registered for gold and salt; however, the production of petroleum and gypsum declined notably.

Table 1.—Colombia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Chromite, gross weight	500	[e] 200	12,000
Copper, mine output, metal content	56	67	[e] 70
Gold ---troy ounces	189,618	186,816	226,243
Iron and steel:			
Iron ore and concentrate ---thousand tons	370	416	480
Pig iron ---do	[r] 243	288	264
Crude steel ---do	[r] 325	373	343
Lead, mine output, metal content	205	294	153
Manganese ore, gross weight	450	492	12,000
Mercury ---76-pound flasks	213	152	144
Platinum-group metals ---troy ounces	25,610	24,111	26,358
Silver ---do	68,307	69,678	75,416
Zinc, mine output, metal content	112	85	8
NONMETALS			
Barite	5,790	6,306	1,922
Cement, hydraulic ---thousand tons	[r] 2,848	2,892	3,216
Clays:			
Bentonite	[e] 1,000	[e] 1,000	1,200
Kaolin	96,575	101,056	[e] 101,000
Other	670,000	738,675	NA
Diatomite	300	357	350
Feldspar	24,836	26,358	30,000
Fertilizer materials:			
Crude, phosphate rock	10,000	6,206	10,421
Manufactured (gross weight):			
Nitrogenous	NA	112,133	NA
Phosphatic	NA	42,159	NA
Other, including mixed	NA	286,706	NA
Fluorspar	NA	4,200	[e] 4,000
Gypsum ---thousand tons	182	201	95
Lime [e] ---do	1,000	1,000	1,000
Magnesite [e]	1,800	1,800	1,800
Mica, all grades	32	38	[e] 40
Precious and semiprecious stones, emerald:			
Gem stones ---thousand carats	[2] 672	[2] 1,750	[3] 109
Morralla ---do	NA	NA	[3] 7,095
Salt:			
Marine ---thousand tons	300	674	843
Rock ---do	338	349	470
Total ---do	638	1,023	1,313
Sand (silice)	NA	4,512	NA
Stone:			
Dolomite ---thousand tons	14	14	44
Limestone ---do	NA	4,900	NA
Marble ---cubic meters	14,380	2,000	[e] 15,000
Quartzite ---thousand tons	172	181	NA
Sulfur: [e]			
From ore	30,500	32,500	27,800
Petroleum refinery byproduct	3,500	3,500	3,500
Total	34,000	36,000	31,300
Talc, soapstone, pyrophyllite	1,975	2,247	900
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	18,000	20,500	23,000
Coal, all grades ---thousand tons	2,800	3,200	3,300
Coke, all types ---do	490	524	[e] 590
Gas, natural:			
Gross production ---million cubic feet	111,288	115,622	113,229
Marketed production ---do	51,186	60,988	59,966
Natural gas liquids:			
Propane (from natural gas) ---thousand 42-gallon barrels	1,778	1,220	1,271
Butane (from natural gas) ---do	777	726	733
Natural gasoline ---do	1,073	1,016	928
Total ---do	[r] 3,628	2,962	2,932

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity [1]		1971	1972	1973 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued				
Petroleum:				
Crude oil	thousand 42-gallon barrels	78,101	71,674	67,089
Refinery products:				
Aviation gasoline	do	503	466	468
Motor gasoline	do	16,355	18,676	19,094
Jet fuel	do	1,482	1,545	1,801
Kerosine	do	3,360	2,997	3,134
Distillate fuel oil	do	7,301	8,986	8,315
Residual fuel oil	do	18,121	18,051	17,650
Lubricants	do	356	52	34
Other:				
Liquefied petroleum gas	do	1,499	1,983	1,932
Naphtha	do	1,338	1,077	1,363
Asphalt and bitumen	do	618	915	730
Petroleum coke	do	[e] 900	[e] 950	
Miscellaneous and unspecified	do	[e] 2,463	[e] 2,279	3,916
Refinery fuel and losses	do	[e] 1,728	1,357	
Total	do	56,024	59,334	58,437

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

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

[2] May include gem stones other than emeralds.

[3] Exports.

TRADE

Shipments of crude oil, Colombia's most important mineral export item, decreased sharply. Exports of emerald and gold increased significantly, but platinum shipments declined in value. Principal mineral import items included refined petroleum products, manufactured fertilizer materials, and asbestos.

Table 2.—Colombia: Trade in crude and refined petroleum

(Thousand 42-gallon barrels)

Commodity	1971	1972	1973
Exports:			
Crude oil	25,396	14,926	9,505
Refinery products:			
Distillate fuel oil	979	2,002	892
Residual fuel oil	10,749	10,085	9,309
Other	--	340	322
Total	11,728	12,427	10,523
Bunker loadings:			
Distillate fuel oil [1]	NA	3,818	2,523
Residual fuel oil	NA	1,084	1,171
Total	NA	4,902	3,694
Imports:			
Refinery products:			
Gasoline	40	248	100
Jet fuel and kerosine	36	--	--
Distillate fuel oil	11,446	--	--
Lubricants	40	9	8
Other	87	6	--
Total	11,649	263	108

NA Not available.

[1] Includes aviation gasoline, jet fuel, and lubricants.

COMMODITY REVIEW

METALS

Copper.—The Government began accepting bids in late 1973 for the development of the Cerro Pantanos copper deposits in the Department of Antioquia. Preliminary surveys and drilling indicated that the deposits, discovered in late 1972, have ore reserves of 655 million tons with a 1% copper content. Twenty foreign companies from the United States, Japan, France, Canada, and Romania have expressed interest in the deposits. The Government plans to develop the deposits by forming a joint-venture group comprised of foreign interests and the Instituto de Fomento Industrial (IFI), the Government development entity. Plans for the joint development project envision 51% control by IFI and 49% foreign participation. The project would cost an estimated $400 million and produce 120,000 tons of refined copper per year. After 25 years of operation, all development property would revert to government ownership.

Iron and Steel.—During 1973, production of iron ore and concentrate increased 15% while pig iron and crude steel output decreased by 8%. Aceriás Paz del Rio, S.A. (A.P.d.R.) continued to be Colombia's only integrated iron and steel producer. It accounted for approximately 90% of the country's annual pig iron output, while Colombiana de Arrabios Ltd. (Colar) produced the remaining amount. Colar, which began pig iron production in December 1972, was considering plans to raise its production 50% by 1975. A.P.d.R. evaluated bids during 1973 for the construction of a cold-rolling mill, and prepared for a preliminary study by the Republic Steel Corp. of a proposed new integrated steel mill which would raise annual production to 1 million tons.

Three new coking plants were proposed or in the planning stage during 1973. Siderúrgica Nacional de Paz del Rio instituted plans for construction of a new coking facility in the Department of Boyacá to supply its steel mill. Because of the anticipated high demand for coke from Venezuelan steel mills, a coking plant was proposed for the cities of either Cúcuta or Pamplora to utilize the coal deposits in the Department of Santander. A new coking plant was also proposed for Berria Port in the Magdalena River Valley. In addition to these facilities, Metalurgica de Boyacá continued installation of a hot-rolling mill and an electric furnace which will increase its capacity to 45,000 tons per year.

The Government stopped granting import licenses for additional electric furnaces. The halt was designed to encourage use of domestic coal and iron ore rather than imported steel scrap, slabs, and billets.

Nickel.—Progress on the Cerro Matoso ferronickel project, the largest mining venture in Colombia's history, was delayed during 1973 by negotiations to clarify government regulations affecting contract agreements. Negotiations focused on interpretation of capital remittance terms in the project contract, which was signed in 1970 by IFI, the Hanna Mining Co., and Chevron Oil Co. Contract modifications proposed by Hanna were under consideration by the Government at yearend.

The lateritic nickel deposit involved in the project contains reserves with a 2.6% nickel content and is located in the Department of Córdoba. Initial output is planned to exceed 17,000 tons annually, but production is not expected to begin until 1978. Total cost of the project is estimated to be approximately $170 million.

Project operations will be handled jointly by Empresa Colombiana de Niquel Ltda. (Econiquel), a subsidiary of IFI, and Compañía de Niquel Colombiano, S.A., equally owned by Hanna Mining Co. and Chevron Oil Co. Although each of the three parent entities must contribute one-third of the investment required for the project, IFI retains 50% voting power.

Precious Metals.—An 8-year decline in gold production was reversed in 1973 when output increased 16% in response to a sharp worldwide increase in gold prices. Placer operations accounted for 80% of production. The output of silver and platinum also increased, by 8% and 9% respectively. Most of the gold and silver and over one-third of the platinum was mined by five companies, all owned or controlled by International Mining Co. (IMC), a U.S. concern.

In July 1973, the Minister of Mines placed a bill before the Colombian Con-

gress which sought to expropriate without compensation all installations and mining rights of three IMC gold, silver, and platinum mining companies. The three firms involved in the attempted expropriation were Cia. Minera Chocó Pacífico, Frontino Gold Mines Ltda., and Pato Consolidated Gold Dredging Ltda. Combined, these companies traditionally dominated the precious metal industry of Colombia, accounting for approximately 60% of the country's gold and silver production and about 40% of its platinum output. The expropriation move followed the collapse of negotiations in early 1973, when the Government attempted to gain 51% controlling interest in the three companies. Congress adjourned in December without taking any action on the expropriation bill. Meanwhile, IMC was considering sale of its operations to a consortium of private Colombian interests.

Also during 1973, IMC closed its gold dredging operations at Nariño after 36 years of production. The two dredges operating at Nariño were sold and transferred to other Colombian dredging companies.

NONMETALS

Asbestos.—Work continued on the Las Brisas asbestos project, which will be the only operating asbestos mine in the Andean chain when completed. The project is located in the Department of Antioquia, and is designed to process up to 63,000 tons of ore annually. Reserves are estimated at 18.2 million tons of ore with a fiber content of 4.3%. Mining and milling facilities are to be operated by Asbestos Colombianas, S.A., in which Nicolet Industries Inc. of Ambler, Pa., owns a 70% interest and private Colombian investors hold the remaining share. Total investment is estimated to be about $11 million. The Colombian market for asbestos will be reserved exclusively for the Las Brisas owners when production begins, but about half of the production will be exported.

Emerald.—In July 1973, the Government closed its emerald mines north of Bogotá in order to halt violence, smuggling, and black market activities in the mining area. Over 100 deaths associated with the mining and transport of emerald were reported for 1972. The Army took control of the Government's 50,000-acre mining area, which was the world's principal source of emerald at the time operations ceased. The mines remained closed at yearend, although the Government announced plans to lease the mines to private investors.

Fertilizer Materials.—In a continuing effort to reduce dependence on fertilizer imports, the Government in 1973 considered plans to construct a fertilizer plant at Barranquilla. The plant, projected to cost $60 million, would be built with technical assistance from the Netherlands. Private Colombian investors and Instituto Venezolano de Petroquimica (IVP), a Venezuelan Government organ, would own and operate the plant if constructed.

Other fertilizer projects which were under government study in 1973 concerned phosphate rock deposits located in the northeastern part of the country, particularly the Departments of Boyacá and Santander. In this area, proven reserves are about 19 million tons with possible reserves of 127 million tons. Tentative plans were also made to build an ammonia plant for fertilizer production in order to take advantage of Texaco's new gasfield discovered in the Department of Guajira.

Salt.—Salt production, virtually all from government-owned facilities, increased by 28% in 1973. Almost two-thirds of production came from marine operations along the Caribbean coast, where new facilities were installed to increase output. Additional facilities to increase marine production for export purposes were under study by the Government at yearend. Inland production, limited by labor problems in recent years, also increased notably in 1973.

MINERAL FUELS

Coal.—Final contract negotiations between IFI and the Peabody Coal Co. of the United States for development of the El Cerrejon coal deposits in the Department of Guajira continued through 1973. Surveys of the deposits indicate measured reserves amounting to 90 million tons of high-quality bituminous coal with less than 6% ash and 1% sulfur and having a heating value of 13,000 British thermal units (Btu) per pound. Part of the reserves are recoverable only by underground mining, but strip mining methods reportedly would be economical for over 10 years. Total cost of development is estimated to be at least $120 million, but initial output is to ex-

ceed 5 million tons per year from open pit mines.

Agreements signed thus far reveal that the project will initially evolve in three stages: (1) Peabody will commence exploration which will cost up to $300,000, equal to the amount already expended by IFI, (2) IFI and Peabody will establish a joint-venture company which will make feasibility studies up to initiation of mine construction, and (3) pending final agreement, Peabody will provide necessary technical and administrative services. IFI and Peabody will be equal partners, each with 40% to 47% ownership, while private Colombian investors will hold the remaining shares.

Also during 1973, Colombia and Brazil established a joint concern to develop Colombian coal reserves near Cúcuta. The two countries are to invest $2 million in feasibility studies, with initial mining operations scheduled for 1974. Colombia will own a 51% interest in the joint operation. The coal will be transported by rail to Cartagena for export to Brazil's planned Itaquí steel plant. Plans envision 240,000 tons of exports beginning in 1977 with shipments continuing for 20 years. In return, Brazil is to supply Colombia with iron ore and steel products.

Petroleum and Natural Gas.—Total output of crude oil in 1973 decreased by more than 6%, a decline for the third consecutive year following peak production in 1970. This trend of declining production reflects diminishing output from older producing fields and a lack of new exploration and development efforts. Exploration and development drilling in 1973 decreased to 17 and 24 wells respectively. The number of exploration wells, the same as the number drilled in 1965, was the lowest for Colombia in over 30 years. Primary reasons for the decline in exploration included low profit levels, complex geological structures, remote locations, and generally unsuccessful exploration projects in recent years.

Production of natural gas declined by 2% in conjunction with the decrease in crude oil output. Natural gas production principally was from oilfields where, in a number of cases, gas-oil ratios have been rising steadily as reservoirs are depleted. Output of natural gas liquids decreased by only 1% in 1973. Proved reserves of crude oil reportedly were revised downward to 688 million barrels at yearend 1973. As of the same date, proved reserves of natural gas were reported at 1,634 billion cubic feet.

To stimulate new production, the Ministry of Mines at yearend 1973 was contemplating Government-controlled price rises for crude oil sold to refineries. The price of crude sold to refineries during 1973 was fixed at $1.64 per barrel, among the lowest in the world. Comprehensive revision of Colombia's petroleum pricing policies was delayed by the Ministry to await the outcome of national elections in April 1974.

Also at yearend, Empresa Colombiana de Petróleos (ECOPETROL), the government-owned oil company, was negotiating with the Texas Petroleum Co. (TEXPET) for marginal crude oil production at its Co-

Table 3.—Colombia: Salient statistics of the petroleum and natural gas industry

	1971	1972	1973 p
Crude oil:			
Production ——thousand 42-gallon barrels——	78,101	71,674	67,089
Delivered to refineries ——do——	53,048	56,657	56,966
Exported ——do——	r 25,393	14,924	9,505
Natural gas:			
Production ——million cubic feet——	111,288	115,622	113,229
Consumption [1] ——do——	r 50,853	60,787	59,966
Injected ——do——	r 33,071	30,474	30,058
Flared ——do——	23,027	19,727	18,125
Natural gas liquids:			
Production ——thousand 42-gallon barrels——	r 3,628	2,962	2,932
Delivered to refineries ——do——	e 900	e 1,150	1,434
Refinery products:			
Refinery output [2] ——do——	56,024	59,334	58,437
Consumption [3] ——do——	37,462	38,972	42,743
Exported ——do——	r 11,827	12,427	10,523

e Estimate. p Preliminary. r Revised.
[1] Includes oil company use for fuel.
[2] Includes refinery losses and refinery fuel, but not treatment of natural gas liquids.
[3] Excludes LPG, aviation fuel to international carriers, and bunker sales.

corna Field. ECOPETROL had previously contracted with Colombia Petroleum (COLPET) for marginal production from its Boquete Field at the rate of $2.36 per barrel. The marginal production contracts are based on remunerative prices rather than world price scales. On the average, approximately 1,000 barrels per day of marginal production was financed by ECOPETROL in 1973 to limit production declines.

In contrast to declining production, refined product consumption continued to increase, rising by over 6% during 1973. Consumption is expected to surpass production by 1976 if present trends continue.

During 1973, TEXPET apparently discovered a major new gasfield in the Department of Guajira. The field, named the Chuchupa gasfield, is both onshore and offshore in the vicinity of the coastal town of Riohacha. Government and industry sources estimate that the field has reserves of 3,000 billion cubic feet with a production capacity of about 500 million cubic feet per day. At yearend, drilling was underway to clearly define the field and explore the surrounding area. TEXPET has obtained leases covering about 1 million acres in the Guajira region.

In September 1973, ECOPETROL, Cayman Corp., and City Investing Co. purchased Gulf Oil Corp.'s 50% share of the 50,000-barrel-per-day Putumayo Basin Fields. TEXPET operates the fields, the largest in Colombia, and owns the remaining half share. In addition to half of production, the purchase included developed and undeveloped concession areas, production facilities, and a 100,000-barrel-per-day trans-Andean pipeline shared equally with TEXPET. ECOPETROL owns 50% of the purchased properties, while Cayman and City Investing own 40% and 10% respectively.

A five-company international combine headed by Cayman Corp., formed in early 1973, began exploration of a 3-million-acre concession in the Napo-Putumayo Basin of southwestern Colombia. Cayman acquired the concession in 1972, and believes that the area contains numerous petroleum deposits that could each economically deliver up to 7,000 barrels per day. The first Cayman well, brought in at yearend, tested out at 1,750 barrels per day. In addition to Cayman, with 25% ownership, the partners in the exlporation venture include City Investing Co. (U.S.), 25%; Total Exploration (France), 25%; Reserve Oil and Gas Co. (U.S.), 12.5%; and Fuyo Petroleum Development Corp. (Japan), 12.5%. ECOPETROL will participate in the development of any commercial oil or gas found by the consortium and will receive a share of the production. If established, commercial production is to be transported to ECOPETROL's planned Tumaco refinery via the trans-Andean pipeline. The concession is located along the Colombia-Ecuador border between Cayman discoveries in Ecuador and Colombia's highly productive Orito oilfield. Concession acreage is divided into two areas of roughly 220,000 acres each, plus a 2.5-million-acre seismic option area. The combine can select at least 50% of the seismic option block for exploratory drilling after completion of the seismic program which has begun. Cayman indicated that initial exploration, both seismic work and drilling, will require expenditures of $5 million. Completion of the exploration program will require at least 2 years. Petty Geophysical Co. (U.S.) has been selected as the seismic contractor.

During 1973, ECOPETROL granted an exploration contract for over 2.2 million acres in the Putumayo Basin to Cenard Oil and Gas Co. of Dallas and FMF Corp. of Great Falls, Va. The contract provides for 2 years of seismic work and 6 years of exploration. Development and production of 28 years is permitted if commercial discoveries are made.

Also in 1973, ECOPETROL and Société Nationale des Pétroles d'Aquitaine (SNPA), a French company, signed a contract for petroleum exploration over a region of 4 million acres in the Departments of Bolívar, Sucre, Magdalena, and Atlántico. SNPA is to spend about $2 million on a general seismic survey of the exploration area.

During 1973, ECOPETROL and the Government of Ecuador discussed possible Colombian purchases of prospective crude production from Cayman holdings in northwestern Ecuador. Cayman's initial production is expected to be about 25,000 barrels per day. If a purchase agreement is reached, a pipeline is to be built from Cayman's Fields to the Colombia-Ecuador border 40 miles away. From the border, oil would move via a large planned pipeline,

or through existing smaller lines to the trans-Andean pipeline. The oil is expected to supply ECOPETROL's planned refinery at Tumaco on the Pacific coast.

At yearend 1973, ECOPETROL was awaiting the results of its bid to purchase the 46,000-barrel-per-day Cartegena refinery owned by International Petroleum Colombia, Ltd. (INTERCOL). ECOPETROL proposed an equal partnership of the two parties, and offered to make an initial investment of $12 million to help finance expansion of the refinery to 60,000 barrels per day. Total sale price was to be $40 million, payable over a period of 5 years. By purchasing the Cartagena refinery, ECOPETROL would own 95% of the country's refining capacity and could achieve greater coordination of crude and product supply.

During 1973, several refinery and petrochemical projects estimated to cost approximately $375 million were in progress or under consideration by the Government. Refinery projects included plans for a 75,000-barrel-per-day refinery at Tumaco and a 25,000-barrel-per-day refinery at Neiva. ECOPETROL opened bidding in November for construction contracts on the Tumaco refinery, which is scheduled to be completed by early 1978. Cost of the project, including a products pipeline to Cali, is estimated at $120 million. The Neiva refinery is a 50–50 joint venture between Tennessee Colombia S.A. (TENNECOL) and Petróleos Brasileiro S.A. (PETROBRAS), the state oil company of Brazil. Tentative plans indicate a cost of $25 million and call for construction to begin in mid-1974.

Expansion of ECOPETROL's Barrancabermeja refinery by adding a turbo-expander and a balance unit was also planned during 1973. The additional units, to be installed by late 1977 at a cost of $80 million are expected to increase the output of gasoline and liquefied petroleum gas (LPG) at the expense of some fuel oil production. Construction bids are to be accepted by ECOPETROL until April 1974.

Plans for a refinery at Cali, under consideration for several years, were discarded by ECOPETROL in 1973. Instead, a 50,000-ton-per-year terephtalic acid plant was proposed to replace the refinery. The plant would be supplied by a products pipeline from the planned Tumaco refinery, and its output would be utilized domestically as a raw material in the manufacture of polyester fiber. If constructed, total cost of the plant would be $58 million, half derived from foreign investment. Expansion of the proposed Tumaco refinery was also under consideration at yearend as a means to offset abandonment of Cali refinery plans.

In addition to the above refinery projects, plans to construct several petrochemical plants were studied by ECOPETROL in 1973, but no firm decisions were made to proceed beyond the planning stage. These plans included a 230,000-ton-per-year aromatics facility at Tumaco, and both a high-density polyethylene plant and paraxylene plant for Barrancabermeja. The Barrancabermeja plants would cost a total of $70 million and annually produce 50,000 tons of polyethylene and 35,000 tons of paraxylene. U.S. firms and a Japanese concern also were discussing the possibility of a joint-venture polyethylene plant with ECOPETROL at yearend.

Additionally, two projects were considered during 1973 by ECOPETROL under a program to expand existing petrochemical facilities at Barrancabermeja. These included expansion of a low-density polyethylene plant by 40,000 tons per year, and expansion of an ethylene plant by 100,000 tons per year. The cost of the former project is estimated to be $15 million, while cost of the latter is estimated at $30 million.

Table 4.—Colombia: Summary data on companies producing and/or refining crude oil during 1973

Company	Principal ownership or affiliation	Nationality of ownership	Crude oil production during 1973 (thousand 42-gallon barrels)	Refining capacity as of Dec. 31, 1973 (thousand 42-gallon barrels per day)
Antex Oil and Gas Co., Inc.[1]	Petroquimica del Atlantico and U.S. citizens.	Colombian-United States.	--	2
Chevron Petroleum Co. of Colombia.	Standard Oil Co. of California.	United States	7,666	--
Colombia-Cities Service Petroleum Corp. (COLCITCO).	Cities Service Co., ECOPETROL, AMOCO, and ARCO.	Colombian-United States.	2,305	--
Colombian Petroleum Co. (COLPET).	ECOPETROL and Texaco, Inc.	do	6,357	6
Empresa Colombiana de Petroles (ECOPETROL).	Colombian Government	Colombian	9,740	160
International Petroleum Colombia, Ltd. (INTERCOL).	EXXON Corp	United States	--	5
Provincia Petroleum Co	International Petroleum Colombia, Ltd., and British Petroleum Co., Ltd.	United States-British.	7,173	--
Shell-Condor, S.A	Royal Dutch/Shell Group	British-Dutch	6,115	--
Tennessee Colombia, S.A. (TENNECOL).	Colombian citizens and PETROBRAS.	Colombian-Brazilian.	1,663	--
Texas Petroleum Co. (TEXPET).	Texaco, Inc	United States	8,277	2
Texas Petroleum Co., ECOPETROL, and Cayman Corp.	Texaco, Inc., ECOPETROL, and Cayman Corp.	Colombian-United States.	17,792	1
Total			67,088	176

[1] Production included with TENNECOL.

The Mineral Industry of Cyprus

By E. Shekarchi [1]

The economy of Cyprus continued to surge forward during 1973. The contribution of the mining industry to the economy, however, was at its lowest point in the past 7 years. Only the higher prices obtained for copper and chromite kept mining an effective factor in the island's economy. To attract potential foreign investors, the Cyprus Government initiated a program of incentives broadly matching those offered domestic investors. Incentives included free entry of capital goods, the offer of a building site or a building in an industrial estate at low rent, rapid depreciation allowances, and the possibility of tariff protection during the industries' formative years.

The text of the 5-year Development Plan (1972–76) was published in March 1973. The plan envisages annual average growth rates of some 7.5% for the gross domestic product (GDP) and 7.2% for the gross national product (GNP). Per capita GNP at 1970 prices is projected to increase from $1,116 [2] in 1971 to $1,477 by 1976. Also financial resources are expected to increase at an annual rate of 7.3%, rising from $744 million in 1971 to $1,056 million in 1976. Of the total available resources during the plan period, 78% will be used to finance consumption expenditure while 22% will be used to finance gross fixed investment and changes in stocks. By the end of 1976, 22% of available resources will be used to finance fixed capital development compared with 20.1% in 1971.

The Geological Survey Department (GSD) continued survey work for the Government as well as consulting work for private companies. Detailed geological mapping, geochemical prospecting, and drilling, which were started in the Limassol Forest in 1972, continued in 1973, according to GSD. The Limassol Forest is underlain by a plutonic complex, in which some evidence of chromium, nickel, cobalt, and copper mineralization was found.

Consulting services on mineral exploration rendered to private companies included drilling for cupreous pyrite, cement raw materials, chromite, nickeliferous pyrrhotite, and bentonite clays. Total area covered by the GSD services was about 22 square miles, accompanied by 10,000 feet of drilling.

The Senior Mines Officer, in his annual report, summarized the exploration activities of Cyprus by stating that 92 licenses were issued, covering copper, chromite, gravel and sand, marble, gypsum, clays, limestone, and umber and ocher.

An agreement between Cyprus and the European Community (EC) was formally signed in 1973. Under the agreement virtually all trade barriers between Cyprus and the EC were to be removed in two phases. In the first phase the EC reduced 70% of its tariffs on all industrial products while Cyprus reduced by 75% of its tariffs. Details of the second phase, were still under negotiation in 1973.

PRODUCTION

The pattern of mineral output in Cyprus in 1973 was generally similar to that of 1972. Production of chromite and cement continued to increase at a rapid rate, chromite by 28.4% and cement by 38%. Production of pyrite decreased 42.9% compared with 1972 output. The island's only petroleum refinery operated for a second year at close to 95% capacity.

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[1] Physical scientist, Division of Ferrous Metals—Mineral Supply.

[2] Where necessary, values have been converted from Cyprus pounds (£C) to U.S. dollars at the rate of £C1=US$2.84.

Table 1.—Cyprus: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Chromite ore and concentrate (marketable)	[r] 41,910	23,665	[2] 30,387
Copper, mine output, metal content [3]	[r] 20,273	18,946	[2] 19,158
NONMETALS			
Asbestos	27,697	29,780	[2] 29,000
Cement, hydraulic	303,250	322,327	[e] 445,000
Clays, crude:			
Bentonite [2]	12,564	10,921	8,883
Other (unspecified) [e 4]	221,500	479,154	NA
Gypsum:			
Crude	[r] 9,107	11,665	[e] 12,000
Calcined	8,159	8,179	NA
Lime, hydrated	107,100	83,349	[e] 85,000
Mineral pigments: [2]			
Terre verte	7	8	1
Umber	6,993	10,430	12,675
Yellow ocher	482	876	640
Pyrites:			
Gross weight	[r] 913,536	696,092	[2] 397,175
Sulfur content	[r] 430,254	327,937	[2] 187,173
Salt, marine	6,592	[e] 7,000	[e] 7,000
Stone, sand and gravel:			
Dimension stone, marble	33,205	57,102	NA
Crushed and broken building stone ----thousand tons----	1,302	1,030	NA
Sand and aggregate ----------do----	2,775	2,753	NA
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline ----------thousand 42-gallon barrels--	--	842	942
Jet fuel and kerosine ----------do----	--	483	483
Distillate fuel oil ----------do----	--	1,003	1,148
Residual fuel oil ----------do----	--	1,670	1,307
Asphalt ----------do----	--	205	127
Liquefied petroleum gas ----------do----	--	--	198
Refinery fuel and losses ----------do----	--	310	297
Other ----------do----	--	--	460
Total ----------do----	--	4,513	4,962

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

[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] Exports.

[3] Includes copper content of copper concentrates, cupriferous pyrite, ore, and cement copper produced; excludes content of iron pyrite.

[4] Estimates of Senior Mines Officer, Republic of Cyprus, for 1971 and 1972.

TRADE

Exports in 1973 totaled 531,000 tons of minerals with a total value of $26.3 million. The most important mining products exported in order of value were cupreous concentrates, asbestos, copper precipitates, and iron pyrites.

According to the annual report of the Senior Mines Officer, a sharp decline in mineral exports was experienced. Quantity of mineral products exported in 1973 fell 113,000 tons from the 644,000 tons exported in 1972.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum, scrap	111	162	Lebanon 70; Israel 38.
Chromium, ore and concentrate	42,951	23,692	Austria 10,069; Canada 6,096; Norway 5,000.
Copper:			
Concentrate	51,446	65,776	West Germany 27,260; Spain 15,965; U.S.S.R. 14,500.
Cement	9,201	5,836	All to West Germany.
Cupreous pyrite	74,513	46,718	West Germany 22,002; Italy 12,700; Netherlands 12,016.
Metal, scrap	365	--	
Iron and steel:			
Scrap	6,393	3,148	Greece 2,143; Italy 999.
Semimanufactures, tubes, pipes, fittings	652	106	Mainly to Israel.
Lead, scrap	141	370	Netherlands 213; Italy 129.
Zinc, scrap	235	--	
Other, waste and scrap of base metals	22	--	
NONMETALS			
Asbestos, crude	22,612	27,988	United Kingdom 8,896; Denmark 8,483; Lebanon 1,942.
Cement	--	29,106	All to Libya.
Clays and clay products, refractory	12,564	11,044	Mainly to Israel.
Gypsum	--	116	Libya 96; Syria 20.
Lime	11,483	3,465	Israel 2,930; Libya 508.
Pigments, mineral	7,475	11,306	United States 7,837; United Kingdom 1,799.
Pyrites, unroasted	611,842	460,170	Turkey 135,550; France 94,823; Italy 85,533.
Stone, gravel, crushed stone	1,444	1,507	Israel 1,253; Libya 254.

[1] Includes reexports.

Table 3.—Cyprus: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum including alloys all forms	1,274	1,555
Copper:		
Copper sulfate (including alums and persulfates)	755	548
Metal, including alloys, all forms	259	292
Gold, including platinum-plated, unwrought and semimanufactures troy ounces	21,043	22,856
Iron and steel:		
Scrap	22	--
Pig iron (including cast iron) and ferroalloys	235	181
Primary forms	105	93
Semimanufactures	95,548	115,073
Lead:		
Oxides	160	164
Metal, including alloys, unwrought and semimanufactures	492	334
Nickel, including alloys, unwrought and semimanufactures	7	10
Platinum group and silver metal, including alloys:		
Platinum group troy ounces	7	--
Silver do	146,107	251,677
Tin, including alloys:		
Scrap long tons	5,517	597
Unwrought and semimanufactures do	397	388
Titanium oxides	122	175
Zinc:		
Oxide and peroxide	17	--
Metal, including alloys, unwrought and semimanufactures	364	452
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	14	--
Grinding and polishing wheels and stones value	$77,191	$91,358
Barite and witherite	24	25
Cement	33,098	8,901
Chalk	369	575
Clays and clay products (including all refractory brick):		
Crude, n.e.s	97	279
Products:		
Refractory (including nonclay bricks) value	$211,591	$100,106
Nonrefractory do	$798,350	$1,096,469
Diamond, gem, not set or strung do	$15,869	$10,351
Diatomite and other infusorial earth	55	119

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

Commodity		1971	1972
NONMETALS—Continued			
Fertilizer materials:			
Manufactured:			
Nitrogenous		41,862	42,864
Phosphatic		14,724	9,138
Potassic		1,623	1,839
Other, including mixed		36,136	38,334
Ammonia		32	25
Gypsum and plasters		69	22
Pigments, mineral:			
Natural, crude		188	175
Iron oxides, processed		19	--
Precious and semiprecious stones, except diamond:			
Natural	value	$19,226	$27,701
Manufactured	do	$26,717	$22,051
Salt and brine		439	490
Sodium and potassium compounds, n.e.s		363	429
Stone, sand and gravel:			
Dimension stone		r 1,105	885
Gravel and crushed rock		647	--
Sand, excluding metal bearing		44	--
Sulfur:			
Elemental, other than colloidal and other		1,735	2,256
Sulfur dioxide		85	133
Sulfuric acid, oleum		211	314
Talc, steatite, natural		482	301
Other n.e.s., building materials of asphalt, asbestos, and fiber cement		4,544	6,873
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural		8,847	623
Coal, including briquets, all grades		95	98
Coke and semicoke		487	625
Peat, including briquets and litter		--	621
Petroleum:			
Crude	thousand 42-gallon barrels	(1)	--
Refinery products:			
Gasoline (including natural)	do	921	221
Kerosine and jet fuel	do	472	134
Distillate fuel oil	do	974	169
Residual fuel oil	do	1,895	969
Liquefied petroleum gas	do	277	197
Lubricants	do	42	54
Mineral jelly and wax	do	4	2
Asphalt and bitumen	do	64	15
Other nonlubricants	do	4	1

r Revised.
1 Less than ½ unit.

COMMODITY REVIEW

METALS

Chromite.—Hellenic Mining Co. Ltd. (HMC) remained the sole producer of chromite on the island. It extended its Kannoures chromite lease for another 13 years, until 1986. The company's annual production for 1973 was approximately 32,000 tons, nearly 28% higher than in 1972. About 30,000 tons of chromite were exported in 1973, mainly to Austria, Canada, and the Scandinavian countries.

Copper.—Cyprus Island Division (CID), a subsidiary of Cyprus Mines Corp. (CMC), has owned and operated copper mines successfully on the island for more than 50 years. In 1973, CID mined copper- and sulfur-bearing ore, containing small amounts of gold and silver, from two mines, Skouriotissa and Lefka. Although reserves of these two mines were exhausted during the year, the company continued mining the lower grade sulfides from an adjoining area. It is expected that the lower grade ore will assure 5 more years of operation. The Xeros concentrator processed 802,000 tons of ore with an average grade of 1.16% copper and 20% sulfur in 1973. The pressure-leach plant at Morphu treated 370,000 tons of tailings produced in earlier years, containing 0.66% copper and 25% sulfur. Total copper produced in CID's Xeros concentrator and the pressure-leach plant amounted to 20.6 million pounds which was sold at an average price of $0.837 per pound.

Encouraged by the continuing high prices and increased demand for copper, CID performed extensive geochemical, geophysical, and drilling work around its

concession, in search of deposits that would prolong the company's operating life beyond the predicted 5 years. A total of 2,775 feet, in 8 holes, was drilled during the year.

HMC, the next largest copper producer on the island, produced copper from the Mousoulos underground mine and from the Mathiati and Alestos opencast mines. Limited copper production was reported from the newly developed Kokkinoyia mine.

The company's exploration and prospecting activities were carried on in nine concessions. At these concessions, 11 holes totaling 18,900 feet were drilled in 1973. By yearend, HMC applied for and received extensions on leases in Kalavassos, Mitsero and Memi, for 20, 25, and 20 years, respectively.

Kampia Mines Ltd.'s exploration activities, which started in 1972, continued in 1973. After drilling 4,947 feet in 14 holes, the company was able to block out two copper-zinc ore bodies in their Peristerka and Pitharohoma concessions. During 1973, estimation of the size of the ore bodies, as well as feasibility studies for a washing and flotation plant to produce copper and zinc concentrate, continued.

Cyprus Sulfur and Copper Co. operated two mines, Limni and Evloimeni, in the western part of the island during the year. The company produced copper concentrate and iron pyrite. Development work was carried on only at the Limni mine.

NONMETALS

Asbestos.—Cyprus Asbestos Mines Ltd., the largest asbestos producing company on the island, continued its operations during the year. The company's total production of 29,000 tons was about equally divided between short-fiber and long-fiber asbestos. The main recipients of Cyprus' asbestos were the United Kingdom, Denmark, Sweden, and six other nations in 1973. The company employed 367 people in its various installations. Consulting work of the Geological Survey of Cyprus continued at the company's Amiandos mine during the year.

Cement.—Production of cement was 38% higher in 1973 than in 1972. The increase was due to a favorable export market as well as a greater demand by the local construction industry.

Two companies produced cement during the year, the Cyprus Cement Co. Ltd. and Vassiliko Cement Works Ltd. Most of the kiln feed used by both companies, which included limestone, clay, gypsum rock, and silica sand was mined on the island. The abundance of feed material promises brighter years ahead for cement producers. Also, with the Suez Canal reopening in the near future, cement products can be exported to Middle East markets.

Gypsum.—United Gypsum Ltd. remained idle during the year with no prospecting or drilling activities. Available stocks of the company were reported to be about 10,000 tons. However, with recent activities to clear up the Suez Canal, the company was preparing to expand its gypsum production in 1974.

The Limassol Chemical Products continued quarrying gypsum rock in 1973. Most of the company's final product was consumed locally in plaster.

Lime.—The Akamas Lime Co. modern new kiln situated near Limni mine produced close to 4,000 tons of lime during the year.

Kythria Lime Co. was dissolved in the latter part of 1972. During 1973 the partners of this company organized two distinct and separate companies, which were to carry on the functions of the old company.

Total production of lime in 1973 was estimated at 85,000 tons, a slight increase over 1972 output.

Pyrite.—Iron pyrite produced by HMC and CMC totaled 397,000 tons in 1973, a drop of 43% compared with 1972 production. CMC attributed the decrease to reduced markets and to low-grade ore. In 1973, CMC decided that it will not produce iron pyrite in the pressure-leaching plant until market conditions improve. Meanwhile the company's exploration group was seeking favorable concession areas, as well as high-grade ore near the Skouriotissa and Lefka mines.

Most of HMC's production was from two mines, Mathiatis and Memi. Owing to market conditions HMC shipped only 90,000 tons in 1973, which was the lowest quantity shipped in the last 5 years.

MINERAL FUELS

Petroleum.—The oil exploration license of the Forest Oil Corp. of Delaware, covering a 10-year period, expired in 1973.

The company had drilled several wells near Lefkoniko, without much success.

The Cyprus Government. with expert help from the Commonwealth Assistance Program, of the United Kingdom, drafted an Offshore Oil Exploration law. The draft law was approved by the Council of Ministers in 1973 and was expected to go to the Cyprus Parliament in early 1974.

According to Cyprus' Senior Mines Officer, the Government planned to sign the International Continental Shelf Convention, which will permit opening up to exploration the island's shelf to a median line between Cyprus and neighboring countries. By the yearend, several international companies had made application for specific offshore areas, while others had applied for areas to be indicated after promulgation of the requisite legislation.

Under the new law, licensees will be required to drill a fixed number of wells during a specified period following the completion of seismic studies and to employ and train Cypriots.

Petroleum consumption of Cyprus during 1973 was about 829,000 metric tons. Of this total, 660,000 metric tons was refined by CPR, 152,000 metric tons was imported in the form of light products, and 88,000 metric tons was from the Soviet Union in the form of heavy fuel oil for use by the Electricity Authority.

A tentative petroleum agreement was signed between the Libyan and Cyprus Governments in 1973. Under the agreement the Libyan Government will make 150,000 metric tons of crude oil available to Cyprus. This crude will be refined outside Cyprus and will be imported to the country as refined products.

Refineries.—Cyprus Petroleum Refinery, Ltd. (CPR), owned by Shell Oil Co., 25.5%; British Petroleum Co., Ltd., 25.5%; Mobil Oil Corp., 34%; and the Cyprus Government, 15%, was operated at near capacity during the year. Most of the refinery's output was consumed locally.

The Mineral Industry of Czechoslovakia

By Boteo A. Tachkov [1]

The Czechoslovak economy continued to grow in 1973, although at a slower pace. Production of most minerals reached new highs. The expansion, however, has been limited to largely quantitative achievements. The continued mining of low-quality ores and the inadequacy of equipment persisted throughout the year. As a result, the growth of the mineral industry lagged behind the growth of the total industrial sector (6.3%) and productivity was below the average.

The mineral industry was disrupted by shortages of cement, pipe, raw materials, and particularly electric power. From 1967 to 1973, demand for electric power in Czechoslovakia increased 44%, but capacity was inadequate and could not supply enough electric power to maintain continuous, uninterrupted service. The capacity deficit, at peak hours, was estimated at 400 megawatts.

As a result of these shortages, work at the most important mineral industry construction sites fell behind schedule. Delays in completion were reported at the East Slovak iron works, the Tusimice power station, the Dalesice hydroelectric plant and the Bratislava petro chemical combine.[2]

In an effort to improve the management in the mineral industry in 1972, responsibility for ore mining was placed in the Federal Ministry of Metallurgy and Engineering under the General Directorate of Ore Mines and Magnesite Plants in Bratislava.

The administration's policy of closing inefficient mines continued in 1973. Mining was suspended at the Barrandian iron ore deposits (and ore processing ceased at the Krupp-Renn plants). The gold mining operations in the Jilove and Kremnica Basins and many graphite, lead-zinc, and antimony mines were also closed. As a result, about 4,500 workers lost their jobs. The closing of inefficient mines was to continue throughout 1974 when eight additional mines employing 1,800 workers were scheduled to close. The closing policy does not affect producers of coal, oil, gas, and some nonferrous minerals for which different criteria applied.[3]

Czechoslovakia, which is relatively poor in mineral resources, produces only 6% of its iron and manganese ores requirements, 20% of its requirements for fluorspar, and 35% of its requirements of pyrite concentrate for sulfuric acid production. Indigenous production, however, supplies all of the country's requirements for antimony, mercury, magnesite, talc, quartzite, foundry graphite, limestone, and coal. In addition, Czechoslovakia is an important world magnesite exporter.

To improve the domestic mineral resource position, a new minerals exploration program was launched in 1973. The program includes geological surveys and technical

[1] Foreign mineral specialist, Division of Fossil Fuels.—Mineral Supply.

[2] Rude Pravo (Prague). Jan. 25, 1974.

[3] Obdrzalek, M. Soucasny Stav a Predpoklady Dalsího Rozvoje Rudného Hornictví v CSSR (Present State and Presumptions for Future Development of the Czechoslovak Ore Mining Industry). Ch. in Sbornik Vedeckych Prachi Vysoké Skoly Bánské v Ostrave (Transactions of the Institute of Mining and Metallurgy at Ostrava), Prague, v. 19, February 1973, p. 93.

development, and is designed to increase mineral supplies by 1990, as follows:

Commodity	Increase in resources 1970–90 (percent)
Copper concentrate	24
Iron ore	36
Lead	59
Magnesite	86
Tin	1,530
Tungsten	2,650
Zinc	88

Sources: Obdrzalek, M. Soucasny Stav a Predpoklady Dalsího Rozvoje Rudného Hornictví v CSSR (Present State and Presumptions for Future Development of the Czechoslovak Ore Mining Industry). Ch. in Sbornik Vedeckych Prachi Vysoké Skoly Bánské v Ostrave (Transactions of the Institute of Mining and Metallurgy at Ostrava), Prague, v. 19, February 1973, p. 93.

While the integration of the Czechoslovak economy into COMECON[4] continued, a substantial increase was realized in the trade with the West. In 1973, it reached 31.7% of the total trade turnover compared with 28.7% in 1972.

[4] COMECON or CMEA (Council for Mutual Economic Assistance) comprises the following countries: Bulgaria, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, and the U.S.S.R.

PRODUCTION

In 1973, Czechoslovakia's output of most minerals exceeded that of 1972. Production at ferrous metals plants increased 5.9%; at ore mining and processing operations, 4.3%; and at nonferrous metals plants, 4.2%. Electric power production increased only 4% (against 8.8% in 1972) and was derived exclusively from greater utilization of steam electric powerplants. One of the largest increases in production (9.5%) was achieved in oil refining. The production of coal, copper ores, lead and zinc ores, and pyrite in 1973 was below the 1972 level.

New productive capacity put into operation during 1973 was as follows: A foundry at the East Slovak iron works; a continuous wire mill in Trinec; a gray cast iron foundry in Hondiu; a coal mine in Stovava; the atomic power station in Saslovska Bohovice; a cement factory in Turna; and the Transit Gas Line from the U.S.S.R. to East Germany.

During 1973, the total investment in new production facilities reached 120,000 million korunas (Kcs), or 8.4% over 1972. However the rate of utilization of production funds decreased, particularly in ore production and nonferrous metallurgy.

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

Commodity [1]	1971	1972	1973 [p]
METALS			
Aluminum:			
Aluminum [e]	75,000	85,000	85,000
Aluminum ingot, primary only	36,942	42,713	42,000
Antimony:			
Mine output, metal content [e]	600	600	600
Smelter [e]	1,300	1,300	1,300
Copper:			
Mine output, concentrate: [e]			
Gross weight	30,676	30,709	[e] 30,700
Copper content [e]	5,300	6,000	6,000
Smelter	4,500	6,000	6,000
Refined, including secondary	17,196	18,068	20,000
Iron and steel:			
Iron ore, gross weight thousand tons	1,609	1,581	1,672
Pig iron and ferroalloys:			
Pig iron do	7,942	8,332	8,534
Blast furnace ferroalloys do	19	28	
Electric furnace ferroalloys do	112	116	[e] 123
Crude steel do	[r] 12,069	12,727	13,158
Steel semimanufactures do	9,525	9,974	NA
Lead:			
Mine output, concentrate:			
Gross weight	8,502	8,195	[e] 8,300
Metal content	5,101	4,917	[e] 5,000
Metal, including secondary	17,609	18,163	18,000
Manganese ore, gross weight [2]	48,000	--	1,000

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS—Continued			
Mercury ---- 76-pound flasks --	5,628	6,614	[e] 7,000
Nickel metal, primary [e] ----	800	800	800
Silver [e] ---- thousand troy ounces --	1,100	1,000	1,000
Tin:			
Mine output, metal content ---- long tons --	166	157	[e] 162
Metal, including secondary ---- do ----	[r] 78	89	[e] 90
Zinc, mine output, concentrate:			
Gross weight ----	17,112	18,525	[e] 18,000
Metal content ----	8,560	9,260	[e] 9,000
NONMETALS			
Barite [e] ----	[r] 7,500	[r] 7,500	7,500
Cement, hydraulic ---- thousand tons --	7,956	8,045	8,381
Clays, kaolin ---- do ----	404	422	450
Fertilizer materials, manufactured:			
Nitrogenous, nitrogen content ----	316,867	343,501	351,000
Phosphatic:			
Thomas slag, P_2O_5 content ----	3,626	3,160	
Other, P_2O_5 content ----	327,176	331,093	336,000
Fluorspar [e] ----	90,000	90,000	90,000
Gypsum and anhydrite, crude ---- thousand tons --	479	501	578
Lime (quicklime and hydrated lime) ---- do ----	2,254	2,420	2,684
Magnesite, crude ---- do ----	619	629	584
Perlite [e] ----	10,000	10,000	10,000
Pyrite:			
Gross weight ---- thousand tons --	352	328	290
Sulfur content [e] ---- do ----	[r] 148	[r] 137	122
Salt ---- do ----	215	224	[e] 220
Sodium carbonate, manufactured ---- do ----	114	120	[e] 125
Stone, limestone and other calcareous ---- do ----	19,444	19,849	19,945
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [e] ----	10,000	15,000	15,000
Coal:			
Bituminous ---- thousand tons --	28,702	27,822	27,779
Brown ---- do ----	81,052	81,726	78,237
Lignite ---- do ----	3,739	3,840	3,012
Total ---- do ----	113,493	113,388	109,028
Coke:			
From bituminous coal:			
Metallurgical ---- do ----	8,613	9,073	[e] 9,200
Gashouse ---- do ----	12	--	--
Unspecified [3] ---- do ----	1,837	1,606	1,631
Total ---- do ----	10,462	10,679	10,831
From brown coal ---- do ----	911	474	[e] 450
Fuel briquets (from brown coal) ---- do ----	1,366	1,343	NA
Gas:			
Manufactured, all types ---- million cubic feet --	[r] 262,563	274,005	NA
Natural, marketed [4] ---- do ----	43,190	41,212	43,267
Petroleum:			
Crude:			
As reported ---- thousand tons --	194	191	199
Converted ---- thousand 42-gallon barrels --	[r] 1,356	1,322	1,376
Refinery products: [5]			
Gasoline ---- do ----	9,979	10,532	[e] 11,000
Kerosine ---- do ----	2,139	2,170	[e] 2,300
Distillate fuel oil ---- do ----	23,917	26,006	[e] 27,300
Residual fuel oil ---- do ----	31,568	27,992	[e] 29,400
Lubricants ---- do ----	[r] 1,119	1,066	[e] 1,100
Liquefied petroleum gas ---- do ----	1,171	1,218	[e] 1,300
Asphalt and bitumen [6] ---- do ----	5,926	7,258	[e] 7,600
Total [5] ---- do ----	75,819	76,242	80,000

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

[1] In addition to the commodities listed, arsenic, gold, feldspar, graphite, uranium, a variety of additional crude construction materials (such as other clays, stone, sand, and gravel) and additional petroleum products are also produced, but information is inadequate to make reliable estimates of output levels.

[2] This material, although reported as manganese ore, is believed to be manganiferous iron ore, with a manganese content of about 17%, and as such is not equivalent to materials reported elsewhere as manganese ore, which generally contain 25% or more Mn.

[3] Derived by subtracting reported metallurgical and gashouse coke from reported total coke output.

[4] Includes gas produced from coal mines; gross output of natural gas is not reported, but it is believed to exceed reported marketed output by only a relatively inconsequential amount.

[5] Data presented are for those products reported in official Czechoslovakian sources and in the Statistical Yearbook of the United Nations; no estimates have been included for other products or for refinery fuels and losses.

[6] Previously reported as natural asphalt rather than under petroleum refinery-derived asphalt.

TRADE

The total trade turnover of Czechoslovakia (exports and imports), reached 71,127 million Kcs of which over 30% was with the main trading partner, the U.S.S.R. About three-fifths of the imports from the U.S.S.R. consisted of raw materials; including 89% of the iron ore imports, 90% of the imported oil, half of the coal imports, and substantial quantities of sulfur and asbestos.[5]

In November 1973, an agreement was signed for Czechoslovak participation in the construction of the Kigembajev plant for producing and processing asbestos in the U.S.S.R. Accordingly, Czechoslovakia will import asbestos products from the U.S.S.R. for a minimum of 12 years.[6]

Most of the imports of copper, zinc, and oil come from COMECON countries, particularly the U.S.S.R., Poland, and Hungary. Recently, however, exploration for minerals was conducted in other countries and included exploration for tin in Nigeria, copper in Zambia and Morocco, lead and zinc in Turkey, tungsten in Portugal, and oil in Iraq and Egypt. According to the contracts, Czechoslovakia would be paid in minerals for the exploration equipment and expertise.

[5] Zahranicni Obchod, Prague, 1974, pp. 1–2.
[6] Work cited in footnote 5.

Table 2.—Czechoslovakia: Exports of selected mineral commodities [1]
(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Oxide and hydroxide	r 3,418	--	
Metal and alloys:			
Scrap	r 1,349	1,693	West Germany 1,011; Austria 682.
Unwrought and semimanufactures [2]	r 11,107	12,435	West Germany 2,474; Switzerland 2,109; France 2,000.
Copper metal and alloys:			
Scrap	r 573	977	All to West Germany.
Unwrought and semimanufactures [2]	r 6,610	7,399	West Germany 5,775.
Iron and steel:			
Ore and concentrate	816	53,513	Austria 31,014; Belgium-Luxembourg 22,399.
Roasted pyrite	r 7,414	--	
Scrap [2] thousand tons	r 233	295	Poland 271.
Pig iron, including cast iron, powder and shot do	19	25	Yugoslavia 21; Austria 4.
Ferroalloys [3] do	r 29	33	West Germany 11; Austria 6; Italy 5.
Steel ingots and other primary forms do	r 343	299	Italy 106; West Germany 99; Yugoslavia 62.
Semimanufactures:			
Bars, rods, angles, shapes and sections [4] do	1,248	1,231	East Germany 148; Poland 125; Canada 81.
Plates and sheets [4] do	663	840	West Germany 196; Italy 139; France 66.
Hoop and strip [4] do	147	207	Yugoslavia 42; Switzerland 31; West Germany 31.
Railway material [4] do	15	11	Romania 5; East Germany 2.
Wire [4] do	66	82	West Germany 19; Hungary 19; Poland 12.
Pipes and tubes [4] do	433	510	U.S.S.R. 339; East Germany 17.
Castings [2] do	r 21	17	All to Poland.
Total do	r 2,593	2,898	
Lead:			
Ore and concentrate	146	3,397	All to Belgium-Luxembourg.
Metal and alloys:			
Scrap	r 203	429	Denmark 282; West Germany 147.
Unwrought and semimanufactures [2]	1,000	259	All to Poland.
Magnesium metal and alloys:			
Scrap	419	982	All to West Germany.
Unwrought and semimanufactures	795	--	
Nickel metal and alloys:			
Scrap	281	1,280	West Germany 1,177.
Unwrought	r 171	--	
Platinum-group metals, unworked and partly worked value, thousands	$282	--	

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Tin ore and concentrate -- long tons --	98	136	All to United Kingdom.
Titanium oxides	r 1,566	1,952	Sweden 493; Italy 425; France 386.
Tungsten ore and concentrate	r 286	169	All to West Germany.
Zinc:			
Ore and concentrate [2]	r 18,947	20,564	Poland 11,390; West Germany 6,148.
Oxide	1,329	2,451	West Germany 1,061; Italy 942.
Metal:			
Scrap	206	--	
Unwrought and semimanufactures [3]	NA	4,900	All to Romania.
Other, n.e.s.:			
Ore and concentrate	20,533	--	
Waste and sweepings of platinum-group metals value, thousands	r $534	$188	All to West Germany.
Ash and other nonferrous base metal-bearing residues	r 4,762	3,999	Austria 3,908.
Metal, unwrought and semimanufactures	NA	308	West Germany 177; Belgium-Luxembourg 131.
NONMETALS			
Abrasives, grinding stones	59	41	All to Italy.
Barite	9,660	13,752	All to West Germany.
Cement, hydraulic -- thousand tons --	r 249	28	Do.
Clays and clay products:			
Crude:			
Fuller's earth [2] -- do --	4	4	All to Poland.
Kaolin [2 3] -- do --	r 97	121	Poland 60; Romania 51; East Germany 10.
Type not specified -- do --	r 376	402	West Germany 209; Austria 44.
Products:			
Nonrefractory -- do --	r 21	21	Austria 6; Yugoslavia 5; West Germany 5.
Refractory -- do --	r 77	70	West Germany 46; Sweden 11.
Diamond, gem and industrial value, thousands	$192	--	
Fertilizer materials:			
Crude	11,340	--	
Manufactured:			
Phosphatic	282	--	
Nitrogenous	--	23,909	West Germany 8,839; Belgium-Luxembourg 4,074; Italy 3,437.
Ammonia	r 4,850	--	
Gem stones, precious and semiprecious, except diamond - value, thousands	r $124	--	
Graphite	r 242		
Magnesite [5] -- thousand tons --	293	207	Poland 64; Hungary 52; East Germany 37.
Mica, all forms	97	20	All to Yugoslavia.
Sodium and potassium compounds, n.e.s.:			
Caustic soda [6]	2,689	--	
Caustic potash [6]	4,704	4,340	All to U.S.S.R.
Stone, sand and gravel:			
Dimension stone, crude and worked	r 44,937	45,508	West Germany 39,851; Netherlands 5,657.
Gravel and crushed rock	r 32,940	26,139	All to West Germany.
Sand	r 26,974	54,066	Austria 43,302; Italy 10,764.
Talc [2]	4,409	3,812	All to Poland.
Other nonmetals, n.e.s.:			
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture	2,629	321	All to Austria.
Slag and ash, n.e.s	17,971		
Unspecified	4,435	3,904	All to West Germany.
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Bituminous [5] -- thousand tons --	3,461	3,310	East Germany 783; Austria 633; Hungary 581.
Lignite [5] -- do --	1,232	1,255	East Germany 1,201.
Coke and semicoke [5] -- do --	2,202	2,417	East Germany 847; Romania 521; Hungary 283.
Gas, natural and manufactured (including liquefied petroleum gas) -- do --	r 17	16	All to West Germany.
Petroleum:			
Partly refined oil thousand 42-gallon barrels	1,558	2,359	Austria 2,345.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products:			
Gasoline thousand 42-gallon barrels	r 341	211	All to Austria.
Kerosine do	11	--	
Distillate fuel oil do	r 2,022	2,911	Switzerland 1,767; West Germany 1,051.
Residual fuel oil do	1,304	582	Austria 519; Italy 63.
Lubricants do	r 53	48	Yugoslavia 36.
Other do	r 716	669	Austria 222; West Germany 207; Yugoslavia 128.
Crude chemicals from coal, gas, or oil distillation	r 71,138	36,497	West Germany 24,319; Yugoslavia 5,336; Italy 5,164.

r Revised. NA Not available.

[1] Because Czechoslovakia publishes only limited data on mineral commodity exports, this table has been compiled from import data of countries trading with Czechoslovakia. For 1971, all entries without a source footnote are from the 1971 edition of Supplement to the World Trade Annual, v. 1 (East Europe), United Nations Statistical Office, Walker and Company, New York, 1974. Except where noted, 1972 entries are from the 1972 edition of the World Trade Annual. Vs. I, II and III, United Nations Statistical Office, Walker and Company, New York, 1974.

[2] Official trade returns of Poland.

[3] Official trade returns of Romania.

[4] Statistics of World Trade in Steel, 1971 and 1972 editions, United Nations, New York.

[5] Statisticka Rocenka Ceskoslovenske Socialistické Republiky, 1973 (Statistical Annual of the Czechoslovak Socialist Republic, 1973), Prague, 1973, 618 pp.

[6] Official trade returns of U.S.S.R.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite and concentrate thousand tons	r 106	173	All from Yugoslavia.
Metal and alloys:			
Scrap	2,254	1,329	All from Austria.
Unwrought [2]	75,900	88,600	All from U.S.S.R.
Semimanufactures [2]	r 19,556	17,905	U.S.S.R. 14,600; Yugoslavia 2,254; West Germany 523.
Chromium, chromite [2] thousand tons	111	104	U.S.S.R. 97.
Copper:			
Ore and concentrate	--	1,294	All from Austria.
Metal and alloys:			
Scrap	351	--	
Unwrought [2 3]	r 50,281	39,274	U.S.S.R. 35,200; Poland 3,491; West Germany 583.
Semimanufactures [2 3]	r 7,750	14,828	Poland 5,831; Yugoslavia 4,330; West Germany 3,715.
Iron and steel:			
Ore and concentrate [2]	r 12,617	13,152	U.S.S.R. 11,393.
Metal:			
Scrap thousand tons	4	2	Mainly from West Germany.
Pig iron [2] do	r 730	805	Mainly from U.S.S.R.
Ferroalloys [2] do	r 104	113	Do.
Steel, primary forms do	1	1	Mainly from West Germany.
Semimanufactures: [4]			
Bars, rods, and sections do	102	104	U.S.S.R. 77; Poland 22.
Plates and sheets do	r 490	356	U.S.S.R. 246; West Germany 70; Austria 7.
Hoop and strip do	r 11	11	Austria 3; Poland 3; West Germany 3.
Railway material do	(5)	(5)	Mainly from Poland.
Wire do	4	4	West Germany 2; Belgium-Luxembourg 1.
Pipes, tubes, and fittings do	r 334	72	West Germany 65.
Castings and forgings do	r 1	1	Mainly from Poland.
Total do	r 942	548	
Lead:			
Ore and concentrate	3,206	--	

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Lead—Continued			
Oxides	r 2,806	3,020	France 1,588; Austria 1,300; Yugoslavia 132.
Metal and alloys, all forms [2]	r 27,069	30,286	U.S.S.R. 24,500; Yugoslavia 5,555.
Magnesium metal and alloys, all forms [2]	852	952	All from U.S.S.R.
Manganese ore and concentrate [6] thousand tons	313	388	U.S.S.R. 260; India 54.
Mercury 76-pound flasks	r 841	NA	
Molybdenum metal and alloys, all forms	3	2	All from Austria.
Nickel metal and alloys, all forms	r 209	90	All from West Germany.
Platinum-group metals and alloys, unwrought and semimanufactures value, thousands	$379	$214	United Kingdom $110; West Germany $104.
Silver and alloys, unwrought and semimanufactures do	r $1,712	$2,461	Netherlands $1,883; Yugoslavia $524.
Tin:			
Oxides long tons	16	36	All from West Germany.
Metal and alloys, all forms do	r 261	698	All from United Kingdom.
Titanium oxides	1,076	726	Italy 380; West Germany 210; United Kingdom 136.
Tungsten:			
Ore and concentrate	r 46	97	West Germany 69; Netherlands 28.
Metal and alloys, all forms	2	2	All from Austria.
Zinc:			
Dust (blue powder)	4,050	2,838	Yugoslavia 1,783; Belgium-Luxembourg 1,055.
Metal and alloys, all forms [2 3]	r 55,385	56,019	U.S.S.R. 29,800; Yugoslavia 17,872; Poland 8,347.
Other:			
Ore and concentrate	r 11,503	[2] 9,651	Finland 9,079.
Oxides, hydroxides, peroxides of metals, n.e.s	939	301	Netherlands 172; Finland 103.
Metals, including alloys, all forms:			
Metalloids	2,230	1,180	All from Norway.
Base metals, including alloys	r 140	103	Belgium-Luxembourg 88; United Kingdom 15.
NONMETALS			
Abrasives, natural, n.e.s.:			
Dust and powder of precious and semiprecious stones value, thousands	$55	$57	All from Switzerland.
Grinding and polishing wheels and stones	r 279	313	West Germany 143; Austria 73; Italy 63.
Asbestos [2]	r 26,341	22,916	U.S.S.R. 21,200.
Barite	1,429	1,456	All from West Germany.
Cement [2 3 7] thousand tons	r 550	436	U.S.S.R. 348; East Germany 86.
Clays and clay products:			
Crude clays	r 12,362	1,391	All from West Germany.
Products:			
Nonrefractory	r 2,812	4,478	Italy 4,131.
Refractory	r 8,219	9,975	West Germany 6,679; France 1,766.
Diamond:			
Gem value, thousands	$82	$138	All from Belgium-Luxembourg.
Industrial do	r $1,274	$1,639	Do.
Diatomite and other infusorial earth	509	1,123	All from Iceland.
Feldspar and fluorspar	r 9,671	12,156	France 7,350; Yugoslavia 2,863; West Germany 1,943.
Fertilizer materials:			
Crude, phosphatic [2] thousand tons	454	416	All from U.S.S.R.
Manufactured:			
Nitrogen, N content [6] do	79	70	U.S.S.R. 59.
Phosphatic, P_2O_5 content [6] do	377	365	U.S.S.R. 169; Morocco 91.
Potassic, K_2O equivalent [6] do	569	611	East Germany 492; U.S.S.R. 119.
Gem stones, precious and semiprecious, except diamond value, thousand	r $276	$240	Switzerland $152; France $88.
Graphite, natural	242	255	All from West Germany.
Lime [3]	86,388	65,940	All from Poland.
Magnesite	917	--	
Mica, worked	8	--	
Pigments, mineral, iron oxides	r 1,492	1,238	All from West Germany.
Pyrite, sulfur content of [6] thousand tons	58	63	U.S.S.R. 60.

See footnotes at end of table.

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

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Salt:			
Rock [7 8]	r 801,442	845,006	East Germany 728,600; Romania 76,000.
Brine [2 3]	r 133,772	111,245	U.S.S.R. 100,700; Poland 10,545.
Sodium and potassium compounds, n.e.s.:			
Caustic soda and caustic potash [3 8]	r 20,131	49,464	West Germany 37,866; Romania 5,900; Poland 5,391.
Soda ash [2 9]	r 49,991	34,061	U.S.S.R. 23,500; Bulgaria 10,561.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	529	5,654	All from Yugoslavia.
Worked	r 398	260	All from Belgium-Luxembourg.
Gravel and crushed rock	1,591	--	
Quartz and quartzite	r 2,985	3,642	All from West Germany.
Sulfur:			
Elemental, all forms [2 3] thousand tons	r 282	322	Poland 187; U.S.S.R. 135.
Sulfur dioxide	338	310	All from West Germany.
Sulfuric acid [2 3] -- thousand tons	r 73	134	U.S.S.R. 112; Poland 22.
Other, unspecified crude nonmetals	45	NA	
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [2 8]	r 20,783	17,400	Romania 8,900; U.S.S.R. 8,500.
Coal and briquets:			
Anthracite and bituminous coal [2 3] thousand tons	5,447	5,535	U.S.S.R. 2,891; Poland 2,642.
Lignite briquets [8] do	787	671	All from East Germany.
Coke and semicoke [2] do	75	70	All from U.S.S.R.
Gas, natural [2] million cubic feet	57,891	68,404	Do.
Petroleum:			
Crude [6] thousand 42-gallon barrels	84,562	92,397	Mainly from U.S.S.R.
Refinery products:			
Gasoline do	r 92	6	All from Yugoslavia.
Kerosine and jet fuel do	8 r 41	NA	
Lubricants do	r 302	367	Austria 260; Yugoslavia 47.
Residual fuel oil [8] do	1,070	1,000	All from Romania.
Other:			
Liquefied petroleum gas do	323	282	All from Austria.
Mineral jelly and wax [7] do	4	4	All from West Germany.
Petroleum coke [7] do	56	53	Do.
Undifferentiated [2 10] do	r 8,004	6,717	Mainly from U.S.S.R.

r Revised. NA Not available.

[1] Because Czechoslovakia publishes only limited data on mineral commodity imports, this table has been compiled from export data of countries trading with Czechoslovakia. For 1971, entries appearing without a source footnote are from the 1971 edition of Supplement to the World Trade Annual, v. 1 (East Europe), United Nations Statistical Office, Walker and Company, New York, 1974. Entries for 1972 appearing without a source footnote are from the 1972 edition of World Trade Annual. Vs. I, II, and III, United Nations Statistical Office, Walker and Company, New York, 1974.

[2] Official trade returns of the U.S.S.R.

[3] Official trade returns of Poland.

[4] Statistics of World Trade in Steel, 1971 and 1972 editions, United Nations, New York, 1972 and 1973.

[5] Less than ½ unit.

[6] Statisticka Rocenka Ceskoslovenske Socialistické Republiky, 1973 (Statistical Annual of the Czechoslovak Socialist Republic, 1973), Prague, 1973, 618 pp.

[7] Official trade returns of East Germany.

[8] Official trade returns of Romania.

[9] Official trade returns of Bulgaria.

[10] Figure indicated for each year includes the difference between official U.S.S.R. exports of crude petroleum to Czechoslovakia and official Czechoslovak imports of crude petroleum from the U.S.S.R.

COMMODTIY REVIEW

METALS

Antimony.—During 1973 production totaled 600 tons, no change from that of the previous year. Although the output amounted to only 0.8% of total world production, it was enough to cover domestic needs. To continue to supply growing requirements, the old and inefficient plant in Vajskove is to be reconstructed. However, future expansion will depend on foreign supplies of raw material because indigenous resources are nearing depletion.

Copper.—The production of copper ore

in 1973 amounted to 657,000 tons or about 15,000 below the 1972 level. Because indigenous production covers only 8% of national demand, authorities are actively searching for new sources. Future production is expected to be concentrated mainly around Borske Hodrus.

Geological tests are to be conducted within the triangle Dobsina-Rudmany-Smolnik where there is a known copper-impregnated amphibolite ore body.

The copper concentrating plant at Krompasich was reported under reconstruction in 1973.

Iron Ore.—The 1973 production of 1,672,000 tons set a new high in Czechoslovakia, although it accounted for only 6% of consumption. The U.S.S.R. provided 79% of the iron ore consumed in Czechoslovakia in 1973. Since 1945, the U.S.S.R. exported about 150 million tons of iron ore to Czechoslovakia. In 1974, a record 12 million tons of iron ore were to be delivered by the U.S.S.R. to Czechoslovakia under long-term contracts in force.

Increased domestic extraction of Slovak siderite ore is expected in the future, and the two main ore-processing plants Rudnany and Nizna Slana are expanding their facilities. Surveys for new resources are to be suspended after completing work at Rudnany, Rosnava, and Nizna Slana.

Iron and Steel.—The production of crude steel in 1973 amounted to 13,158,000 tons, showing a gain of 3.4% over that of 1972; pig iron output amounted to 8,534,000 tons, or 2% above the level of the previous year. With a production of 906 kilograms of steel per capita in 1973, Czechoslovakia ranks fourth in the world.

At present, measures are being taken to improve the quality of the steel produced. Steel for thin sheets was not manufactured before 1966, and all sheet steel used for external parts in cars and other machines was imported. At the East Slovak steel plant, production of cold-rolled thin and extra deep-drawing sheets was initiated for the first time in 1968. In 1973, the production was about 120,000 tons per year. The planned capacity of the plant consists of two-thirds thin cold-rolled sheets and one-third thick or thin hot-rolled sheets. With the completion of the second steelworks and reconstruction of the old one in 1974–75, a substantial improvement is expected in the quality of Czechoslovak steel. The expansion of the plant will increase capacity to 3.6 million tons per year, and employment to 21,000.

During the year, some improvements in structual steel output were accomplished. The total output rose 3.4%, production of thick plate rose 14%; thin sheet, 12.6%; cold-rolled sheet, 20.4%; and steel pipe, 6.5%.

The blast furnaces are also being enlarged and modernized. From the existing 17 blast furnaces in 1973, only 14 furnaces are to be operating in 1990. The consumption of coke per ton of pipe iron is expected to decrease from the present 613 kilograms to 400 kilograms by 1990. The East Slovak plant, which is the most modern steel plant in Czechoslovakia, reportedly consumed 511 kilograms of coke per ton of pig iron in 1973.

Lead and Zinc.—The production of 566,000 tons of lead and zinc ore in 1973 was 18,000 tons less than in 1972. A substantial increase in production is expected with the commissioning of the mine at Banske Stiavnici. The mine at Zlatich Horach is under reconstruction with arrangements for extraction of complex lead-zinc ores and hydrometallurgical processing. Problems were encountered in developing the Pribram mine, which is to compensate for closing the old mines, Anna, Vogtech, Prokop, and 25 Unor.[7]

Tin.—Tin ore output for 1973 contained an estimated 162 long tons of tin metal or 3% more than that of 1972. Mining activities in the future will be concentrated around the newly discovered deposits at Krasno and Cinovec-South. Geological surveys will concentrate in the areas of Banske Stiavnice, Pribramsky, Kutnohorsky, and Severni Moravu.

NONMETALS

Cement.—Despite the production of 8,381,000 tons of cement in 1973, or 336,000 tons more than in 1972, the demand was far from satisfied. The construction of three major new plants that could lessen the cement shortage was behind schedule. Czechoslovakia was scheduled to become self-sufficient in cement by 1975 when new plants will add 2.5 million tons of annual productive capacity.

[7] Page 94 of work cited in footnote 3.

Fertilizer Materials.—Production of 351,000 tons of nitrogenous and 336,000 tons phosphatic (P_2O_5) fertilizers was an increase over that of the previous year. Still it was far below requirements and large quantities had to be imported. Except for deposits of coal, Czechoslovakia has limited reserves of raw materials for fertilizer production. The authorities have avoided coal-based plants as uneconomical, and the primary nitrogen capacity is based on imported natural gas from the U.S.S.R. With the completion of the plants now under construction, Czechoslovakia is to become self-sufficient in nitrogen fertilizers and is also to export fertilizers (largely urea).

The investment in new fertilizer capacity in the period 1971–75 consists of the following:

Location	Product	Capacity (metric tons per year)	Starting date
Sala	Ammonia	272,000	1972
Do	Urea	90,000	1972
Do	Ammonia	287,000	1973
Do	Urea	94,000	1973
Do	Complex	100,000	1973
Do	Ammonium and calcium nitrate	75,000	1975
Semtin	Ammonium phosphates	205,000	1972
Zaluci	Ammonia	272,000	1973
Do	Urea	91,000	1973
Most	Urea	20,000	1973

Source: Nitrogen. January–February–1974.

Magnesite.—The production of 584,000 tons (7% below that of 1972) fully covered the consumption and large quantities were exported. Production is expected to continue its growth because the plants in Medenci and Krusnych are expanding. Experiments are being conducted on the application of magnesite in water filtration, the cellulose industry, and in soil conditioning.

MINERAL FUELS

The overall consumption of primary energy reached 101.7 million tons in standard fuel equivalent in 1973, an increase of 1.6% over 1972. Future increases in demand will be met mainly from nuclear powerplants which, according to plans, should have a total capacity of 8,540 megawatts by 1980.

Coal is the most important component in the total energy supply, representing about 76.3% of the total in 1973, compared with 5.5% for natural gas, 17.6% for oil, 0.4% for hydropower, and 0.2% for nuclear power. Despite the increases expected in nuclear power production, coal will remain the main energy source. Due to limited reserves of gas (11 billion cubic meters) and oil (9 million tons), their share in total power production remains insignificant. Hydropower generation also has limited possibilities, and no substantial changes should be expected. Domestic output covered 78% of energy consumption in 1973. Imports of fuels have increased sharply, rising from 15 million tons of standard fuel equivalent in 1965 to about 28 million in 1973. A further increase to over 46 million is expected by 1980.

Nuclear Energy.—The first Czechoslovak nuclear powerplant at Jalovske Bohunice was in operation during 1973. The power sources of the Soviet-type plant are two light-water reactors and four generators. By 1978, the plant is expected to reach its full planned capacity of 840 megawatts.

Two more Soviet-type nuclear powerplants with total capacity of 1,760 megawatts are planned to be built with Soviet assistance. Their operation is planned for the years 1977–80 when increments of 440-megawatt capacity are expected to be activated every year.

Table 4.—Czechoslovakia: Primary energy balance, 1972–1973
(Million tons of standard fuel equivalent)[1]

Kind	Total primary energy		Coal and coke		Crude oil, petroleum products		Natural and associated gas		Hydro-electric power		Nuclear power		Imported electric power	
	1972	1973	1972	1973	1972	1973	1972	1973	1972	1973	1972	1973[e]	1972[2]	1973[e]
Production[3]	71.6	70.1	69.6	67.8	0.2	0.3	1.5	1.6	0.3	0.3	--	0.1	--	--
Exports[4]	6.2	5.6	5.7	5.5	.1	NA	.3	NA	--	--	--	--	0.1	0.1
Imports[4]	25.2	28.0	6.2	5.9	16.5	17.5	1.9	3.9	--	--	--	--	.6	.7
Apparent consumption	90.6	92.5	70.1	68.2	16.6	17.8	3.1	5.5	.3	.3	--	.1	.5	.6

[e] Estimate. NA Not available.
[1] Conversion factors used are hard coal, 1.0; brown, 0.5; lignite, 0.25; crude oil and natural gas, 1.3; hydroelectric power and nuclear electricity, 0.125.
[2] SR 1973, p. 252.
[3] Production, see production tables.
[4] United Nations Statistical Bulletin, April 1974, p. 9.

Coal.—The expectation of a larger energy supply derived from increasing use of oil, gas, and nuclear power has slowed the development of coal production in the energy-short Czechoslovak economy. In 1973, production of all types of coal was 109.0 million tons, or 4% below the level of the previous year. The industry experienced delays in new mine development and associated construction.

Although Czechoslovakia is self-sufficient in lignite, only 80% of the hard coal (anthracite, and bituminous) consumption was derived from indigenous production in 1973. Each year, about 5 million tons of hard coal is imported from Poland and the U.S.S.R. In 1973, 27,779,000 tons of hard coal was produced, showing a decline of 1.0% compared with that of 1972. During the year, the CSM Stonava mine with 400,000 tons annual capacity was commissioned.

Consumption of hard coal by consumer in 1965 and 1972 was as follows, in percent:

Consumer	1965	1972
Electric powerplants	18.1	19.9
Other space-heating and steam-raising	17.4	19.1
Coke plants	43.3	48.5
Coal gas plants	1.4	--
Railroads	7.6	3.4
Households	2.6	3.3
Others	9.6	5.8
Total	100.0	100.0

Source: Statisticka Rocenka CSSR (Statistical Annual of the Czechoslovak Socialist Republic). Prague, 1973, p. 254.

Production of hard coal by major basin was as follows, in thousand tons:

Basin	1970	1971	1972
Ostravsko Karvinsky	23,725	24,380	23,793
Kladensky	2,451	2,460	2,346
Plzensky	543	532	452
Trutnovsky	731	738	716
Rosicky	608	592	515
Total	28,058	28,702	27,822

Source: Statisticka Rocenka CSSR (Statistical Annual of the Czechoslovak Socialist Republic). Prague, 1973, p. 256.

The Ostravsko-Karvinsky Basin produces about 85% of the 1972 total, two-thirds of which is suitable for coke.

According to official Czechoslovak sources, in 1972 89.4% of the total hard coal production was mechanized. A reported 81.1% was produced by cutter-loaders and 90.1% was mechanically loaded.

Brown coal production in 1973 amounted to 78,237,000 tons, or 3,500,000 tons less than in the previous year. New annual production capacity totaling 800,000 tons was commissioned during the year at Sverama II and Most I mines.

The production of brown coal by major basins was as follows, in thousand tons:

Basin	1970	1971	1972
Severocesky	55,006	57,353	58,297
Sokolovsky	19,515	20,088	19,748
Handlovsky	2,770	2,864	2,908
Modrokamensky	716	747	773
Total	78,007	81,052	81,726

Source: Statisticka Rocenka CSSR (Statistical Annual of the Czechoslovak Socialist Republic). Prague, 1973, p. 257.

Of the total 81,726,000 tons of brown coal produced in 1972, open pit mining accounted for 69,380,000 tons or 85%, whereas 12,346,000 tons or 15% was deep mined.

Brown coal consumption by consumer in 1965 and 1972 was as follows, in percent:

Consumer	1965	1972
Electric powerplants	32.1	44.0
Other heating and steam raising	22.7	24.9
Briquets plants	1.8	2.8
Coal gas plants	1.2	3.1
Chemicals plants	4.6	1.2
Railroads	5.9	1.9
Households	11.8	9.4
Others	19.9	12.7
Total	100.0	100.0

Source: Statisticka Rocenka CSSR (Statistical Annual of the Czechoslovak Socialist Republic). Prague, 1973, p. 259.

In 1972, the average annual output production per worker in hard coal mining was 470 tons. The average annual output per worker in mining brown coal was 847 tons in deep mines and 2,167 tons in open pit mines.

The production of coke in 1973 was 9,200,000 tons of metallurgical and 1,631,000 tons other coke. About 2.5 million tons of coke was exported, all to COMECON countries. Although total coke production has remained relatively stable in the last 5 years, the production of metallurgical coke increased about 10%, as the output of other coke declined. The yield of coke from coal charged into coke ovens at 1.7 tons has also been unchanged for the past several years.

Authorities have recognized the need for modernization of coke production facilities, and a program has been advanced to replace the present 15 small coke-oven batteries with 6 large, more efficient coke-oven batteries.

Natural Gas.—Natural gas production increased 2.5%, to reach slightly more than 1 billion cubic meters. This is far below consumption, and large quantities are imported from the U.S.S.R. via the Brotherhood Pipeline. The gas pipeline (720 millimeters in diameter, 540 kilometers long) began operations in 1967. The gas flow begins in Ruthenia and leads to Pozsony (Bratislava). A 300-millimeter branch extends the line to Prague via Brno. Almost one-third of the gas delivered is used in the production of nitrogen fertilizer.

In 1970, an agreement was signed between the U.S.S.R. and Czechoslovakia for the construction of a dual gas pipeline for delivery of Soviet gas across Czechoslovak territory to Austria, West Germany, Italy, and East Germany. The U.S.S.R. had delivered the necessary 1,220 millimeter pipe and East Germany, the 920 millimeter pipe. Czechoslovakia started receiving additional gas with the completion of the pipeline during 1973. In 1974, deliveries of natural gas from the U.S.S.R. were expected to reach 2.5 billion cubic meters.

Petroleum.—The domestic production of 333,000 tons of petroleum was 4.1% higher than in 1972. This amount covered only a small fraction of the consumption. An estimated 13 million tons of crude oil was imported from the U.S.S.R. and about 500,000 tons from Iraq. In 1973, Czechoslovakia negotiated a long-term contract with Egypt for the supply of crude oil in exchange for Czechoslovak equipment valued at over U.S. $100 million. This is similar to a contract signed with Iraq for a U.S. $50-million exchange. Since more oil is expected from Middle Eastern countries in the future, Czechoslovakia will participate in the construction of the Adriatic pipeline (34 million tons per year of crude oil throughput), which was expected to deliver 5 million tons per year to the refineries in Bratislava after 1976.

During 1973, the total oil refined by all refineries was about 9 million tons. A new refinery was scheduled to be completed in 1974 at Kralupy, near Prague. The refinery will take feedstock from "Druzba" pipeline, which links the U.S.S.R. with other East European countries. The refinery was expected to produce 3 million tons per year of petroleum products such as naphtha, propane-butane, gasoline, and fuel oil.

A record 14 million tons of crude oil was expected to be delivered by the U.S.S.R. in 1974. However, a warning has been issued that the U.S.S.R. cannot ignore world oil market prices, and not only higher prices, but also restrictions in the supply are to be expected. For this reason, efforts are underway to expand the supply of crude oil from other countries.

The Mineral Industry of the Arab Republic of Egypt

By John L. Albright[1]

Although dolomite and salt discoveries were reported during 1973 and construction activities continued at aluminum, iron and steel, and sand brick plants, Egypt's mineral industry activities were dominated by the natural gas and petroleum sectors. More than $76.8[2] million was allocated in the 1973 state budget for developments in the oil industry. Crude oil output declined, but several new fields were being brought into production, and the Government opened large areas of the country to bidding by foreign oil companies for petroleum exploration. Egypt's crude oil production is forecast at 1 million barrels per year by the end of 1982. A petrochemical plant was under construction at Ṭalkhā; a small petroleum refinery came onstream at Ṭanṭā; and construction of a 250,000-barrel-per-day refinery in the proposed Alexandria "free zone" was planned. Several petroleum and natural gas pipelines were constructed, and Egypt's proposed crude oil transit trunkline from the Gulf of Suez to the Mediterranean Sea (SUMED) was renegotiated and transit agreements signed.

In October 1973, war erupted with Israel in the Gulf of Suez area, and petroleum operations were disrupted. Preliminary post-war plans drafted by government officials will place heavy demands on the cement and iron and steel industries, and new electric powerplants will be built to meet anticipated higher electricity demands. Plans were prepared to restore the Suez Canal, which has been closed to international shipping since 1967.

A Ministry of Finance, Economy, and Foreign Trade was established in June 1973. A separate Ministry of Petroleum and Mineral Resources (formerly part of the Ministry of Industry, Petroleum, and Mineral Resources) was also created.

PRODUCTION

Crude oil output declined for the third consecutive year, but Egypt remained the fourth-largest oil producer in Africa, accounting for 2.8% of the oil produced on that continent. During 1973, petroleum was produced at the rate of 165,700 barrels per day, down 44,300 barrels per day from that of 1972. Wells in the Gulf of Suez accounted for more than one-half of the production. Israel has occupied Egypt's oilfields on the Sinai Peninsula since the 1967 war between the two countries, and Israeli petroleum workers have produced an estimated 200 million barrels of crude oil from these fields over the past 7 years. During 1973, the Israelis produced an estimated 34.6 million barrels, at the rate of nearly 94,800 barrels per day. Egypt's capacity to produce refined petroleum products increased in 1973 since the Ṭanṭā petroleum refinery began operations at the daily rate of 7,300 barrels. The Abū Mādī gasfield on the Nile Delta north of Cairo began production during 1973. Approximately 106 million cubic feet of gas will be piped daily to industrial consumers in the Cairo area. Cement and iron and steel were the major nonpetroleum minerals produced.

[1] Mineral specialist, Division of Fossil Fuels—Mineral Supply.

[2] Where necessary, values have been converted from Arab Republic of Egypt pounds (E£) to U.S. dollars at the rate of E£1.00=US$2.56.

Table 1.—Arab Republic of Egypt: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Iron and steel:			
Iron ore and concentrate ---thousand tons--	473	427	430
Pig iron e ---do----	500	r 300	250
Crude steel ---do----	256	e 227	e 290
Manganese ore and concentrate ----	4,278	2,409	e 2,400
NONMETALS			
Asbestos ----	70	441	440
Barite ----	291	1,704	e 2,000
Cement, hydraulic ---thousand tons--	3,921	3,822	3,624
Clays:			
Fire ---do----	634	922	896
Kaolin ----	44,727	24,626	e 25,000
Diatomite ----	2,250	1,668	e 1,700
Feldspar, crude ----	3,171	3,234	e 3,200
Fertilizer materials:			
Crude phosphate rock ---thousand tons--	713	563	550
Manufactured:			
Nitrogenous ---do----	385	293	e 370
Phosphatic:			
Thomas slag ---do----	r 34	44	NA
Superphosphate ---do----	r 487	518	NA
Fluorspar ----	644	898	e 1,000
Gypsum and anhydrite, crude ---thousand tons--	527	433	e 470
Pumice ----	225	250	e 250
Salt, marine ---thousand tons--	421	1,661	e 400
Sodium sulfate, natural ----	4,000	2,000	NA
Stone, sand and gravel:			
Basalt ---thousand cubic meters--	406	417	
Dolomite ---thousand tons--	91	88	
Granite:			
Broken ---do----	21	15	
Dimension ---cubic meters--	350	450	
Gravel ---thousand cubic meters--	1 1,455	110	NA
Limestone and other calcareous, n.e.s ---do----	1 r 5,286	4,793	
Marble blocks, including alabaster ---cubic meters--	5,926	7,380	
Broken and gravel ----	7,018	6,170	
Quartz ----	13,593	13,690	
Sand, including glass sand ---thousand cubic meters--	3,035	2,869	
Sandstone ---do----	86	93	
Sulfur, elemental byproduct e ----	650	1,000	1,000
Talc, soapstone, steatite, pyrophyllite ----	6,321	7,727	e 7,700
MINERAL FUELS AND RELATED MATERIALS			
Coke: e			
Oven and beehive ---thousand tons--	350	350	355
Gashouse and other low-temperature ---do----	30	30	30
Total ---do----	380	380	385
Gas, natural: e			
Gross production ---million cubic feet--	31,000	r 25,000	18,000
Marketed ---do----	3,000	2,500	2,000
Petroleum:			
Crude ---thousand 42-gallon barrels--	106,993	76,880	60,483
Refinery products:			
Gasoline and naphtha ---do----	r 5,560	7,680	
Kerosine and jet fuel ---do----	5,735	7,448	
Distillate fuel oil ---do----	5,588	6,908	
Residual fuel oil ---do----	17,130	21,425	
Refinery fuel and losses ---do----	r 1,818	2,370	NA
Other:			
Liquefied petroleum gas ---do----	81	197	
Asphalt ---do----	442	673	
Unspecified ---do----	133	119	
Total ---do----	r 36,487	46,820	NA

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

1 In previous edition, this figure was erroneously captioned cubic meters rather than thousand cubic meters.

TRADE

Egypt's export quota of refined petroleum products to members of the European Communities (EC) was increased to 7,200 barrels per day from the 4,000 barrels per day set in the 1972 preferential trade agreement. The additional fuel will go mainly to Denmark, Ireland, and the United Kingdom. During 1973, Egypt and Iraq signed an accord providing for imports of 7.5 million barrels of Iraqi crude oil.

In an effort to stimulate trade and attract foreign investments, two industrial "free zones" were planned wherein manufacturers might export and import goods free of government duty or controls. The Maryūṭ area of Alexandria and the Naṣr City Area of Cairo were selected as the sites for the "free zones." Foreign companies are encouraged to build plants in these areas, and a government convention signed under the auspices of the World Bank provides for international arbitration on any disputes concerning foreign investments. Port facilities are to be expanded at Maryūṭ, and extensive plans were made to renovate and expand port facilities at Maṭrūḥ, 200 kilometers east of As Sallūm, at a cost of $56.3 million. When completed in 1979, Maṭrūḥ, will be Egypt's second most important port, after Alexandria.

Plans were studied to double track the railroad between Alexandria and As Sallūm and extend it into Libya, and bids were received from 20 foreign companies to link Egypt and Libya by highway. "Free zone" projects already approved include a large export petroleum refinery and a seismographic data processing center. An economic and industrial cooperation accord between Egypt and Greece called for Greek participation in the Egyptian "free zone" industrial projects.

Egyptian officials inspected the war-battered Suez Canal, closed to international shipping since the 1967 Mideast war, and

Table 2.—Arab Republic of Egypt: Exports and reexports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum, including alloys, semimanufactures	331	244
Copper, including alloys, semimanufactures	16	--
Iron and steel:		
Pig iron, sponge iron, powder	--	4,658
Primary forms	--	131
Semimanufactures	57,172	84,773
Lead, including alloys, semimanufactures	3	4
Other, ash and residue-bearing nonferrous metals, n.e.s	129	74
NONMETALS		
Asbestos, crude	10	--
Cement	1,361,622	799,022
Chalk	204,044	--
Clay products:		
Refractory, including nonclay brick	39	32
Nonrefractory	292	864
Diamond, industrial ---carats---	NA	648
Fertilizer materials:		
Crude, phosphatic	77,951	52,517
Manufactured, phosphatic, Thomas slag	78,755	117,247
Gypsum and plasters	--	553
Lime	1,480	4,341
Salt	38,604	16,233
Stone, sand and gravel:		
Dimension stone, crude and worked	16	64
Gravel and crushed rock	145	98
Sulfur, sulfuric acid	40	479
Talc, steatite	90	311
Other crude nonmetals, n.e.s	70	--
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	626	765
Coke and semicoke of coal, lignite, or peat	--	22,117
Petroleum:		
Crude ---thousand 42-gallon barrels---	3,665	36,203
Partly refined ---do---	148	356
Refinery products:		
Distillate fuel oil ---do---	144	1,957
Residual fuel oil ---do---	--	(1)
Other, nonlubricating oils, n.e.s ---do---	340	837
Total ---do---	484	2,794

NA Not available.
[1] Less than ½unit.

Table 3.—Arab Republic of Egypt: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Oxide and hydroxide	75	106
Metal:		
Scrap	11,294	8,463
Unwrought and semimanufactures	2,876	1,540
Arsenic trioxide, pentoxide, acid	(2)	(2)
Chromium, oxides and hydroxides	22	61
Cobalt oxides and hydroxides	(2)	2
Copper:		
Matte	2,779	137
Metal, including alloys, all forms	859	749
Gold ---troy ounces--	r 32,311	28,614
Iron and steel:		
Roasted pyrite	3,779	--
Metal:		
Scrap	63,265	66,287
Sponge iron, powder, shot	5	193
Spiegeleisen	47,807	96,317
Ferromanganese	3,315	3,208
Steel, primary forms	12,500	93,879
Semimanufactures	232,059	242,909
Lead:		
Oxides	551	951
Metal, including alloys, all forms	11,318	8,737
Magnesium metal, unwrought and semimanufactures	7	--
Manganese oxides	1,175	1,579
Mercury ---76-pound flasks--	478	470
Molybdenum metal, including alloys, all forms	3	3
Nickel:		
Matte, speiss, similar materials	11	3
Metal, including alloys and semimanufactures	31	10
Rare-earth metals, compounds of thorium, uranium, rare-earth metals	4	4
Silver metal, unwrought and semimanufactures, including alloys troy ounces--	48,323	57,839
Tin:		
Oxide ---long tons--	2	6
Metal, including alloys, all forms ---do---	578	139
Titanium oxides	820	593
Tungsten ore and concentrate, gross weight	1	1
Uranium and thorium, including alloys	66	48
Zinc:		
Oxides	167	444
Metal, including alloys, all forms	2,548	1,396
Other:		
Ore and concentrate, n.e.s	1,576	3,762
Metal, including alloys, all forms:		
Pyrophoric alloys, including ferrocerium	--	(2)
Base metals, including alloys, all forms, n.e.s	1	1
NONMETALS		
Abrasives, natural, n.e.s	45	223
Asbestos	6,819	8,787
Boron materials, oxide and acid	76	541
Cement	67	1,830
Chalk	8	339
Clays and clay products, including refractory brick:		
Crude clays, n.e.s	5,202	5,372
Products:		
Refractory, including nonclay brick	11,141	12,453
Nonrefractory	318	131
Diatomite	610	531
Feldspar and fluorspar	113	58
Fertilizer materials:		
Crude, potassic	7,445	632
Manufactured:		
Nitrogenous	429,831	273,639
Other, including mixed	6	2
Ammonia	23	67
Graphite, natural	824	155
Gypsum and plasters	233	201
Magnesite	8,791	2,363
Mica, including worked	41	8
Pigments, mineral, natural and crude	1,051	967
Pyrite, unroasted	37,677	18,652
Salt	27	16
Sodium and potassium compounds, n.e.s.:		
Caustic soda	25,244	48,507
Caustic potash, peroxides of potassium and sodium, n.e.s	311	574

See footnotes at end of table.

Table 3.—Arab Republic of Egypt: Imports of mineral commodities[1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972
NONMETALS—Continued		
Stone, sand and gravel:		
Dimension stone, crude and worked	618	30
Dolomite	301	--
Gravel and crushed rock	(2)	--
Quartz and quartzite	15	8
Sand, excluding metal bearing	1,714	2,097
Sulfur:		
Elemental	58,065	62,954
Sulfuric acid	6	1
Talc, steatite, natural	20	67
Other nonmetals, n.e.s.:		
Crude n.e.s	273	141
Oxides, hydroxides, peroxides of barium and strontium	10	500
Bromine, fluorine, iodine	6	6
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	173,639	22,572
Coal and briquets:		
Anthracite and bituminous coal	433,112	28,740
Briquets of anthracite and bituminous coal	--	41
Lignite and lignite briquets	(2)	--
Hydrogen and rare gases	79	24
Peat, including peat briquets and litter	3,840	156
Petroleum:		
Crude and partly refined ----thousand 42-gallon barrels--	r 11,131	10,047
Refinery products:		
Gasoline ----do----	(2)	(2)
Kerosine and jet fuel ----do----	2,520	2,277
Distillate fuel oil ----do----	5,456	2,460
Residual fuel oil ----do----	412	806
Lubricants ----do----	3	4
Other:		
Liquefied petroleum gas ----do----	1,147	1,661
Not specified ----do----	52	38
Total ----do----	r 9,590	7,246
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	285	186

r Revised.
[1] From the Central Agency for Public Mobilisation and Statistics, October 1972 and October 1973.
[2] Less than ½ unit.

prepared plans to restore the waterway, which can cut by half the distance ships must ply between Western Europe and Middle East oil ports. Foreign commercial companies and military units will probably be called upon to aid in clearing unexploded mines and shells, lifting sunken ships, removing Israeli-erected bridging, dredging the waterway, and renovating port facilities. In 1967, oil tankers accounted for approximately 75% of the canal's traffic. The canal's draught was then 11.6 meters, sufficient for loaded ships of 60,000 to 70,000 tons. The closed canal forced changes in international shipping patterns and hastened the construction of supertankers, which have provided for the economic transport of crude oil from Mideast producing countries to Western Europe and North America. Should the canal be reopened, a depth of 21.3 meters would be required to accommodate the 250,000-ton supertankers.

COMMODITY REVIEW

METALS

Aluminum.—Construction continued at the Naj Ḥammādī aluminum smelter in the Nile Valley near Qinā; completion was expected in early 1974. Six electrolysis units will convert imported alumina into aluminum at an aggregate rate of 100,000 tons annually, valued at an estimated $76.8 million. Only one-fourth of the output will be used domestically; the remainder will be exported.

Iron and Steel.—Construction activities fell behind schedule at the Ḥulwān iron and steel complex near Cairo, but the plant's third blast furnace was completed and placed in operation near yearend. Construction of Ḥulwān's fourth furnace was scheduled to begin in 1974 and planned to be placed in service during 1975. Poland

and the U.S.S.R. were the principal suppliers of cooking coal for the Ḥulwān complex; domestic iron ore was supplied from the Bahareza Oasis deposit in the Western Desert, 350 kilometers southwest of the steel plant.

The standard-gage rail line connecting the iron ore deposits with the Ḥulwān complex begun in January 1967, officially opened in July 1973. The railroad will transport 3.8 million tons of iron ore annually at a daily rate of 10,400 tons. Railroad operations will be carried out by 23 main-line diesel-electric locomotives, 5 switching locomotives, and 630 pieces of rolling stock (of which 565 are 65-ton-capacity ore cars). In June 1973, an agreement was concluded by Egypt with the U.S.S.R. for the main-line locomotives; four were scheduled to be delivered during 1974 and the remainder in 1975.

NONMETALS

Teams of geologists reportedly discovered new gypsum, kaolin, phosphate, and salt deposits in Egyptian desert areas. The gypsum discovery at Gharbanian on the Mediterranean Sea near the Alamein oilfield has recoverable reserves estimated at 12 million tons, enough to meet Egypt's demands for 30 years. Kaolin was found at Kalābishah, and phosphate deposits were found at Abu Shagila.

Cement.—At yearend, extensive plans were being developed to reconstruct factories, homes, and transport facilities in the war-damaged areas of Eastern Egypt, which will call for increased supplies from the country's cement industry. No cement plants were constructed during the year, but Egyptian and Soviet negotiations were held concerning the proposed Asyūṭ (Upper Egypt) and Ḥulwān (Cairo area) plants. The Ḥulwān plant will cost $20.5 million and will have an annual capacity of 400,000 tons of reinforced concrete. Ḥulwān's iron and steel complex will supply the cement plant with the necessary reinforcing materials. Yugoslavia will assist Egypt in expanding the production capacity of the Alexandria plant by 200,000 tons annually.

Dolomite.—Egyptian geologists discovered dolomite near the Bahareza Oasis (Western Desert), and preliminary estimates placed reserves at 80 million tons. The deposit is adjacent to the new railroad, which connects the Bahareza Oasis with Cairo. Chemical analysis reportedly indicated that the dolomite contains a high percentage of calcium and magnesium, in the form of carbonates.

Fertilizer Materials.—Egyptian geological surveys were conducted at Marhaz at Wāḥāt al Khārijah, 240 kilometers west of Qinā. Reserves of phosphate rock in the area were reevaluated upward to an estimated 1 billion tons. To exploit these deposits, a railroad will probably be built to Qinā, the site of a proposed phosphorus processing complex, and to the Red Sea port of Al Quṣayr.

Ṭalkhā's nitrogenous fertilizer plant was not completed during 1973, but was rescheduled to begin production before yearend 1974. A delegation from the International Bank for Reconstruction and Development (IRBD) visited Egypt in 1973 and discussed financing the proposed Ṭalkhā urea fertilizer plant. Construction costs will total $115.2 million, of which $66.6 million in foreign currency will be required. IBRD may extend a $25 million loan for the project; the remainder of the foreign currency requirement will be provisionally financed by the Kuwait Fund for Arab Economic Development.

Salt.—Geologists reportedly discovered a new saline deposit on the Red Sea south of Marsa Alam. Port facilities at Abu Ossoum will be used for the export of salt, production eventually reaching 250,000 tons annually.

Sand and Gravel.—Traditionally, brick has been the most important building material in Egypt, but the existing plants have been inadequate to meet increasing demands. The Naṣr brick plant produced sand- and gravel-base brick at the rate of 200 million per year, and a similar installation with an annual capacity of 170 million was under construction at Quessina, in the northern delta. Smaller brick plants were planned, and an agreement was signed by Egypt and the People's Republic of China (PRC) for assistance in construction of a sand brick factory at Mudīrīyat al Minyā. This $2.2 million facility will have an annual capacity of 50 million sand-and-lime brick, and further contracts are expected with the PRC for the construction of eight similar facilities.

MINERAL FUELS

Carbon Black.—A 22-million-pound-per-year carbon black plant, North Africa's first, was in the engineering stage at the Gofi-Naṣr Petroleum Co. The French firm of Petrole Chimie Engineering is to build

the $6 million plant at Alexandria. Because two automobile assembly plants began production at Ḥulwān during 1973 (the Egyptian Light Transport Co. and the Naṣr Auto Manufacturing Co.), Egypt was interested in establishing a rubber tire production plant. The tire plant will probably be built in Alexandria with an initial capacity of 1,600 to 3,000 tires per year. Most of the carbon black required for the tire production will probably be procured from the Gofi-Naṣr Petroleum Co.

Natural Gas.—Estimated natural gas reserves totaled 7.5 trillion cubic feet and were located primarily in four dispersed areas: Abū Gharādiq (about 115 kilometers southwest of the El Alamein oilfield); Abū Māḍī (Nile Delta, about 140 kilometers north of Cairo); Abū Qīr (10 kilometers offshore in the Mediterranean Sea, 24 kilometers northeast of Alexandria); and El Morgan (Gulf of Suez).

Egypt's largest gasfield, Abū Gharādiq (with reserves totaling 2.2 trillion cubic feet), was being prepared for production by Faiyum Petroleum Co. (FAPCO), jointly owned by Amoco International Oil Co. and the state-owned EGPC. Plans were being developed for a $40 million project calling for the construction of a 56-centimeter diameter, 320-kilometer gasline from this Western Desert gasfield to the Ḥulwān industrial area near Cairo, with gas treatment plants at both ends of the pipeline. Abū Gharādiq gas production was scheduled to begin in 1975 at the daily rate of 105.9 million cubic feet and to be doubled at a later date.[3]

Egypt and the International Egyptian Oil Co. (IEOC), a subsidiary of the Italian Ente Nazionale Idrocarburi (ENI), signed a May 1973 agreement forming a joint operating company, Delta Petroleum Co. (Delpeco). Delpeco began producing natural gas from the Abū Māḍī reserves and will work the gasfield for 20 years.[4] IEOC discovered the Abū Māḍī Field in 1967; its reserves were estimated at 700 billion cubic feet. Delpeco will pipe the gas to the nearby Ṭalkhā petrochemical plant and to other industrial plants at Al Maḥallah al Kubrá and Ṭanṭá. During 1973, a 30-centimeter-diameter pipeline was constructed from the Abū Māḍī wells to the Ṭalkhā petrochemical plant, which was under construction. Abū Māḍī gas will ultimately be produced at the rate of 30 million cubic feet per day.

Recoverable reserves, estimated at 700 billion cubic feet, were being developed for production at the offshore Abū Qīr gasfield. Egypt plans an offshore platform (from which nine wells are to be drilled), a 28-centimeter-diameter pipeline to an onshore treatment plant, and gas trunklines to Alexandria, Damanhūr, and Kafr ad Dawwār. Construction was scheduled to begin before yearend 1973; production will begin in 1975 at the rate of 106 million cubic feet per day.

The Egyptian General Electricity Corp. requested bids from foreign firms to build a thermal electric powerplant at Abū Qīr, to be fueled by natural gas. The Kuwait Fund for Arab Economic Development extended a loan of $15.2 million for a term of 20 years, including a grace period of 5 years, to assist in financing the development of the Abū Qīr gasfield. Total costs of the project were estimated at $32.5 million.

EGPC hopes to utilize the natural gas produced in association with crude oil at El Morgan Field. Small amounts of gas were piped to the Ras Shuqair thermal electric powerplant; the rest was flared.

Petroleum.—*Exploration.*—During 1973, Egyptian General Petroleum Co. (EGPC) concluded a series of concession agreements with foreign oil companies. Exploring companies will bear all costs until a commercial discovery is made; arrangements will then be made for the foreign company to recover exploration and production costs. Finally, development arrangements will be made between EGPC and the foreign company. Offshore areas are subject to production-sharing contracts, and onshore acreage production will be a joint venture with EGPC.[5] EGPC contracts permit the operating company to use 40% of the production to recover costs, with the remaining 60% split either 80% to 20% or 75% to 25% between EGPC and the foreign company, respectively.

A concession agreement with Petrobrás Internacional S.A. (Braspetro) was for a period of 30 years, renewable for another 10 years. Deminex Deutsche Erdölversorgun-

[3] Middle East Economic Survey (Beirut, Lebanon). Egypt Plans Production of 3–4 Billion Cu. Ms. of Gas Annually for Internal Use. V. 16, No. 19, Mar 2, 1973, pp. 9–10.

[4] World Oil. Egypt. V. 177, No. 3, Aug. 15, 1973, pp. 138–139.

[5] Middle East Economic Survey. (Beirut, Lebanon). Egypt Concludes Four New Oil Agreements. V. 16, No. 31, May 25, 1973, pp. 7–8.

Table 4.—Arab Republic of Egypt: Petroleum concession agreements with foreign companies signed during 1973

Company and country	Location	Acreage (square kilometers)	Exploration commitment
American Pacific International, Inc., United States.	Western Desert	400	$3 million over 39 months.
Continental Oil Co., United States	Nile Delta	[1] 14,000	$20 million over 8 years.
Deminex Deutsche Erdölversorgungsgesellschaft, mbH, West Germany.	Offshore Gulf of Suez	2,000	$22 million over 8 years.
Eastern Resources Ltd., United Kingdom.	Western Desert	10,000	NA.
Esso Egypt, United States	Offshore Mediterranean Sea, east of Alexandria.	15,000	$50 million over 12 years.
Geoquest Co., Canada	Offshore Mediterranean Sea, north of Alexandria.	1,760	$13 million over 8 years.
Do	Offshore Mediterranean Sea, north of As Sallūm.	400	
Mobil Exploration Egypt, United States.	Offshore Mediterranean Sea, east of Alexandria.	6,500	$23 million over 8 years.
Petrobrás Internacional S.A., (Braspetro), Brazil.	Nile Valley and Western Desert.	18,000	$14.4 million over 8 years.
Transworld Petroleum, Inc., United States.	Offshore west coast, Gulf of Suez.	100	$5.6 million over 4 years.
Tripco Petroleum, Inc. (formerly Transworld International Petroleum Co., Inc.), United States.	Eastern Nile Valley	6,000	$9 million over 6 years.

NA Not available.
[1] One-half interest with International Egyptian Oil Co., a subsidiary of Ente Nazionale Idrocarburi (ENI); excludes Abu Madi gasfield.

gsgesellschaft, mbH will probably begin preparatory work on its concession early in 1974. Esso Egypt's agreement was for a 30-year period, renewable for another 10 years; the company was expected to conduct a geological and seismic survey of its 15,000-square-kilometer concession and commence drilling operations in 1974. Mobil Exploration Egypt planned to start preliminary operations in 1974 and begin drilling early in 1975. During 1974, EGPC was expected to award additional concessions in the Western Desert, the region northwest of Cairo, offshore Mediterranean Sea, and offshore Red Sea. Geophysical Services International, a British firm, agreed to conduct a seismic survey over 5,000 linear kilometers offshore the Mediterranean coast between Alexandria and the Libyan border. Test results will be sold to interested companies at prices ranging from $32 million to $60 million.

Soviet oil technicians completed their exploration program in the Siwah Oasis area of the Western Desert. Soviet teams conducted seismic surveys and drilled 12 to 15 wells in the 45,000-square-kilometer area over the past 5 years, but no oil discoveries were announced. The Ministry of Petroleum and Mineral Resources was expected to open the area to international bids during 1974.

Gulf of Suez Petroleum Co. (GUPCO), the joint operating company of Amoco Egypt Oil Co. and EGPC, reported a significant offshore oil discovery 18 kilometers northwest of the El Morgan Field in the Gulf of Suez. Named "July" Field, the new discovery tested 5,280 barrels per day of 32° API, 0.93%-sulfur crude oil from 8.5 meters of sands through a 3/8-inch choke. Associated gas output averaged approximately 155 cubic feet per barrel of oil. Oil reserves at the 16-square-kilometer "July" structure were estimated at 300 million barrels.[6] Three more wells were planned for drilling in 1973, eight in 1974. Pipelines will be laid to Ras Shuqair, El Morgan oilfield's export terminal, and "July" Field oil production was scheduled to begin early in 1974 at the rate of 30,000 barrels per day. Production was expected to expand to 100,000 or 150,000 barrels per day by yearend 1974.

A large oilfield was discovered in the Gulf of Suez near Ras Gharib covering nearly 148 square kilometers. Initial yields are expected to be 50,000 barrels per day and may reach 350,000 barrels per day when the field is fully developed.

[6] Middle East Economic Survey (Beirut, Lebanon). GUPCO's Oil Discovery Northwest of Morgan is Egypt's Second Largest. V. 16, No. 40, July 27, 1973, p. 10.

Pipelines.—Two petroleum pipelines, one for transporting crude oil and the other for refined petroleum products, were placed in service during the year. Both lines serve the new Ṭanṭā petroleum refinery northwest of the capital. The crude oil trunkline, approximately 180 kilometers long, was completed at a cost of $12.8 million. It can pump up to 40,000 barrels per day of oil from Suez to the refinery. The other pipeline, built at a cost of $11.3 million, will be used to move fuels from the refinery to the Muṣṭurud storage and distribution facility on the outskirts of Cairo. It is 88 kilometers of 30-centimeter-diameter steel pipe, and has a daily throughput capacity of about 40,000 barrels.

Near midyear, negotiations began to break down between Egypt and an eight-nation West European consortium concerning the proposed SUMED pipeline. In 1971, the Europeans had signed a contract to build the large-diameter, high-capacity line, but rising costs forced them to request higher payment for the line. Egypt then held talks with a U.S. group concerning a new proposal to build the SUMED pipeline. Bechtel Corp. conducted a cost analysis and feasibility study, surveyed the pipeline route, and signed a $397.6 million preliminary contract for the construction of the 338-kilometer trunkline. Kidder, Peabody and Co., an investment firm, and the First National City Bank of New York assumed the responsibility for arranging the necessary financing. At yearend, Gulf of Suez-Mediterranean Petroleum Pipeline Co. was formed to finance and operate the SUMED pipeline.[7] EGPC will retain 50% ownership in the company, and four Arab oil-producing states will share the remaining equity. Abu Dhabi, Kuwait, and Saudi Arabia will each invest $60 million in the new company, and Qatar will invest $20 million. Egypt will provide $200 million for its share of the company. Construction was to begin in early 1974, with the first stage to be completed within 24 months.

The line, which will have a daily throughput capacity of 800,000 barrels, will be constructed of welded steel pipe 107 centimeters in diameter. Two pump stations, one at the Sohna terminal 40 kilometers south of Suez and the other near Cairo, will push the oil to the Alexandria "free zone," where a petroleum refinery and tanker-loading facilities are to be built. Second-stage construction plans call for a parallel 107-centimeter-diameter pipeline to be laid 6 months after the first link is completed, raising the SUMED's daily throughput capacity to 1.67 million barrels. Additional pump stations and expanded terminal facilities will be required to reach the line's maximum throughput capacity of 2.4 million barrels per day. During 1973, oil transit agreements for 10-year periods were signed with 13 foreign oil companies for the combined 1.67 million-barrel-per-day oil shipment. Transit fees and specific shipment dates were not announced.

Pipeline construction plans were reviewed for a natural gas trunkline from Abū Gharādiq wells to the Ḥulwān industrial area, and a short gasline was constructed from the Abū Maḍī Field to the Ṭalkhā petrochemical plant. Gaslines are also planned from the offshore Abū Qīr Field to Alexandria, Damanhūr, and Kafr ad Dawwār.

[7] Middle East Economic Survey (Beirut, Lebanon). Arab Finance for Egypt's SUMED Pipeline Project. V. 17, No. 8, Dec. 14, 1973, p. 11.

Table 5.—Arab Republic of Egypt: Foreign oil companies with transit agreements for the SUMED pipeline

Company	Country	Traffic (thousand barrels per day)
AGIP, S.p.A	Italy	100
Amoco International Oil Co	United States	100
British Petroleum Co. Ltd	United Kingdom	150
Caltex Petroleum Corp	United States	300
Cie. Française des Pétroles	France	150
Compania Española de Petroleos S.A	Spain	60
Continental Oil Co	United States	100
Essence et Lubrifiant de France/Entreprise de Recherches et d'Activités Pétrolières.	France	60
General Petroleum and Mineral Organization	Saudi Arabia	200
Mobil Oil Corp	United States	150
Petrofina S.A	Belgium	60
Refineria de Petroleos de Escombreras, S.A	Spain	90
Shell International Petroleum Co., Ltd	United Kingdom	150

Production.—Crude oil production decreased 21.3% to 60.5 million barrels during 1973, averaging 165,700 barrels per day. This was due mainly to reduced GUPCO operations in the El Morgan Field, which were affected by the Egyptian-Israeli conflict in the Gulf of Suez. El Morgan's output averaged 97,300 barrels per day; Western Desert wells produced 41,800 barrels per day; and Eastern Desert oilfields accounted for about 26,600 barrels per day. Water-injection equipment planned for the El Morgan Field will increase output there to 180,000 barrels per day. Egypt's anticipated 1974 production was expected to total 192,000 barrels per day, a total increase of 9.6 million barrels over 1973 output.

Refining.—In 1973, Egypt's refining capacity totaled approximately 174,400 barrels per day, up 4.4%. Suez Oil Processing Co. began production at the rate of 7,400 barrels per day at the newly constructed Ṭanṭā petroleum refinery in the Nile Delta, 100 kilometers north of Cairo. First-year production at Ṭanṭā, in thousand barrels per day, was reported as follows: Fuel oil 1.4, gas oil 2.1, gasoline 2.0, and kerosine 1.8. Refinery construction costs totaled $5.1 million, and the ultimate throughput capacity of the plant was set at 14,600 barrels per day. Two pipelines were built to serve the refinery. Crude oil supplies will arrive by pipeline from Suez, and refined products will be piped to Muṣṭurud.

Plans were reviewed for a $400 million, 250,000-barrel-per-day export refinery to be built in the Alexandria "free zone", and the Board of the Foreign Investment Authority gave preliminary approval to the project. Financing will be provided by the Arab oil states.[8] Saudi Arabian and other Persian Gulf crude oils will be delivered to the refinery through the planned SUMED pipeline. Fuels produced at Egypt's new Alexandria refinery will be marketed primarily in Western Europe.

[8] Journal of Commerce. Egypt Plans $400 Million Oil Refinery. Dec. 31, 1973, p. 8.

The Mineral Industry of Finland

By F. L. Klinger [1]

Strong demand in foreign and domestic markets led to increased production and trade by the Finnish mineral industry in 1973. Mine production and exports of chromium, copper, nickel, and zinc rose to record levels, as did refinery production of byproduct metals such as cobalt, selenium, and silver. There was also record output of iron and steel, but owing to high domestic demand, exports declined and imports of iron ore and steel semimanufactures were substantially greater than in 1972. Rising prices generated large increases in the value of mineral commodity trade, but the gain in exports was more than offset by increased imports and the resulting trade deficit was 30% larger than in the previous year.

Although the cost of materials and labor continued to rise and Finland was experiencing the fastest rate of inflation since 1956, investments in the mineral industry appeared to remain high. Construction started on the new blast furnace and ancillary facilities at Raahe. Development of new mine projects was continued at Kolari (iron ore) and Mustavaara (vanadium). The Hammaslahti copper mine began production on schedule, and production of copper-nickel ore at the new Vuonos mine was rapidly increasing. Production capacity for manufactured fertilizers was increased at Siilinjärvi. The natural gas pipeline from the Soviet border to Kouvola was virtually completed by yearend, and construction of Finland's third nuclear powerplant was scheduled to start in early 1974.

PRODUCTION

Volume indices of production in the principal sectors of the mineral industry are shown by the following tabulation. The base year for the indices was changed to 1970 from the previously used base of 1959.

The higher indices shown for 1973 were generated mainly by increased output of the following commodities: copper and nickel ores, limestone and cement, iron and steel, and manufactured fertilizers.

Production of mineral commodities is listed in table 1.

Sector	(1970=100) 1971	1972	1973
Mining and quarrying	89	90	98
Nonmetallic mineral processing	102	113	120
Primary metals industry	89	114	129
Chemical industry	107	137	139
Petroleum refining [1]	108	106	113
All industry	102	114	117

[1] Including manufacture of rubber and plastics.

Source: Central Bureau of Statistics (Helsinki). Bulletin of Statistics (Tilastokatsauksia). No. 11, 1973, pp. 8–9; No. 4, 1974, pp. 8–9.

[1] Physical scientist, Division of Ferrous Metals—Mineral Supply.

Table 1.—Finland: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Cadmium, refined metal	120	175	179
Chromium, chromite concentrate:			
Gross weight	111,988	97,390	135,203
Chromic oxide content	48,267	41,488	57,461
Cobalt:			
Mine output, metal content e	1,300	1,300	1,300
Metal, refined	925	803	1,010
Copper:			
Mine output, metal content	28,500	34,824	38,213
Metal:			
Primary:			
Blister	32,984	41,500	47,173
Electrolytic	32,339	38,424	42,907
Secondary (unrefined)	14,969	17,425	18,771
Gold metal troy ounces	17,490	17,619	19,773
Iron and steel:			
Iron ore:			
Magnetite concentrate thousand tons	528	573	589
Pelletized iron oxide (from pyrite) do	215	280	164
Roasted pyrite (purple ore) do	135	142	143
Pig iron do	1,029	1,183	1,412
Ferrochromium do	35	24	40
Steel:			
Crude:			
Ingots do	1,025	1,456	1,615
Castings do	16	18	18
Semimanufactures (rolled) do	620	930	1,135
Lead, mine output, metal content	4,739	3,649	2,128
Mercury 76-pound flasks	135	212	196
Nickel:			
Mine output, metal content	3,508	5,159	5,780
Sulfate, metal content	123	191	220
Metal, electrolytic	3,890	5,458	5,839
Platinum metal e troy ounces	600	650	725
Rare-earth metals, lanthanide concentrate:			
Gross weight	1,244	--	--
Oxide content	35	--	--
Selenium metal kilograms	6,273	5,069	9,171
Silver metal troy ounces	622,663	625,138	793,351
Titanium concentrate, ilmenite, gross weight	139,500	149,500	159,000
Vanadium pentoxide:			
Gross weight	1,979	2,214	2,248
Vanadium content	1,109	1,190	1,259
Zinc:			
Mine output, metal content	50,887	49,893	58,592
Metal	63,702	81,096	80,662
NONMETALS			
Asbestos	10,360	6,388	6,427
Cement, hydraulic	1,811	1,984	2,092
Feldspar	64,062	59,858	58,318
Fertilizer materials, manufactured:			
Nitrogenous thousand tons	255	305	321
Phosphatic do	204	e 200	80
Mixed and other do	911	968	1,015
Lime do	230	235	233
Pyrite:			
Gross weight do	860	857	777
Sulfur content do	389	e 388	357
Stone:			
Limestone and dolomite:			
For cement do	2,348	2,597	2,909
For lime do	481	434	445
For sulfite and metallurgical uses do	170	155	153
Other do	753	716	838
Quartz do	86	92	93
Sulfur, byproduct (recovered):			
Elemental	101,456	119,221	122,715
Gaseous (in SO_2)	198,267	250,352	240,540
Talc	100,679	90,327	109,704
Wollastonite	5,549	6,491	6,547
MINERAL FUELS AND RELATED MATERIALS			
Coke, all types thousand tons	112	86	67
Gas, manufactured million cubic feet	1,800	1,708	1,572
Peat:			
For fuel use thousand tons	102	151	240
For agricultural and other use do	235	127	155

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity		1971	1972	1973 p
MINERAL FUELS AND RELATED MATERIALS—Continued				
Petroleum refinery products:				
Gasoline	thousand 42-gallon barrels	9,962	10,379	12,786
Jet fuel	do	736	1,064	1,126
Kerosine	do	54	54	55
Distillate fuel oil	do	19,127	20,515	e 19,649
Residual fuel oil	do	24,389	26,327	e 22,326
Liquefied petroleum gas	do	5,044	4,451	{ 968
Other	do			{ NA
Refinery fuel and losses	do	5,880	6,550	NA
Total	do	65,192	69,340	NA

e Estimate. p Preliminary. NA Not available.

TRADE

Exports of mineral commodities from Finland in 1973 were valued at about $300 million,[2] equivalent to 9.4% of the value of all Finnish exports. Imports of mineral commodities in 1973 were valued at about $1 billion, equivalent to 23% of the value of all imports. The apparent net deficit for mineral commodity trade in 1973 ($700 million) was about 33% more than in 1972.

Nonferrous metals (principally copper and zinc) and iron and steel continued to be the main items exported, accounting for 84% of the value of mineral commodity exports in 1973. Similarly, fuels and iron and steel were the principal commodities imported, accounting for 78% of the value of mineral commodity imports. Compared with 1972, the total value of exports of mineral commodities in 1973 rose by 43%, while the total value of imports rose by 36%. These increases were mainly due to rising prices, although in some cases, as in exports of copper, there was a noteworthy increase in quantity.

With the accession of the United Kingdom and Denmark to the European Communities (EC) membership, Finland's trade with EC countries increased sharply in 1973. Exports to the EC made up 47% of the value of all Finnish exports in 1973, compared with 21% in 1972. The free-trade agreement between Finland and the EC was finally approved in November 1973.

Finland's trade in mineral commodities in 1971 and 1972 is detailed in tables 2 and 3.

[2] Where necessary, values have been converted from Finland markka (Fmk) to U.S. dollars at the rate of Fmk 3.816=US$1.00 for 1973, and Fmk4.10=US$1.00 for 1972.

Table 2.—Finland: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, including alloys:		
Scrap	274	88
Unwrought	550	840
Semimanufactures	10,176	11,209
Chromium, chromite	37,043	15,111
Cobalt metal, unwrought and semimanufactures	1,036	860
Copper:		
Ore and concentrate	3	25
Metal, including alloys:		
Unwrought, including matte	7,744	7,761
Semimanufactures	12,439	15,456
Gold metal, unworked or partly worked troy ounces	7,764	3,045
Iron and steel:		
Ore and concentrate, except roasted pyrite	27,251	8,273
Metal:		
Scrap	3,194	11,133
Pig iron, ferroalloys, spiegeleisen, and similar materials	219,131	188,979
Steel, primary forms	179,323	266,255
Semimanufactures	235,051	302,531
Lead:		
Ore and concentrate	4,400	5,911
Metal, including alloys:		
Scrap	750	5
Unwrought	284	(1)
Semimanufactures	2	21
Mercury 76-pound flasks	--	218

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS—Continued		
Nickel metal, including alloys:		
Unwrought	3,402	4,749
Semimanufactures	54	34
Platinum-group metals, including alloys ---troy ounces	170	1,415
Silver metal, including alloys ---do	118,755	1,310,739
Tin metal, including alloys:		
Scrap ---long tons	49	15
Unwrought ---do	20	1
Semimanufactures ---do	7	(1)
Titanium:		
Ore and concentrate	10,500	9,079
Oxides	3,627	2,833
Vanadium oxides	1,874	2,440
Zinc:		
Ore and concentrate	300	100
Oxide	8	14
Metal:		
Scrap	12	267
Unwrought	56,147	67,821
Semimanufactures	305	8
Other:		
Ash and residue containing nonferrous metals	5,692	9,583
Waste and sweepings of precious metals ---kilograms	3,396	49,339
NONMETALS		
Asbestos	10,113	5,576
Cement	77,099	170,751
Clay products:		
Refractory (including brick)	373	349
Nonrefractory	1,511	1,204
Diamond, industrial ---carats	1,000	--
Diatomite and other infusorial earth	40	36
Feldspar	40,869	44,136
Fertilizer materials, manufactured:		
Nitrogenous	52,100	48,226
Phosphatic, other than Thomas slag	1	77,824
Other, including mixed	20,215	19,309
Graphite, natural	71	--
Lime	25	38
Mica, crude, including splittings and waste	50	--
Precious and semiprecious stones, except diamond:		
Natural ---carats	243,500	1,424,500
Manufactured ---do	11,500	4,500
Sodium and potassium compounds, n.e.s., caustic soda	1,124	1,236
Stone, sand and gravel:		
Dimension stone	22,020	25,205
Other stone:		
Limestone	12,234	14,242
Quartz and quartzite	189	36
Crushed, broken and gravel, n.e.s	6,380	2,347
Sand, excluding metalbearing	358	454
Sulfur:		
Elemental, all forms	37,643	33,670
Sulfuric acid	36,569	79,361
Talc and steatite	20	3,934
Other nonmetals, n.e.s.:		
Slag, dross and similar waste, not metalbearing:		
From manufacture of iron and steel	--	111
Slag and ash, n.e.s	45	163
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	4,153	7,261
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	30	1
Coke and semicoke	3,415	20,400
Peat and peat briquets	10,103	12,572
Petroleum refinery products:		
Gasoline (including naphtha) ---thousand 42-gallon barrels	383	939
Distillate fuel oil ---do	119	300
Lubricants ---do	9	13
Liquefied petroleum gas ---do	65	9
Bitumen ---do	(1)	(1)
Other ---do	r 966	2
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	3,529	1,424

r Revised.
1 Less than ½ unit.

Table 3.—Finland: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Ore and concentrate	1,348	2,055
Oxide and hydroxide	26,102	18,520
Metal, including alloys:		
Scrap	39	--
Unwrought	15,225	16,735
Semimanufactures	18,840	20,438
Antimony metal, including alloys, all forms	116	47
Arsenic trioxide, pentoxide, and acids	311	358
Cadmium metal, including alloys, all forms	5	3
Chromium:		
Chromite	1,587	889
Oxide and hydroxide	375	346
Cobalt:		
Oxide and hydroxide	2	2
Metal, including alloys, all forms	5	3
Copper:		
Ore and concentrate	--	598
Copper sulfate	503	1,566
Metal, including alloys:		
Scrap	NA	27
Unwrought	10,459	9,226
Semimanufactures	5,243	8,300
Gold metal, unworked or partly worked, troy ounces	103,114	119,212
Iron and steel:		
Ore and concentrate, except roasted pyrite	895,359	770,630
Metal:		
Scrap	116,574	67,046
Pig iron, including cast iron	937	1,493
Sponge iron, powder, shot	3,827	3,545
Ferroalloys	22,382	22,875
Steel, primary forms	20,636	30,085
Semimanufactures:		
Bars, rods, angles, shapes, sections	202,351	200,399
Universals, plates, sheets	255,948	328,206
Hoop and strip	32,650	37,464
Rails and accessories	1,533	1,971
Wire	16,640	11,532
Tubes, pipes, fittings	97,267	117,266
Castings and forgings, rough	1,351	1,230
Lead:		
Ore and concentrate	580	NA
Oxides	525	445
Metal, including alloys:		
Unwrought	8,411	12,267
Semimanufactures	925	971
Magnesium metal, including alloys, all forms	50	55
Manganese:		
Ore and concentrate	5,082	5,180
Oxides	560	1,250
Mercury, 76-pound flasks	531	513
Molybdenum metal, including alloys, all forms	2	2
Nickel:		
Ore and concentrate	7,521	3,255
Metal, including alloys:		
Scrap	218	20
Unwrought	145	121
Semimanufactures	234	228
Platinum-group metals, thousand troy ounces	11	6
Silver metal, including alloys, do.	2,379	2,079
Silicon	209	251
Tin:		
Oxides, long tons	6	7
Metal, including alloys:		
Unwrought, do.	431	237
Semimanufactures, do.	42	73
Titanium:		
Ore and concentrate	7,295	304
Oxides	181	111
Tungsten metal, including alloys, all forms	31	36
Zinc:		
Oxides	335	382
Metal, including alloys:		
Scrap	46	372
Unwrought	1,980	2,496
Semimanufactures	739	850

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS—Continued		
Other:		
Ore and concentrate	6,038	536
Metal, including alloys, all forms:		
Metalloids, n.e.s	2	9
Pyrophoric alloys	2	3
Base metals, n.e.s	202	251
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, similar materials	251	177
Dust and powder of precious and semiprecious stones, except diamond kilograms	2	1
Grinding and polishing wheels and stones	2,293	1,977
Asbestos	8,049	4,722
Barite and witherite	814	1,332
Borates, crude, natural	4,391	8,122
Cement	7,477	7,654
Chalk	11,497	8,476
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	284,826	300,202
Products:		
Refractory (including nonclay bricks)	38,941	32,723
Nonrefractory	1,884	1,103
Cryolite and chiolite	71	41
Diamond:		
Gem, not set or strung value, thousands	$216	$627
Industrial carats	25,500	39,500
Diatomite	765	948
Feldspar, leucite, and nepheline syenite	1	11
Fertilizer materials:		
Crude, phosphatic	571,041	443,054
Manufactured:		
Nitrogenous	25,402	46,957
Phosphatic	6,550	4,707
Potassic	247,325	234,118
Other, including mixed	38,844	4,786
Ammonia	83,666	79,526
Fluorspar	6,019	5,124
Graphite, natural	627	271
Gypsum and plasters	109,430	135,844
Lime	16	16
Magnesite	2,240	2,978
Mica, all forms	1,020	360
Pigments, mineral:		
Natural, crude	71	77
Iron oxides, processed	1,875	2,022
Precious and semiprecious stones, except diamond:		
Natural kilograms	2,110	6,182
Manufactured do	227	363
Salt (excluding brine)	470,766	476,236
Sodium and potassium compounds, n.e.s.:		
Caustic soda	30,103	36,037
Caustic potash	269	255
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	955	208
Worked	497	454
Dolomite, chiefly refractory grade	6,607	5,112
Gravel and crushed rock	823	2,720
Limestone, except dimension	318,993	382,612
Quartz and quartzite	2,785	1,643
Sand, excluding metalbearing	84,073	90,805
Sulfur:		
Elemental	56,594	40,921
Sulfuric acid	16,712	48
Talc and steatite	6,236	5,157
Other nonmetals, n.e.s.:		
Slag, dross and similar waste, not metalbearing:		
From iron and steel manufacture	20	6,450
Slag and ash, n.e.s	200	100
Oxides and hydroxides of magnesium, strontium, and barium	6,645	5,294
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	466	266
Carbon black	6,361	5,610
Coal, all grades, including briquets thousand tons	2,931	2,661
Coke and semicoke do	714	722
Peat	56	28

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity		1971	1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum:			
Crude and partly refined	thousand 42-gallon barrels	65,307	67,253
Refinery products:			
Gasoline	do	142	585
Kerosine and jet fuel	do	63	180
Distillate fuel oil	do	13,816	15,850
Residual fuel oil	do	7,013	10,227
Liquefied petroleum gas	do	128	227
Lubricants	do	637	611
Other [1]	do	730	250
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	thousand tons	14	12

NA Not available.
[1] Includes other finished products and unfinished oils requiring further processing, including topped crude.

COMMODITY REVIEW

METALS

Aluminum.—Production of aluminum semimanufactures (mostly wire and extruded products) during the first 6 months of 1973 was reported to be 38% more than in the comparable period of 1972.[3] Increased demand was partly due to a relatively high level of activity in construction of industrial and residential buildings. Prices for aluminum were 10% to 15% higher during the first half of 1973, compared with the previous year. Imports of aluminum ingot and semimanufactures (primary aluminum is not produced in Finland) in 1973 totaled more than 42,000 tons, while exports totaled 13,700 tons. Domestic consumption probably exceeded 36,000 tons, including 20,000 tons of primary ingot.

Chromium.—Production and exports of chromite concentrate and ferrochromium in 1973 were well above the levels of 1972. Exports of chromite totaled 30,800 tons, while exports of ferrochromium increased by 50% to 38,400 tons. Production capacity of the ferrochrome smelter at Tornio was increased to 50,000 tons per year in late 1972.

Cobalt.—A sharp increase in production of cobalt-bearing concentrates was reported in 1973. The increase may have been due mainly to increased output of nickel and copper ores at the Vuonos mine. Production of refined cobalt at Kokkola exceeded 1,000 tons for the first time since 1970. Exports of cobalt in 1973 rose to 991 tons valued at $6.1 million.

Copper and Nickel.—Production and exports of copper and nickel increased in 1973. The main factors were a 30% increase in production of nickel and copper ore at the Vuonos mine, a 20% increase in output of copper ore at the Pyhäsalmi mine, and the startup of full-scale production of copper ore at Hammaslahti. Production of refined copper and nickel increased 12% and 7%, respectively, compared with 1972 output. Exports of refined copper in 1973 were 3 times the volume exported in 1971 or 1972, totaling 24,500 tons valued at $40 million. The unusually large exports of metal were probably derived mostly from producer stocks. Exports of refined nickel in 1973 totaled 5,618 tons valued at $18 million.

In 1973, ores containing nickel and copper were produced at five mines. Copper ores were produced at seven other mines, of which five also produced ores of lead, zinc, or other metals. All except one of these mines were operated by Outokumpu Oy. The Luikonlahti mine was operated by Myllykoski Oy. Some 1972 production statistics for this group are shown in the following tabulation, in metric tons:

[3] Aluminium. V. 50, No. 1, January 1974, pp. 53–54.

Mine	Type	Ore treated	Concentrate produced				
			Copper	Nickel	Zinc	Lead	Pyrite
Vuonos	Open pit-underground	1,144,500	4,340	29,650	--	--	NA
Kotalahti	Underground	470,120	2,562	51,473	--	--	NA
Kylmäkoski	Open pit-underground	215,470	928	9,716	--	--	--
Hitura	Underground	184,925	(1)	15,264	--	--	--
Petolahti	Open pit	22,412	(1)	1,434	--	--	--
Outokumpu	Underground	[2] 640,328	85,837	--	2,110	--	176,760
Pyhäsalmi	Open pit-underground	807,921	21,043	--	21,052	--	438,459
Vihanti	Underground	831,931	13,130	--	65,740	2,772	20,559
Luikonlahti	do	583,556	22,816	--	--	--	190,393
Hällinmäki [3]	Open pit-underground	251,710	8,485	--	--	--	--
Aijala-Metsämonttu	Underground	120,163	16	--	7,594	514	145
Hammaslahti	Open pit-underground	(4)	--	--	--	--	--
Total		5,273,036	159,157	107,537	96,496	3,286	826,316

NA Not available.
[1] Included in nickel concentrates.
[2] Includes 125,000 tons of old tailings.
[3] Also known as Virtasalmi.
[4] Mine under development in 1972.

Source: Outokumpu Oy. Annual Report, 1972. 32 pp.

The Aijala, Kylmäkoski, and Petolahti mines were scheduled to close in 1974, due to exhaustion of ore reserves. The Korsnäs concentrator, where ore from Petolahti has been processed since the lead mine closed in 1972, will also be closed.

Outokumpu Oy. was conducting metallurgical tests on nickel carbonate in 1973, to investigate the feasibility of using the carbonate for producton of electrolytic nickel. The carbonate being tested was produced by Freeport Minerals Co. at Belle Chasse, La., from Philippine nickel ore.

Iron Ore.—The 10% drop in production of iron ore concentrate in 1973 was mainly due to reduced output of iron oxide recovered from pyrite at Kokkola. Imports of iron ore totaled 948,000 tons in 1973, an increase of 23% over 1972. Import requirements were expected to be reduced in 1975 when production of ore will begin at the Rautuvaara mine, but may again increase in 1976 when the new blast furnace at Raahe is completed.

Iron and Steel.—The few data available indicated that domestic demand for iron and steel increased in 1973. Compared with 1972, production of pig iron rose 20% while exports declined by 12%. Production of steel semimanufactures increased by 22% while exports declined by 7% and imports increased by 11%. Apparent consumption of steel semimanufactures in 1973 (production plus imports less exports) was 1.4 million tons, compared with 1.1 million tons in 1972.

Rautaruukki Oy produced 56% of the pig iron and 49% of the crude steel produced in Finland in 1973. The company's cold-rolling mill at Hämeenlinna had its first full year of production, and output of cold-rolled sheet and plate more than doubled compared with 1972. Construction of the new blast furnace began in 1973 and was expected to be completed by 1976.

The Ovako Co. produced an estimated 600,000 tons of pig iron in 1973 at Koverhar and Turku, and 800,000 tons of raw steel at Koverhar and Imatra. About half of the steel was produced in basic oxygen converters at Koverhar, and the remainder was produced in electric and open-hearth furnaces at Imatra.

Data published by the United Nations [4] indicated that 717,000 tons of iron and steel scrap was consumed in Finland in 1972. Consumption in steelworks (527,000 tons) included 275,000 tons in electric furnaces, 137,000 tons in oxygen (Linz-Donawitz) furnaces, and 115,000 tons in open-hearth furnaces. Consumption in foundries and blast furnaces was 145,000 tons and 45,000 tons, respectively. Total consumption of scrap in 1973 was probably not very different from that of 1972, owing to the increased domestic supply of pig iron; also, imports of scrap declined slightly in 1973.

Titanium.—Production of ilmenite concentrate increased about 6% in 1973, but the quantity of titanium dioxide and pigment exported declined about 12%. The total value of exports increased to approximately $19.8 million, 6% more than in 1972.

Vanadium.—Output of byproduct vanadium pentoxide from magnetite processed

[4] Economic Commission for Europe (ECE). Quarterly Bulletin of Steel Statistics for Europe. V. 23, No. 4, 1972, table B-5.

at the Otanmäki mine was about 6% more than 1972. Exports declined slightly to 2,354 tons in 1973, but their total value ($7.8 million) was 18% higher than in 1972. Development of the Mustavaara vanadium mine was continued by Rautaruukki Oy. Production was scheduled to begin in 1976.

Zinc.—With increased output from the Pyhäsalmi and Vihanti mines, production of zinc concentrate rose to 110,000 tons in 1973, a 14% increase compared with 1972. However, imports of zinc concentrate dropped by 38% to 53,000 tons, and production of slab zinc was slightly less than in 1972. Exports of slab zinc in 1973 totaled 69,000 tons valued at $35 mllion.

Zinc metal is produced only at the Kokkola works of Outokumpu Oy. Byproduct metals recovered at the zinc plant included cadmium, mercury, and selenium. Selenium is also recovered from copper anode slimes processed at the company's Harjavalta works.

NONMETALS

Cement and Other Construction Materials.—The volume of building construction continued to increase in 1973, despite a 17% increase in building costs and a tax on investments which came into effect in June and will last until September 1974. The volume of buildings authorized and under construction during 1973 increased more than 20% compared with 1972.

Production of limestone, primarily for cement manufacture, increased 12% in 1973, and output of cement was about 5% higher than in 1972. Production of cement was equivalent to 87% of installed capacity at the beginning of the year. Exports of cement remained at the high level of 1972, while imports rose to 88,000 tons, a tenfold increase compared with imports during the previous 3 years.

In other construction materials, production of bricks increased in 1973 but output remained well below the average of 1967–71. Output of window glass declined by 21% after rising for several years. Imports of gypsum, sand and gravel, and crushed stone were essentially unchanged from the levels of 1972. Imports of clays increased about 10%. Exports of dimension stone continued to rise at an annual rate of about 15%.

Fertilizer Materials.—New plants for production of nitric acid, phosphoric acid, and concentrated compound fertilizers were completed at Siilinjärvi in 1973. Annual production capacity for fertilizer materials at this works by yearend included 230,000 tons of sulfuric acid, 200,000 tons of phosphoric acid, 150,000 tons of monoammonium phosphate, 80,000 tons of nitric acid, and at least 200,000 tons of concentrated compound fertilizer.

Finland's output of sulfuric acid declined slightly in 1973 although exports continued to rise. Production of ammonia rose 13% to 259,000 tons. Imports of crude phosphate and potassium compounds rose to 591,000 tons and 283,000 tons, respectively, while exports of urea and compound fertilizers more than doubled.

Other Nonmetals.—Production and exports of asbestos, feldspar, quartz, and sulfur were about the same as in 1972. Output of talc increased about 21% and Finland became a net exporter of talc for the first time.

MINERAL FUELS

Coal and Coke.—Imports of solid fuels in 1973 included 2,967,000 tons of coal and 832,000 tons of coke. Compared with 1972 figures, total imports increased 12% in quantity and 10.6% in value.

Finland's consumption of coal and coke in 1972 and 1973 was reported as follows, in thousand metric tons:

Consuming sector	1972	1973
Coal:		
Electric power generation	1,199	1,658
Paper and woodworking industry	630	623
Other industries	532	560
Gas and coke manufacturing	119	84
Space heating	315	198
Locomotive fuel	23	20
Total	2,818	3,143
Coke:		
Metals reduction	773	835
Other	59	25
Total	832	860

Source: Ministry of Commerce and Industry, through U.S. Embassy, Helsinki (State Department Airgram A-62, Apr. 5, 1974).

Natural Gas.—The 125-kilometer Imatra-Kouvola segment of the pipeline from the Soviet Union was essentially completed in 1973. Deliveries of gas were expected to begin early in January 1974. Deliveries of gas were scheduled to total 500 million cubic meters in 1974 and 1 billion cubic

meters in 1975, and then to rise by yearly increments of 100 million cubic meters to an annual rate of 1.4 billion cubic meters by 1979. At the latter rate, the gas was expected to constitute about 3% of Finland's total energy supply in 1979.[5]

Nuclear Energy.—After a land-exchange deal was approved by the Government in May 1973, final plans were made by Teollisuuden Voima Oy (TVO), a private company, to proceed with construction of a nuclear powerplant on Olkiluoto Island near Eurajoki, about 8 miles north of Rauma on the Baltic coast. Construction was to begin in early 1974, and completion was scheduled for late 1978. The plant will have a boiling-water reactor and a generating capacity of 660 megawatts of electricity, and is expected to cost about $270 million. The contract for delivery of the powerplant, on a turnkey basis, was awarded to the Swedish firm ASEA-Atom AB. A condition of the Government's approval of the project was that state-owned companies will own 40% of the total capital stock of TVO.

Near Loviisa, 50 miles east of Helsinki, construction of two 440-megawatt nuclear powerplants was continued by Imatran Voima Oy, the state-owned power company. The first plant was scheduled for completion in 1976 and the second for early 1978. The company was also planning to build a powerplant on Olkiluoto Island, not far from the site of the TVO project.

Petroleum.—Imports of crude oil (including topped crude) in 1973 totaled 9.5 millions tons valued at $274 million, an increase of 3% in volume and 37% in dollar value compared with imports in 1972. About 70% of the crude oil came from the Soviet Union, 20% from Iran, and most of the remainder from Saudi Arabia.

Crude oil processed at the Porvoo and Naantali refineries in 1973 totaled 9.14 million tons. Output of refinery products totaled 8.25 million tons, about 5% less than in 1972. Fuel oils accounted for 61% of refinery output, followed by gasoline (18%), diesel oil (11%), and other products (10%). Imports of refinery products totaled 4.35 million tons, about 10% more than imports in 1972, with fuel oils accounting for about 92% of the volume.

Effective May 3, 1973, the Government increased the maximum retail prices for gasoline and other petroleum-based fuels by 2% to 10% compared with previous levels. The new prices for selected products, including the turnover tax of 12.4% and applicable to the cities of Helsinki, Turku, and Kotka, were as follows, in U.S. cents per U.S. gallon: gasoline (100 octane), 80 cents; gasoline (92 octane), 77 cents; diesel oil, 46 cents; light fuel oil, 21.9 cents; and heavy fuel oil, 13.8 cents.

Consumption of petroleum products in Finland in 1972 and 1973 as reported by Neste Oy in thousand metric tons follow:

Product	1972	1973
Motor gasoline	1,170	1,244
Naphtha and solvents	194	276
Kerosine, including jet fuel	128	127
Light fuel oil, including diesel oil	4,266	4,599
Heavy fuel oil	5,109	5,769
Liquefied petroleum gases	80	90
Bitumen products	327	352
Other	116	153
Total	11,390	12,610

Source: Neste Oy. Annual reports for 1972 and 1973.

[5] U.S. Embassy, Helsinki, Finland. State Department Telegram No. 71, Jan. 11, 1974.

The Mineral Industry of France

By E. Shekarchi [1]

The French economy was seriously affected when oil prices quadrupled in the fourth quarter of 1973, because 60% of the country's energy was based on imported oil (137 million tons). To combat oil shortages the French Government required energy consumption to be reduced by 20%, the prices of oil products, gas, and electricity to be raised by an average of 5%, and the interest rates on saving accounts to be increased. At yearend, French economic authorities revised the economic growth forecast downward from 5.5% for 1973 to 5% in 1974. They attributed the decline to loss of export markets and reduced energy consumption. The gross national product (GNP) at 1973 prices was $248.4 billion [2] compared with $218.6 billion in 1972. Estimated per capita GNP was $4,800 in 1973, compared with $4,200 in 1972.

Under the new economic conditions, Charbonnages de France (CDF) determined that the previously scheduled closures of old coal mines must be postponed so that coal production in 1980 could remain at approximately 20 million tons, and in 1990, at 10 million tons. Prior to the oil shortage, coal production was to be reduced to 14 million tons by 1980 and to 5 million tons by 1990. Also, CDF adopted an interim policy of encouraging the burning of coal in power stations (many of which were bi-fuel) in order to lessen dependence on imported oil while awaiting expansion of nuclear capacity in the 1980's. Coal imports were expected to increase from 16 million tons in 1973 to 22 million tons in 1974.

In contrast to many industries in France and in all industrialized countries in Europe, which suffered stagnating sales and the crushing effects of the winter's energy shortage, the French steel and aluminum producers were able to declare very satisfactory financial performances in 1973. Overall crude steel production reached 25 million tons in 1973, an increase of 1 million tons over that of 1972. Steel companies invested $33 million in a project to open coal mines in Virginia, U.S.A., owned by Chessie System, Inc. Previously, French steel companies relied upon coal deposits in the Ruhr and Lorraine Basins.

The Bureau de Recherches Géologiques et Minières (BRGM), a combined industrial, commercial, and government organization, acted in several different capacities. It carried out work in the national interest; supported research and development in the area of natural resources; served as a consultant under contract to public or private French or foreign enterprises; and as a conduit for bilateral or multilateral technical cooperation. During the year, BRGM expanded into solid wastes research and full-scale experimental work on air and water pollution. Also, BRGM applied for an exclusive exploration permit for lead-zinc, copper, silver, gold and other associated minerals over a 103-square-kilometer area in Finistere and Cote du Nord. The BRGM budget for the year included $14 million from government, $14 million from private companies, and $2 million from investment funds controlled by BRGM in 1973.

To compliment the steps that were set forth by the French Council of Ministers (FCM) in 1972 to encourage exports and initiate operations overseas, FCM made the following announcements in 1973. (1) The French Public Export Credit Insurance

[1] Physical scientist, Division of Ferrous Metals—Mineral Supply.

[2] Where necessary, values have been converted from French francs (F) to U.S. dollars at the rate of F4.6 = US$1.00.

Agency (FPECIA) was to receive the additional authority needed to streamline administrative procedures; FPECIA's emphasis was to invest and promote products in populated petroleum producing countries, raw material producing nations, and the Eastern block countries. (2) The Government of France was to broaden export promotion by reinforcing interest subsidies for investments overseas. (3) Insurance programs for foreign investments were to be raised from 75% exercised in 1972 to 90% of the value of investments in future programs.

Because of the oil shortage, the Government initiated restrictions on the export of refined petroleum by yearend. Traditionally, export licenses for petroleum products were automatically granted, but in the latter part of the year authorities discouraged export license requests, delayed the granting of export licenses, or imposed postponements.

PRODUCTION

Table 1 gives the production of primary minerals and processed metals and nonmetals.

Table 1.—France: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Aluminum:			
Bauxite, gross weight ---thousand tons--	3,184	3,258	3,299
Alumina ---do---	1,215	1,274	1,112
Metal:			
Primary ---do---	384	394	359
Secondary ---do---	98	112	123
Antimony, smelter production	1,526	2,090	2,355
Arsenic, white	8,023	r e 9,000	e 9,000
Bismuth, metal ---kilograms--	r 76,000	67,000	57,000
Cadmium, metal	579	572	606
Cobalt, metal	576	774	836
Copper:			
Mine output, metal content	r 334	472	414
Metal:			
Blister (secondary)	r 6,860	8,340	8,800
Refined [1]	r 15,000	15,600	e 15,600
Gold:			
Mine output, metal content ---troy ounces--	65,620	58,128	e 60,000
Metal ---do---	56,392	53,531	55,235
Iron and steel:			
Iron ore and concentrate ---thousand tons--	55,862	54,254	54,228
Pig iron ---do---	r 17,900	18,551	19,760
Ferroalloys:			
Blast furnace ---do---	445	449	544
Electric furnace ---do---	350	355	444
Steel:			
Ingots and castings ---do---	22,859	24,054	25,264
Semimanufactures ---do---	r 18,644	19,481	20,223
Lead:			
Mine output, metal content	r 29,759	26,620	25,038
Metal, refined:			
Primary	106,307	136,133	128,075
Secondary	18,758	17,261	19,819
Antimonial lead (lead content)	33,422	33,459	38,516
Total refined lead	158,487	186,853	186,410
Magnesium metal, including secondary	r 7,216	6,848	7,150
Nickel, metal content of metallurgical products (pure nickel, ferronickel, nickel oxide)	r 9,941	13,072	10,892
Silicon	r 37,295	31,580	e 32,000
Silver:			
Mine output, metal content ---thousand troy ounces--	2,283	1,858	1,656
Metal (content of final smelter products) ---do---	3,611	4,210	4,176
Tin concentrate, metal content ---long tons--	344	308	306
Tungsten concentrate, metal content	r 74	561	695
Uranium:			
Mine output, uranium content	1,291	1,440	1,644
Chemical concentrate, uranium content [2]	1,755	1,743	1,917
Vanadium (byproduct from bauxite) e	r 90	r 90	80

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS—Continued			
Zinc:			
Mine output, metal content	r 15,123	13,290	13,300
Metal, including secondary:			
Slab	r 210,688	251,189	249,407
Dust	r 7,968	10,326	9,971
NONMETALS			
Alabaster	2,200	NA	NA
Asbestos	710	r e 710	e 710
Barite	r 91,245	100,000	110,000
Bromine, elemental	14,530	13,560	e 14,000
Cement, hydraulic ---thousand tons	r 28,848	30,245	30,720
Clays:			
Bentonite [3]	17,320	e 20,000	e 20,000
Brick and tile clay ---thousand tons	10,816	NA	NA
Ceramic and pottery clay	548,083	NA	NA
Clay and marl for cement industry ---thousand tons	13,929	NA	NA
Kaolin and kaolinite clay, crude	542,552	r e 525,000	e 525,000
Refractory clay ---thousand tons	926	NA	NA
Diatomite	168,467	NA	NA
Feldspar:			
Crude	192,000	147,000	e 150,000
Marketable [4]	69,908	e 54,000	e 55,000
Fertilizer materials:			
Crude (natural):			
Phosphatic chalk	18,800	18,424	22,729
Potash:			
Gross weight ---thousand tons	12,131	10,606	13.247
K_2O equivalent ---do---	2,000	1,760	2,263
K_2O equivalent (marketable) ---do---	1,870	1,624	2,067
Manufactured:			
Nitrogenous, nitrogen content ---do---	r 1,421	1,492	1,701
Phosphatic:			
Superphosphate, gross weight ---do---	1,233	1,301	1,243
Thomas slag ---do---	2,540	2,557	2,498
Potassic ---do---	1,850	NA	NA
Mixed, gross weight ---do---	7,713	7,920	8,580
Fluorspar:			
Crude	600,000	640,000	570,000
Marketable	245,659	r e 290,000	e 300,000
Fly ash [e] ---thousand tons	4,000	4,000	4,000
Gypsum and anhydrite, crude ---do---	r 5,963	6,192	6,160
Lime, quicklime and hydrated lime, including dead-burned dolomite ---do---	4,446	4,835	e 5,000
Mica	3,122	e 3,100	e 3,100
Pigments, natural mineral, iron oxide	2,542	NA	NA
Pumice	800	e 800	e 800
Pozzolana and lapilli	r 766,065	627,000	e 650,000
Pyrite:			
Gross weight ---thousand tons	82	33	--
Sulfur content	r 43	14	--
Quartz and glass sand:			
Quartz	621,600	[5] 453,000	NA
Glass sand ---thousand tons	2,390	NA	NA
Salt:			
Rock salt ---do---	292	198	236
Brine salt ---do---	r 957	1,093	1,334
Marine salt ---do---	r 1,165	1,006	1,268
Salt in solution ---do---	r 3,221	3,107	3,466
Total ---do---	r 5,635	5,404	6,304
Stone, sand and gravel, n.e.s.:			
Building stone:			
Granite and similar rocks ---do---	906	NA	NA
Limestone ---do---	2,447		
Marble ---do---	226		
Other ---do---	22		
Crushed limestone and granite ---do---	5.484		
Dolomite:			
For agriculture	125,794	NA	NA
Crude for calcining	771,202	NA	NA
Other	578,857	NA	NA
Total	1,475,853	NA	NA
Limestone, agricultural and industrial:			
For agriculture ---thousand tons	503	NA	NA
For iron and steel industry ---do---	5,320		
For lime and cement ---do---	30,058		
For sugar mills ---do---	961		
Total ---do---	36,842	NA	NA

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
NONMETALS—Continued			
Stone, sand and gravel, n.e.s.—Continued			
Road building, foundation and ballast (other than alluvial sand and gravel):			
Ballast ---thousand tons	86,066		
Foundation material ---do	3,194		
Ground rock for road filler ---do	172		
Paving block and curbing ---do	159		
Slate:			
Roof ---do	109		
Other ---do	28		
Other stone:			
Beach pebble ---do	215	NA	NA
Lava ---do	7		
Marl ---do	165		
Mine fill ---do	9,300		
Millstones and grindstones	505		
Sand and gravel:			
Industrial sands:			
Foundry ---thousand tons	1,800		
Miscellaneous ---do	539		
Other sand and gravel (alluvial):			
By dredging ---do	104,503	201,180	207,960
By other winning methods ---do	r 100,712		
Sulfur, elemental, byproduct ---do	r 1,801	1,730	1,810
Talc:			
Crude	253,630	268,400	e 270,000
Powder	245,997	236,075	257,811
MINERAL FUELS AND RELATED MATERIALS			
Bituminous asphaltic material [6]	113,294	115,883	117,561
Carbon black	156,400	158,630	e 160,000
Coal:			
Anthracite ---thousand tons	9,179	8,485	7,059
Bituminous ---do	23,835	21,278	18,633
Lignite ---do	r 2,752	2,962	2,764
Total ---do	r 35,766	32,725	28,456
Metallurgical ---do	r 12,502	11,545	11,880
Gashouse ---do	4	--	--
Total ---do	r 12,506	11,545	11,880
Coal briquets ---do	r 3,773	3,351	3,234
Gas, natural:			
Gross production ---million cubic feet	380,690	386,694	387,118
Marketed ---do	252,463	260,374	266,300
Natural gas liquids:			
Natural gasoline ---thousand 42-gallon barrels	3,162	3,112	3,373
Propane ---do	1,630	1,729	1,777
Butane ---do	1,645	1,893	1,890
Total ---do	6,437	6,734	7,040
Peat ---thousand tons	106	r e 110	e 110
Petroleum:			
Crude ---thousand 42-gallon barrels	13,651	10,811	9,344
Refinery products:			
Gasoline:			
Aviation ---do	242	368	403
Motor ---do	114,410	132,456	142,995
Jet fuel ---do	22,216	24,972	26,709
Kerosine ---do	340	532	284
Distillate fuel oil ---do	301,962	320,690	357,753
Residual fuel oil ---do	216,337	250,339	289,504
Lubricants ---do	7,932	8,458	8,291
Liquefied petroleum gas ---do	27,132	31,767	34,256
Bitumen ---do	19,695	19,093	23,355
Other ---do	r 39,577	29,411	66,220
Refinery fuel and losses ---do	52,101	70,810	53,101
Total ---do	r 801,944	888,896	1,002,871

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

[1] Data given are for the imported anode and blister portions of total electrolytic copper produced. Excludes that part from scrap materials and black copper included in previous editions of this chapter.

[2] Produced in part from imported raw materials.

[3] Including smectic clay.

[4] Reportedly includes pegmatite.

[5] Data represents quantity for ceramic industry only.

[6] Excludes bituminous material.

TRADE

Details of foreign trade including total tonnage by commodities are given in tables 2 and 3.

Table 2.—France: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Bauxite	109,318	85,848	West Germany 57,712; United Kingdom 9,195; Switzerland 6,434.
Oxide and hydroxide [1]	347,392	383,997	Italy, 134,749; Spain 83,152; Republic of South Africa 43,030.
Metal, including alloys:			
Scrap	25,344	24,664	Italy 16,427; West Germany 5,231; Belgium-Luxembourg 1,905.
Unwrought	135,412	165,442	Italy 38,299; West Germany 33,323; Belgium-Luxembourg 26,756.
Semimanufactures	99,713	121,444	West Germany 42,992; United States 12,911; Netherlands 10,315.
Antimony metal, including scrap	35	112	United Kingdom 46; Italy 30; Belgium-Luxembourg 13.
Arsenic (anhydride)	7,205	8,887	United States 1,800; United Kingdom 1,399; Italy 963.
Beryllium —value, thousands [2]	$552,395	$95,540	United Kingdom $75,719.
Bismuth, all forms	112	243	Italy 148; Belgium-Luxembourg 60.
Cadmium	132	135	Belgium-Luxembourg 72; West Germany 36.
Chromium:			
Chromite	155	325	Italy 206.
Oxide and hydroxide	56	217	NA.
Metal	308	458	United States 150; Sweden 86; West Germany 56; Italy 55.
Cobalt	340	465	United States 186; United Kingdom 48; Hungary 40.
Columbium —value, thousands [2]	$12	$4	NA.
Copper:			
Matte	909	358	West Germany 172; Spain 100.
Metal and alloys:			
Scrap	50,531	57,863	West Germany 19,261; Belgium-Luxembourg 18,091; Italy 14,939.
Blister and other unrefined	6,714	6,334	Belgium-Luxembourg 4,809; Spain 1,483.
Refined	6,014	3,805	West Germany 1,685; Italy 1,013; Belgium-Luxembourg 415.
Semimanufactures	59,058	72,528	West Germany 28,492; Netherlands 10,497; United States 9,723.
Gallium [3] —value, thousands [2]	$876	$1,276	Switzerland $1,233.
Germanium, all forms	1	--	
Gold:			
Ashes and sweepings —kilograms	45	773	Switzerland 41.
Metal:			
For domestic use thousand troy ounces	142	297	Netherlands 193; West Germany 84.
Temporary imports —do	4,244	4,006	Muscat and Oman 1,210; Switzerland 1,170; United Kingdom 498.
Iron and steel:			
Iron ore —thousand tons	18,304	19,072	Belgium-Luxembourg 15,088; West Germany 3,982.
Pyrite cinder —do	150	120	Belgium-Luxembourg 87; West Germany 33.
Metal:			
Scrap —do	2,741	3,081	Italy 2,230; Belgium-Luxembourg 452; Spain 226.
Pig iron, including spiegeleisen [4] —do	145	111	Belgium-Luxembourg 40; West Germany 36; Italy 24.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Ferroalloys ——thousand tons	362	451	West Germany 117; United States 116; Italy 93.
Shot and powder ——do	25	27	West Germany 10; Italy 7.
Steel:			
Primary forms, including coil ——do	983	974	West Germany 203; Belgium-Luxembourg 199; Italy 108.
Semimanufactures:			
Bars, rods, wire rods, sections ——do	2,963	2,935	West Germany 676; United States 543; Belgium-Luxembourg 262.
Plates, sheets, universals ——do	2,752	3,067	West Germany 816; United States 451; Italy 299.
Hoop and strip ——do	254	381	West Germany 136; Italy 53; Belgium-Luxembourg 52.
Rails and accessories ——do	221	258	Italy 72; Greece 34; Republic of South Africa 23.
Wire ——do	102	115	West Germany 28; United States 25; Belgium-Luxembourg 11.
Tubes, pipes, fittings ——do	822	892	United States 133; Netherlands 114; West Germany 57.
Castings and forgings, rough ——do	29	31	Belgium-Luxembourg 12; United States 9; West Germany 4.
Lead:			
Ore	1,156	95	United Kingdom 43.
Oxides	10,244	12,332	Netherlands 3,272; Italy 2,224; Czechoslovakia 1,588.
Metal, including alloys:			
Scrap	9,417	14,140	Italy 9,457; West Germany 2,829; Belgium-Luxembourg 1,569.
Unwrought	30,159	19,222	Belgium-Luxembourg 4,783; Switzerland 3,445; India 3,300.
Semimanufactures	1,440	1,729	Italy 568; Belgium-Luxembourg 318; West Germany 308.
Magnesium metal, including alloys, all forms	840	3,560	West Germany 2,515.
Manganese:			
Ore	320	3,827	Spain 3,310; Brazil 140.
Oxide	253	121	NA.
Metal, including alloys, all forms	3,986	5,023	Italy 1,404; West Germany 1,353; Sweden 866.
Mercury ——76-pound flasks	145	290	Spain 145; Italy 87.
Molybdenum:			
Ore	--	6	All to Italy.
Oxide	114	33	Italy 25; Austria 6.
Metal, all forms	49	80	Netherlands 30; Italy 15; West Germany 13.
Nickel:			
Matte, speiss, etc	67	325	East Germany 319.
Oxide and hydroxide	318	257	Italy 51; United States 35; Hong Kong 31.
Metal, including alloys:			
Scrap	1,046	2,508	Netherlands 856; West Germany 763; Belgium-Luxembourg 275.
Ingots	4,339	5,767	West Germany 1,526; United States 1,474; Sweden 876.
Semimanufactures, including anodes	3,183	3,572	West Germany 758; Spain 748; United States 328.
Platinum and platinum-group metals, including alloys——thousand troy ounces	133	411	West Germany 306; Spain 21; Poland 20.
Selenium	5	11	Belgium-Luxembourg 2.
Silver metal, including alloys ——thousand troy ounces	7,660	11,722	Spain 4,587; West Germany 1,516; Netherlands 1,190.
Tantalum, all forms ——value, thousands [2]	$200	$161	United States $58; West Germany $46; United Kingdom $33.
Thorium oxide	6	11	United Kingdom 3; United States 3.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Tin:			
Ore ——long tons—	478	443	Spain 433; United Kingdom 10.
Oxide ——do——	26	40	West Germany 38.
Metal, including alloys:			
Scrap ——do——	1	41	Sweden 35.
Ingots ——do——	379	282	Italy 86; Switzerland 86; Tunisia 23.
Semimanufactures ——do——	82	156	Belgium-Luxembourg 26; West Germany 18; Italy 14.
Titanium:			
Ore	124	336	Algeria 334.
Oxide	13,648	20,895	United States 9,406; West Germany 1,803; United Kingdom 1,793.
Metal, all forms	140	400	United Kingdom 195; Netherlands 63; Sweden 46.
Tungsten:			
Ore	1,046	1,402	All to West Germany.
Trioxide	47	89	Austria 57; West Germany 20.
Metal, all forms	189	237	West Germany 76; United Kingdom 62; Netherlands 36.
Zinc:			
Ore	3	2,687	Italy 1,201; West Germany 1,158; Belgium-Luxembourg 328.
Matte	652	241	Belgium-Luxembourg 110.
Oxide	45	80	NA.
Metal, including alloys:			
Scrap	1,495	1,698	Italy 1,361; Belgium-Luxembourg 263.
Dust (blue powder)	1,686	2,848	Norway 1,507; Belgium-Luxembourg 941; West Germany 155.
Slab and ingot	30,583	48,160	United States 23,330; United Kingdom 7,931; West Germany 5,749.
Semimanufactures	6,675	17,712	West Germany 7,645; Belgium-Luxembourg 5,078; Denmark 2,089.
Zirconium:			
Ore	131	31	NA.
Oxide	108	77	Mexico 22; Netherlands 19; Spain 18.
Metal, including nuclear grade	139	146	United States 61; West Germany 46.
Other:			
Ore and concentrate	353	1,290	Switzerland 1,175.
Ash and residues from nonferrous metals:			
Aluminum	5,476	6,608	Italy 4,645; West Germany 1,432; Belgium-Luxembourg 286.
Copper	4,330	3,013	Belgium-Luxembourg 1,882; Spain 643; Italy 269.
Lead	7,521	8,070	Belgium-Luxembourg 7,532; West Germany 407.
Nickel	413	589	Canada 159; Netherlands 157; Italy 116.
Zinc	5,034	7,107	Belgium-Luxembourg 4,542; West Germany 1,218; Italy 826.
Other	26,141	36,181	Sweden 13,432; West Germany 12,571; Belgium-Luxembourg 6,638.
Ashes, sweepings and other residues of platinum, silver, and other precious metals	24	115	West Germany 59; Sweden 30; Belgium-Luxembourg 22.
Slag and ash, n.e.s	24,103	37,337	Belgium-Luxembourg 21,823; West Germany 10,245; Spain 3,142.
Metal, including alloys, all forms [5]	613	597	West Germany 133; United States 117; Yugoslavia 105.
NONMETALS			
Abrasives, natural:			
Pumice, emery, other	464	642	Belgium-Luxembourg 163; Algeria 87.
Dust and powder of precious and semiprecious stones—value, thousands [2]	$180	$293	Spain $105; Switzerland $99; United Kingdom $50.
Grinding and polishing wheels	2,470	2,933	Italy 500; Belgium-Luxembourg 494; West Germany 431.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Asbestos, crude	338	5,715	NA.
Barite, including witherite	21,314	26,421	Gabon 5,039; Belgium-Luxembourg 4,927; Republic of Congo (Brazzaville) 3,877.
Borates, natural	244	476	Senegal 180; Ivory Coast 180.
Cement ——thousand tons	1,787	1,890	West Germany 400; Ivory Coast 329; United States 203.
Chalk	375,274	397,826	West Germany 168,648; Belgium-Luxembourg 75,822; Netherlands 52,627.
Clays and clay products (including all refractory brick):			
Crude:			
Kaolin	75,624	103,362	West Germany 60,119; Italy 13,971; Netherlands 6,318.
Bentonite	2,958	2,416	Belgium-Luxembourg 777; Switzerland 293; Tunisia 289.
Refractory	431,251	362,174	Italy 205,312; West Germany 80,079; Belgium-Luxembourg 36,252.
Other	86,047	134,655	Italy 69,057; West Germany 21,905; Belgium-Luxembourg 11,858.
Products, refractory (including nonclay brick)	302,258	403,354	West Germany 168,415; Belgium-Luxembourg 65,607; Switzerland 38,305.
Corundum:			
Natural, including emery (included in abrasives above)	145	279	Belgium-Luxembourg 87; Algeria 82.
Artificial	15,254	15,456	West Germany 2,386; Belgium-Luxembourg 2,316; Italy 2,127.
Cryolite and chiolite, natural	930	95	NA.
Diamond:			
Industrial, excluding powder value, thousands [2]	$1,630	$2,351	Romania $707; Ireland $577; West Germany $351.
Gem, unset ——do	$10,181	$10,762	Switzerland $3,965; Netherlands $2,422; United States $2,315.
Diatomite	16,933	17,016	West Germany 9,382; Netherlands 2,321; Italy 740.
Feldspar	35,837	37,597	Belgium-Luxembourg 17,692; West Germany 8,707; Spain 5,029.
Fertilizer materials:			
Crude:			
Nitrogenous (natural sodium nitrates)	10	1,011	Spain 1,010.
Phosphate rock	2,979	3,494	Liberia 843.
Potassic salts	47,704	36,778	Belgium-Luxembourg 28,289; Switzerland 4,347; Netherlands 4,069.
Organic	23,362	23,954	Switzerland 14,730; West Germany 2,435; Spain 2,214.
Manufactured:			
Nitrogenous ——thousand tons	307	546	Belgium-Luxembourg 103; Egypt 60; West Indies 50.
Phosphatic:			
Basic slag ——do	269	318	Austria 140; Switzerland 116; Italy 52.
Other ——do	43	43	United Kingdom 9; Spain 8; People's Republic of China 8.
Potassic ——do	1,228	678	Belgium-Luxembourg 202; Netherlands 73; Italy 67.
Ammonia, anhydrous ——do	181	135	West Germany 68; Ireland 24; Spain 20.
Flint (pebbles)	102,444	109,767	West Germany 31,800; United Kingdom 24,350; Belgium-Luxembourg 13,465.
Fluorspar	122,216	75,163	West Germany 38,218; Italy 13,069; Czechoslovakia 7,350.
Graphite	1,613	2,132	Belgium-Luxembourg 920; Italy 299; Spain 256.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Gypsum and anhydrite, including plasters thousand tons	1,155	1,192	Belgium-Luxembourg 434; Netherlands 158; Sweden 136.
Iodine	22	42	United Kingdom 10; Egypt 7; Hungary 7.
Lime	331,224	375,997	West Germany 176,511; Belgium-Luxembourg 160,875; Guinea 21,215.
Magnesite, including calcined	1,509	373	United Kingdom 127; Italy 97.
Mica	1,423	1,395	West Germany 714; United Kingdom 358; Belgium-Luxembourg 114.
Pigments, mineral, including iron oxide	2,608	2,948	Algeria 485; United Kingdom 436; Morocco 365.
Pozzolan, santorin, etc	2,142	3,185	Switzerland 3,144.
Precious and semiprecious stones, except diamond [6] value, thousands [2]	$12,094	$16,814	Switzerland $8,662; United States $2,689; West Germany $1,138.
Pyrite, gross weight	275	NA	
Salt	113,822	103,788	West Germany 53,758; Belgium-Luxembourg 24,530; Sweden 7,590.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	308,694	317,058	Guinea 88,555; United States 55,730; Australia 43,108.
Caustic potash	11,831	10,137	Netherlands 4,033; United Kingdom 1,363; Switzerland 1,147.
Stone, sand and gravel: [7]			
Building stone:			
Crude and partly worked, n.e.s	89,747	93,618	Belgium-Luxembourg 49,004; Switzerland 20,110; West Germany 16,653.
Worked:			
Slate, including crude	26,714	28,903	Netherlands 14,436; Belgium-Luxembourg 9,130; West Germany 2,695.
Not specified	11,613	14,583	West Germany 7,482; Belgium-Luxembourg 4,862; Switzerland 1,152.
Dolomite, chiefly refractory grade	92,722	79,893	Belgium-Luxembourg 36,775; West Germany 15,410; Netherlands 10,380.
Gravel and crushed stone thousand tons	11,448	12,305	West Germany 9,138; Switzerland 2,054; Belgium-Luxembourg 606.
Limestone (except dimension)	135,555	165,222	Belgium-Luxembourg 75,660; Switzerland 54,714; West Germany 33,668.
Quartz and quartzite	5,137	3,678	Belgium-Luxembourg 2,654; United Kingdom 153.
Sand, excluding metal bearing thousand tons	3,367	3,825	West Germany 1,771; Switzerland 1,092; Italy 487.
Sulfur, elemental do	r 953	1,004	United Kingdom 369; Republic of South Africa 116; Netherlands 90.
Talc and steatite	59,574	57,455	West Germany 16,066; United Kingdom 10,646; Belgium-Luxembourg 3,944.
Other nonmetals, n.e.s.:			
Crude	203,937	225,987	Switzerland 195,728; West Germany 22,093; Belgium-Luxembourg 5,022.
Slag, dross, and similar waste, not metal bearing, from iron and steel manufacture thousand tons	1,214	1,331	West Germany 981; Netherlands 167; Belgium-Luxembourg 91.
Oxides and hydroxides of magnesium, strontium, barium	8,059	6,509	U.S.S.R. 2,583; West Germany 917; Sweden 445.
Fluorine	297	230	Saudi Arabia 200.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	7,913	7,467	United Kingdom 7,276; West Germany 89.
Carbon black	40,160	32,954	Italy 9,174; West Germany 7,871; Spain 4,643.
Coal and briquets:			
Bituminous	932,027	940,749	West Germany 500,045; Belgium-Luxembourg 222,967; United Kingdom 87,117.
Briquets of bituminous coal	110,444	127,563	United Kingdom 108,045; Italy 13,099; Switzerland 4,441.
Lignite	18,243	24,137	Spain 21,832; West Germany 1,365.
Coke	r 506,113	577,335	West Germany 143,235; Belgium-Luxembourg 118,152; Italy 69,529.
Gas, natural ---million cubic feet	1,165	352,660	Mainly to Belgium-Luxembourg.
Hydrogen, helium, rare gases	831	651	Switzerland 403; Spain 72; Belgium-Luxembourg 32.
Peat, including briquets	3,395	3,047	West Germany 2,180; Hungary 40.
Petroleum refinery products:			
Gasoline -thousand 42-gallon barrels	20,417	22,684	United Kingdom 6,082; West Germany 5,375; Switzerland 5,368.
Kerosine and jet fuel ---do	4,705	5,776	Switzerland 2,725; West Germany 1,493; United Kingdom 508.
Distillate fuel oil ---do	27,479	32,357	Switzerland 17,081; West Germany 10,319; Netherlands 1,638.
Residual fuel oil ---do	24,317	20,005	West Germany 4,754; Italy 3,076; Switzerland 2,988.
Lubricants ---do	2,471	3,838	United Kingdom 878; Belgium-Luxembourg 671; Netherlands 518.
Other:			
Liquefied petroleum gas ---do	6,515	6,030	Spain 2,687; Portugal 999; West Germany 568.
Bitumin, petroleum coke, other residues ---do	2,542	2,417	West Germany 1,218; Switzerland 598; Belgium-Luxembourg 223.
Chemical derivatives of coal, petroleum, or gas	73,033	104,031	West Germany 40,533; Belgium-Luxembourg 20,283; Switzerland 13,457.

r Revised. NA Not available.
1 Excluding artificial corundum.
2 Based on exchange rates of 5.554 francs per U.S. dollar in 1971 and 5.045 francs per U.S. dollar in 1972.
3 Including indium and thallium.
4 Including cast iron and shot, grit, powder and sponge of iron and steel.
5 Alkali, alkaline earth, and rare-earth metals except sodium.
6 Including synthetic and reconstituted stone but not including diamond.
7 Not including slate, flint, or industrial limestone.

Table 3.—France: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite	504,628	517,905	Australia 303,171; Greece 109,508; Guyana 56,997.
Oxide and hydroxide [1]	9,967	9,756	West Germany 4,536; Canada 2,038; Netherlands 1,519.
Metal, including alloys:			
Scrap	14,991	23,089	Belgium-Luxembourg 7,538; West Germany 6,860; Netherlands 3,331.
Unwrought	165,552	194,126	Greece 46,761; West Germany 28,941; Cameroon 25,726.
Semimanufactures	84,693	109,932	West Germany 49,097; Belgium-Luxembourg 32,280.
Antimony:			
Ore and concentrate	5,075	4,643	Thailand 866; Bolivia 859; Morocco 607.
Metal, all forms	801	1,119	People's Republic of China 524; Belgium-Luxembourg 408.
Arsenic, anhydride and acid	21	--	
Beryllium metal, all forms --value, thousands--	$254	$203	United States $154; West Germany $20.
Bismuth	898	1,209	Peru 398; Bolivia 292; Japan 225.
Cadmium	491	569	Belgium-Luxembourg 292; Japan 49.
Chromium:			
Ore	340,407	276,393	Malagasy Republic 90,958; U.S.S.R. 68,870; Turkey 37,807.
Oxide and hydroxide	2,468	3,189	West Germany 1,320; U.S.S.R. 955; United Kingdom 640.
Metal	67	90	West Germany 40; United Kingdom 22.
Cobalt:			
Ore	4,100	7,815	All from Morocco.
Oxide and hydroxide	201	269	Belgium-Luxembourg 176.
Metal, all forms	609	410	Zaire 161; Belgium-Luxembourg 145.
Columbium:			
Ore (including tantalum ore)	515	619	All from Canada.
Metal, all forms --value, thousands [2]--	$73	$123	United Kingdom $50; United States $38; West Germany $20.
Copper:			
Ore and concentrate	578	4,346	Mainly from Mauritania.
Matte	574	3,580	United States 1,827; Belgium-Luxembourg 1,659.
Metal, including alloys:			
Scrap	12,076	13,279	West Germany 3,664; Belgium-Luxembourg 2,715; Algeria 1,535.
Blister and other unrefined	16,425	15,713	Zaire 8,899; Belgium-Luxembourg 4,171; Spain 2,538.
Refined	303,937	369,725	Belgium-Luxembourg 105,299; Zambia 68,486; Chile 40,521.
Semimanufactures	r 36,990	54,846	West Germany 20,764; Belgium-Luxembourg 18,206.
Germanium, gallium, etc. value, thousands [2]	r $412	$394	Belgium-Luxembourg $252; Netherlands $52.
Gold:			
Ashes and sweepings --kilograms--	2,200	23,113	Switzerland 259; Spain 49; Italy 45.
Metal:			
For domestic use thousand troy ounces--	135	322	United Kingdom 184; Rhodesia 46; North Korea 32.
Temporary imports --do--	4,626	3,385	United Kingdom 1,497; Switzerland 603.
Iron and steel:			
Ore and concentrate, except roasted pyrite --thousand tons--	9,370	11,559	Brazil 3,181; Mauritania 2,364; Sweden 1,733.
Roasted pyrite --do--	68	89	Spain 51; Italy 32.
Metal:			
Scrap --do--	252	239	Belgium-Luxembourg 108; West Germany 60; United Kingdom 53.
Pig iron, spiegeleisen, other [3] do--	255	395	Mainly from West Germany.
Ferroalloys --do--	117	146	New Caledonia 97; West Germany 18.

See footnotes at end of table.

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

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Steel, primary forms thousand tons	1,841	1,941	Belgium-Luxembourg 953; West Germany 642.
Semimanufactures:			
Bars, rods, sections [4] do	r 1,840	2,440	Belgium-Luxembourg 1,020; West Germany 967; Italy 286.
Plates, sheets, universals do	2,226	2,806	West Germany 517; Belgium-Luxembourg 511; Japan 61.
Hoop and strip do	325	394	Belgium-Luxembourg 246; West Germany 113.
Rails and accessories do	87	85	United Kingdom 49; Belgium-Luxembourg 24.
Wire do	102	127	West Germany 55; Belgium-Luxembourg 52.
Tubes, pipes, fittings do	367	442	West Germany 183; Italy 66; Belgium-Luxembourg 64.
Castings and forgings, rough	11,541	12,638	Belgium-Luxembourg 4,740; West Germany 4,348; Switzerland 2,954.
Lead:			
Ore and concentrate	149,886	159,837	Morocco 65,251; Ireland 43,528; United States 12,619.
Oxide	2,517	2,826	Belgium-Luxembourg 1,098; West Germany 555; Mexico 419.
Metal, including alloys:			
Scrap	5,488	13,393	Netherlands 6,115; Belgium-Luxembourg 5,321; Switzerland 1,213.
Unwrought	42,512	41,071	Belgium-Luxembourg 12,817; United Kingdom 6,986; Tunisia 6,742.
Semimanufactures	611	690	Belgium-Luxembourg 366; West Germany 220.
Magnesium, including alloys:			
Scrap	72	89	NA.
Unwrought	935	784	United States 209; United Kingdom 207; Norway 175.
Semimanufactures	64	41	West Germany 19; United States 11.
Manganese:			
Ore and concentrate thousand tons	1.117	1,123	Gabon 471; Republic of South Africa 405; U.S.S.R. 86.
Oxide	1,955	4,171	West Germany 1,634; Japan 1,490; Belgium-Luxembourg 1,023.
Metal, all forms	235	598	Republic of South Africa 259; Japan 207.
Mercury, all forms 76-pound flasks	10,907	7,455	Spain 2,553; Yugoslavia 1,015; Algeria 899.
Molybdenum:			
Ore and concentrate	5,391	5,331	Canada 2,595; Netherlands 1,085; United States 956.
Oxide	28	71	Netherlands 34; West Germany 30.
Metal, all forms	100	156	West Germany 54; Austria 48; Netherlands 29.
Nickel:			
Matte	13,661	18,905	New Caledonia 17,877; Canada 731.
Oxide and hydroxide	80	103	Canada 96.
Metal, including alloys:			
Scrap	677	752	Spain 200; Senegal 143; Belgium-Luxembourg 114.
Unwrought	11,284	14,181	United Kingdom 3,726; New Caledonia 2,977; Canada 2,580.
Semimanufactures (including anodes)	5,832	3,882	West Germany 1,669; United Kingdom 845; United States 788.
Platinum and platinum group:			
Ashes and sweepings kilograms	1,023	1,153	Netherlands 305; Bulgaria 146; Spain 139.
Metals troy ounces	321,346	289,003	U.S.S.R. 80,441; United Kingdom 60,604; Switzerland 39,256.
Selenium	114	95	Japan 33; West Germany 15; Sweden 8; United States 8.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Silver:			
Ashes and sweepings ____kilograms__	8,647	7,935	Netherlands 3,242; Spain 3,081; Switzerland 1,281.
Metal, all forms thousand troy ounces__	20,306	34,490	United Kingdom 13,704; Switzerland 6,808; United States 5,536.
Tantalum, all forms	15	19	United States 11.
Thorium:			
Ore (monazite)	2,557	4,652	Australia 3,944; Malaysia 504.
Metal ____value, thousands [2]__	$11	$5	NA.
Tin:			
Oxide ____long tons__	93	169	Belgium-Luxembourg 106; West Germany 43.
Metal, including alloys:			
Scrap ____do____	223	163	Switzerland 89; Italy 47.
Ingots ____do____	10,429	11,337	Malaysia 3,681; United Kingdom 2,324; Indonesia 1,811.
Semimanufactures ____do____	175	165	West Germany 65; Sweden 31; Netherlands 28.
Titanium:			
Ore	112,961	139,703	Australia 138,404; Ceylon 404.
Oxide	22,362	30,535	West Germany 15,148; Netherlands 4,254; Belgium-Luxembourg 3,933.
Metal, all forms	1,556	1,071	U.S.S.R. 385; United Kingdom 241; Japan 175.
Tungsten:			
Ore	2,311	1,891	Thailand 411; Republic of Korea 270; People's Republic of China 233.
Trioxide	104	5	All to West Germany.
Metal, all forms	92	118	West Germany 54; Netherlands 42.
Uranium:			
Ore	1,952	1,540	Gabon 1,129; Niger 411.
Metal, including alloys ___kilograms__	303,244	330,201	Niger 145,036; West Germany 93,501; Argentina 63,000.
Zinc:			
Ore and concentrate	384,844	436,517	Canada 169,217; Peru 115,072; Ireland 47,765; Morocco 35,479.
Oxide	3,807	5,583	Italy 1,649; West Germany 1,398; United Kingdom 833.
Metal, including alloys:			
Scrap	20,331	17,937	Belgium-Luxembourg 7,029; Netherlands 6,185; West Germany 2,914.
Blue powder	4,419	4,480	Belgium-Luxembourg 4,341.
Unwrought	40,511	61,708	North Korea 16,753; Belgium-Luxembourg 9,985; Netherlands 8,989.
Semimanufactures	4,436	3,654	West Germany 1,832; Yugoslavia 1,000; Belgium-Luxembourg 312.
Zirconium:			
Ore	32,732	32,163	Australia 30,375; United States 1,564.
Oxide	401	400	United Kingdom 240; United States 47; West Germany 44.
Metal	52	21	Sweden 11.
Other:			
Ashes and concentrates	41,726	15,655	Iran 7,190; New Caledonia 5,842; Australia 1,324.
Ashes and residues containing nonferrous metals:			
Aluminum	6,644	8,764	West Germany 4,142; Italy 1,706; Netherlands 1,598.
Copper	1,636	1,587	Belgium-Luxembourg 460; Chile 409; Brazil 300.
Lead	349	1,362	Morocco 896; West Germany 196; Netherlands 104.
Nickel	331	95	NA.
Zinc	14,799	13,992	West Germany 6,404; Belgium-Luxembourg 2,442; Sweden 1,617.
Other	22,744	25,788	Canada 22,234; Morocco 1,583.
Metal, including alloys, all forms	230	176	West Germany 89; United States 40.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS			
Abrasives:			
Emery, natural corundum, other	47,576	57,044	Turkey 51,880; Greece 2,400; West Germany 1,399.
Pumice	11,820	11,350	Italy 9,498; Netherlands 919.
Dust and powder of precious and semi-precious stones—value, thousands [2]	$5,068	$5,340	United States $1,914; United Kingdom $1,111; Switzerland $992.
Grinding and polishing wheels	7,034	6,322	Italy 1,571; Belgium-Luxembourg 1,369; West Germany 1,247.
Asbestos	128,980	148,298	Canada 71,600; U.S.S.R. 44,012; Republic of South Africa 16,827.
Barite and witherite	80,287	64,423	West Germany 46,488; People's Republic of China 9,303; Spain 4,860.
Boron materials:			
Crude natural borates	133,201	105,743	United States 61,284; Turkey 43,135.
Oxide and acid	716	1,213	Italy 674; United States 269; Turkey 259.
Bromine	NA	67	Israel 66.
Cement	47,783	37,172	Italy 18,805; West Germany 15,167; Belgium-Luxembourg 2,257.
Chalk	8,504	7,263	Belgium-Luxembourg 5,746; West Germany 1,483.
Clays and clay products:			
Crude:			
Kaolin, including calcined	302,535	304,567	United Kingdom 238,142; United States 40,583; West Germany 6,535.
Bentonite	100,275	105,782	Italy 34,049; Greece 32,567; West Germany 14,585.
Refractory clays	183,691	203,349	West Germany 146,402; United Kingdom 22,874; Belgium-Luxembourg 11,672.
Clay and refractory construction materials (bricks, etc.)	718,726	733,563	West Germany 250,181; Italy 204,786; Belgium-Luxembourg 147,231.
Cryolite and chiolite, natural	3,874	1,334	Denmark 1,265.
Diamond:			
Industrial, except dust value, thousands [2]	$5,962	$5,516	Ireland $2,485; Belgium-Luxembourg $1,493; United Kingdom $741.
Gem, unset ——do	$27,900	$37,925	Belgium-Luxembourg $14,713; Israel $6,668; Switzerland $6,510.
Diatomite	5,302	5,760	United States 1,845; West Germany 1,561; Algeria 1,222.
Feldspar	31,003	31,757	Norway 21,026; West Germany 5,514; Portugal 2,403.
Fertilizer materials:			
Crude:			
Nitrogenous (natural sodium nitrate)	13,977	23,397	Chile 13,425; Belgium-Luxembourg 9,972.
Phosphate rock—thousand tons	3,924	4,158	Morocco 1,515; Togo 1,041; United States 523; Senegal 497.
Manufactured:			
Nitrogenous	632,984	735,139	Belgium-Luxembourg 295,676; Netherlands 110,268; Romania 100,553.
Potassic	220,269	323,808	Israel 116,415; Belgium-Luxembourg 78,560; West Germany 66,977.
Phosphatic:			
Basic slag	892,358	891,004	Belgium-Luxembourg 767,358; West Germany 123,646.
Other	457,868	407,684	Netherlands 119,464; Belgium-Luxembourg 111,218; Tunisia 92,310.
Ammonia, anhydrous	142,735	245,045	Belgium-Luxembourg 170,845; Netherlands 28,237; United States 28,043.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Flint (pebbles)	1,057,932	878,238	United Kingdom 439,522.
Fluorspar	5,589	3,685	Italy 1,345; Republic of South Africa 1,268; West Germany 503.
Graphite	5,707	4,456	Malagasy Republic 2,219; Italy 878; West Germany 578.
Gypsum and plaster	29,334	42,127	West Germany 40,161; Italy 1,382.
Iodine, crude	760	889	Japan 761.
Lime	166,037	182,479	Belgium-Luxembourg 121,216; West Germany 57,724.
Lithium and strontium minerals	3,299	3,447	Republic of South Africa 1,257; Mozambique 742; United Kingdom 740.
Magnesite, including calcined	55,993	47,514	Austria 20,011; Greece 8,622; Czechoslovakia 3,829.
Mica	4,587	5,731	India 1,789; Republic of South Africa 1,570; Norway 1,041.
Pigments:			
Earth pigments, including iron oxides	1,563	2,334	Iran 1,000; West Germany 803.
Earth, other (pozzolanic), santorin, etc	1,984	597	NA.
Precious and semiprecious stones [5] value, thousands [2]	$15,363	$22,111	India $5,937; Switzerland $5,391; Colombia $3,912.
Pyrite	249,314	204,281	Cyprus 110,268; U.S.S.R. 51,815; Spain 41,851.
Salt	78,350	122,669	Netherlands 56,247; Algeria 19,950; Belgium-Luxembourg 19,877.
Sodium and potassium salts, n.e.s.:			
Caustic soda	67,585	51,135	Belgium-Luxembourg 39,905; Italy 4,800; West Germany 4,559.
Caustic potash and peroxides of potassium and sodium	172	403	West Germany 280; Sweden 70.
Stone, sand and gravel: [6]			
Dimension stone:			
Crude and partly worked:			
Slate	1,246	2,055	United Kingdom 1,274; Italy 341; Belgium-Luxembourg 260.
Other	205,451	216,591	Republic of South Africa 63,500; Norway 21,609; West Germany 12,808.
Worked:			
Slate	36,138	49,220	Spain 46,044; Portugal 1,075; United Kingdom 878.
Other	94,558	110,207	Italy 84,486; West Germany 17,253.
Dolomite, chiefly refractory grade	179,911	319,688	Belgium-Luxembourg 179,311; West Germany 136,772.
Gravel and crushed stone thousand tons	6,529	5,881	Belgium-Luxembourg 4,469; United Kingdom 476; West Germany 243.
Limestone	158,494	213,718	Belgium-Luxembourg 212,236; West Germany 1,438.
Quartz and quartzite	30,670	21,902	West Germany 10,619; Italy 9,413; Norway 572.
Sand, excluding metal bearing thousand tons	1,570	1,744	Belgium-Luxembourg 666; Netherlands 547; United Kingdom 364.
Sulfur, elemental, all grades	428,936	459,659	Poland 182,488; United States 121,880; Canada 111,337.
Talc and steatite	7,623	3	NA.
Other nonmetals, n.e.s	810,116	831,183	Switzerland 679,960; Greece 41,129; West Germany 39,796.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	2,568	1,440	United States 736; West Germany 578.
Carbon black	64,279	66,024	Netherlands 33,311; West Germany 13,453; United States 9,516.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
MINERAL FUELS AND RELATED MATERIALS —Continued			
Coal and briquets:			
Coal ---thousand tons--	13,522	11,884	West Germany 5,853; United States 1,766; Poland 1,578.
Coal briquets ---do---	144	122	Netherlands 73; Belgium-Luxembourg 39.
Lignite and lignite briquets --do---	259	233	West Germany 232.
Coke ---do---	2,626	2,652	West Germany 2,274; Netherlands 205.
Gas, natural ---million cubic feet--	152,373	248,795	Mainly from Netherlands.
Hydrogen and rare gases ---	8,615	12,359	West Germany 8,794; Belgium-Luxembourg 2,745; Netherlands 603.
Peat, including briquets --thousand tons--	51	63	West Germany 37; Netherlands 14; Poland 6.
Petroleum:			
Crude ---thousand 42-gallon barrels--	716,364	898,209	Saudi Arabia 193,793; Kuwait 132,022; Iraq 108,493.
Refinery products:			
Gasoline ---do---	16,814	17,382	Italy 6,423; West Germany 5,723; Romania 1,087.
Kerosine ---do---	863	563	United Kingdom 179; Netherlands 136; West Germany 92.
Distillate fuel oil ---do---	32,920	32,990	Italy 15,975; U.S.S.R. 6,449; Romania 3,174.
Residual fuel oil ---do---	3,201	11,969	Italy 5,042; U.S.S.R. 2,554; West Germany 1,852.
Lubricants ---do---	434	501	United Kingdom 149; United States 104; West Germany 74.
Other:			
Liquefied petroleum gas do---	7,489	9,795	Algeria 6,702; Venezuela 710.
Vaseline, waxes, petroleum coke, bitumen, etc --do---	1,715	3,464	United States 1,102; West Germany 961.
Mineral tar and crude chemicals derived from coal, petroleum, or gas ---	268,750	320,227	United States 131,271; West Germany 58,260; Italy 45,503.

r Revised. NA Not available.
[1] Excluding artificial corundum.
[2] Based on exchange rates of 5.554 francs per U.S. dollar in 1971 and 5.045 francs per U.S. dollar in 1972.
[3] Including cast iron and sponge, powder, etc., of iron and steel.
[4] Including wire rod.
[5] Including synthetic and reconstituted stone but not including diamond.
[6] Excluding flint and industrial limestone.

COMMODITY REVIEW

METALS

Bauxite.—Production of bauxite increased 1.3% and alumina decreased 13% in 1973 compared with that of 1972. Combined primary and secondary aluminum production decreased 5% in 1973. Pechiney Ugine Kuhlmann (PUK), one of the leading aluminum producers in France, experienced minimal energy problems in 1973 because the company's power production facilities operated 60% on hydroelectricity and only 40% on natural gas and other fuel. However, lower production in 1973 was attributed to a 53-day strike that stopped production at the Noguérs aluminum smelter.

After extensive research, PUK announced in 1973 that it would build a pilot plant at L'Estaque, in the Rhône Delta, for the production of alumina from clays and shales. PUK's new H^+ processes, which used sulfuric acid to break down the aluminum silicate found in most ordinary clays and shales, was expected to free aluminum production from dependence on bauxite. The impure aluminum sulfate produced was converted to aluminum chloride by the addition of hydrochloric acid. The final alumina product was obtained by a crystallization process similar to that of sugar refining. PUK reported that, depending on the alumina content of clay, 60 to 100 tons

of clay would be required to produce 20 tons of alumina.

The new process yielded a purer product than did the conventional Bayer process but required more energy. The new plant, which was to cost about $8 million, was expected to be in full production by 1976.

Gold.—Gold production increased 3.2% in 1973 compared with that of 1972. The only gold mine in France was operated by Société des Mines et des Produits Chimiques de Salsique in the Department of Aude, southern France. The deposit was a complex metal bearing ore of arsenopyrite, containing gold, silver, copper, bismuth, and arsenic.

Iron Ore.—French iron ore production decreased slightly in 1973 compared with 1972 output. Most of the production was from the Lorraine Basin, which extends over a large area between the Meurthe and Moselle Rivers. The West Basin as well as the Pyrénées Basin contributed 4.2% in 1973. The output of each basin between 1971 and 1973 in thousand tons follow:

	Lorraine Basin	Basin West	Pyrénées	Total [1]
1971	53,577	2,206	78	55,861
1972	52,085	2,065	96	54,246
1973	51,958	2,178	92	54,228

Source: Chambre Syndicale des Mines de Fer de France. Rapport d'activité. 1973, p. 13.
[1] Data do not agree with that shown on table 1 because of difference in source.

Iron and Steel.—Between 1953 and 1973, annual raw steel production in France more than doubled, from 11.2 million tons to 25.3 million tons. Forecasts for the year 1980 were projected at 31 million tons. The yearly French raw steel production compared with that of the European Community (EC) countries in million tons follow:

	France	European Community [1]
1950	8.7	31.7
1953	11.2	42.5
1960	17.3	73.0
1962	17.2	73.0
1969	22.5	107.3
1971	22.9	103.4
1972	24.1	112.6
1973	25.3	--
1975 (forecast)	28.0	13.6
1980 (forecast)	31.0	15.0

[1] Original six countries.

Apparent per capita consumption of raw steel per year increased from 170 kilograms in 1950 to 330 kilograms in 1960 and to 460 kilograms in 1970. By comparison, in the original six EC members, consumption in 1970 was 511 kilograms per year.

French steel companies are privately owned, except for a small special steel company S.A.F.E., a wholly owned subsidiary of Renault the automobile manufacturer that was nationalized in 1946.

Production of major steel producers in 1972 and 1973 in million tons follow:

Producers	Production 1972	1973
De Wendel et Union Sidérurgique Lorraine	8.20	11.20
Union Sidérurgique du Nord de la France	8.10	9.10
Société des Acièries de Cockerill	.90	1.00
Compagnie des Ateliérs et Fores de la Loire Société des Forges et Ateliérs du Creusot	.40	1.10
Métallurgie de Normandie	.90	.95
Société d'Electro-Chimie, d'Electro-Métallurgie et des Acièries d'Electriques de Ugine	.50	.50
Société des Acièries de Pompey	.40	.45
Other	4.70	1.10

In 1973, the French steel industry had two main concerns. (1) Monetary developments and (2) the exceptionally high rate of long- and medium-term debts that represented 83% of turnover at the beginning of 1973.

Although the French steel industry was last among the EC's four major steel producers in production gains in 1973 and had to import one-half-million tons of steel during the year, it expected to raise exports in 1974 to the high levels of 1971. It was also expected that the industry will observe the limits of its voluntary restraint agreement with the United States. According to the Chambre d'Acièrs Fins et Spéciaux, output of special steels in France rose 8% in 1973 to 2.9 million tons or almost full capacity. Of this total, 2.1 million tons was engineering steels (1.1 million tons alloy and 1 million tons carbon steel); 529,000 tons, stainless steel; and 96,000 tons, tool and bearing steel.

At Dunkirk, after startup at yearend 1972 of the No. 2 melting shop and the associated three twin-strand continuous slab casters, the 1973 production was increased by the lighting of blast furnace No. 4, with a hearth diameter of 14 meters, and the completion of the hot strip mill. Production for 1974 was expected to be 7 or 8 million tons. At Mardyck, the tinning line

started up in the first quarter of 1973, and the first coils were rolled on the five-strand cold reduction mill. Also, 1973 was marked by the completion of a new blast furnace, with a hearth diameter of 9.5 meters, at Denain.

Following startup of the slabbing mill in October, the continuous wide hot strip mill at the Fos-sur-Mer works of France's Solmer was completed in December 1973. Initial capacity of the mill was 4 million tons per year.

November 1973 marked the start of operations at France's first ministeelworks. S.A. Iton-Seine, a joint venture involving three French rerollers, (1) Usines Metallurgiques de Saint-Eloi (UMSE), (2) Ets Experton-Revollier, Forges de Breteuil et, Forges de Bretagne (ERFB), and (3) Cie. Française de Ferrailles (CFF), inaugurated its mill and began production. Scrap arrived either by truck, rail, or river at the Iton-Seine's mill, located on the Seine at Bonnières, south of Paris, and adjacent to the rolling mill of the reroller participant UMSE. After storage in a covered area, the feed is transferred to the adjacent melting shop on an automated-weighing conveyor belt. The melting shop is equipped with a Tagliaferuin, 40-ton, 24,000 kilovolt-ampere electric arc furnace with a hearth diameter of 4.65 meters. The melt is transferred to a three-strand Danieli continuous caster that produces billets in the range of 90 to 140 square millimeters.

Several other minimills, some in the Paris area, others in southern France, were due to start operation in the near future. Capacity, location, and products of the ministeelworks are presented in the following tabulation:

Company	Location	Arc furnace	Continuous casting	Product	Date
S.A. Iton-Seine (SAIS).	Bonnières-Sur-Seine.	1 (40 tons capacity, 130,000 tons per year).	Three-strand billet.	Billets	1973
Aciéries et Laminoirs de Paris(ALPA).	Porcheville --	1 (60 tons capacity, 180,000 tons per year).	Four-strand billet.	Reinforcing bars	Mid-1974
S.A. Sudacier (SAS).	Toulon ------	2 (65 tons capacity, 250,000 tons per year).	----do--------	Bars and wire rods	1974
Sté. des Aciéries de Monterean (SAM).	Monterean ---	----	----	Reinforcing bars	1975

France's Creusot-Loire Steel Co. and Sweden's Uddeholm Steel Manufacturers joined forces in 1973 to pool their research findings on the development of a new steel manufacturing process called the Creusot-Loire-Uddeholm (CLU) process. In the CLU process, superheated steam is reacted with carbon monoxide in the melt to avoid chrome and manganese losses. The yields were reported at 97.6% for chromium and 78.2% for manganese. In comparing the CLU process with the argon-oxygen decarburization (AOD) process, CLU officials claimed that its process would save stainless steel producers $20 per ton. Also, the CLU process offered a wider range in the choice of raw materials and longer life for converter linings than did the AOD process.

By yearend, a 70-ton CLU converter was operating in Sweden, and another was planned for construction in France. Meantime, several nations were negotiating to obtain patent rights from Creusot-Loire-Uddeholm.

Ferrous Scrap.—The tight world market for ferrous scrap did not affect France's steel industry appreciably. France imported only a marginal 239,000 tons from abroad. Total demand by France's steel industrial complex was estimated at 3 million tons, of which more than 90% was derived domestically. Most of the balance was imported from three EC countries, Belgium, West Germany, and the United Kingdom.

Lead and Zinc.—Exclusive prospecting rights to explore for lead, zinc, copper, and silver were granted to Cie. Royale Asturienne des Mines of Belgium. The exploration areas were located in the Chenelette permit, Rhône Department, and at the Cénadere permit in the Upper Pyrénées. Also, exploration for lead-silver deposits near Correze were continued by BRGM and Rhône-Poulenc S.A. of France during 1973. The

latter company expected to install a 100,000-ton-capacity processing plant at the exploration site to exploit the complex ore.

Nickel—Société Le Nickel (SLN) remained the sole nickel producer in France in 1973. Production of nickel, totaling 10,892 tons, was 17% lower in 1973 compared with that of 1972. The decrease was due to the high cost of production and the heavy taxes that SLN paid to New Caledonia. At yearend, the French Government proposed that the New Caledonian administration reduce taxes in 1974 and buy SLN's power station. The administration's decision was not known by yearend.

Under the agreement signed between SLN and Groupement d'Importation et de Repartition des Métaux (GIRM), GIRM purchased, at a negotiated price, most of the SLN's nickel production in 1973. They further agreed that SLN could repurchase the nickel ore and metal, at the same price, over the next 4 years.

Silver.—Silver production declined slightly to 4,176,000 troy ounces in 1973 compared with 4,210,000 troy ounces in 1972. Most of the silver was produced as a byproduct from the refining of complex cupriferous or argentiferous ore.

Tin.—Production of tin in 1973 remained at the same level as that of 1972. Compagnie Minière de St Reman (Comiren) continued tin mining in the Finisterre area during the year. Exploration efforts in the vicinity of Finisterre and southern parts of France were unproductive. Comiren reported that tin imports into France would be increased substantially in the future.

Tungsten.—Société Minière d'Anglade was the only tungsten producer in France during the year. The company's planned expansion did not materialize owing to the drop in ore grade and the high cost of mine operation. However, by yearend, company officials were discussing an increase in the capacity of the flotation circuit from 33,000 tons to 60,000 tons annually. Total tungsten production was 24% higher in 1973 than that in 1972.

Uranium.—The Commissariate á L'Énergie Atomique (CEA), the French Atomic Commission, remained the main uranium producer in France during 1973. The privately owned, Compagnie Française des Mines d' Uranium (CFMU) produced about 5% of the total uranium ore, which was 500,000 tons containing 1.4% U_3O_8.

A decision was made by CEA, in anticipation of a sharp increase in uranium demand by the Western World, to increase uranium production 10% in 1974. In 1972, CEA's budget totaled $1.5 billion, of which more than half was allocated for use by the civil sector, and the remainder went to the military. In 1973, CEA expected the military expenditure to remain steady, and no increase in budget was foreseen.

NONMETALS

Fertilizer Materials.—The Ministry of Agriculture reported that during 1972–73 France produced about 18 million tons of mixed fertilizer, imported 1.4 million tons, and consumed about 19.1 million tons. France exported approximately 325,000 tons of mixed fertilizer to EC countries.

Potash.—French potash prices, previously 50% lower than world market prices and 30% lower than most EC countries, were raised 24% in the latter part of 1973. The increase was due to the energy crisis and the increased cost of imported raw materials.

France's state-owned potash company, Mines Dominales de Potasse d'Alsace (MDPA), produced 1.8 million tons of potash (K_2O equivalent) in 1973. Close to 200,000 tons of potash was imported from Canada to supply the increased demand. MDPA's plan to erect a 1-million-ton-capacity salt extraction plant on the Rhine River did not materialize during the year. Until the extraction plant could be built, France would have to import most of its potash needs from Canada. The latest estimate of the potash reserves in France was given at 300 million tons.

Nitrogen.—Ugine-Kuhlmann began construction of a new concentrated nitric acid plant at Chasse. Completion date or cost estimates were not available by yearend. It was also reported that the Azolacq Co. was considering construction of a melamine plant with an annual capacity of 15,000 tons at Pardies. The cost of this plant was estimated at about $8 million. According to Azolacq reports, it was shown that melamine could be produced economically from urea and furthermore that some urea producing plants could be converted to melamine production.

Production of nitrogenous fertilizers remained less than satisfactory during the year owing to operating difficulties at a

number of new plants producing ammonium nitrate and urea.

Fluorspar.—Production of marketable fluorspar in France was 300,000 tons in 1973, an increase of 3% over the 1972 production. Most of the fluorspar deposits in France are located in various parts of the Massif central and the eastern Pyrénées, and the Var District of Provence. The fluorspar industry was dominated by PUK and Société Denain-Anzen Minéraus (DAM); however, at least 10 smaller metallurgical grade fluorspar (metspar) producers were also active during the year.

Both large fluorspar operators were involved in acid-grade and metspar production. There were 4 major fluorspar flotation milling operations in France, three of which PUK owned completely; the fourth was jointly owned with DAM. The joint venture mill was located at Olette and received all of its feed from the Escara open pit mines in the Pyrénées some 50 kilometers west of Perpignan. PUK's fluorspar flotation mills were located at Langeac in the Haute Loire District, 80 kilometers southeast of Clermont Fernad; Teillet in the Tarn District, some 23 kilometers east of Albi; and Fontsante in the Var District, some 12 kilometers west of Cannes.

Much of the French acid-grade fluorspar production was consumed by the captive market of PUK; however, some was exported to West Germany and Belgium.

Reportedly, in a bid to penetrate the electronics market, Rhône-Poulenc planned to construct a new plant to produce high-purity hydrofluoric acid. The plant was to produce acid with an extremely low content of arsenic, iron, sodium, potassium and free ions in general, to meet the growing demand in semiconductor applications, particularly metal oxide semiconductors. The plant with a 1,000-ton annual capacity, was to be located at Salindres. Upon completion, the Rhône-Poulenc plant was to become the second hydrofluoric acid producer in France after Produits Chimique Ugine Kuhlmann Co.

To meet increasing domestic demand for fluorine, Dong Trieu Société Française Immobiliere et Minière S.A. was seeking an exclusive exploration permit for fluorspar and related minerals in a 20-square-kilometer area of central France. By yearend, action on this request was pending.

Pyrite.—The operation of pyrite mines by Société des Mines et des Produits Chimiques de Salsique (SMPCS) was halted during the year because of ore depletion and the high cost of production. SMPCS's previous exploration efforts in the vicinity of the ore body were unproductive; however, the company continued its exploration efforts at other sites during the year.

Refractories.—France remained the third largest refractories manufacturer in Western Europe, after West Germany and the United Kingdom. Total production in 1973 was at the same level as that of 1972, 720,000 tons.

During 1973, the diversified Saint-Gobain-Pont-à-Mousson (SGPM) group announced that it had concentrated all of its refractories interests under the auspices of a new company, Société Européenne des Produits Réfractaires S.A. (SERP). SERP also became a major shareholder in Sté. Generale des Produits Réfractaires (SGPR) and L'Electro-Réfractaire (LER). Until the latter part of 1972, SGPR and LER were the largest refractories manufacturers in France.

Sulfur.—Sulfur production from desulfurization of natural gas at Lacq, in the southwest of France, and other petroleum refineries reached 1.8 million tons in 1973, an increase of 5% compared with that of 1972. This increase brought France closer to realizing the proposal of the sixth plan—that by 1975 the country could supply all of its domestic sulfur demand.

Société Nationale des Petroles d'Aquitaine (SNAP) remained the sole sulfur producer in France and fourth largest sulfur producer in the world in 1973. SNAP's gas deposits at Lacq, which contained 15.4% H_2S, were scrubbed in amine solutions to absorb the H_2S. By heating, the amine solutions were regenerated and H_2S was extracted. The H_2S was then burned in Claus kilns and converted to brimstone. Sulfuric acid production was by far the largest outlet for brimstone. The sulfur production was either solidified in large vats or delivered to customers in molten form.

SNAP's policy of distributing its production equally between domestic consumption and the export market remained in effect in 1973.

MINERAL FUELS

Energy.—*Geothermal.*—Since 1959, the Société Technique de Geothermie (STG), a small private company, had successfully operated a geothermal heating system in

Melun, 30 kilometers south of Paris. STG's geothermal system provided heat and hot water to 3,000 residents for household use and to a number of schools and commercial centers. The STG enterprise began with the discovery of hot water 5,600 feet below the city. Two wells were drilled; one brought 3,570 cubic feet of water per hour at 130° F to the surface, the other returned this water underground after it had been circulated through heat exchangers. Water for the city was heated both by the heat exchangers and by conventional means; it was then circulated to the customers. The closed loop containing geothermal water eliminated contact with the water circulated for consumer use and caused little undesired impact on the city's environment.

It was estimated that the geothermal source supplied 40% of the heat consumed in the mixed geothermal-conventional heating system. This presented a saving of 100 gallons of heating oil per hour during an average 8-month heating season. With patented technology and 5 years of experience, STG was actively seeking new opportunities in France and the United Kingdom at yearend.

Nuclear.—As part of its new energy policy, the French Government announced a sizable and accelerated nuclear powerplant construction program in 1973. The program called for the construction of 40 to 50 nuclear powerplants of about 1,000 megawatts each, according to the following schedule: Six plants were to start in 1974, seven, in 1975, and an equal number, each subsequent year until 1980. The estimated cost of each plant was given at $200 million to $250 million, thus involving total expenditures of some $9 billion to $12 billion. A contract for 12 such plants, using Westinghouse of the United States technology, was placed by Electricité de France (EDF), the Government-owned public power monopoly. It was also reported that EDF signed another agreement with General Electric of the United States for two nuclear powerplants and took options on six additional ones.

The Marconle Phenix, a demonstration fast-breeder technology reactor with a planned capacity of 250 megawatts of electricity, started operation in December 1973. A commercial-size, 1,200-megawatt breeder reactor, the Super Phenix, was scheduled to start operation in 1979.

In 1973, the French firm Eurofuel, the Belgian firm Métallurgique et Méchanique Nucleaires (MMN), and Westinghouse Electric Corp. of the United States signed an agreement to establish a new enterprise, Franco-Belge de Fabrication de Combustible (FBFC). The FBFC was to produce nuclear fuel for light-water reactors, at its Dessel plant in Belgium. Eurofuel apparently owned 60% of FBFC's capital; MMN owned 24%; and Westinghouse owned 16%.

Coal.—Production of coal in France declined from 32.7 million tons in 1972 to 28.5 million tons in 1973. Stocks of coal, reported as shipping coal, fell from 1.3 million tons at yearend 1972 to 422,000 tons at the end of 1973; inventories of low-grade declined from 2.6 million to 1.9 million at yearend.

The output of the mines of Nord/Pas-de-Calais, the largest coal producing area in France, decreased 17% compared with that of 1972; the output of the second largest coal producing area, Lorraine, declined 7.6%. The coal mines of Aquitaine, Blansy, Cevénnes, and Loire produced more than 1 million tons each in 1972 whereas in 1973 only Aquitaine and Blansy's production reached 1 million tons.

Lignite production decreased 7% in 1973 compared with that of 1972 bringing production to 2.7 million tons. Output per manshift for the industry averaged 5.8 tons, slightly above last year's level. Virtually all of the lignite production was consumed in electric powerplants or by small consumers adajacent to producing fields.

Customs data published by the Ministère des Finance et des Affaires Economiques indicated that coal (anthracite and bituminous) imports into France in 1973 were 12.5 million tons compared with 11.7 million tons in the preceding year. The average cost insurance and freight (c.i.f.) value per ton of France's imports of anthracite and bituminous coal remained stable during the year; the average value of anthracite imported in 1973 was $27.40 per ton compared with $27.20 for 1972, and bituminous c.i.f. value per ton in 1973 was about $22.50.

Of the total coal imports, bituminous coal accounted for the largest share, amounting to 9.9 million tons in 1973. The EC, largely West Germany, supplied approximately 6 million tons of France's total imports during the year. Total anthracite

Table 4.—France: Salient statistics of the coal and lignite industry
(Thousand metric tons unless otherwise specified)

	1972	1973
COAL (ANTHRACITE AND BITUMINOUS)		
Production:[1]		
Nord/Pas-de-Calais	12,593	10,404
Lorraine	10,939	10,111
Aquitaine	1,308	1,189
Auvergne	562	469
Blansy	1,677	1,400
Cevénnes	1,130	985
Duaphiné	518	430
Loire	1,015	696
Others	21	--
Total	29,763	25,684
Average number of days worked	239.3	237.2
Average daily output (tons)	124.4	108.3
Number of workers:		
Underground	r 51,543	44,883
Overall	r 84,929	75,773
Production per man-shift (tons):		
Underground	2.139	2.413
Overall	1.503	1.381
Stocks at yearend:		
Shipping ore	r 1,341	422
Low-grade	r 2,610	1,919
LIGNITE		
Production:		
Provence	1,510	1,454
Region Landaise	1,452	1,310
Number of days worked	242.7	240.5
Average daily output (tons)	12.2	11.5
Number of workers	2,090	1,955
Output per man-shift (tons)	5.837	5.872

r Revised.

Source: Charbonnages de France. Statistique Annuelle (Paris), 1974, pp. 8–9.

receipts in France reached 2.7 million tons, of which 900,000 tons originated in the U.S.S.R. Other sizable suppliers in descending order were West Germany, the Republic of South Africa, and the Netherlands.

An agreement was signed between CSI, U.S.A., and Union Sidérurgique du Nord et de l'Est de la France S.A. (Usinor) in the latter part of 1973. The agreement called for CSI to mine cooking coals in Virginia, U.S.A., for the exclusive use of Usinor's steel operation in France at a cost of about $33 million.

Imports of coal in thousand tons by country of origin, for the past 3 years follow:

Origin	1971[1]	1972	1973
Australia	--	69	120
Belgium	203	229	217
Germany, West	5,842	5,885	5,938
Morocco	--	--	2
Netherlands	410	336	389
Poland	2,045	1,638	1,819
South Africa, Republic of	209	381	482
U.S.S.R.	1,416	1,169	1,087
United Kingdom	466	299	536
United States	2,958	1,691	1,843
Other	87	2	65
Total	13,636	11,699	12,498

[1] Figures differ from those shown on table 3 because of source.

Coke and Coal Chemicals.—Production of coke and coal chemicals amounted to 10.5 million tons in 1973, a 5.4% increase compared with that of 1972. Nord/Pas-de-Calais Basin was the leading producer of coke and semicoke, more than 50%, followed by the Lorraine, Aquitaine, and Loire Basins.

Production of coke and semicoke in various basins, in thousand tons, for the years 1971–73 follow:

	1971	1972	1973
Nord/Pas-de-Calais	4,159	3,823	4,245
Lorraine	2,487	2,356	2,515
Aquitaine	407	376	353
Loire	332	252	224
Total	7,385	6,807	7,337

Source: Charbonnages de France. Rapport de Gestion (Paris), 1973, p. 76.

Production in thousand tons of coke and coal chemicals in France, by origin, for the past 2 years follow:

	1972[1]	1973[1]
Coke-oven coke:		
Plants annexed to colliers	6,807	7,337
Steel plants cokeries	4,738	4,531
Other coke	13	--
Total	11,558	11,868
Coal chemicals	3,219	3,224
Total	14,777	15,092

[1] Figures differ from those shown on table 1 because of source.

Source: Charbonnages de France. Statistique Annuelle (Paris), 1974, pp. 44–45.

The outflow of coke, semicoke, and coal chemicals to various industries in France, in thousand tons, during 1971–73 follow:

	1971	1972	1973
Steel industry	4,319	4,201	4,627
Other industries	1,314	1,162	1,231
Small industries	390	320	298
Exports	523	515	861
Domestic consumption	517	480	498
Total	7,063	6,678	7,515

Source: Charbonnages de France. Rapport de Gestion (Paris), 1973, p. 76.

Exports of coal, coke, patent fuel, and lignite briquets increased to 1.0 million tons in 1973, compared with 1.6 million tons in 1972; imports of these solid fuels increased to 16.3 million tons in 1973 compared with the previous year's 15.1 million tons.

Exports and imports of solid fuels, in thousand tons, in 1972–73 follow:

	Exports		Imports	
	1972 [1]	1973	1972 [1]	1973
Coal (anthracite and bituminous)	[2] 888	981	11,699	12,499
Coke	[r] 632	917	3,118	3,498
Patent fuel	88	80	120	109
Lignite briquets	--	--	234	244
Total	[r] 1,608	1,978	15,171	16,350

[r] Revised.
[1] Figures differ from those shown on tables 2 and 3 because of source.
[2] Includes a small amount of lignite.

Source: Statistique Annuelle (Paris). Monthly Issues 1973.

Natural Gas.—The natural gas industry increased its share of French energy consumption slightly during 1973, accounting for 8.9% compared with 7.9% in 1972. Domestic production of natural gas reached 387 million cubic feet in 1973. Although this represented a small increase over 1972 production, the continued growth in consumption meant that domestic gas production, for the first time since the discovery of the gasfield, could not meet at least half of France's commercial requirements. The 1973 gas reserves, moreover, were not expected to support 1973 rates of production beyond 1983.

To overcome this situation, Government authorities were encouraging investors to drill for gas in the most promising offshore areas such as the Irish Sea. During the year, 13 exploration wells were drilled. Exploration was expected to speed up since about 50 requests for exploration permits were pending at the end of 1973.

Imports of natural gas, which totaled 308 million cubic feet, continued to come largely from the Netherlands. Algerian LNG accounted for 54 million cubic feet. However, at yearend 1973, a breakdown at the Skikda, Algeria, liquefaction plant created a shortage that would carry into 1974. Faced with the inevitability of a decline in domestic production and a probable freezing of Dutch gas exports to France by yearend, French gas officials were actively searching for new supply contracts. Negotiations were underway, either directly or as part of various consortia, with Algeria, the U.S.S.R., and Norway (for the French share of the Ekofish Field production), as well as more exploratory discussions with various Persian Gulf countries.

Natural gas consumption was divided, 42% for domestic and commercial uses, 43% for industry, and 15% for electricity generation.

Prices.—The French price structure for energy products in 1973 suffered the same shocks as did those of other energy-importing nations. The formula previously used to establish exrefinery petroleum product prices was rendered unacceptable because of rapid movements in crude petroleum prices and was abandoned in June 1973. Price fixing of refinery products was accomplished from June by continued negotiations between the energy companies, the Ministry of Industry, and the Ministry of Finance. The basis for the calculations was the weighted average cost of landed crude. The changes in crude access costs, participation costs, and currency parities during 1973 made negotiations between three agencies highly argumentative and usually resulted in compromises.

By yearend, a new round of negotiations on prices was scheduled for the fall of 1974.

Petroleum.—French domestic petroleum production decreased from 10.8 million barrels in 1972 to 9.3 million barrels in 1973, supplying only 1% of France's internal requirements. French petroleum production was limited to a number of small onshore fields in the southwest, the Paris Basin, and the Alsace Basin. No major new petroleum discoveries were reported during the year.

Crude petroleum imports accounted for 99% of French petroleum supply and in turn represented approximately 65% of total domestic energy consumption. Although the Government sought to obtain maximum diversity in supply sources, the Persian Gulf producers remained their major supplier (79%); Saudi Arabia with 20% was the largest single supplier. Deliveries from North Africa, particularly Libya, decreased substantially during 1973, and relatively small shipments from the U.S.S.R. almost doubled in 1973 compared with that of 1972. The full breakdown of French crude oil imports in million tons follow:

	1972	1973
Saudi Arabia	24.34	20.17
Iraq	14.28	18.68
Abu Dhabi/Oman	11.36	15.87
Kuwait	17.13	15.48
Nigeria	13.26	12.59
Algeria	10.83	11.10
Iran	7.12	10.82
Libya	9.79	6.49
U.S.S.R	1.76	3.36
Qatar	2.19	3.41
Venezuela	1.80	1.80
Gabon	1.56	1.41
Zaire	.19	.95
Others	2.10	12.00
Total	117.71	134.13

Source: Comité Professionnel du Pétrole (Paris), 1973, p. 98.

Petroleum product imports totaled 7.36 million tons in 1973, they included some heavy oils but consisted mainly of heating oils for resale by independent distributors. Following the oil price rises of October, product imports to France decreased substantially.

Government control of petroleum imports continued through the mechanism of 10-year crude-importing licenses. These licenses, which delegated the Government's crude oil import monopoly to selected companies, were renewed in June 1973 for the 1975–85 period. A major new element in the 1973 crude-import licenses was the introduction of a clause authorizing the Government to suspend the import rights of a company failing to meet its supply obligations even if the circumstances of such failing was beyond the company's control. Licenses for the import of refined products remained unchanged during 1973.

Consumption of major oil products and natural gas in thousand tons for 1972–73 follow:

Product	1972 r	1973
Regular gasoline	2,858	3,532
Premium gasoline	14,522	15,772
Aviation gasoline	46	48
Jet fuel	1,708	1,812
Special gasoline	74	78
White spirit	144	155
Kerosine	45	44
Gas oil	5,729	6,533
Fuel oil domestic	33,638	37,217
Light fuel oil	2,133	2,023
Heavy fuel oil	29,762	34,134
Lubricants	970	1,051
Liquefied petroleum gas	2,488	2,696
Bitumen	2,991	3,395
Parafin wax	57	66
Petroleum coke	231	395
Incandesabile gas	274	215
Petroleum fuel stocks	3,072	3,831
Natural gas (billion cubic meters)	14.0	15.4

r Revised.

Source: Comité Professionnel du Pétrole (Paris), 1973, p. 171.

The output of 23 French refineries in 1973 was 126 million tons of products from 135 million tons of crude run. The majority refinery product, conforming to the French consumption pattern, continued to be fuel oil, both as home heating oil and heavier industrial oil.

The French Government continued to encourage, largely for national security purposes, the establishment of a petroleum refining capacity in excess of France's internal needs. Total annual petroleum refining capacity at the end of 1973 was 154 million tons.

French refinery capacity in million tons for the years 1965, 1972, and 1973, by location and ownership follow:

Refinery	1965	1972	1973
North:			
Dunkerque (BP)	5.5	5.5	5.5
Valenciennes (Antar)	--	3.5	3.5
Le Havre/Basse-Seine:			
Gonfreville (CFR) [1]	10.6	23.3	23.3
Port-Jerome (Esso)	4.0	7.2	7.2
Petite-Couronne (Shell)	5.5	9.2	9.2
Gravenchon (Mobil)	3.6	3.6	3.6
Vernon (BP)	--	3.0	3.0
Ile de France (Paris):			
Grandpuits (ELF)	--	3.6	3.6
Gargenville (ELF)	--	6.0	6.0
Atlantic:			
Donges (Antar)	4.1	8.0	8.3
Vern-sur-Seine (Antar)	1.2	1.4	1.5
Pauillac (Shell)	.5	4.0	4.0
Ambès (ELF)	1.8	2.0	2.1
Bordeaux (Esso)	2.4	2.9	2.9

See footnote at end of table.

Refinery	1965	1972	1973
Mediterranean:			
Frontignan (Mobile)	1.7	4.0	6.0
La Mède (CFR)	6.4	10.2	10.2
Berre (Shell)	6.0	13.5	13.5
Lavéra (BP)	4.4	11.0	11.0
Fos-sur-Mer (Esso)	3.0	3.0	8.0
Alsace/Lorraine:			
Reichstett (CRR) [2]	3.7	3.7	3.7
Herrlisheim (SRS) [3]	3.9	4.5	4.5
Hauconcourt (SLR) [4]	--	4.4	4.4
Lyonnais: Feyzin (ELF)	2.0	7.2	8.8
Total	70.3	144.7	153.8

[1] Compagnie Française de Raffinage (CFR).
[2] Compagnie Rhénane de Raffinage–Shell/Mobil/ELF.
[3] Société de la Raffinerie de Strasbourg–Antar/BP/CFR.
[4] Société de la Raffinerie de Lorraine—CFR/Esso/ELF.

French refineries were required to maintain minimum stocks equivalent to 90 days' consumption (based on the previous 12-month period). These stocks, which increased 14% above the 1972 level, totaled 48,458 million tons at the end of 1973. Of this total, 15,257 million tons was held as crude; 8,445 million, as intermediate products; and 24,756 million, as finished products. The French armed forces also held an undisclosed emergency stock at yearend.

Consumption.—French civilian oil consumption rose 11.6% in 1973 somewhat higher than the 1972 growth rate of 10.7%. Of the total French energy consumption in 1973, oil provided 66.5% compared with 65.3% in 1972. Total domestic oil consumption was 11 million tons. Imports and exports of major oil products as well as refinery products for 1973, in thousand tons follow:

Product	Refinery production	Import	Export
Gasoline	16,555	433	1,531
Aviation gasoline	45	29	6
Jet fuels	3,339	4	626
Liquefied petroleum gas	2,951	268	636
Diesel oil	12,499	2,638	4,362
Heating oils	35,458	92	213
Fuel oils	43,284	1,705	3,668
Light fractions and chemical feedstocks	6,860	1,102	1,146
Lube oils	1,184	71	386
Asphalt	3,854	28	400

Source: Comite Professionnel du Petrole (Paris), 1973, pp. 58–59, 100, 102.

Transportation.—Six new ships were added to the French petroleum and dual-purpose fleet during 1973, giving a total of 88 vessels and a deadweight tonnage of 10.4 million. The new ships included five tankers of 240,000 deadweight tons and up, and one liquefied natural gas (LNG) tanker of 40,000 cubic meters. The fleet thus continued to have the capacity, sought by French policymakers, to supply slightly over half of France's petroleum import requirements.

There were no major additions to France's petroleum pipeline network in 1973. Of the two major petroleum pipelines in operation, the Seine Valley to the Paris Rhône-Rhine system into West Germany continued to increase throughput. Almost 11.3 million tons of crude oil were transported in this pipeline in 1973, an increase of 14% compared with that of 1972. The other system, South European petroleum pipeline from Marseille to Karlsruhe, increased throughput 12%, reaching a total of 42.3 million tons. Of this total, 19.6 million tons was delivered to upper-Rhine refineries in West Germany, and 2.8 million tons of crude were transported to Switzerland. Of the other two significant crude oil pipelines in France, the Donges line maintained a throughput of about 1.2 million tons in 1973, and the Parentis line decreased throughput by almost 20%, to 900,000 tons, during the year.

Refined product pipelines showed a greater increase in throughput in 1973 compared with that of 1972. The Mediteranean-Rhône network experienced a 24% rise to 6.2 million tons during the year, and the refined throughput of the Seine-Paris network increased 27% to 16.6 million tons. The latter development was due in part to completion and use of a 22-inch trunkline circling Paris to the north from Vigny to Mitry-Mory.

Total refinery distribution in France was accomplished by the following means (percentages were approximated because some statistical inconsistencies did exist).

Means	Percent
Coastal tankers	8
River barges	12
Railway tank cars	15
Trucks	34
Pipelines	18
Direct sales	13
Total	100

The Mineral Industry of Gabon

By Henry E. Stipp [1]

Gabon's mineral industry made significant progress in 1973 mainly because of a 20% increase in petroleum output and higher prices for petroleum and its products in world markets. The petroleum sector contributed a quarter of the gross domestic product (GDP) estimated at $450 million in 1973, nearly 20% of total salaries in the private sector, and 20% of total government revenues.

The Government of Gabon and the United Nations Development Program (UNDP) continued their mineral survey in the Koulamoutou-Franceville Region and also the Woleu-Ntem Region. Results of the survey reportedly will be released to the public in mid-1974. Total cost of the project was estimated at more than $1 million.[2] The Government policy of purchasing equity in mining companies continued. Participation of 25% in uranium mining, 10% in manganese mining, 10% in the Shell Oil Co. of Gabon (Shell-Gabon), and 10% in the Essence et Lubrificiant de France of Gabon (Elf-GABON), (formerly Elf-SPAFE) oil company was in the process of being acquired. Petroleum exploration concession agreements with other companies were being renegotiated. These agreements will include government equity participation of 12½% which would be paid when oil is produced.

The first crosstie for the Trans-Gabon railroad was laid officially on December 30. Financing for the railroad was on schedule, and work on the project was expected to begin in early 1974. The railroad in its later stages will link the rich manganese and uranium mines at Moanda and Mounana in the southeast, and eventually the 860-million-ton iron ore deposit at Belinga in the northeast, with a deepwater port at Santa Clara, 17 miles north of Libreville.

After September the Government of Gabon purchased 10% of Elf-GABON and Shell-Gabon oil companies and announced plans to control 25% of the Société Gabonaise de Raffinage (SOGARA) refinery located at Port Gentil. The Government also announced in Ordinance 45–73 the right of the Government of Gabon to obtain 35% of the capital stock and oil production of new companies, 25% of which will be donated. The right to claim the same proportion of petroleum output of firms currently producing was also proclaimed.

In mid-November the Government of Gabon became an associate member of the Organization of Petroleum Exporting Countries (OPEC).

Gabon's deepwater port at Owendo, 10 miles from Libreville, was opened in December. The port includes a petroleum depot among its industrial facilities.

The Kinguele hydroelectric complex, 100 miles northeast of Libreville, was inaugurated. This $24 million project will furnish 52 megawatts of electrical power to the Libreville area.

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[1] Physical scientist, Division of Ferrous Metals—Mineral Supply.

[2] Where necessary, values have been converted from African Financial Community Francs (CFAF) to U.S. dollars at the rate of CFAF 225 = US$1.00.

PRODUCTION AND TRADE

Substantial increases in the production of crude oil, uranium concentrate. and refined petroleum products were recorded, together with a smaller increase in production of natural gas. Although the output of gold decreased about 2% from that of 1972, value increased sharply. Statistics on the quantity of minerals produced in 1973 are shown in table 1.

In the 13 years since independence, extractive industries have become very important to the economy of Gabon. In 1972 manganese ore and concentrate and crude oil furnished 65% of export earnings. Manganese exports to the United States in 1972 were valued at $9.4 million and crude oil exports at about $30 million. Statistics on foreign trade are shown in tables 2 and 3.

Table 1.—Gabon: Production of mineral commodities

Commodity [1]	1971	1972	1973 [p]
Gas, natural:			
Gross production ---million cubic feet--	10,594	[e] 12,000	[e] 14,000
Marketed production ---do---	[r] 1,095	1,201	1,402
Gold, mine output, metal content ---troy ounces--	13,728	11,413	11,224
Manganese:			
Ore, 50% to 53% Mn, gross weight --thousand metric tons--	1,866	1,903	1,877
Pellets, battery and chemical grade, 82% to 85% MnO_2, gross weight ---do---	37	34	42
Total ---do---	1,903	1,937	1,919
Petroleum:			
Crude ---thousand 42-gallon barrels--	41,911	45,671	55,048
Refinery products:			
Gasoline ---do---	1,329	1,180	1,347
Jet fuel and kerosine ---do---	810	724	891
Distillate fuel oil ---do---	2,087	2,059	2,195
Residual fuel oil ---do---	2,517	2,488	2,820
Other ---do---	61	57	62
Refinery fuel and losses ---do---	274	213	191
Total ---do---	7,078	6,721	7,506
Uranium oxide (U_3O_8) content of concentrate ---metric tons--	545	523	635

[e] Estimate. [p] Preliminary. [r] Revised.
[1] In addition to the commodities listed, a variety of crude construction materials (clays, sand, gravel and stone) is also produced, but output is not reported and available information is not adequate to permit formulation of reliable estimates of output levels.

Table 2.—Gabon: Apparent exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
Chromite	700	154	All to France.
Copper metal, including alloys, all forms	38	--	
Manganese ore	[r] 1,105,384	1,273,916	France 470,514; Japan 248,931; United States 244,204; Norway 112,281; West Germany 90,249.
Petroleum:			
Crude ---thousand 42-gallon barrels--	[r] 17,580	20,410	France 12,186; West Germany 3,331; Belgium-Luxembourg 2,189; Netherlands 1,418; Italy 812; United Kingdom 474.
Refinery products, residual fuel oil ---do---	[r] 410	507	Sweden 262; United Kingdom 128; United States 117.
Uranium and thorium ores and concentrates	1,464	1,129	All to France.

[r] Revised.

Sources: Statistical Office of the United Nations. 1971 and 1972 editions of World Trade Annual. Vs. I, II, and III. Walker and Co., New York; and Statistical Offices of the European Communities. 1972 Foreign Trade Analytical Tables. Vs. B and I, Luxembourg.

Table 3.—Gabon: Apparent imports of mineral commodities
(Metric tons unless otherwise specified)

Commodity		1971	1972
Aluminum metal and alloys, all forms		r 85	(1)
Barite and witherite		4,556	5,039
Cement, hydraulic		r 35,692	24,116
Clay products:			
Nonrefractory		1,110	987
Refractory		58	407
Copper metal and alloys, all forms		r 34	46
Iron and steel semimanufactures		r 25,538	64,050
Petroleum refinery products:			
Kerosine	thousand 42-gallon barrels	2	--
Lubricants	do	16	15
Other	do	(2)	(2)
Sodium and potassium compounds, caustic soda		468	NA
Stone, sand and gravel		r 425	NA
Other, crude nonmetallic minerals, n.e.s		r 149	NA

r Revised. NA Not available.
1 Unreported quantity valued at US$65,000.
2 Less than ½ unit.

Source: Statistical Office of the United Nations. 1971 and 1972 editions of World Trade Annual. Vs. I, II, and III. Walker and Co., New York.

COMMODITY REVIEW

METALS

Gold.—Gabonese Mining Exploration and Exploitation Co. (SOGAREM) the State gold agency, was exploring for new deposits in 1973. Production was from deposits at Eteké, Lastourville, Makoku, and Njolé; however, present deposits, especially those at Eteké and Lastourville, are nearing exhaustion. Output by local operators was expected to remain at 350 to 500 kilograms per year unless significant new deposits are discovered.

Iron Ore.—The Government of Gabon was planning to obtain a 60% share equity in Société des Mines de Fer de Mékambo (SOMIFER), owner of the large iron ore deposit near Mékambo, northeastern Gabon. Financing for extension of the Trans-Gabon railroad from Booué, terminus of the first leg of the railroad, to Mékambo was being arranged by the Government. This would facilitate development of the SOMIFER deposit, so that shipments of iron ore could begin by 1983. The SOMIFER consortium at yearend consisted of Bethlehem Steel Corp., 50% ownership; Bureau Minièr de la France d'Outre-Mer, 12%; Banque de Paris and des Pays-Bas, 5%; Cie. Française Pour l'Outre-Mer, 3%; Cie. Financière du Canal de Suez, 5%; five French steel firms, 9%; eight steel firms of the Ruhr Region of West Germany, 10%; Fiat of Italy, 3.5%; two Belgian steel firms, 2%; and one Netherlands steel company, 0.5%.

Manganese.—Compagnie Minière de l'Ogooué (COMILOG) reduced output of manganese ore slightly in 1973 compared with that of 1972. The 350-mile route for shipping manganese ore to the port at Pointe Noire, Congo, is limited by the capacity of a 47-mile-long aerial bucket cableway. Capacity of the cableway was increased to 2.3 million tons per year at yearend 1973. Extension of the Trans-Gabon railroad to Franceville would provide a second route for shipping manganese ore to an ocean port, and enable annual production to reach planned rates of 2.9 million tons in 1980 and 3.4 million tons by 1985. Gabon's reserves, estimated at 230 million tons of marketable 50% to 52% manganese-content ore, are the largest known outside the Soviet Union.[3] Substantial deposits of low-quality ore also have been discovered.

Uranium.—The substantial increase in uranium concentrate output in 1973 compared to that of 1972 was attributed mainly to the full restoration of mining operations at the Mounana deposit, after the cave-in of underground workings that curtailed operations in 1972. Reportedly Compagnie des Mines d'Uranium de Franceville (COMUF) has never operated at full capacity because of the limited market for uranium ore. Market conditions for uranium are expected to become more favorable because of the increase in price for other forms of energy. At yearend the Gabonese

[3] U.S. Embassay. Libreville, Gabon, State Department Airgram A-035, Apr. 16, 1974, 5 pp.

Government was negotiating with France, its sole customer, to raise the price for uranium ore and concentrate. Also the Government planned to acquire 25% of the share equity of COMUF. Reserves of uranium ore are very large and will permit mining at the present rate for 40 years.[4] Potential reserves have not been adequately measured.

MINERAL FUELS

Natural Gas.—Producing oil wells furnish 12.4 billion cubic feet per year of associated natural gas[5]. About 10% of the produced gas (1.2 billion cubic feet in 1973) is used to generate electricity in Port Gentil. The remaining gas is flared. In 1971 proved recoverable reserves of natural gas totaled 6.5 trillion cubic feet.

Petroleum.—Two companies, Elf-GABON and Shell-Gabon, produced crude oil from wells located onshore at Mandji, near Port Gentil, and at Gamba-Ivinga, 180 miles south of Port Gentil, on the coast. Elf-GABON also produced crude oil from offshore wells located near Port Gentil. The Grondin Marine Field of Elf-GABON located about 50 miles south of Port Gentil, near Fernand-Vaz, began producing in February 1973; output totaled about 11.7 million barrels at yearend. The Barbier deposit located offshore about 17.4 miles south of Grondin was being developed for output in 1974 by Elf-GABON.

National production of crude oil averaged 150,800 barrels per day in 1973, compared with 126,000 barrels per day in 1972. Total proved reserves at yearend 1973 were 1.16 billion barrels.

Thirteen companies were searching for oil in Gabon; nine of these were subsidiaries of U.S. firms. Total exploration and production investment was estimated at more than $420 million, of which $300 million has been spent by Elf-GABON. A number of companies, mostly U.S. firms, have been negotiating with the Ministry of Mines for new exploration permits. At yearend 1973, an association of companies consisting of Elf-GABON, Ocean Drilling & Exploration Co. of Gabon (Odeco-Gabon), and Ocean Oil and Gas Co. of Gabon (Ocean-Gabon), (the last two are subsidiaries of U.S. firms Ocean Drilling & Exploration Co. (Odeco), and Ocean Oil and Gas Co.) discovered oil in the Breme structure, off the coast, about 65 miles south of Cap Lopez. The well, Breme No. 2, flowed at a rate of 2,265 barrels per day through a ¾-inch choke from strata at a depth of 5,167 feet to 5,200 feet and from 5,207 feet to 5,220 feet.

Production from the Lucina deposit of Shell-Gabon (50%), Gulf Oil Co. of Gabon (30%), and Elf-GABON (20%) was expected to begin in 1974 at an estimated 30,000 barrels per day.

Shell-Gabon and Elf-GABON were using secondary recovery methods to maintain output from the Gamba-Ivinga Field onshore at about 25,000 to 26,000 barrels per day. Storage capacity of crude oil at the Gamba-Ivinga terminal was 817,674 barrels. The Elf-GABON terminal at Port Gentil had 2,327,226 barrels of storage capacity.

At yearend Gulf conducted geophysical work on its Atlantic Profunde permit. Other exploration work was being conducted offshore by Texaco-Chevron, Ashland-Esso, Tenneco-Continental, and Odeco-Ocean; most of these groups were in association with Elf-GABON. Other searches along the coast were being conducted by the Oceanic Exploration-Canadian Bonanza and the Valmar Construction-Mesa-Grace Diamond Shamrock groups.

In November Elf-GABON increased the price of crude from Mandji to $4.60 per barrel and to $6.60 per barrel for royalty purposes, retroactive to October 20, 1973. The price for Gamba-Ivinga crude was raised to $5.10 per barrel and $7.40 per barrel for royalty purposes. The SOGARA petroleum refinery also raised prices for its refined products to reflect exrefinery prices in Curaçao. In December expansion of the SOGARA refinery was started. When the expansion is completed in 2 years, the refinery will have twice the current capacity. Refinery capacity now is 17,200 barrels per stream day; catalytic reforming capacity is 1,500 barrels per day. The refinery purchases annually 1 million barrels of Gabon crude. SOGARA produces petroleum products mainly for the Central African Economic and Customs Union (UDEAC) market. Much of the production of the new refinery will be exported outside the UDEAC market.

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[4] Le Moniteur Africain (Dakar). Uranium Production And Prospects In Gabon and Niger. Feb. 14, 1974, pp. 14–15.

[5] U.S. Embassy, Libreville, Gabon. State Department Airgram A–109, Dec. 8, 1973, 8 pp., 1 encl.

The Mineral Industry of East Germany

By Joseph B. Huvos [1]

In 1973, East Germany was the world's leading producer of lignite, accounting for about one-third of the world's output. In the production of potash, the country ranked fourth and provided about one-seventh of the world's output. Other commodities produced in quantities less important by world standards included salt, iron ore, bituminous coal, nonferrous metals, fluorspar, natural gas, and crude oil. Efforts continued to switch East Germany's chemical industry from its lignite base to the use of imported crude oil, and to complement manufactured gas made from lignite with domestic and Soviet natural gas.

East German official statistics are not complete, only data for selected commodities were reported. East Germany's mineral processing industries continued to operate by using imported raw materials, including most notably bauxite, aluminum, iron and steel, phosphates, and crude oil.

During 1973, solid fuels and energy production increased by 2.7%; ore mining, metallurgy, and potash by 2.2%; the chemical industry by 1.1%; and glass and ceramics by 0.3%. Investments in industry grew to 18.1 billion marks,[2] an increase of 9% during 1973, with 9% for energy, ore mining, metallurgy, and potash, and 4% for the chemical and metals processing industries.[3]

PRODUCTION

During 1973, East Germany's iron and steel industry continued to expand at a moderate rate, while domestic production of most nonferrous metal ores decreased.

In the potash area, the effect of new developments at the Zielitz potash combine for expanding production were not yet evident. Among the fossil fuels, lignite production decreased by an insignificant amount, and plans are to stabilize production at present levels. The already insignificant bituminous coal production declined further. Crude oil production remained at neglible levels and is not expected to increase much in the future. Only natural gas production continued its spectacular growth and supplied the greater part of East German demand.

[1] Foreign mineral specialist, Division of Fossil Fuels—Mineral Supply.

[2] Values have not been converted from East German currency units (marks) to U.S. dollars owing to fluctuating exchange rates. The official East German exchange rate not recognized by the International Monetary Fund was 2.22 marks=US$1.00.

[3] Neues Deutschland (East Berlin). V. 29, No. 18, Jan. 18, 1974, p. 3.

Table 1.—East Germany: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Aluminum:			
Alumina	47,348	45,140	47,267
Metal, primary [e]	60,000	60,000	92,000
Cadmium metal, primary [e]	15	16	16
Copper: [e]			
Mine output, metal content	5,000	3,000	1,500
Smelter output	2,000	2,400	1,500
Refinery output	40,000	40,000	42,000
Iron and steel:			
Iron ore, gross weight [2] thousand tons	318	268	52
Pig iron do	2,028	2,151	2,202
Crude steel do	5,350	5,670	5,892
Steel semimanufactures (rolled products, forgings and pressings) do	3,551	3,708	3,876
Lead: [e]			
Mine output, metal content	10,000	7,000	7,000
Metal refined, including secondary	25,000	20,000	20,000
Silver, mine output, metal content thousand troy ounces	5,000	5,000	7,000
Tin: [e]			
Mine output, metal content long tons	1,000	1,000	1,000
Metal, including secondary do	1,200	1,180	1,200
Zinc: [e]			
Mine output, metal content	10,000	8,000	6,000
Metal, including secondary	15,000	15,000	18,000
NONMETALS			
Barite [e]	30,000	30,000	31,000
Boron minerals, processed borax, $Na_2B_4O_7 \cdot 10H_2O$ content	[r] 3,910	3,705	4,000
Cement, hydraulic thousand tons	8,473	8,857	9,548
Fertilizer materials, manufactured:			
Nitrogenous, N content:			
Ammonium sulfate do	163	171	159
Calcium ammonium sulfate do	168	188	179
Unspecified do	57	69	73
Total do	388	428	411
Phosphatic, P_2O_5 content:			
Superphosphate do	207	210	205
Calcined phosphate do	122	112	116
Thomas slag do	13	14	14
Unspecified do	72	73	68
Total do	414	409	403
Potassic, marketable potash, K_2O equivalent do	2,426	2,458	2,556
Fluorspar do	80	80	90
Gypsum and anhydrite:			
Crude [e] do	315	[r] 340	340
Calcined do	266	290	289
Lime and dead-burned dolomite do	2,810	2,935	3,029
Pyrite: [e]			
Gross weight do	140	140	140
Sulfur content do	58	58	58
Salt:			
Marine do	50	50	51
Rock do	2,171	2,137	2,235
Total do	2,221	2,187	2,286
Sodium carbonate	714,000	720,670	779,971
Sodium sulfate	232,000	186,144	187,319
Stone, sand and gravel:			
Crushed stone thousand tons	10,281	10,675	11,315
Sand and gravel do	7,424	7,701	7,731
Sulfur:			
Elemental do	100	88	90
Sulfuric acid do	1,076	1,045	1,058
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Bituminous do	852	815	753
Lignite do	262,814	248,451	246,245
Total do	263,666	249,266	246,998

See footnotes at end of table.

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

Commodity [1]		1971	1972	1973 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued				
Coke:				
From anthracite and bituminous coal	thousand tons	2,316	1,605	1,856
From brown coal:				
High temperature	do	1,759	1,944	1,875
Low temperature	do	4,415	3,794	3,864
Total	do	8,490	7,343	7,595
Fuel briquets (from lignite)	do	55,439	50,801	50,154
Gas:				
Manufactured	million cubic feet	158,213	169,298	170,004
Natural, marketed production [3]	do	100,752	183,635	[e] 245,000
Petroleum:				
Crude [e]	thousand 42-gallon barrels	[r] 2,100	[r] 2,300	2,500
Refinery products:				
Gasoline	do	20,051	21,311	23,262
Kerosine, jet fuel, distillate fuel oil	do			
oil	do	27,507	28,768	30,431
Residual fuel oil	do	33,940	40,033	44,366
Lubricants	do	2,421	2,496	2,507
Asphalt	do	4,170	4,598	5,012
Total [4]	do	88,089	97,206	105,578

[e] Estimate. [p] Preliminary. [r] Revised.
[1] In addition to the commodities listed, magnesium, nickel, 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] Gross production of natural gas is not reported, but presumably it is only slightly greater than reported marketed gas.
[4] Total of reported figures only; no estimates have been made for unreported products and/or for refinery fuel and losses.

TRADE

In 1973, East Germany's limited mineral exports consisted mainly of lignite briquets, potash, rock salt, gypsum, kaolin, chalk, and iron and steel semimanufactures.

As in previous years, the U.S.S.R. supplied an important part of the basic raw materials needed by the key branches of East Germany's industry; the materials supplied were crude oil, coal and coke, iron ore, rolled steel, nonferrous metals, and chemical products. Hungary and Yugoslavia provided bauxite, and Middle Eastern countries provided some crude oil.

Table 2.—East Germany: Exports of selected commodities [1]
(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum metal and alloys:			
Scrap	[r] 1,107	9,666	Netherlands 6,729; France 2,471.
Unwrought	710	830	Finland 630; United Kingdom 200.
Semimanufactures [2]	1,139	894	All to Poland.
Copper metal and alloys:			
Scrap	[r] 665	919	All to Netherlands.
Unwrought	641	2,339	United Kingdom 2,204.
Semimanufactures	34	91	All to Austria.
Iron and steel metal:			
Scrap [2] thousand tons	24	26	Italy 12; Poland 11.
Pig iron, ferroalloys, similar materials do	[r] 151	308	Italy 161; Sweden 63; United Kingdom 45.
Steel, primary forms do	[r] 24	47	Belgium-Luxembourg 35.
Steel, semimanufactures [2] do	217	243	Poland 136.
Lead:			
Oxides	[r] 1,773	1,983	Italy 750; France 605; Sweden 418.
Metal and alloys:			
Scrap	275	364	All to United Kingdom.
Unwrought and semimanufactures	[r] 5,297	3,346	Netherlands 2,970; Austria 376.
Nickel metal and alloys	45	53	All to Netherlands.

See footnotes at end of table.

Table 2.—East Germany: Exports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Platinum-group metals and silver:			
Platinum group value, thousands	$391	$72	All to Netherlands.
Silver ... do	$1,552	$780	Do.
Tin metal and alloys, all forms [2] long tons	153	328	All to Poland.
Zinc:			
Oxides	r 4,481	2,448	Norway 555; Sweden 383; Denmark 340; Italy 336.
Metal and alloys:			
Scrap	291	53	All to Netherlands.
Unwrought and semimanufactures	r 1,625	2 1,730	Netherlands 744; Belgium-Luxembourg 422; United Kingdom 299; France 250.
Other, metal-bearing slag, ash, similar residues	r 12,505	15,677	Austria 11,910; Netherlands 3,579.
NONMETALS			
Barite [2]	1,998	9,979	All to Poland.
Cement	12,928	32,712	All to Yugoslavia.
Chalk [3]	35,924	41,134	NA.
Clays and clay products:			
Kaolin, crude [3]	86,627	105,334	NA.
Products:			
Nonrefractory	r 7,936	7,517	Belgium-Luxembourg 3,062; Denmark 2,306; Switzerland 799.
Refractory	r 10,798	8,513	Belgium-Luxembourg 4,352; Sweden 2,216.
Diamond, industrial value, thousands	$158	$144	All to Belgium-Luxembourg.
Feldspar and fluorspar [2]	r 35,518	36,092	Poland 22,557; Austria 5,942; Yugoslavia 4,385.
Fertilizer materials:			
Phosphatic, manufactured (gross weight) [2] thousand tons	22	--	
Potassic, crude and manufactured, K_2O equivalent [3] do	1,757	1,820	Czechoslovakia 466; Poland 401; United Kingdom 152.
Gypsum, calcined [3]	71,605	92,963	NA.
Mica, worked	16	NA	
Salt, rock [3] thousand tons	845	910	Czechoslovakia 729.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	r 9,805	500	All to Finland.
Caustic potash, sodium and potassium peroxides [4]	r 4,517	3,970	Yugoslavia 1,846; U.S.S.R. 1,164; Switzerland 549.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked, dimension stone	645	723	All to Norway.
Gravel and crushed rock: [3]			
Gravel thousand tons	214	740	NA.
Crushed do	103	18	NA.
Sand, excluding metal bearing do	23	20	All to Austria.
Sulfur:			
Elemental	r 4,056	NA	
Sulfuric acid and monohydrate	r 21,437	49,429	All to Poland.
Other nonmetals, n.e.s	r 27,581	21,248	United Kingdom 13,733; Belgium-Luxembourg 4,315; Norway 3,200.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [3]	8,500	8,700	NA.
Coal, brown coal briquets thousand tons	2,760	2,486	Czechoslovakia 671; West Germany 566; Poland 348.
Coke do	r 27	5	All to Sweden.
Gas (natural or manufactured, not specified) million cubic feet	932	735	NA.
Petroleum refinery products: [3]			
Gasoline thousand 42-gallon barrels	3,776	5,154	NA.
Distillate fuel oil thousand 42-gallon barrels	1,810	6,404	NA.

See footnotes at end of table.

Table 2.—East Germany: Exports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum refinery products [3]—Continued			
Residual fuel oil thousand 42-gallon barrels	731	4,449	NA.
Other:			
Paraffin do	350	276	NA.
Montan wax do	185	186	NA.
Crude chemicals from coal, gas, and oil distillation	5,326	4,659	Switzerland 3,539.

r Revised. NA Not available.

[1] Because East Germany publishes only limited data on mineral commodity exports, this table has been compiled from a variety of sources. Entries for 1971 appearing without a source footnote are from the 1971 edition of Supplement to the World Trade Annual. V. 1 (East Europe), United Nations Statistical Office, Walker and Company, New York, 1974. Entries for 1972 appearing without a source footnote are from the 1972 edition of World Trade Annual. V's. 1, 2, and 3, Statistical Office of the United Nations, Walker and Company, New York, 1974.

[2] Data totally or partially from official trade returns of Poland.

[3] Official trade returns of East Germany.

[4] Data totally or partially from official trade returns of the U.S.S.R.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite [2] thousand tons	286	268	Hungary 192; Yugoslavia 76.
Alumina, Al_2O_3 content [2]	63,392	96,897	NA.
Metal and alloys:			
Unwrought [3]	r 112,638	112,344	U.S.S.R. 104,500.
Semimanufactures (rolled) [2]	29,900	29,400	U.S.S.R. 19,600; Italy 1,848.
Cadmium metal and alloys [3]	171	211	All from U.S.S.R.
Chromium, chromite, Cr_2O_3 content [2]	49,400	55,100	Mainly from U.S.S.R.
Copper:			
Ore and concentrate	8,067	17,643	Sweden 14,087; Austria 3,556.
Metal and alloys:			
Scrap	r 438	396	United States 206; Belgium-Luxembourg 110; Netherlands 80.
Unwrought	2,431	2,389	Sweden 1,567; United Kingdom 822.
Semimanufactures	r 1,061	315	Austria 112; Italy 80; United Kingdom 79.
Iron and steel:			
Iron ore, iron content [2] thousand tons	1,561	1,601	Mainly from U.S.S.R.
Scrap do	[3] r 260	NA	
Pig iron [2] do	822	700	Mainly from U.S.S.R.
Ferroalloys [2]	16,700	17,000	Spain 9,343; U.S.S.R. 4,200; Norway 2,570.
Steel semimanufactures: [2]			
Bars and rods do	597	605	NA.
Angles, shapes, sections do	434	559	NA.
Hot and cold rolled strip do	275	282	NA.
Light plates and sheets do	108	60	NA.
Heavy plates and sheets do	519	498	NA.
Pipe do	280	273	NA.
Lead, unwrought, unalloyed [3]	46,400	45,615	U.S.S.R. 45,000.
Magnesium, unwrought, unalloyed [3]	3,371	2,955	All from U.S.S.R.
Manganese ore:			
Metallurgical grade [3] thousand tons	193	172	Do.
Battery and chemical grade [3] do	2	2	Do.
Mercury 76-pound flasks	11,256	2,002	All from Spain.
Nickel metal, all forms	r 304	51	All from Sweden.
Silver, unworked or partly worked value, thousands	$515	$7,082	All from United Kingdom.
Tin metal and alloys, unwrought long tons	29	143	All from Spain.
Titanium oxide	887	181	Mainly from France.
Tungsten ore and concentrate	73	NA	
Zinc:			
Ore and concentrate	--	1,806	All from Sweden.
Oxide	200	NA	
Metal and alloys, all forms [3]	44,477	41,500	All from U.S.S.R.

See footnotes at end of table.

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

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Other:			
Ores and concentrates of molybdenum, tantalum, titanium, vanadium, zirconium	r 327	NA	
Metals and alloys, all forms:			
Metalloids	NA	85	All from Netherlands.
Base metals and alloys, all forms, n.e.s	20	76	All from Belgium-Luxembourg.
Ash and residues containing nonferrous metals	591	NA	
NONMETALS			
Abrasives, natural:			
Dust and powder of precious and semiprecious stones, except diamond value, thousands	$131	$115	All from Netherlands.
Grinding wheels and stones	207	248	Austria 124; Sweden 124.
Asbestos [2]	58,342	59,657	U.S.S.R. 48,700.
Cement, hydraulic [3 4] thousand tons	r 210	180	U.S.S.R. 159; Spain 18.
Clays and clay products:			
Crude clays:			
Bentonite [5]	5,172	6,434	All from Yugoslavia.
Kaolin [2]	r 31,721	25,342	United Kingdom 15,639; Czechoslovakia 9,703.
Other [4]	293	5,036	All from Poland.
Products:			
Nonrefractory	r 189	NA	
Refractory	r 4,709	3,272	United Kingdom 1,495; France 1,121.
Diamond, industrial value, thousands	r $921	$1,811	All from Belgium-Luxembourg.
Feldspar and fluorspar	r 23,195	22,897	Norway 9,165; Sweden 4,310; Yugoslavia 3,610; Spain 3,428.
Fertilizer materials: [2]			
Crude, phosphate rock and apatite concentrates, P_2O_5 content thousand tons	r 453	517	NA.
Manufactured:			
Nitrogenous, N content do	194	238	NA.
Phosphatic, P_2O_5 content do	10	16	NA.
Graphite [2]	6,327	6,569	U.S.S.R. 2,605; Austria 1,105.
Lime [4]	1,500	1,369	All from Poland.
Magnesite, crude, calcined, sintered [6] thousand tons	r 37	37	All from Czechoslovakia.
Mica [2]	1,073	1,259	NA.
Pigments, mineral, including processed iron oxides	153	446	Netherlands 337; United States 109.
Precious and semiprecious stones, except diamond value, thousands	$298	$133	All from United Kingdom.
Pyrite, sulfur content [2]	74,433	51,980	NA.
Stone, sand and gravel, crushed stones	1,861	684	All from Yugoslavia.
Sulfur: [4]			
Elemental, all forms	44	59	All from Poland.
Sulfuric acid [7]	r 24,007	55,804	Poland 49,429.
Talc and related materials	1,353	3,491	All from Austria.
Other, slag, dross, similar waste, not metal bearing	NA	14,707	All from Norway.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [2]	35,400	30,200	U.S.S.R. 18,900.
Coal:			
Anthracite and bituminous [2] thousand tons	7,973	7,601	U.S.S.R. 3,918; Poland 2,168.
Lignite [4] do	3,561	4,106	All from Poland.
Coke [2] do	3,045	3,077	U.S.S.R. 1,074; Czechoslovakia 845; Poland 783.

See footnotes at end of table.

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

Commodity	1971	1972	Principal sources, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Gas, manufactured [2] million cubic feet	3,888	162	NA.
Petroleum: Crude [2] thousand 42-gallon barrels	80,255	109,206	U.S.S.R. 82,416; Iraq 2,750.
Refinery products do	NA	394	Netherlands 364.

r Revised. NA Not available.
[1] Because East Germany publishes only limited data on mineral commodity imports, this table has been compiled from a variety of sources. Entries for 1971 appearing without a source footnote are from the 1971 edition of Supplement to the World Trade Annual. V. 1 (East Europe), United Nations Statistical Office, Walker and Company, New York, 1974. Entries for 1972 appearing without a source footnote are from the 1972 edition of World Trade Annual. V's. 1, 2, and 3, Statistical Office of the United Nations, Walker and Company, New York, 1974.
[2] Official trade returns of East Germany.
[3] Data totally or partially from official trade returns of the U.S.S.R.
[4] Data totally or partially from official trade returns of Poland.
[5] Data totally or partially from official trade returns of Yugoslavia.
[6] Data totally or partially from official trade returns of Czechoslovakia.
[7] Data totally or partially from official trade returns of Bulgaria.

COMMODITY REVIEW

METALS

Aluminum.—In 1973, East Germany's estimated aluminum production grew by more than 50% over that of 1972, and it may be assumed that the reason was an increase in productive capacity. East Germany has no indigenous raw materials for producing alumina or aluminum and imports bauxite from Hungary and Yugoslavia and some alumina from West Germany.

East Germany's apparent aluminum demand was not satisfied by domestic production, necessitating imports of primary metal, including 29,400 tons of aluminum products.

East Germany's alumina is produced at the VEB Chemiewerke Lauta and the reduction of alumina to primary metal is performed at the VEB Elektrochemisches Kombinat in Bitterfeld, said to have a capacity of 45,000 tons per year and increased recently by an unspecified amount. Other electrolytic operations included a 22,000-ton-per-year plant at the Aluminumwerke Lauta in Lauta, where improved Söderberg electrodes are used. Secondary aluminum processing facilities estimated to have a capacity of 35,000 tons per year were available at the VEB Elektrochemisches Kombinat in Bitterfeld and at the VEB Leichtmetallwerk in Rackwitz, which has also rolling mills and a foil production of 3,000 tons per year.

The Hettstedt rolling mill at the light metal works of the Mansfeld combine, which was commissioned in 1972, reached its planned capacity during 1973.[4]

Future plans [5] for the development of East Germany's aluminum industry comprise expansion of rolled stock capacity at the light metal works in Nachterstedt before the end of 1975 and further unspecified expansion at the same location within the period ending in 1980.

Also at Hettstedt, a new process was developed for the production of zinc-plated aluminum, for use in heat transfer systems.[6]

Cadmium.—In 1973 East Germany's estimated cadmium output was unchanged compared with that of 1972.

East Germany's cadmium is produced at the VEB Mansfeld Kombinat "Wilhelm Pieck" in Eisleben and at the ElektroWerk at Weida, Thuringia, mostly from cemented cadmium coming from the smelting of zinc and other nonferrous metals, which it accompanies in the ores.

Copper.—In 1973 East Germany's mine and smelter output declined to approximately half that of 1972. East Germany's estimated refined copper production increased 5%.

East Germany's copper resources consist of polymetallic complex ores called cop-

[4] Neues Deutschland (East Berlin). (Production according to plans.) V. 28, No. 321, Nov. 20, 1973.
[5] Graf, G. (Development of Metallurgy in the German Democratic Republic with Special Emphasis on University Training.) Neue Hütte (Leipzig), v. 18, No. 11, November 1973.
[6] Metal Bulletin (London). East German Process. No. 5787, March 1973, p. 17.

per schists (slates), found in the Mansfeld and Sängerhausen Basins, where they are mined by VEB Mansfeld Kombinat "Wilhelm Pieck" in Eisleben. The operating mines are Max Lademann, Fortschritt and Otto Borsowski in the Mansfeld Basin and Thomas Münzer and Niederröblingen in the Sängerhausen Basin.

Smelting is performed at the Karl Liebknecht Hütte in Eisleben and the August Bebel Hütte in Helbra. There, combined capacities of the smelters is 25,000 tons per year, and for the electrolytic refineries 45,000 tons per year.

There are also secondary facilities of various capacities at the VEB Mansfeld Hütten Kombinat in Hettstedt; the VEB Kupfer und Blechwalzwerk in Ilsenburg; and the VEB Berliner Metallhütten und Halbzeugwerke in Berlin-Schöneweide.

In 1973, East Germany's copper smelting capacity was expanded and rationalized further by the commissioning of a new copper blast furnace at the Integrated Smelter at Mansfeld (VEB Mansfeld Kombinat "Wilhelm Pieck").

In 1971, East Germany's copper demand was estimated at 90,000 tons per year. The Soviet Union was reported to have supplied 45,000 tons of copper.[7] In 1972, estimates for East Germany's copper consumption were also around 90,000 tons per year.

Early in 1973 East Germany had a contract with Chile for the 1973 import of 12,400 tons of refined copper.

There are official plans for increasing copper wire production through introduction of continuous-cast and processed copper wire and the reconstruction of an existing copper anode plant by 1980.[8]

Iron and Steel.—In 1973 East Germany's output of pig iron increased 2.4%, while crude steel production increased by 3.9% over 1972.

East Germany has only small iron ore reserves and in 1973 East German iron ore output decreased by an estimated 67%. In order to satisfy demand, East Germany imported iron ore with an iron content of 1.6 million tons in 1972, about 70% of which came from the Soviet Union.

East Germany's iron ore resources are located in five areas: (1) The Harz Mountains, where iron ore with 20% to 22% iron content was mined at the VEB Eisenerzgruben; (2) Brückenburg, Braunsumpf, and Elbingerode; (3) near Magdeburg, where red and brown hematite with up to 43% iron content was mined in open-cast mines at the VEB Eisenerzgruben (West-Badeleben); (4) at the VEB Eisenerzgruben Saalfeldes, Wittmannsgeseuth and Schmiedefeld with open-cast and underground mines; (5) at the VEB Eisenmanganerzbergwerk Schmalkaden, where 43% iron ore with some manganese is mined in open cast and underground mines.

Major plants of East Germany's steel industry are the VEB Eisenhüttenkombinat Ost located at Eisenhüttenstadt with six 700-cubic-meter blast furnaces (1.5 million tons of pig iron capacity per year); the VEB Maxhütte, Bergbau and Hüttenkombinat located at Unterwellenborn with four blast furnaces and Bessemer converters; the VEB Niederschachtofenwerk Calbe (formerly VEB Eisenhütterwerk West), located at Calbe on the Saale, with more than 10 low-shaft furnaces using siliceous ore and lignite coke, for a capacity of 350,000 tons per year producing also low-carbon high-manganese iron.

Other iron and steel plants with lesser importance are the VEB Edelstahlwerk "8. Mai 1945" in Dresden; the VEB Rohrwerke Bitterfeld; the VEB Stahl and Walzwerk Brandenburg; VEB Walzwerk Burg; the VEB Walzwerk Finow; the VEB Stahl and Walzwerk Grödlitz; VEB Walzwerk Hettstedt (Südharz); Firma Kirchoff and Lehr (Arnsdorf/Dresden); VEB Ferro-Legierungs-Werk Lippendorf; VEB Prezisionszieherei Mitscherling u. Söhne KG (Köthen); VEB (B) Stahlverformungswerk Ohrdruf; VEB Blechwalzwerk Olbernau; VEB Stahl und Walzwerk Riesa; VEB Rohr und Kaltwalzwerk (Karl Marx Stadt); VEB Kaltwalzwerk und Zieherei Zalzungen (Bad Salzungen); VEB Eisen und Hüttenwerke Thäle; VEB Stahl und Walzwerk "Wilhelm Florin" (Henningsdorf/Berlin); VEB Walzwerk "Willi Becker" (Kirchmoser/Brandenburg).

East German steel demand exceeded supply and in 1972 East Germany imported 699,500 tons of pig iron and 2.3 million tons of processed steel as well as semi-manufactures in significant quantities.

Plans for expanding East Germany's steel industry by 1975 include a new 3.5-million-ton-per-year sinter plant; conversion of the open hearth furnaces of the Riesa, Gröditz,

[7] Mining Magazine (London). V. 126, No. 1, January 1972, p. 35.

[8] Graf, G. (Development of East German Metallurgy.) Neue Hütte, v. 18, No. 11, November 1973, pp. 641–644.

and Brandenburg steelworks to natural gas; reconstruction and expansion of the rolling mills at Riesa, Henningsdorf, and Maxhütte; conversion of the Maxhütte Bessemer plant to basic oxygen operation; completion of a 1-million-ton-per-year cold sheet mill; startup of a new 10,000-ton-per-year wire mill in Freital; a 20,000-ton-per-year railroad tire plant in Gröditz; a 650,000- to 700,000-ton-per-year bar mill in Henningsdorf and Brandenburg; and reconstruction of a tube mill at Riesa.[9]

Lead and Zinc.—In 1973 East Germany's estimated primary and refined lead production was unchanged, while estimated primary zinc production decreased by one-fourth and secondary zinc output increased 20%.

East Germany's domestic lead and zinc resources consist of some poor, complex polymetallic ores, which contain lead, zinc, silver, pyrites, fluorspar and form narrow veins that are mined around Freiberg. There are some mines north, east, and south of Freiberg, and the ores are concentrated by flotation in two plants. Residues of the Mansfeld copper slate are also processed for the recovery of their lead and zinc content.

Silver.—In 1973, East Germany's silver output increased by 40%.

East Germany's gold and silver is a by-product of copper, lead, and zinc refining. The processing of these metals is done at the VEB Mansfeld Kombinat "Wilhelm Pieck" in Eisleben.

Tin.—In 1973 East Germany's estimated tin output was unchanged, while estimated refined tin including secondary tin, increased by 1.7% over that of 1972.

East Germany's tin resources consist of deposits located in Saxony's Erzgebirge (ore mountains). The ore is mined at Altenberg, Sadisdorf, and Ehrenfriedensdorf, where an ore with 0.2% to 0.35% tin is enriched by gravity concentration to 40%.

The metal is recovered at the VEB Zinnhütte Freiberg, where 99% and 99.9% grade tin are produced, the latter by electrolytic refining. Capacity of the plant is estimated at 1,300 long tons per year.

NONMETALS

Barite.—In 1973 East Germany's estimated barite production increased 3.3%. East German barite is recovered in the flotation plant of the fluorspar and barite plant Lengenfeld located in the south of the country.[10]

Cement.—In 1973, East Germany's estimated cement production increased by 7.8% over that of 1972.[11]

East Germany's cement plants are distributed around the country at about 11 locations. The largest among them is the Karsdorf plant which during mid-1973 reached its design capacity of 4 million tons per year.[12] Another cement plant under construction, to be commissioned during 1975–76, is the plus 2-million-ton-per-year VEB Eischsfelder Zementwerke Deuna near Erfurt.[13] Blast furnace slag cement is produced at the VEB Hüttenzementwerk Ost and at the VEB Bergbau und Hüttenkombinat Maxahütte, Zementwerk Unterwellenborn. Some more cement is produced by the gypsum-sulfuric-acid method at the VEB Gipsschwefelsäurewerk Coswig.

Fertilizer Materials.—During 1973 East Germany's fertilizer production did not change significantly while creation of new plant capacity and conversion from lignite to natural gas continued.

Nitrogenous fertilizer production decreased 4.0% during 1973. Nitrogenous fertilizer plant construction continued. Much of the above-mentioned activity was concentrated at the chemical and fertilizer combine Piesteritz, where productive capacity will be raised from 1970 to 1975 by 200,000 tons of nitrogen per year,[14] comprising a 1,075-ton-per-day urea plant to go onstream in 1974; a 305,000-ton-per-year nitric acid plant built by the U.S.S.R. went onstream during 1973.[15] An ammonia plant was also commissioned that same year at Piesteritz.[16]

Optimum application of nitrogen as fertilizer in East German soils has been deter-

[9] Graf, G. (Development of Metallurgy in the German Democratic Republic.) Neue Hütte (Leipzig), v. 18, No. 11, November 1973, p. 643. Metal Bulletin (London). Big East-German Expansion. No. 5875, Mar. 19, 1974, p. 36.

[10] Siebert, B., and J. Meisel. (Raising Flotation Rates in Processing Barite.) Neue Bergbautechnik (Leipzig), v. 3, No. 5 May 1973, pp. 393–395.

[11] Die Wirtschaft (East Berlin). (Cement Production.) V. 28, No. 28, July 11, 1973, p. 11.

[12] Neues Deutschland (East Berlin). During 1974 for the First Time 4 Million Tons of Cement From Karsdorf. V. 29, No. 43, Feb. 2, 1974, p. 4; In the Karsdorf Cement Plant. V. 28, No. 48, July 6, 1973, p. 2.

[13] Neues Deutschland (East Berlin). In the County of Erfurt. V. 28, No. 151, June 2, 1973, p. 3.

[14] Die Wirtschaft (East Berlin). (The Piesteritz Nitrogen Works Grow as Planned.) V. 28, No. 10, Mar. 7, 1974, p. 3.

[15] Nitrogen (London). (New Plant Construction.) No. 84, July–August 1973, p. 10; No. 82, March–April 1973.

[16] Volksarmee (East Berlin). (U.S.S.R. Natural Gas for GDR Ammonia Plant.) V. 14, No. 4, April 1973, p. 10.

mined recently and depending on the amount of crops to be raised has ranged from 50 and 120 kilograms per hectare.[17]

In 1973 East Germany's estimated potassic fertilizer production increased by 4.0%. The country's current 5-year plan for 1971–75 set goals at 2.9 million to 3.1 million tons of potassium oxide equivalent for its potassic fertilizer output in 1975. Potash reserves are estimated at 13 billion tons.[18]

East Germany's potassic fertilizer resources consist of potash deposits found in five major regions, all belonging to the Zechstein formation. They are the Nerva region in the far southeast; the southern Harz region and the Saale-Unstrut region on the southern and southeastern approaches of the Harz; and finally, the northern Harz region between Harz and Flechtling, the latter including the well-known Strassfurt region.[19]

Four Zechstein seams are mined in East Germany, which are, in chronological order, the Thüringen, Hessen, Strassfurt, and Rennerberg seams. The Thüringen is 3 to 5 meters thick, with carnallite and 12% potassium oxide and about 4% magnesium sulfate; the Hessen is 2 to 2.5 meters thick, containing mostly sylvinite, with 9% to 12% potassium oxide and 15% to 25% magnesium sulfate; the Strassfurt is often 1.5 to 3.6 kilometers deep, is mined to depths of 1,100 meters, and is 2 to 10 meters thick, with 11% to 17% potassium oxide. The carnallite of the Strassfurt seam, with 8% to 10% potassium oxide and 8% to 15% magnesium sulfate is 20 to 60 inches thick and is not mined but reserved for the future when depths of over 1,100 meters will be mastered. The Renneberg seam is 4 to 12 meters thick with sylvinite, contains 12% to 17% potassium oxide, and is low in sulfates.

The potash is mined almost exclusively in underground mines. Drilling and blasting is done mostly with diesel-driven trackless equipment in conjunction with conveyor belts for moving the materials.[20]

The run-of-mine potash is processed by grinding and separation by flotation, or by a process based on the difference in the solubility of the components at varying temperatures.

In order to reach the potash goal of 2.9 to 3.1 million tons of potassium oxide equivalent set by the current 5-year plan (1971–75), a major new mine and mill, VEB Kalibetrieb Zielitz, was developed, and trial production was started in 1973. This newest plant of the VEB Kombinat Kali is the largest in East Germany.

In the mine, the Renneberg potash bed is mined; it slopes at an angle of 18° to 25° and is encountered at depths ranging from 700 to 1,000 meters. Reserves are sufficient for up to 50 years at present mining rates. The potash mineral is sylvinite, averaging 15% potassium oxide and containing principally one-fourth potassium chloride and three-fourths sodium chloride. The bed mined is 6 to 9 meters thick, is overlain by rock salt, and is underlain by rock salt and carnallite. The mining method is based on the conventional room and pillar method, and drilling and blasting are used; the ore is transferred by 8-ton scoop trams to precrushers, and conveyors are used to move it to the 50-ton skips operating at 15 meters per second.

The Zielitz refinery grinds the crude ore to less than 1 millimeter size in rod mills and the ore is then upgraded by flotation to 60% potassium oxide. In spite of the large size of the Zielitz mine, its impact will be small for the present on East Germany's potash production, because of the shutdown of the old Strassfurt mine. All future surplus production is slated for export.[21]

East Germany is a major exporter of potash. The following amounts were exported in 1972, in metric tons of potassium oxide: Poland, 401,300; Hungary, 160,200; Austria, 91,660; Brazil, 39,160; Netherlands, 38,257; and Belgium, 35,201.

In 1973, East Germany's production of phosphatic fertilizers declined 1.5% from that of 1972, continuing the trend of the last 4 years.

East Germany imports all phosphatic raw materials, mainly in the form of apatite concentrate. Of the 516,600 tons of total phosphorous pentoxide equivalent of phosphatic materials imported, 453,000 tons of apatite concentrate were imported from the

[17] Bauern-Echo, (East Berlin). (Electronic Data Processing Methods—the Right Measure in the Intensive Rational Use of Nitrogen.) June 6, 1973, p. 7.

[18] Industria Mineraria, (Milan, Italy). (The Potash Salts of East Germany.) V. 24, ser. 2, No. 3, March 1973, p. 153.

[19] Taubert, H. (The Potash and Salt Mining Industry of the German Democratic Republic.) Neue Bergbautechnik (Berlin), v. 4, No. 1, January 1974, pp. 5–8.

[20] Taubert, H. (Potash and Salt Mining in the German Democratic Republic.) Neue Bergbautechnik (Leipzig), v. 4, No. 1, January 1974, p. 8

[21] Phosphorus and Potassium (London). (Zielitz—a Major Achievement of the German Democratic Republic's Potash Industry.) No. 67, September–October 1973, pp. 30–32.

Soviet Union; 129,000 tons of phosphate rock from Morocco; and 32,000 tons of phosphate rock from Tunisia in 1972.

Fluorspar.—In 1973 East Germany's estimated fluorspar production increased 12.5%. Fluorspar resources consist of deposits in the Harz, in the Thüringer Wald, and in the Erzgebirge in the south of the country. About one-third of the deposits are in Ilmenau and Gehren, and similar amounts are found near Schmalkaden in the Thüringer Wald.

East Germany's fluorspar mine-mills are at Rottleberode, Steinbach, Mommelstein, Ilmenau, Gehren, Siptenfeld, Strassberg, Schönbrunn, and Marienberg. Three grades of fluorspar are produced, acid grade with 98% calcium fluoride, ceramic grade with 95%, and metallurgical grade with 70% to 85%.

Gypsum.—In 1973 East Germany's crude gypsum production was unchanged. The country's major gypsum deposits are found at the southern margin of the Harz at Niedersachsenwerfen, near the city of Erfurt and in the Thüringer Wald region; 12 plants were located near Erfurt, at Krolpa (Gera), Rottleberode (Halle), and Sperenberg (Pottsdam).

Lime.—In 1973 East Germany's lime production increased by an estimated 3.2%. The country is rich in good quality limestones. The best are the Devonian limestones in the Harz Mountains, near Elbingerode and Rübeland. There is also some chalk on Rügen Island near Sassnitz and Sagurd, and there are also many lime plants there.

Salt.—In 1973 East Germany's estimated salt production increased 4.5%. Salt resources are in the Zechstein formation. Only pure salt deposits are used as in the area of Bernburg-Strassfurt, where they form a 20- to 30-meter-thick deposit which is mined through shafts. Besides conventional mining, brine leaching has been used to supply the chemical industries in the Strassfurt, Bernburg, and Halle Areas.[22] The rock salt mined is ground and classified for sale.

Sand and Gravel.—In 1973, East Germany's sand and gravel production increased by an estimated 0.4% over that of 1972.

The VEB Bagger und Schleppbetriebe (Rostock) recovers gravel from the sea for concrete aggregate purposes.[23]

Sulfur.—In 1973 East Germany's sulfur production increased by an estimated 2.3% over that of 1972. Sulfur is recovered as a byproduct of synthetic fuel production by the following companies: VEB Kombinat Espenhain, VEB Leunawerke Walter Ulbricht, and VEB Kombinat Otto Grohtewohl, Böhlen.

Sulfuric Acid.—In 1973, East Germany's sulfuric acid production increased by 1.2% over that of 1972. Sulfuric acid is made from domestic pyrite, and other nonferrous ores as in the VEB Mansfeld Kombinat "Wilhelm Pieck," Eisleben, and VEB Bergbau und Hüttenkombinat Albert Funk, Freiberg. Some brimstone and some pyrite, (51,980 tons in 1972) were also imported for sulfuric acid production. Furthermore, some sulfuric acid and cement is made from gypsum at Wolfen and Coswig.

A 100,000-ton-per-year sulfuric acid plant was commissioned in August 1973 at Magdeburg by the VEB Fahlberg List; the plant was built by Polimex-Cekop Ltd. of Poland at a $2.1 million cost and is based on Polish brimstone supplied by the Polish Ciech-Siarkopol Company.[24] Another similar plant is to be built by Polimex-Cekop at Nünchritz (East Germany) to be commissioned by 1976. Participating were the Pekkadix Co., part of the Metalchem/Biprokwas group of Gliwitze, the Budochem of Radom and Elekromontaz of Szczecin (all from Poland).[25]

Titanium Dioxide.—In 1973 a 25,000-ton-per-year titanium dioxide plant was commisisoned at Celje, Yugoslavia. The plant is a joint project of East Germany and Yugoslavia, 49% of the 30-million-dollar investment was provided by East Germany, which will receive the pigment produced to cover a major share of its demand for titanium dioxide.

MINERAL FUELS

East Germany's primary energy consumption from fossil fuels, hydroelectric power, and nuclear energy rose from 109.0 million tons of standard fuel equivalent in 1972 to an estimated 114.0 million tons in 1973. The estimated output of crude oil increased from 318,000 to 346,000 tons and

[22] Taubert, H. (The Potash and Rocksalt Mining Industry in the German Democratic Republic.) Neue Bergbautechnik (Leipzig), v. 4, No. 1, January 1974, p. 6.

[23] Boenisch, W. (Mineral Wealth From the Baltic.) Die Wirtshaft (East Berlin), No. 3, January 1974, p. 5.

[24] Sulphur (London). German Democratic Republic. No. 11. November–December 1973, p. 4.

[25] Sulphur (London). German Democratic Republic. No. 10, September–October 1973, p. 11.

that of natural gas from 5.2 billion to 6.9 billion cubic meters. The share of these two fuels in East Germany's primary energy supply rose from 22.4% to about 25.7% during the 1972–73 period.

In 1973 East Germany produced 246.9 million tons of bituminous coal and lignite. The share of coal (bituminous coal and lignite) in the primary energy supply declined from 77.3% in 1972 to 73.9% in 1973. While the production of natural gas increased rapidly, the output of crude oil increased only by small amounts, and that of coal was essentially not changed. The share of all coal in the energy balance is to decline, while its quantity is unchanged. Although the share of liquid and gaseous hydrocarbons will gain steadily in importance, coal will remain the major source of energy consumed in East Germany well into the 21st century.

In 1973 East Germany produced 76.9 terawatt-hours of electricity, 5.6% more than in 1972. Thermal powerplants generated 68.3 terawatt-hours (88.8%) of total electricity; hydroelectric powerplants about 1.3 terawatt-hours (1.7%); and nuclear powerplants including all other types of energy sources 7.3 terawatt-hours (9.5%). Installed capacity of power generating plants at yearend, totaled 14,940 megawatts. In 1973, East German industry consumed 54,508 megawatt-hours (69.4% of the electrical energy produced) and 2.0 billion cubic meters of manufactured gas (42% of the gas manufactured in the country). However, the coefficient of fuel utilization in manufacturing process operations was 0.430 kilogram per killowatt-hour, almost 25% more than in West Germany where it was 0.350 kilogram per kilowatt-hour. The secondary energy sources were poorly utilized.[26]

Primary electric energy from sources other than those mentioned previously accounted for 1.2% of East Germany's generating capacity. Total generating capacity is to be expanded by 1975, the last year of the current 5-year plan (1971–75) by one-half of its present value, of which 60% is to be fueled by lignite and 14% by nuclear energy. East Germany's main power generating plants commissioned since 1949 were Hagenweder-Berzdorf (500 megawatts constructed in 1955–62); Elbe-Vockerode (384 megawatts, 1959); Trattendorf (450 megawatts, 1954–59); Hohenwarte pumped storage plant (365 megawatts, 1964); Lübbenau (1,300 megawatts, 1957–64); Vetschau (1,200 megawatts, 1960–67); Lippendorf (600 megawatts, 1966–70); Thierbach (800 megawatts, 1965–70); Boxberg (3,900 megawatts, 1968); and Rheinsberg nuclear powerplant (70 megawatts, 1966); and Nord Greifswald nuclear powerplant (880 megawatts, 1967).[27]

The production of lignite is kept at a constant level, that of natural gas and crude oil is raised as much as possible, but this is effective only in the case of natural gas where sufficient reserves had been discovered. Almost one-third of East Germany's investment was spent to maintain and improve the East German energy industry. Primary fuel exports consisted mainly of fuel briquets and some petroleum products.

The U.S.S.R. was the major supplier of the crude oil imported by East Germany and in 1973 will begin also to supply natural gas. Imports of energy sources are to increase in 1975 to 32%, compared with 25% in 1970.

Total primary energy balances for East Germany in 1972 and 1973 are shown in table 4.

[26] Deutsches Institut für Wirtschaftsforschung (Berlin). (Structural Weakness and Rising Costs of Energy Economy in the German Democratic Republic.) V. 41, No. 32/74, Aug. 5, 1974, pp. 349–354.

[27] Statistische Praxis (Leipzig). (Development of the Energy Economy.) No. 4, 1974, pp. 1–4.

Table 4.—East Germany: Primary energy balance for 1972 and 1972
(Million tons standard fuel equivalent)

Year	Total primary energy	Coal (lignite, brown, bituminous) and coke	Crude oil and petroleum products	Natural and associated gas	Hydro and nuclear electricity
1972:					
Production	83.077	75.535	0.414	6.927	0.201
Import	29.929	10.370	19.315	.067	.177
Export	4.019	1.666	2.285	.012	.056
Apparent consumption	108.987	84.239	17.444	6.982	.322
1973:					
Production	84.493	74.600	.450	9.242	.201
Import	33.339	11.220	20.859	1.052	.208
Export	3.812	1.511	2.237	.013	.051
Apparent consumption	114.020	84.309	19.072	10.281	.358

Coal.—*Lignite.*—In 1973, East Germany's lignite output decreased 1.0%, the second year with a decrease since 1971, and according to plans, East Germany's lignite production will be kept at a constant or slightly decreasing level in the foreseeable future. East Germany was the world's leading producer of lignite in 1973, followed by the U.S.S.R., West Germany, and Czechoslovakia, in that order. The nation's estimated lignite reserves in 1970 were 20 billion tons.[28]

Lignite resources are found mainly in three basins—Lausitz, Borna, and Magdeburg—totaling 176 individual deposits.[29] East Germany's known lignite reserves are not expected to increase further, because geological prospecting has reached an advanced stage.[30]

East Germany's lignite mines are organized in three mining districts—Cottbus, Halle, Leipzig—with a total of 36 mines. Of these, eight mines produce lignite in excess of 10 million tons per year (Lohsa, Meuro, Scado, Seese, Spreetal in the Cottbus District, Mücheln in the Halle District, and Espenhain and Zwenkau in the Leipzig District). The following 12 mines have a production between 5 and 10 million tons per year: Burghammer, Kleinleipisch, Klettwitz, Schlabendorf, Sedlitz, and Welzon-Süd in the Cottbus District; Gaitsche, Muldenstein, and Profen in the Halle District; and Haselbach, Schleenhain, and Witznitz in the Leipzig Area. The following 14 mines had an output of less than 5 millon tons per year: Berzdorf, Greifenhain, Koschen in the Cottbus District; Amsdorf, Golpa-Nord, Holzweissig, Kayna-Süd, Königsaue, Lochau, Pirkau, Rossbach, and Wulfersdorf in the Halle District; and Borna-Ost and Peres in the Leipzig District.[31]

East Germany's lignite mining industry is highly mechanized. About one-half of the deposits are mined by the conveyor bridge method, whch has the greatest productivity.[32] The rest of the deposits are mined by the train-loading method and the so-called conveyor belt method, where the names apply mainly to the mode of removing the overburden.

In 1972, the last year for which trade data were available, East Germany exported lignite fuel briquets, of which 671,000 tons went to Czechoslovakia; 565.6 tons to West Germany; 418,400 tons to West Berlin; 234,700 tons to Austria; and 33,800 tons to Denmark.

In 1973 East Germany's estimated bituminous coal output decreased 7.6%, compared with that of 1972. Bituminous coal reserves are in the south of the country, and are estimated at 10 million to 15 million tons; geological conditions make the mining of these deposits increasingly unprofitable, and according to existing plans, future production will be reduced further.

Natural Gas.—In 1973, East Germany's estimated natural gas production increased by a spectacular 33.4% over that of 1972. According to the published production plans for the current 5-year plan (1971–75), East Germany's natural gas production will reach 400 billion to 495 billion cubic feet per year in 1975. East Germany's gas reserves, which were discovered only quite recently, are estimated at more than 3,500 billion cubic feet.

East Germany's natural gasfields are in the Magdeburg Area, near Langensalza and Salzwedel and in the Reinkenhagen Area.

In 1973, East Germany's manufactured gas production increased 0.4% over that of 1972. In the past, East Germany's gas supplies consisted entirely of manufactured gas made from lignite and from bituminous coal. This gas was used mainly as a feedstock for the petrochemical industry. According to published plans, East Germany's manufactured gas production will not be increased further in the future and will constitute 20% of East Germany's gas supply in 1975. Domestic and imported natural gas from the Soviet Union will provide the remaining 80%.

In 1972, East Germany imported 5.6 billion cubic feet of natural gas from the Soviet Union. By 1975, the last year of the

[28] Fricken, U. (The Energy Economy of the German Democratic Republic–Development and Perspectives.) Glückauf, v. 108, 1972, No. 23, pp. 1090–1095.
Siebold, K. (Development of the Brown Coal Industry in the German Democratic Republic.) Neue Bergbautechnik (Leipzig), 1972, pp. 837–840.

[29] Pietzsch, K. Die Braunkohlen Deutschlands. (Germany's lignites.) Borntraeger (Berlin), 1925, p. 200.

[30] Siebold, K. (Development of the German Democratic Republic's brown coal industry.) Neue-Berg bautechnik (Leipzig), 1972, pp. 837–840.

[31] Neue Bergbautechnik (Leipzig). Review of the Producing Capabilty of East German Open Pit Mines in 1972. V. 3, No. 12, December 1973, p. 960.

[32] Strzodka, K., and Others. (Goals and Problems of East German Lignite Mining Industry.) Neue Bergbautechnik, v. 3, No. 10, October 1973, p. 726.

current 5-year plan (1971–75), Soviet imports will reach 190 billion cubic feet per year. This becomes possible, as the 1,000-kilometer gas pipeline between Kalinin (U.S.S.R.), Czechoslovakia, and Deutschneudorf was commissioned in April 1973.

Petroleum.—In 1973, East Germany's estimated crude oil production increased 8.7% but satisfied only 2.3% of demand; the rest, 97.7%, had to be imported. The bulk of the 1972 imports, 82,416,000 barrels, came from the U.S.S.R., with increasing amounts expected every year. Soviet oil is shipped through the Friendship pipeline, which enters East Germany at Schwedt. East Germany imports also some Middle Eastern and North African oil: Iraq provided 2,750,000 barrels; Arab Republic of Egypt provided 969,000 barrels and Syria 347,000 barrels in 1972.

East Germany's refining capacity, estimated at 12 million tons per year is to be expanded to 20 million tons per year by 1975, the end of the current 5-year plan (1971–75). At present, East Germany's refining capacity is concentrated in two main areas. One area is around Schwedt on the Oder and the other is near Halle. The larger one is the Schwedt refining complex, with a throughput of 8 million tons per year in 1972. Schwedt is located at the terminal of the "Friendship" Soviet-East-German pipeline but is processing also Mideastern crude coming by sea through the port of Rostock. The remaining 4-million-ton refining capacity is distributed between Leuna (2.5 million) and Böhlen and Lützgendorf (1.5 million).

The Schwedt petroleum refinery is part of the VEB PCK Schwedt (Schwedt Petrochemical combine), the center of a well developed petrochemical industry.

The Mineral Industry of the Federal Republic of Germany

By D. H. Desy [1] and Henry E. Stipp [1]

The economic recovery of 1972 developed into a boom in the first half of 1973 but slowed somewhat in the second half of the year. Inflation followed rising demand, and in May the Government announced a series of anti-inflationary measures including a temporary tax on new investments (removed in December) and a temporary surcharge on higher level income tax brackets and corporate profits. Adding to inflationary pressures was the oil crisis in the last quarter of the year.

The gross national product (GNP) in 1973 was $343.4 billion, compared with $259.0 billion in 1972. The per capita GNP in 1973 was $5,529, compared with $4,200 for 1972. Total exports amounted to $66.1 billion in 1973, compared with $46.6 billion (revised) in 1972. Exports to the United States were $5.6 billion in 1973 and $4.3 billion in 1972. Total imports in 1973 and 1972 were $53.9 billion and $40.3 billion

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Table 1.—Federal Republic of Germany: Employment and turnover in the mineral industry

	Average 1973 employment (thousand persons)	Turnover (million dollars)			
		1972 [1]		1973 [2]	
		Domestic	Foreign	Domestic	Foreign
MINES					
Iron	3	47	--	57	--
Nonferrous metals	3	27	5	39	10
Potash and salt	12	195	77	268	104
Other nonmetallic minerals	1	12	5	15	6
Coal	212	1,895	675	2,453	898
Lignite	20	308	13	389	15
Peat	4	36	8	48	12
Oil and gas	6	508	2	639	4
Total	261	3,028	785	3,908	1,049
QUARRIES					
Stone	24	539	7	632	9
Sand and gravel	15	416	19	467	26
Slate, clays, other	29	887	42	1,102	59
Cement	17	802	22	895	35
Refractories	16	232	76	292	101
Lime, gypsum, chalk	15	387	28	480	38
Limestone, sandstone	6	206	--	225	1
Pumice	6	232	--	238	2
Total	128	3,701	194	4,331	271
PROCESSING PLANTS					
Iron and steel	316	6,349	2,457	9,361	3,781
Nonferrous plants	91	2,390	483	3,539	855
Petroleum refineries	37	6,359	239	9,456	355
Coal chemicals	3	85	26	101	35
Total	447	15,183	3,205	22,457	5,026
Grand total	836	21,912	4,184	30,696	6,346

[1] Values have been converted from Deutsche marks to U.S. dollars at the rate of DM3.20=US$1.00.
[2] Values have been converted from Deutsche marks to U.S. dollars at the rate of DM2.70=US$1.00.

(revised), respectively, while imports from the United States were $12.2 billion in 1973 and $10.8 billion in 1972.

The unemployment rate was 1.3% in 1973, compared with 1.1% in 1972. Employment and turnover figures are shown in table 1. Average employment in the mineral industry was 836,000 in 1973, 1.6% below the number in 1972. The major decrease was in coal mining, and this was partially offset by an increase in employment in processing plants.

PRODUCTION AND TRADE

The index of industrial production for 1973 was 178.6. up 7.1% from that of 1972. However, the overall index for the mining sector declined slightly. In the mineral industry, iron and steel and nonferrous metal production showed the greatest gains, while coal and stone and sand showed a slight decline.

Industry sector	Index of production (1962=100)		Change (percent)
	1972 r	1973	
Mining	92.3	91.9	−0.4
Coal	74.0	72.1	−2.6
Metal ores:			
Iron	38.5	40.2	+4.4
Nonferrous	115.3	115.6	+.3
Potash and salt	140.6	145.9	+3.7
Crude oil and natural gas	280.6	292.4	+4.2
Iron and steel	140.1	161.6	+15.3
Nonferrous metals	168.5	192.8	+14.4
Petroleum, refined	227.1	239.7	+5.5
Stone and sand	151.5	147.8	−2.4

r Revised.

Source: Statistiches Bundesampt, Wiesbaden. Industrie und Handwerk. Reihe 2, February 1974, p. 6.

Table 2.—Federal Republic of Germany: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Aluminum:			
Bauxite, gross weight	r 3,048	2,032	--
Alumina thousand tons	826	916	905
Metal:			
Primary do	428	445	533
Secondary:			
Unalloyed do	29	32	36
Alloyed do	247	262	295
Bismuth, smelter e	400	300	400
Cadmium, smelter	981	914	e 1,200
Cobalt, smelter	601	457	370
Copper:			
Mine output, metal content	1,484	1,321	1,436
Metal:			
Blister and anodes:			
Primary	82,646	159,427	239,608
Secondary	122,639	101,519	74,464
Refined, including secondary:			
Electrolytic	305,001	300,584	300,662
Fire refined	95,051	97,940	105,996
Gold:			
Mine output, metal content troy ounces	1,704	2,710	e 1,700
Metal (including secondary) do	198,338	199,752	298,937
Iron and steel:			
Iron ore and concentrate thousand tons	r 4,941	4,748	6,327
Pig iron and blast furnace ferroalloys do	r 29,651	31,688	36,461
Electric furnace ferroalloys do	r 338	315	367
Steel ingots and castings do	40,313	43,705	49,521
Semimanufactures do	28,717	31,192	36,706
Lead:			
Mine output, metal content	41,339	38,630	34,496
Metal, unalloyed:			
Primary	98,400	102,000	85,900
Secondary	202,800	171,600	216,800

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS—Continued			
Magnesium, metal and alloys:			
Unwrought (secondary only)	1,800	1,800	e 1,800
Castings	39,110	33,721	34,049
Mercury (secondary only) 76-pound flasks	2,002	2,031	e 5,800
Molybdenum metal	130	150	263
Nickel, including secondary [1]	200	200	125
Platinum troy ounces	3,537	2,283	4,340
Silver:			
Mine output, metal content thousand troy ounces	1,871	1,756	1,382
Metal, including secondary do.	18,049	20,120	20,821
Tin metal, including secondary long tons	2,334	2,375	2,142
Tungsten metal	809	800	1,609
Zinc:			
Mine output, metal content	r 145,487	134,658	e 140,000
Metal, unwrought, unalloyed, primary	r 101,300	235,500	e 250,000
NONMETALS			
Barite	r 411,082	373,140	326,505
Bromine, fluorine, iodine	4,196	4,347	4,638
Cement, hydraulic thousand tons	41,013	43,145	40,860
Chalk do.	192	206	256
Clays:			
Fire clay (excluding Klebsand) do.	4,597	4,862	e 5,000
Kaolin (marketable) do.	417	417	413
Bleaching do.	614	589	e 600
Other (Schieferton) do.	127	133	e 140
Corundum, artificial do.	98	93	98
Diatomite and similar earth (marketable)	66,553	58,046	e 45,994
Feldspar (marketable)	353,693	349,446	307,020
Fertilizers:			
Crude, potassic:			
Gross weight thousand tons	22,306	22,023	24,950
K_2O equivalent do.	2,815	2,845	2,975
Manufactured:			
Nitrogenous (nitrogen content):			
Nitrogen fertilizers do.	964	959	1,006
Mixed fertilizers do.	421	420	453
Total do.	1,385	1,379	1,459
Phosphatic (P_2O_5 content):			
Superphosphate do.	46	57	48
Thomas slag fertilizers do.	347	300	264
Other phosphatic fertilizers do.	r 136	168	NA
Mixed fertilizers do.	r 430	418	447
Total do.	959	943	NA
Potassic, K_2O equivalent:			
Marketable crude do.	45	53	57
Chemically processed do.	2,398	2,395	2,491
Total do.	2,443	2,448	2,548
K_2O content of mixed fertilizers [2] do.	r 478	426	446
Mixed fertilizers, gross weight do.	r 3,073	2,938	3,099
Fluorspar (marketable)	84,687	84,070	86,934
Graphite:			
Crude	15,700	12,374	NA
Marketable [3]	12,688	11,348	NA
Gypsum (including anhydrite) thousand tons	2,534	2,683	1,714
Lime, quicklime and hydrated lime, including dead-burned dolomite do.	10,554	10,913	11,236
Pigments, natural mineral do.	15	18	e 20
Pumice:			
Crude and washed do.	7,914	8,263	7,035
Marketable do.	5,020	5,020	3,794
Pyrite (marketable concentrate):			
Gross weight do.	495	422	e 550
Sulfur content do.	219	190	e 250
Quartz, quartzite, glass sand:			
Quartzite do.	245	267	353
Quartz sand (ground) do.	898	716	539
Quartz sand (unground) and glass sand do.	5,500	5,554	7,076
Salt (marketable):			
Rock do.	6,719	6,027	7,010
Marine and other do.	2,201	2,436	e 2,450
Stone, sand and gravel, n.e.s.:			
Dimension stone thousand cubic meters	270	286	308
Limestone, industrial thousand tons	64,852	67,766	75,384
Crushed and broken do.	120,762	124,555	119,411

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
NONMETALS—Continued			
Stone, sand and gravel, n.e.s—Continued			
Slate: [4]			
Roofing for office and industry ____thousand tons__	18	13	12
Splittings and ground _____do____	69	48	NA
Basalt lava and lava sand _____do____	7,593	7,931	NA
Calcite _____do____	11	12	NA
Grinding and whetstone _____cubic meters__	616	56	65
Printing stone _____thousand cubic meters__	35	38	44
Tuff _____thousand tons__	3	2	NA
Industrial sands:			
Molding sand _____do____	1,094	1,050	1,169
Other (Klebsand) _____do____	r 149	150	172
Sand and gravel _____do____	212,829	219,999	206,860
Sulfur, elemental byproduct _____do____	184	219	333
Talc, including talc schist _____do____	30	30	30
MINERAL FUELS AND RELATED MATERIALS			
Carbon black _____	262,171	264,106	290,546
Coal:			
Anthracite _____thousand tons__	9,920	7,470	6,359
Bituminous _____do____	100,875	95,000	90,930
Pech _____do____	68	--	--
Lignite _____do____	104,479	110,416	118,658
Total _____do____	215,342	212,886	215,947
Coke:			
Metallurgical _____do____	r 41,379	37,977	37,475
Gashouse _____do____	r 2,220	1,894	1,705
Total _____do____	r 43,599	39,871	39,180
Fuel briquets:			
Anthracite and bituminous _____do____	2,716	2,427	2,271
Lignite _____do____	7,758	6,751	6,487
Gas:			
Manufactured gas (excluding that from petroleum refineries):			
Blast furnace gas _____million cubic feet__	445,492	458,418	517,251
Coke oven gas [5] _____do____	606,597	555,144	544,973
Other gas _____do____	233,464	201,646	179,927
Total _____do____	1,285,553	1,215,208	1,242,151
Natural:			
Gross production _____do____	562,779	645,111	e 690,000
Marketable production _____do____	555,194	635,544	680,583
Petroleum:			
Crude _____thousand 42-gallon barrels__	53,597	51,271	47,944
Refinery products:			
Gasoline, aviation and motor _____do____	112,824	115,927	121,803
Jet fuel _____do____	11,955	8,833	12,544
Kerosine _____do____	849	1,101	1,251
Distillate fuel oil _____do____	301,225	302,096	321,551
Residual fuel oil _____do____	186,564	193,087	231,117
Lubricants _____do____	8,342	6,638	6,918
Liquefied petroleum gas _____do____	23,621	34,939	29,155
Bitumen _____do____	28,504	28,319	27,574
Other _____do____	87,258	21,605	62,635
Refinery fuel and losses _____do____	39,636	49,437	44,547
Total _____do____	800,778	761,982	859,095

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

[1] Primary nickel and nickel contained in ferronickel, monel metal, and nickel oxide used directly by the steel industry.

[2] K_2O equivalent of potassic constituent not added to K_2O equivalent of marketable crude and chemically processed potassic fertilizers because this apparently would result in double counting.

[3] In part produced from imported crude graphite.

[4] Excludes slate recovered from mine dumps.

[5] Includes water gas and generator gas from coke ovens.

Table 3.—Federal Republic of Germany: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Bauxite	3,020	5,960	Belgium-Luxembourg 4,800; France 267; Austria 221.
Alumina	151,923	207,037	Austria 87,499; Italy 7,323.
Aluminum hydroxide	81,456	95,844	Sweden 25,516; Netherlands 23,189; Belgium-Luxembourg 9,691.
Metal, including alloys:			
Scrap	15,288	17,425	Netherlands 5,884; Italy 5,534; France 5,527.
Unwrought	63,258	85,190	France 29,091; Belgium-Luxembourg 25,420; Netherlands 12,337.
Semimanufactures	r 142,069	169,383	France 48,294; Netherlands 26,221; Belgium-Luxembourg 19,011.
Antimony metal, including alloys, all forms	34	50	Italy 24.
Arsenic, hydroxides and acids	82	187	New Zealand 20.
Beryllium metal, including alloys, all forms kilograms	92	30	NA.
Bismuth metal, including alloys, all forms	262	259	U.S.S.R. 97; Netherlands 38.
Cadmium metal, including alloys, all forms	287	180	Belgium-Luxembourg 32.
Chromium:			
Chromite	5,590	7,722	Netherlands 2,672; France 1,354; Belgium-Luxembourg 1,109.
Oxide and hydroxide	8,525	8,126	NA.
Metal, including alloys, all forms kilograms	119,100	142,200	United States 60,200; Belgium-Luxembourg 41,200; France 25,000.
Cobalt metal, including alloys, all forms	231	282	Japan 69; Austria 51; United Kingdom 32.
Columbium and tantalum: Metal, including alloys, all forms:			
Columbium ---kilograms	1,574	4,531	Belgium-Luxembourg 2,188; France 110.
Tantalum ---do	34,364	37,762	United States 3,950.
Copper:			
Ore and concentrate	1,100	--	
Matte	6,848	2,006	All to Belgium-Luxembourg.
Copper sulfate	1,725	496	NA.
Metal, including alloys:			
Scrap	35,664	35,114	Italy 13,498; Belgium-Luxembourg 6,916; Austria 5,501.
Unwrought:			
Blister	594	20,941	Belgium-Luxembourg 11,507; United Kingdom 9,398; Netherlands 23.
Refined	103,135	79,452	France 18,975; Austria 17,693; United Kingdom 9,831.
Alloys	7,751	7,448	Switzerland 1,954; Belgium-Luxembourg 1,718; Czechoslovakia 1,084.
Master alloys	337	484	Belgium-Luxembourg 241; France 86; Norway 70.
Semimanufactures	105,059	121,848	United States 24,029; France 19,339; Netherlands 19,008.
Germanium metal, including alloys, all forms kilograms	1,500	3,300	Belgium-Luxembourg 2,600; Romania 700.
Gold:			
Ashes, residue, scrap ---do	r 5	8	NA.
Metal:			
Unwrought ---thousand troy ounces	298	253	Italy 82; Switzerland 46; United Kingdom 30.
Semimanufactures ---do	7,591	5,546	Italy 1,555; France 1,394; Netherlands 987.
Iron and steel:			
Iron ore and concentrate	8,658	4,802	NA.
Roasted pyrite	28,573	46,817	Austria 22,709; Belgium-Luxembourg 20,270.
Metal:			
Scrap ---thousand tons	2,185	2,122	Italy 1,691; Belgium-Luxembourg 159; France 58.
Pig iron, including cast iron ---do	776	819	France 337; Italy 203; Belgium-Luxembourg 87.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Sponge iron, powder, shot thousand tons	16	25	Norway 8; Switzerland 4; Netherlands 3.
Spiegeleisen ——do	3	1	Mainly to France.
Ferroalloys:			
Ferrochrome ——do	32	32	Belgium-Luxembourg 9; France 5; Italy 5.
Ferromanganese ——do	38	32	Belgium-Luxembourg 12; France 9; Netherlands 4.
Ferronickel	233	82	Mainly to Belgium-Luxembourg.
Ferrosilicon ——thousand tons	15	14	France 2; Belgium-Luxembourg 2; Netherlands 1.
Ferrosilicochrome ——do	1	4	Italy 2; Austria 1.
Ferrosilicomanganese	2,540	163	France 74; Belgium-Luxembourg 51; Netherlands 30.
Other ——thousand tons	8	11	Spain 1; Austria 1; Italy 1.
Steel, primary forms ——do	2,524	2,505	France 604; Italy 408; United States 406.
Semimanufactures:			
Bars, rods, angles, shapes, sections ——do	3,054	3,142	France 927; United States 511; Netherlands 347.
Universals, plates, sheets ——do	4,275	4,825	United States 990; France 690; Netherlands 340.
Hoop and strip ——do	603	651	Netherlands 116; France 109; Switzerland 51.
Rails and accessories ——do	158	142	Italy 25; Netherlands 24; People's Republic of China 22.
Wire ——do	249	250	France 54; Netherlands 35; United States 26.
Tubes, pipes, fittings ——do	2,348	2,383	U.S.S.R. 642; Netherlands 455; France 176.
Castings and forgings, rough ——do	58	64	Belgium-Luxembourg 14; France 8; United States 8.
Lead:			
Ore and concentrate	2,806	1,548	All to Yugoslavia.
Oxides	6,845	8,219	Netherlands 3,351; Algeria 1,023; Belgium-Luxembourg 709.
Metal, including alloys:			
Scrap	15,409	14,919	Netherlands 6,781; Italy 4,059; Belgium-Luxembourg 3,556.
Unwrought	72,134	66,645	Italy 37,028; Netherlands 4,186.
Semimanufactures	6,104	6,564	Switzerland 1,267; Sweden 838; Denmark 837.
Magnesium:			
Oxide, hydroxide, peroxide	2,647	4,596	Austria 782; Netherlands 703; U.S.S.R. 650.
Metal, including alloys:			
Scrap	1,892	2,861	United Kingdom 1,142; Italy 647; United States 528.
Unwrought	115	268	Italy 43; United Kingdom 40; France 39.
Semimanufactures	220	317	Netherlands 59; United Kingdom 49; Sweden 44.
Manganese:			
Ore and concentrate	4,625	20,524	Netherlands 19,492.
Oxides	2,350	3,197	NA.
Metal	188	167	Italy 33; Netherlands 33; Belgium-Luxembourg 27.
Mercury ——76-pound flasks	1,326	1,421	Switzerland 348; United Kingdom 261; Iran 203.
Molybdenum:			
Ore and concentrate	448	929	Belgium-Luxembourg 270; Netherlands 266; Austria 166.
Metal, including alloys, all forms	153	229	NA.
Nickel:			
Ore and concentrate	1	10	All to Austria.
Matte and speiss	103	126	Canada 123; Switzerland 3.
Metal, including alloys:			
Scrap	936	1,956	Netherlands 1,037; United Kingdom 367; United States 214.
Unwrought	r 4,213	2,247	Netherlands 708; France 616; United States 174.
Semimanufactures	9,083	11,322	France 1,454; Switzerland 981; Indonesia 820.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Platinum-group metals and silver:			
Waste and sweepings ---kilograms--	3,500	3,542	Netherlands 2,518; United Kingdom 690; Switzerland 332.
Metals, including alloys, all forms:			
Platinum group--thousand troy ounces	517	734	Japan 119; Netherlands 55; Hong Kong 40.
Silver ---do---	32,475	35,427	Italy 16,155; Sweden 3,448.
Tin:			
Ore and concentrate ---long tons--	6	(1)	
Oxides ---do---	304	241	Brazil 40; Czechoslovakia 37; Belgium-Luxembourg 24.
Metal, including alloys:			
Scrap ---do---	34	242	Denmark 147; United Kingdom 80; Netherlands 15.
Unwrought ---do---	1,161	1,206	France 844; Netherlands 114; Austria 55.
Semimanufactures ---do---	460	468	Netherlands 106; Switzerland 44; Austria 31.
Titanium:			
Ore and concentrate	312	299	Austria 159; Switzerland 132.
Oxides	35,432	45,544	Italy 9,110; United States 5,735; France 4,100.
Metal, including alloys, all forms	435	650	United Kingdom 278; United States 101; France 85.
Tungsten:			
Ore and concentrate	362	799	United States 447; India 109; Czechoslovakia 69.
Metal, including alloys, all forms	r 969	1,322	Italy 192; Spain 163; France 128.
Uranium and thorium:			
Uranium, thorium, rare-earth compounds	212	718	United States 493; France 116; Japan 52.
Metal, including alloys, all forms ---kilograms--	5,500	3,300	France 1,900; Spain 300.
Vanadium metal, including alloys, all forms ---do---	900	5,700	France 5,000; United States 600.
Zinc:			
Ore and concentrate	55,187	43,974	Belgium-Luxembourg 25,294; Netherlands 13,006; Poland 5,106.
Oxide and peroxide	9,190	11,179	NA.
Metal, including alloys:			
Scrap	5,846	6,787	France 2,625; Italy 1,905; Netherlands 1,648.
Dust	3,057	3,016	Netherlands 1,317; Switzerland 647; Romania 385.
Unwrought	49,575	104,674	United States 41,390; Netherlands 14,574; Italy 13,207.
Semimanufactures	12,604	10,746	NA.
Zirconium metal, including alloys, all forms--	29	28	Sweden 11; United States 8; India 1.
Other:			
Ore and concentrate:			
Of columbium, tantalum, vanadium, zirconium	1,492	1,961	Austria 683; Italy 215; United Kingdom 192.
Of base metals, n.e.s	--	2	NA.
Ash and residue containing nonferrous metals	169,600	150,457	Netherlands 65,624; Belgium-Luxembourg 31,453; Sweden 22,478.
Oxides, hydroxides, and peroxides of metals, n.e.s	7,377	9,373	Austria 1,134; Belgium-Luxembourg 1,120; Italy 973.
Metals, including alloys, all forms:			
Metalloids:			
Arsenic and tellurium	7	23	France 19.
Selenium and phosphorus	10,238	15,098	NA.
Silicon	143	159	United States 62; United Kingdom 51.
Alkali, alkali earth, rare-earth metals	8,952	23	NA.
Base metals, including alloys, all forms, n.e.s	758	9	Switzerland 3; Japan 2; United States 2.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS			
Abrasives:			
Natural:			
Pumice, emery, corundum	694,015	940,658	Netherlands 813,177; Belgium-Luxembourg 122,528.
Dust and powder of precious and semi-precious stones--thousand carats	r 203	260	Netherlands 87; Greece 49; United States 34.
Grinding and polishing wheels and stones	9,669	9,729	France 1,278; Netherlands 1,065; Italy 857.
Artificial:			
Corundum	37,328	33,752	Sweden 5,101; France 3,886; Netherlands 3,355.
Silicon carbide	9,995	14,947	NA.
Asbestos	1,271	1,217	Belgium-Luxembourg 544; Austria 276.
Barite and witherite	122,452	103,734	Netherlands 43,500; France 42,720.
Boron materials:			
Crude natural borates	11,566	13,119	Italy 3,585; Sweden 2,740; Netherlands 2,646.
Oxide and acid	237	167	Brazil 47.
Bromine	401	270	People's Republic of China 80; Poland 70; Czechoslovakia 65.
Cement, hydraulic--thousand tons	1,394	1,441	Netherlands 1,074; Switzerland 101; Austria 56.
Chalk	10,416	10,368	Netherlands 4,090; Sweden 3,350; Switzerland 1,285.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Fire clay--thousand tons	309	319	Italy 80; Belgium-Luxembourg 65; Netherlands 58.
Kaolin--do	89	102	Austria 33; Italy 22; Belgium-Luxembourg 16.
Kyanite, sillimanite, andalusite, mullite--do	(1)	1	Italy 1.
Other--do	895	871	Netherlands 422; Belgium-Luxembourg 144; France 119.
Products:			
Refractory (including nonclay brick)--do	520	671	France 177; Belgium-Luxembourg 89; Italy 80.
Nonrefractory--do	479	535	France 138; Netherlands 97; Belgium-Luxembourg 86.
Diamond:			
Gem:			
Crude or rough cut--thousand carats	25	20	NA.
Other--do	55	60	Belgium-Luxembourg 25; Netherlands 15; Italy 10.
Industrial--do	155	125	Netherlands 50; Switzerland 25.
Diatomite and other infusorial earth	6,236	5,353	United Kingdom 1,931; Italy 820; Netherlands 681.
Feldspar, leucite, nepheline, nepheline syenite	8,714	11,735	Italy 2,004; Czechoslovakia 1,731; Switzerland 1,657.
Fertilizer materials:			
Crude:			
Phosphatic	6,724	7,069	NA.
Potassic	47,034	38,938	Belgium-Luxembourg 21,506; Netherlands 10,078; United Kingdom 7,354.
Manufactured:			
Nitrogenous--thousand tons	952	968	Belgium-Luxembourg 262; Brazil 159; Turkey 54.
Phosphatic:			
Thomas slag--do	196	55	Austria 27; Netherlands 14; Brazil 11.
Other--do	4	16	NA.
Potassic--do	1,855	1,887	Belgium-Luxembourg 330; Netherlands 144; Denmark 139.
Mixed--do	708	761	Turkey 153; France 118; United Kingdom 60.
Ammonia, anhydrous--do	29	77	Poland 52; France 16; Czechoslovakia 4.
Fluorspar	10,220	9,991	Belgium-Luxembourg 2,968; Austria 2,104; Denmark 1,598.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Graphite, natural	7,235	7,076	Italy 1,853; United States 1,800; France 327.
Gypsum and plasters	289,802	313,452	Netherlands 106,308; Switzerland 68,657; Belgium-Luxembourg 47,627.
Iodine	22	19	Netherlands 2; Italy 2; France 2.
Lime	545,613	587,063	Netherlands 467,649; France 54,315; Belgium-Luxembourg 41,899.
Lithium minerals	155	471	Italy 281; France 83.
Magnesite	9,348	6,421	France 3,521; Spain 1,554; Belgium-Luxembourg 250.
Mica:			
Crude, including splittings and waste	912	711	Switzerland 286; Sweden 110; Austria 60.
Worked, including agglomerated splittings	118	187	France 28; Denmark 26; Austria 13.
Pigments, mineral:			
Natural, crude	8,613	5,248	Netherlands 1,926; Denmark 678; United States 502.
Iron oxides and hydroxides	114,191	125,972	France 17,768; United States 17,631; United Kingdom 13,751.
Precious and semiprecious stones, except diamond:			
Natural ---kilograms	144,587	191,956	Italy 22,539; United Kingdom 22,250; People's Republic of China 17,902.
Manufactured ---do	7,770	7,302	United States 2,959; Italy 970; Switzerland 715.
Pyrite (gross weight)	412	488	United Kingdom 146; Brazil 108; Sweden 55.
Salt ---thousand tons	1,442	1,240	Belgium-Luxembourg 808; Sweden 197; Denmark 76.
Sodium and potassium compounds, n.e.s.:			
Caustic soda ---do	362	447	Netherlands 52; Hungary 39; Yugoslavia 30.
Caustic potash, sodic and potassic peroxides ---do	12	13	U.S.S.R. 5; Switzerland 1; Italy 1.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	3,763	4,168	Austria 2,165; Netherlands 1,061; Belgium-Luxembourg 391.
Slate	23,375	17,478	Netherlands 5,004; Denmark 4,914; Belgium-Luxembourg 4,369.
Other	541,403	241,741	Netherlands 215,233; Switzerland 16,636.
Worked:			
Building and monumental stone	15,741	14,815	Belgium-Luxembourg 4,340; Netherlands 3,857; France 2,589.
Slate	641	611	Netherlands 344; Belgium-Luxembourg 156.
Paving and flagstone	18,253	33,099	Netherlands 22,345; Denmark 7,886.
Dolomite	82,197	75,912	Netherlands 36,291; France 16,876; Belgium-Luxembourg 15,930.
Gravel and crushed rock---thousand tons	11,175	10,609	Netherlands 8,752; Switzerland 1,185.
Limestone ---do	166	197	Netherlands 172; Austria 13; Belgium-Luxembourg 11.
Quartz and quartzite:			
Quartz crystal ---kilograms	15	36	Italy 25.
Other	50,372	54,543	Austria 16,387; France 10,558; Belgium-Luxembourg 6,272.
Sand, excluding metal bearing thousand tons	7,061	6,660	Netherlands 5,845; Belgium-Luxembourg 299.
Sulfates, natural, magnesium sulfate (Kieserite) ---do	310	360	Netherlands 72; Norway 51; United States 31.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Sulfur:			
Elemental:			
Other than colloidal	43,923	45,019	Switzerland 14,661; Austria 8,326; Denmark 4,917.
Colloidal	2,792	3,507	Italy 672; France 516; United Kingdom 483.
Sulfur dioxide	13,521	8,022	Belgium-Luxembourg 3,029; Sweden 1,483; Austria 1,171.
Sulfuric acid	281,183	553,223	Netherlands 122,939; Spain 112,137; France 71,024.
Talc, steatite, soapstone	4,446	4,708	Denmark 2,466; Switzerland 484; Netherlands 326.
Vermiculite, chlorite, perlite	686	686	Austria 486.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum, amber, jet—kilograms	500	800	NA.
Pottery	6,307	8,550	Austria 3,157; Netherlands 1,954; United Kingdom 1,508.
Other—thousand tons	1,600	636	Netherlands 532; Belgium-Luxembourg 43; France 29.
Slag, dross, and similar waste, not metal bearing:			
From iron and steel manufacture—do	1,302	1,087	Netherlands 1,064.
Slag and ash, n.e.s—do	493	401	Netherlands 348.
Oxides and hydroxides of strontium and barium	3,707	3,611	France 2,727; Belgium-Luxembourg 588.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	87,727	99,643	NA.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	3,338	994	Switzerland 710.
Carbon black	71,687	76,951	France 13,512; Belgium-Luxembourg 9,498; Netherlands 6,926.
Coal and briquets:			
Anthracite and bituminous—thousand tons	14,057	13,043	France 5,911; Italy 2,865; Belgium-Luxembourg 2,792.
Briquets of anthracite and bituminous coal—do	221	206	United Kingdom 110; Austria 62.
Lignite and lignite briquets—do	733	639	France 237; Austria 166; Belgium-Luxembourg 83.
Coke and semicoke—do	9,162	9,054	Belgium-Luxembourg 3,736; France 2,754; Netherlands 914.
Gas, natural—do	312	301	Switzerland 97; Netherlands 81; Belgium-Luxembourg 37.
Helium and other rare gases	11,231	15,017	NA.
Peat and briquets—thousand tons	270	299	Netherlands 168; Switzerland 45; France 36.
Petroleum:			
Crude and partly refined—do	1	--	
Refinery products:			
Gasoline, motor spirit—do	701	842	Switzerland 473; Austria 202.
Kerosine, white spirit—do	1,034	1,104	Switzerland 75; United Kingdom 21; Netherlands 6.
Distillate fuel oil—do	2,032	2,021	France 290; Netherlands 156; Denmark 64.
Residual fuel oil—do	3,887	3,724	Austria 554; Netherlands 411; Belgium-Luxembourg 370.
Lubricants—do	409	385	United Kingdom 59; Belgium-Luxembourg 55; Sweden 37.
Mineral jelly and wax—do	123	115	Italy 15; Denmark 12; Netherlands 9.
Other—do	2,537	2,398	France 665; United Kingdom 526; Netherlands 420.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals—do	266	224	France 63; United States 42; United Kingdom 31.

r Revised. NA Not available.
1 Less than ½ unit.

Table 4.—Federal Republic of Germany: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite ---thousand tons--	2,831	2,330	Australia 1,405; Yugoslavia 356.
Alumina	r 349,202	310,612	Surinam 184,027; Guinea 88,791.
Aluminum hydroxide	1,236	1,475	United States 1,226.
Metal, including alloys:			
Scrap	58,947	85,956	Austria 21,112; Netherlands 16,904; United States 11,286.
Unwrought	315,496	224,826	Norway 91,320; Netherlands 28,390; Austria 16,044.
Semimanufactures	122,647	143,793	France 43,287; Belgium-Luxembourg 38,620; Netherlands 29,838.
Antimony:			
Ore and concentrate	3,269	3,326	Turkey 2,119; Thailand 402; Austria 365.
Metal, including alloys, all forms	1,260	1,363	People's Republic of China 685; Belgium-Luxembourg 538; Czechoslovakia 50.
Arsenic hydroxides	905	762	France 416; Sweden 263.
Beryllium metal, including alloys, all forms ---kilograms--	937	304	United States 225.
Bismuth metal, including alloys, all forms	165	537	United Kingdom 110; U.S.S.R. 97.
Cadmium metal, including alloys, all forms	962	1,260	Belgium-Luxembourg 512; U.S.S.R. 174; United States 112.
Chromium:			
Chromite	483,488	372,045	Republic of South Africa 193,497; U.S.S.R. 112,617; Turkey 48,914.
Oxide and hydroxide	1,713	2,954	Yugoslavia 460; Netherlands 149.
Metal, including alloys, all forms	236	215	U.S.S.R. 86; France 62; United Kingdom 35.
Cobalt metal, including alloys, all forms	993	1,252	Zaire 318; Belgium-Luxembourg 276; United States 252.
Columbium and tantalum: Metal, including alloys, all forms:			
Columbium ---kilograms--	13,799	5,038	United States 4,643.
Tantalum ---do---	68,983	55,488	United States 44,032; France 4,435.
Copper:			
Ore and concentrate	171,247	417,117	New Guinea 148,760; Chile 80,680; Canada 74,744.
Matte	2,349	269	All from United Kingdom.
Copper sulfate	4,040	5,570	France 3,731; Belgium-Luxembourg 867; U.S.S.R. 671.
Metal, including alloys:			
Scrap	80,453	71,644	France 19,111; Netherlands 15,101; Switzerland 7,071.
Unwrought:			
Blister	155,679	117,894	Republic of South Africa 49,371; Chile 30,919; Peru 14,505.
Refined	363,121	393,678	Chile 100,717; Belgium-Luxembourg 60,210; Zambia 56,914.
Alloys	50,009	55,561	United Kingdom 15,948; U.S.S.R. 7,042; Czechoslovakia 5,183.
Master alloys	1,444	1,578	United Kingdom 916; Switzerland 411; United States 148.
Semimanufactures	r 83,619	100,491	Belgium-Luxembourg 43,625; France 28,596; Netherlands 10,300.
Germanium metal, including alloys, all forms ---kilograms--	100	NA	
Gold:			
Ashes, residues, scrap ---do---	211,591	226,777	United States 75,612; Switzerland 61,242; Sweden 25,318.
Metal:			
Unwrought ---thousand troy ounces--	4,162	2,750	Switzerland 1,186; Republic of South Africa 1,103; U.S.S.R. 147.
Semimanufactures ---do---	94	91	Switzerland 43; United States 20.
Iron and steel:			
Iron ore and concentrate--thousand tons--	40,322	40,670	Sweden 8,696; Brazil 8,330; Liberia 6,758.
Roasted pyrite ---do---	1,184	1,195	Spain 770; Belgium-Luxembourg 161; Denmark 119.

See footnotes at end of table.

Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Iron and Steel—Continued			
Metal:			
Scrap ---thousand tons--	1,044	1,208	Netherlands 584; Belgium-Luxembourg 168; France 149.
Pig iron, including cast iron --do----	143	188	Canada 70; U.S.S.R. 38; France 33.
Sponge iron, powder, shot ----do----	28	40	France 10; Sweden 10; Canada 9.
Spiegeleisen ----	246	410	France 330.
Ferroalloys:			
Ferrochrome -----thousand tons--	49	64	Republic of South Africa 33; United States 4; Yugoslavia 3.
Ferromanganese ----------do----	126	161	France 66; Norway 42; Belgium-Luxembourg 17.
Ferronickel ----------do----	15	30	New Caledonia 18; Greece 7; Dominican Republic 3.
Ferrosilicon ----------do----	105	129	Norway 51; France 26; Yugoslavia 9.
Ferrosilicochrome ---------do----	15	17	Republic of South Africa 14; Sweden 1; France 1.
Ferrosilicomanganese -----do----	62	59	Norway 42; Czechoslovakia 8; Republic of South Africa 5.
Other ----------do----	11	15	France 6; Belgium-Luxembourg 3; Norway 3.
Steel, primary forms ---------do----	1,476	2,008	Belgium-Luxembourg 406; Netherlands 369; Austria 251.
Semimanufactures:			
Bars, rods, angles, shapes, sections ----------do----	3,510	3,727	France 643; Italy 583; Netherlands 147.
Universals, plates, sheets--do----	3,589	4,092	Belgium-Luxembourg 1,451; France 860; Japan 372.
Hoop and strip ----------do----	499	570	Belgium-Luxembourg 299; France 120; Netherlands 75.
Rails and accessories -----do----	28	28	France 8; Netherlands 8; Belgium-Luxembourg 7.
Wire ----------do----	133	165	Belgium-Luxembourg 87; France 28; Netherlands 13.
Tubes, pipes, fittings -----do----	445	641	Netherlands 180; Italy 101; Belgium-Luxembourg 91.
Castings and forgings, rough do----	33	37	Romania 15; Belgium-Luxembourg 8; France 3.
Lead:			
Ore and concentrate ----	223,009	200,858	Ireland 56,663; Peru 37,878; Sweden 35,219.
Oxides ----	5,578	4,961	Belgium-Luxembourg 1,577; France 754; Netherlands 623.
Metal, including alloys:			
Scrap ----	13,232	17,052	Netherlands 5,532; Canada 2,911; France 2,842.
Unwrought ----	126,443	122,025	United Kingdom 34,287; Australia 24,006; Sweden 15,794.
Semimanufactures ----	2,947	2,918	Belgium-Luxembourg 1,743; France 614; Yugoslavia 345.
Magnesium:			
Oxides, hydroxide, peroxide ----	2,729	3,244	United States 1,297; France 894; Netherlands 348.
Metal, including alloys:			
Scrap ----	590	1,483	Czechoslovakia 982; Sweden 170; Austria 117.
Unwrought ----	46,629	38,512	Norway 22,459; U.S.S.R. 6,295; Italy 5,677.
Semimanufactures ----	179	94	United States 71; Netherlands 8; United Kingdom 3.
Manganese:			
Ore and concentrate ------thousand tons--	821	476	Republic of South Africa 289; Gabon 90; Australia 46.
Oxides ----	4,075	1,547	Belgium-Luxembourg 949; Japan 290; Netherlands 169.
Metal ----	3,757	3,977	France 1,368; Republic of South Africa 1,260; Japan 1,097.
Mercury ----------76-pound flasks--	17,434	14,010	Italy 4,624; Spain 3,986; Turkey 1,166.
Molybdenum:			
Ore and concentrate ----	12,453	14,192	United States 5,185; Chile 3,629; Netherlands 2,321.
Metal, including alloys, all forms --------	384	282	Austria 205; United States 21; France 16.

See footnotes at end of table.

Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Nickel:			
Ore and concentrate	120	4	NA.
Matte and speiss	1,990	2,309	Canada 2,095; United Kingdom 87.
Metal, including alloys:			
Scrap	5,031	7,009	Czechoslovakia 1,117; United Kingdom 1,001; United States 959.
Unwrought	32,604	35,126	United Kingdom 7,551; Australia 5,674; Norway 5,555.
Semimanufactures	r 2,462	2,238	United Kingdom 863; France 501; United States 286.
Platinum-group metals and silver:			
Waste and sweepings ——kilograms——	517,206	435,039	Netherlands 65,785; Switzerland 52,039; Poland 50,205.
Metals, including alloys, all forms:			
Platinum group——thousand troy ounces	630	769	U.S.S.R. 314; United Kingdom 204; United States 79.
Silver ——do——	59,331	73,970	Yugoslavia 13,334; United Kingdom 10,271; Belgium-Luxembourg 9,461.
Tin:			
Ore and concentrate ——long tons——	6,184	6,502	All from Bolivia.
Oxides ——do——	113	184	Japan 67; Netherlands 37; France 36.
Metal, including alloys:			
Scrap ——do——	395	269	Switzerland 87; Netherlands 72; United States 36.
Unwrought ——do——	15,239	15,488	Malaysia 3,854; Indonesia 3,626; Thailand 2,436.
Semimanufactures ——do——	147	236	Netherlands 124; United Kingdom 6.
Titanium:			
Ore and concentrate	487,209	457,499	Norway 304,612; Canada 125,286; Australia 27,142.
Oxides	15,257	18,331	Belgium-Luxembourg 8,070; Netherlands 5,595; France 2,138.
Metal, including alloys, all forms	2,018	1,485	U.S.S.R. 1,049; United States 193; Japan 105.
Tungsten:			
Ore and concentrate	5,432	6,226	France 1,490; United States 1,487; People's Republic of China 961.
Metal, including alloys, all forms	396	345	Switzerland 67; France 65; Netherlands 57.
Uranium and thorium:			
Ore	4,717	1,884	Mainly from France.
Uranium, thorium, rare-earth compounds	424	504	France 163; United Kingdom 142; Austria 109.
Metal, including alloys, all forms ——kilograms——	4,400	12,500	All from France.
Vanadium metal, including alloys, all forms	28	44	United States 41; Italy 3.
Zinc:			
Ore and concentrate	355,231	501,415	Canada 240,467; Sweden 69,171; Peru 61,571.
Oxide and peroxide	4,891	7,098	France 1,517; Belgium-Luxembourg 1,409; Czechoslovakia 1,061.
Metal, including alloys:			
Scrap	3,233	2,327	Denmark 767; North Korea 316; Netherlands 308.
Dust	12,763	11,144	Belgium-Luxembourg 10,208; Norway 428; Netherlands 251.
Unwrought	170,918	144,360	Belgium-Luxembourg 84,305; Netherlands 18,905; Norway 8,239.
Semimanufactures	r 13,945	18,971	France 7,108; Yugoslavia 5,949; Belgium-Luxembourg 3,907.
Zirconium metal, including alloys, all forms ——kilograms——	159,600	176,900	United States 79,600; France 46,100; Sweden 28,500.
Other:			
Ores and concentrates:			
Of columbium, tantalum, vanadium, zirconium	39,279	37,114	Australia 29,785; Netherlands 1,503; United States 1,485.

See footnotes at end of table.

Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Other—Continued			
Ores and concentrates—Continued			
Of precious metals	--	5	NA.
Of base metals, n.e.s	1,205	1,981	Bolivia 1,235; Australia 628; Austria 51.
Ash and residue containing nonferrous metals	138,277	169,416	Canada 32,604; France 16,152; Belgium-Luxembourg 15,412.
Oxides, hydroxides, and peroxides of metals, n.e.s	3,618	6,814	Belgium-Luxembourg 2,185; Switzerland 1,310; United States 504.
Metals, including alloys, all forms:			
Metalloids:			
Arsenic and tellurium	51	98	Sweden 67; U.S.S.R. 15; Japan 11.
Selenium and phosphorus	21,091	24,763	NA.
Silicon	27,592	30,861	Norway 9,802; France 8,936; Italy 4,099.
Alkali, alkaline earth, rare-earth metals	727	706	France 539; Canada 57.
Pyrophoric alloys	70	57	United Kingdom 3; France 3; Denmark 1.
Base metals, including alloys, all forms, n.e.s	2,020	6	Mainly from U.S.S.R.
NONMETALS			
Abrasives:			
Natural:			
Pumice, emery, corundum	8,181	133,531	Greece 63,917; Italy 63,543.
Dust and powder of precious and semiprecious stones—thousand carats	4,329	5,103	United States 1,995; Ireland 1,942; Belgium-Luxembourg 374.
Grinding and polishing wheels and stones	r 5,036	5,035	Italy 1,000; Austria 908; Spain 777.
Artificial:			
Corundum	9,479	8,789	Austria 3,718; Netherlands 2,509; France 1,556.
Silicon carbide	13,263	15,214	Norway 8,371; Switzerland 2,335; U.S.S.R. 1,361.
Asbestos	167,941	206,602	Canada 130,034; Italy 22,704; Republic of South Africa 22,435.
Barite and witherite	99,960	90,329	People's Republic of China 26,975; Turkey 20,089; Czechoslovakia 13,752.
Boron materials:			
Crude natural borates	118,973	163,689	United States 97,064; Turkey 64,666; Netherlands 1,045.
Oxide and acid	12,711	14,884	France 7,403; Turkey 3,964; United States 2,260.
Bromine	1,046	1,631	France 597; Israel 514; United Kingdom 433.
Cement, hydraulic—thousand tons	974	892	France 357; Belgium-Luxembourg 197; Sweden 128.
Chalk—do	87	77	France 71; Belgium-Luxembourg 3; Sweden 1.
Clays and clay products (including all refractory brick):			
Crude clays:			
Fire clay—do	270	230	Czechoslovakia 86; Republic of South Africa 38; United States 35.
Kaolin—do	591	645	United Kingdom 342; United States 130; France 81.
Kyanite, sillimanite, andalusite, mullite—do	29	16	India 5; Republic of South Africa 4; France 1.
Other—do	283	282	Netherlands 77; Czechoslovakia 57; France 44.
Products:			
Refractory (including nonclay brick)—do	234	330	Czechoslovakia 86; Austria 68; France 40.
Nonrefractory—do	945	1,195	Netherlands 593; Italy 214; France 122.
Cryolite and chiolite	1,833	1,687	Denmark 1,593; Netherlands 59.

See footnotes at end of table.

Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Diamond:			
Gem:			
Crude or rough cut--thousand carats--	150	150	NA.
Other ----------do----	385	435	Belgium-Luxembourg 240; Israel 100; Netherlands 40.
Industrial ----------do----	680	605	Belgium-Luxembourg 265; Netherlands 180; Republic of South Africa 90.
Diatomite and other infusorial earth ----------	53,408	55,193	Denmark 37,412; France 10,223; United States 6,050.
Feldspar, leucite, nepheline, nepheline syenite	87,753	92,026	Norway 61,572; France 14,516; Italy 10,909.
Fertilizer materials:			
Crude:			
Nitrogenous ----------	725	596	All from Chile.
Phosphatic ----------thousand tons--	2,757	2,865	United States 1,440; U.S.S.R. 861; Morocco 330.
Manufactured:			
Nitrogenous ----------	578,386	849,764	Belgium-Luxembourg 280,814; Romania 140,869; Yugoslavia 110,286.
Phosphatic:			
Thomas slag ----------	432,612	493,265	Belgium-Luxembourg 454,294; Arab Republic of Egypt 20,825; United Kingdom 16,145.
Other ----------	22,751	31,904	NA.
Potassic ----------	34,149	63,513	Canada 35,506; France 27,995.
Mixed ----------	272,425	251,037	France 110,854; Yugoslavia 84,354; Belgium-Luxembourg 21,048.
Ammonia, anhydrous ----------	200,617	197,297	Netherlands 118,601; France 71,971; Austria 5,172.
Fluorspar ----------	239,568	158,453	Spain 44,908; Italy 11,329; Republic of South Africa 1,745.
Graphite, natural ----------	25,163	22,074	People's Republic of China 4,317; Malagasy 3,226; Norway 2,213.
Gypsum and plasters ----------	179,612	242,262	Austria 149,152; France 74,949; Poland 12,734.
Iodine ----------	978	956	Japan 904; Chile 49.
Lime ----------	154,449	187,366	Mainly from France.
Lithium minerals ----------	6,543	6,862	Netherlands 3,652; Republic of South Africa 2,489; United States 466.
Magnesite ----------	390,606	357,578	Greece 117,360; Austria 90,750; North Korea 47,138.
Mica:			
Crude, including splittings and waste ----	7,896	8,520	Argentina 2,183; India 1,462; United Kingdom 1,090.
Worked, including agglomerated splittings	482	473	France 252; Belgium-Luxembourg 130; Spain 25.
Pigments, mineral:			
Natural, crude ----------	1,815	1,681	Mainly from Austria.
Iron oxides and hydroxides ----------	1,454	1,428	France 590; Netherlands 419; United States 217.
Precious and semiprecious stones, except diamond:			
Natural ----------thousand kilograms--	2,245	1,513	Brazil 733; Republic of South Africa 200; Australia 123.
Manufactured ----------do----	25	21	Switzerland 14; France 3; Japan 1.
Pyrite (gross weight) --------thousand tons--	1,381	11,057	U.S.S.R. 5,516; Norway 4,517; Turkey 397.
Salt ----------	428,550	493,428	Netherlands 419,885; France 51,904.
Sodium and potassium compounds, n.e.s.:			
Caustic soda ----------	171,282	147,067	Belgium-Luxembourg 49,167; United States 11,138; Netherlands 7,747.
Caustic potash, sodic and potassic peroxides ----------	10,974	6,964	France 451.

See footnotes at end of table.

Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	263,292	224,644	Austria 78,313; Italy 49,713; Portugal 24,837.
Slate	13,188	15,039	United Kingdom 4,812; Spain 2,983; Portugal 2,739.
Other	441,851	409,968	Sweden 146,281; Denmark 78,612; Republic of South Africa 49,147.
Worked:			
Building and monumental stone	348,725	452,747	Italy 402,853; Spain 13,455.
Paving and flagstone	100,367	128,042	Portugal 79,216; Romania 16,430; Poland 14,563.
Slate	12,279	11,848	Italy 7,096; France 1,399; United Kingdom 1,136.
Dolomite	276,137	637,474	Belgium-Luxembourg 555,548; Austria 40,353.
Gravel and crushed rock—thousand tons	15,994	16,473	France 9,335; Denmark 3,875.
Limestone—do	1,557	1,709	Austria 1,218; Belgium-Luxembourg 163.
Quartz and quartzite:			
Quartz crystal—kilograms	101	141	Japan 111.
Other	82,017	84,506	Belgium-Luxembourg 29,119; Sweden 14,403; Yugoslavia 13,740.
Sand, excluding metal bearing—thousand tons	3,654	2,897	France 2,081; Netherlands 371; Belgium-Luxembourg 347.
Sulfates, natural, magnesium sulfate (Kieserite)	149	--	
Sulfur:			
Elemental:			
Other than colloidal	331,692	414,444	Poland 163,079; United States 147,215; France 47,452.
Colloidal	730	154	France 147.
Sulfur dioxide	--	73	NA.
Sulfuric acid	115,236	107,950	Poland 27,653; France 22,806; Sweden 14,001.
Talc, steatite, soapstone	93,486	90,399	Austria 32,170; Italy 17,825; France 16,207.
Vermiculite, chlorite, perlite	76,594	83,254	Greece 44,426; Hungary 16,838; Republic of South Africa 12,826.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum, amber, jet	538	2,180	Spain 2,175.
Pottery	13,994	14,667	U.S.S.R. 6,834; Czechoslovakia 1,135.
Other	367,383	503,930	Austria 136,875; Norway 109,662; France 84,014.
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture—thousand tons	1,687	1,868	France 994; Belgium-Luxembourg 714; Netherlands 55.
Slag and ash, n.e.s—do	110	103	Belgium-Luxembourg 43; Czechoslovakia 24; Denmark 22.
Oxides and hydroxides of strontium and barium	223	344	Spain 205; United States 112.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	163,542	207,092	Belgium-Luxembourg 77,027; Austria 31,654; Sweden 23,695.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	22,003	21,851	Trinidad 18,073; United States 3,546.
Carbon black	35,395	37,572	Netherlands 16,674; France 7,525; United States 5,697.
Coal and briquets:			
Anthracite and bituminous—thousand tons	7,268	6,930	United States 2,143; Poland 1,555; United Kingdom 1,082.
Briquets of anthracite and bituminous coal—do	127	94	Netherlands 92.

See footnotes at end of table.

Table 4.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Coal and briquets—Continued			
Lignite and lignite briquets, thousand tons	1,179	1,209	Czechoslovakia 1,204.
Coke and semicoke, do	406	846	United States 266; France 147; Netherlands 137.
Gas, natural, do	9,336	11,943	Netherlands 11,810.
Helium and other rare gases	2,039	1,915	NA.
Peat and briquets, thousand tons	36	26	Netherlands 12; Poland 9; Denmark 2.
Petroleum:			
Crude and partly refined, do	100,230	102,600	Libya 28,482; Saudi Arabia 18,997; Algeria 11,430.
Refinery products:			
Gasoline, motor spirit, do	3,324	3,743	Netherlands 923; Belgium-Luxembourg 650; France 544.
Kerosine, white spirit, do	898	1,209	Netherlands 773; Belgium-Luxembourg 111; United Kingdom 76.
Distillate fuel oil, do	19,914	20,303	Netherlands 10,009; Italy 2,179; France 1,381.
Residual fuel oil, do	4,302	5,061	Netherlands 2,689; France 735; Belgium-Luxembourg 570.
Lubricants, do	226	233	United Kingdom 54; United States 49; Netherlands 38.
Mineral jelly and wax, do	98	107	United States 44; Netherlands 28; France 11.
Other, do	4,763	5,572	Netherlands 3,459; United States 1,045; France 347.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals, do	633	665	Netherlands 363; Belgium-Luxembourg 76; Sweden 54.

r Revised. NA Not available.

COMMODITY REVIEW

METALS

Aluminum.—Production of primary aluminum in 1973 amounted to 533,000 tons, up 20% over production in 1972. Net imports of crude aluminum of 304,000 tons showed an increase of 11% over those of 1972. Apparent consumption also was up 14%.

The aluminum balance for 1973 compared with 1972 was as follows, in thousand tons:

	1972 r 1	1973 e 1
Production of primary aluminum	444.4	532.0
Production of secondary aluminum	252.2	285.0
Total	696.6	817.0
Imports of crude aluminum	360.1	405.0
Exports of crude aluminum	−85.3	−101.0
Stock change	−1.8	−14.0
Apparent consumption	969.6	1,107.0

e Estimate. r Revised.
1 Data differ from that shown on tables 2, 3, and 4 because of difference in source.

Source: Herklotz, R. R. Federal Republic of Germany. Aluminium (Düsseldorf), v. 50, No. 1, January 1974, pp. 51–53.

Total capacity of 574,000 tons of primary aluminum at the beginning of 1973 was increased at yearend by the addition of two new plants.

At the beginning of November, the first of 204 electrolytic cells at the aluminum smelter of Vereinigte Aluminium-Werke (VAW) Elbewerk GmbH in Stade-Bützfleth was turned on. Production will be 60,000 tons per year initially and may later be quadrupled. The second plant was that of Reynolds Aluminum GmbH in Hamburg which was started up at yearend with a capacity of 100,000 tons per year of primary aluminum. Alumina for both smelters will be supplied by Aluminium Oxid Stade GmbH in Stade, which is owned 50% by Reynolds Aluminum and 50% by VAW. This plant will initially produce 600,000 tons per year of aluminum oxide from Australian bauxite.. Reynolds is also building a new aluminum rolling mill in Hamburg which will have a capacity of 50,000 tons of rolled products per year.

The demand for semiproducts increased in all segments of consumption, reaching a peak during the second quarter of 1973 that exceeded the comparable figures for 1972 by 23%. Aluminum-processing industry production in 1972 and 1973 is shown

in the following tabulation in thousand tons:

	1972 r	1973 e
Production of semiproducts	645.9	760.0
Aluminum castings	226.9	250.0
Miscellaneous items	96.8	97.0
Total	969.6	1,107.0

e Estimate. r Revised.

Source: Herklotz, R. R. Federal Republic of Germany. Aluminium (Düsseldorf), v. 50, No. 1, January 1974, pp. 51–53.

In spite of generally booming economic conditions, West German primary aluminum smelters operated at a loss throughout the year. For example, during fiscal 1973 the Essen smelter of Leichtmetall, GmbH reportedly lost DM55 million (equivalent to $20.4 million at the end of 1973) according to the company's annual report. This was primarily due to the fact that the U.S. dollar determines the world market price of aluminum, and to the upward revaluation of the Deutsche mark against the dollar in recent years and especially in 1973. The exchange rate went from DM 3.202= US$1.00 at the end of 1972 to DM 2.073= US$1.00 at the end of 1973.

Copper.—Mine production of copper (copper content of concentrate) amounted to 1,400 tons, up 9% from the previous year. Refined copper production of 407,000 tons was 2% above that of 1972.

Exploration by a consortium consisting of Preussag AG of Hanover, Metallgesellschaft AG, Altenburg AG, and Rio Tinto Zinc Corporation Limited found indications of a copper-nickel deposit near Bad Harzburg on the edge of the Harz region. The area was explored using a combination of classical and modern prospecting methods, including mapping, geochemical prospecting, and geophysical surveying, and was finally located by drilling to a depth of 200 meters. Grade and extent of the deposit have not yet been disclosed but are apparently sufficiently encouraging that the consortium intends to invest in further, more detailed exploration in the area.

Iron Ore.—Reversing the declining trend of the past few years, iron ore and concentrate production increased 33% above that of 1972 for a total of 6.3 million metric tons. Iron content, averaging 32%, was equivalent to 1.6 million tons. This represented about 5% of the iron, as iron ore, consumed in producing pig iron during the year, the remainder being supplied by imported ore. Brazil, Sweden, and Liberia were the principal suppliers of iron ore to West Germany, furnishing 11.0, 10.8, and 8.5 million tons, respectively.

Iron and Steel.—Pig iron production, including blast furnace ferroalloys, was 36.5 million tons in 1973, 15% above that of 1972. Crude steel production in 1973 reached a record 49.5 million tons, exceeding the previous record production of 1969 by 13%. West Germany was the largest steel producer in the European Communities (EC) with 33% of the total in 1973, compared with 31% in 1972. West Germany's share of world production remained at 7%. Production was at 84% of capacity, compared with 77% in 1972.

Of the steel produced, 67.8% came from the basic oxygen process, 18.3% from the open hearth process, 10.4% from the electric furnace process, and 3.5% from the basic bessemer (Thomas) process.

Demand and consumption of iron and steel scrap was high in 1973; consumption was 25 million tons, 10% over that of 1972. Scrap prices in midsummer 1973 were 67% above the average price in June 1972, and then dropped off by 9% in September. In view of rising demand, the West German steel industry requested that the EC curb exports of scrap. The West German scrap industry is closely tied in with the steel industry; three of the four largest scrap dealers are subsidiaries of steel companies, and the fourth owns a steelmaking subsidiary. Six other large dealers are owned by steel mills, and there are also a number of independent dealers.

All the major steel producers increased their output of raw and finished steel during 1973. The Thyssen group continued as the largest West German steel producer with an annual output of 14 million tons of crude steel, and was second only to the British Steel Corp. in the EC, followed by the German-Dutch combination, Hoesch AG and Koninklijke Nederlandsche Hoogovens en Staalfrabrieken N.V. (ESTEL, N.V.) with 11.6 million tons. The other major West German producers, Stahlwerke Peine-Salzgitter AG, Mannesmann AG, Fried. Krupp Hüttenwerke AG and Klöckner-Werke AG also improved production in 1973.

West German steel firms have continued their trend to merge. Among the latest were the acquisition by the Thyssen group of Rheinstahl AG of Essen, and the mer-

ger of Mannesmann AG, West Germany's largest steel tube manufacturer, with Demag AG, an engineering firm. The latter merger was an example of the increasing tendency for diversification. Both mergers were subject to approval by the West German Economics Ministry and the European Commission in Brussels.

The West German steel industry has been handicapped in the past few years by a number of factors, including a decreasing growth rate, the necessity for funding from outside the industry, recent revaluations of the Deutsche mark, and the fact that steel firms have been prohibited by the Federal Government from buying foreign coking coal and have had to rely on the more expensive domestic coal. Although domestic coal is subsidized by the Government, the price paid by West German steel producers is above that at which they could obtain coal in the world market. Investment in steel plants declined from around $926 million in the early 1970's to $741 million in 1973.

One result of this situation is that the German steel industry is beginning to look abroad for investment in new productive capacity. One notable example was the merger of a German firm with a Netherlands' firm to form ESTEL, N.V., in 1972. Other examples were the $55.6 million steel plant that recently went into operation at Septiba Bay, Guanabara, Brazil in which Thyssen has a 49% share, and the Wendel-Sidelor Steel Complex at Fos, near Marseilles, France, in which Thyssen has a 5% interest.

Ferrostahl A.G. of Essen, a wholly owned subsidiary of Gutehoffnungshütte Aktienverein (GHH), has joined with the Indonesian Krakatau Steel Co. for the construction of a direct-reduction steel plant in western Java.

Construction of a new oxygen steel plant at the Rheinhausen works of Fried. Krupp Hüttenwerke, which was to have begun in 1971 was rescheduled to begin in 1973. The plant will raise the company's annual crude steel capacity to 6 million tons per year from the current 4.5 million tons.

Capacity at the Bremen works of Klöckner-Werke was increased in 1973 by blowing in a 7,700-ton-per-day blast furnace, the second largest in West Germany. Other features of the expansion program completed or in progress were a 3.75-million-ton-per-year hot strip mill, a continuous slab caster, and increased steelmaking capacity.

Peine-Salzgitter completed installation of a continuous slab caster rated at 88,000 tons per month. Slabs will be rolled on the plate mill and hot strip mill.

Stahlwerke Bochum AG acquired a new 17,000-horsepower reversing cold strip mill, which will be used for rolling silicon steel strip.

Thyssen put into operation at Duisburg a 10,000-ton-per-day blast furnace, the largest in Western Europe, but operation has been restricted to a rate of 7,000 tons per day for environmental reasons.

Other new blast furnace installations included one at Krupp's Rheinhausen plant with a 2-million-ton-per-year capacity, and a furnace with slightly under 1 million-ton-per-year capacity installed by Peine-Salzgitter.

At yearend, negotiations were continuing for the construction at Kursk, U.S.S.R., of a direct-reduction steel plant by the West German firms of Salzgitter AG, Korf-Stahl AG, and Fried. Krupp Hüttenwerke.

Table 5.—Federal Republic of Germany: Scrap supply and consumption

(Thousand metric tons)

	1971	1972	1973
Supply:			
Iron and steel plants	8,856	9,149	10,363
Foundries	2,579	2,456	2,626
Purchases:			
Domestic	7,634	8,740	9,257
Imported	969	1,187	1,358
Other, including variation in stock estimates	3,279	2,787	3,508
Total new supply	23,317	24,319	27,112
Consumption:			
Iron and steel plants	16,427	18,196	20,051
Iron and steel foundries	4,744	4,510	4,925
Consigned for export	2,032	1,939	2,319
Stocks at yearend	2,164	1,838	1,656

Table 6.—Federal Republic of Germany: Salient statistics of the iron and steel industry

(Thousand metric tons unless otherwise specified)

	1971	1972	1973
PIG IRON			
Blast furnaces available ——number	r 97	89	88
Blast furnaces in operation at yearend ——do	r 70	78	76
Maximum production capacity	r 41,770	r 42,700	45,420
Production:			
Thomas	11,819	11,802	9,840
Open hearth	16,122	18,331	24,900
Foundry	280	206	186
Spiegeleisen and blast furnace ferromanganese	210	210	247
Other	1,559	1,454	1,655
Total [1]	29,990	32,003	36,828
Blast furnace charge:			
Iron ore:			
Domestic	953	748	770
Iron content	365	277	281
Imported	14,425	14,226	19,248
Iron content	8,668	8,632	11,785
Sinter and briquets	32,662	35,942	38,806
Iron content	18,157	20,012	21,713
Manganese ore	421	431	514
Iron content	46	49	67
Other iron-bearing materials:			
Slag, scale, cinder, dust	3,209	3,003	3,031
Scrap	543	699	608
Limestone	919	868	1,104
Phosphate rock [2]	123	177	117
Coke:			
Total	15,638	15,598	18,221
Kilograms per ton of iron produced	520	486	495
STEEL			
Converters:			
Basic bessemer:			
Total ——number	18	14	9
In operation at end of year ——do	18	14	9
Oxygen:			
Total ——do	43	44	47
In operation at end of year ——do	29	33	39
Furnaces:			
Open hearth:			
Total ——do	89	85	83
In operation at end of year ——do	46	54	57
Electric:			
Total ——do	176	179	180
In operation at end of year ——do	159	160	158
Maximum production capacity (all furnaces)	57.875	r 57.000	59.050
Production of crude steel:			
Basic bessemer	2,831	2,662	1,729
Oxygen	24,908	r 28,229	33,596
Open hearth	8,537	8,331	9,040
Electric	4,030	4,479	5,150
Other	7	4	6
Total	40,313	r 43,705	49,521
Ingots	39,654	43,154	48,924
Liquid steel for castings	659	552	597
Furnace feed for ingot steel:			
Pig iron:			
Total	27,446	29,705	33,922
Kilograms per ton crude steel	(692)	(688)	(693)
Scrap:			
Total	15,874	17,493	19,439
Kilograms per ton crude steel	(400)	(405)	(397)
Preblown Thomas and other presmelted steels	15	6	4
Ferroalloys and alloying metals	356	433	549
Other iron-bearing materials	1,116	1,039	1,275
Iron and manganese ores	597	680	990
Total iron-bearing materials	45,404	49,356	56,179
Limestone	2,822	3,009	3,368
CASTINGS			
Production of iron and steel castings	4,313	r 4,114	4,492
Consumption of raw materials:			
Pig iron	1,924	1,821	1,970
Scrap	4,744	4,510	4,925

See footnotes at end of table.

Table 6.—Federal Republic of Germany: Salient statistics of the iron and steel industry—Continued

(Thousand metric tons unless otherwise specified)

	1971	1972	1973
CASTINGS—Continued			
Consumption of raw materials—Continued			
Ferroalloys and other metals	92	85	100
Total	6,760	6,416	6,995
EMPLOYMENT			
In coking plants of smelters —persons—	2,841	2,685	2,482
Blast furnace, steel mills, hammer and forge shops —do—	354,590	339,625	345,489

r Revised.
[1] Data differ from that shown on table 2 because of difference in source.
[2] Data differ from that shown on table 7 because of difference in source.

Table 7.—Federal Republic of Germany: Raw materials consumed in the production of pig iron

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973
Iron ore:			
Domestic	4,900	5,145	4,975
Imported	39,261	42,144	49,938
Total	44,161	47,289	54,913
Manganese ore	562	570	675
Pyrite cinder	2,893	2,243	2,155
Slags and plant scale	5,543	5,754	5,902
Blast furnace dust	1,429	1,534	1,485
Scrap	543	699	608
Total gross weight of metallic raw materials	55,131	58,089	65,738
Iron content of total metallic raw materials:			
Iron ore:			
Domestic	1,419	1,082	1,033
Imported	22,635	24,496	29,642
Manganese ore	53	56	74
Pyrite cinder	1,427	1,090	1,040
Slags and plant scale	2,409	2,620	2,709
Blast furnace dust	525	575	[1] 572
Scrap	438	555	489
Total iron content	29,062	31,043	36,099
Limestone	3,505	4,059	5,293
Phosphate [2]	r 155	r 178	131
Total metallic raw materials, limestone, and phosphate, gross weight	58,791	r 62,326	71,162
Coke	15,638	15,598	18,221

r Revised.
[1] Data differ from that shown on table 8 because of difference in source.
[2] Data differ from that shown on table 6 because of difference in source.

Table 8.—Federal Republic of Germany: Production of sinter and consumption of raw materials

(Thousand metric tons unless otherwise specified)

	1971	1972	1973
Production:			
Gross weight	32,805	36,175	39,320
Iron content	18,313	20,215	22,104
Consumption of raw materials:			
Iron ore	28,925	32,454	35,056
Cinder	2,853	2,207	2,115
Slags and scale	2,374	2,788	2,922
Blast furnace dust	1,429	1,534	1,473
Limestone	2,586	3,191	4,189
Iron content of materials consumed:			
Iron ore	15,184	17,236	19,157
Cinder	1,575	1,641	1,573
Slags and scale	1,315	1,516	1,584
Blast furnace dust	525	575	[1] 569
Total	18,443	20,409	22,343

[1] Data differ from that shown on table 7 because of difference in source.

Table 9.—Federal Republic of Germany: Production of finished steel
(Thousand metric tons)

	1971	1972	1973
Wire rods	3,293	3,780	4,286
Bars and rods	4,923	5,335	6,416
Angles, shapes, sections (excluding rails)	2,012	2,224	2,487
Universal plates	402	409	502
Other heavy plates and sheets (more than 4.75 millimeters thick)	4,233	4,582	5,199
Medium plates and sheets (3 to 4.75 millimeters)	429	458	590
Thin plates and sheets (less than 3 millimeters)	6,562	7,025	8,366
Hot-rolled strip including skelp	2,483	2,676	3,043
Hot-rolled wide strip	2,336	2,718	3,267
Rails and railway track material	450	409	518
Seamless steel tubes	1,594	1,576	2,031
Total finished steel	28,717	31,192	[1] 36,705
Selected semimanufactures:			
Tinplate	780	756	806
Galvanized and terneplate	1,147	1,320	1,472
Steel pipe, welded	1,830	2,059	2,067
Extrusions and forgings	565	526	602
Steel castings	343	284	312

[1] Data differ from that shown on table 2 because of difference in source.

Lead and Zinc.—Mine output of lead in 1973 was 34,500 tons, down 11% from 1972 production. Mine production of zinc was 140,000 tons, slightly higher than the 134,700 tons produced in 1972. Smelter production of lead consisted of 86,000 tons of primary and 217,000 tons of secondary lead for a total of 303,000 tons, which was 11% over the total of 273,600 tons in 1972. Production of slab zinc amounted to 395,000 tons, compared with 359,000 tons in 1972, an increase of 10%.

Employment in the lead and zinc mines decreased by 194 persons during the year. At yearend, employment totaled 2,778 persons, about 1,000 less than 10 years ago. A further decrease is anticipated with the expected closing of the Ramsbeck mine.

At yearend, five lead and zinc mines and six beneficiation plants were in operation. The metal content of the ores was between 6.7% and 7.1% lead and zinc, about the same as in previous years. About 70% of the lead ore shipped in the Federal Republic came from the Harz region mines of Preussag AG, about 20% from the mines of Sachtleben Bergbau AG, and about 10% from the mines of AG des Altenbergs für Bergbau und Zinkhüttenbetrieb.

Of the lead smelter production in 1973, 11.1% was derived from domestic ore, 17.3% from imported ore, and 71.6% from secondary sources. In comparison, in 1972, 13.7% came from domestic ore, 23.7% from imported ore, and 62.6% from secondary sources.

Zinc smelters produced 29.9% of their output from domestic ore, 53.8% from imported ore, and the balance from secondary sources in 1973; in 1972, the proportions were 32.2% from domestic ore, 49.1% from imported ore and the balance from secondary sources.

Uranium.—Nuclear energy is expected to become increasingly important in the expansion of electric power generation in the future. In 1973, nuclear power generators totaling 2,229 megawatts were onstream, plants of 5,899 megawatts capacity were under construction, and additional capacity of 12,132 megawatts was on order or planned.

The 1973 Federal budget included DM1.3 billion for research and technology in nuclear energy, 5.8% higher than the amount budgeted in 1972. Of this amount, DM750 million was for research, DM449.2 million for technology, and the balance for contributions to international organizations and miscellaneous uses.

A construction permit has been issued for the first stages of the 300-megawatt sodium-cooled fast breeder reactor demonstration plant to be built at Kalkar, North Rhine-Westphalia, near the Dutch border. The license authorizes excavation and construction up to ground level of the reactor building and implies approval of the basic powerplant design. The project is being jointly funded by the West German, Dutch, and Belgian Governments. The construction contract provides for a ceiling of DM999.7 million for delivery of the power station and manufacturing of the fuel elements for the first charge.

NONMETALS

Cement.—Production of cement decreased 5.3% in 1973, to 40.9 million tons from 43.1 million tons in 1972.

The Portlandzementwerk in Dotternhausen, Baden-Württemburg, recently installed an aerial ropeway for transporting limestone from the quarries in the hills to the cement plant. The system has a capacity of 300 tons per hour and covers a distance of 2,270 meters with a difference in level of 303 meters. The ropeway is virtually automatic, requiring only one attendant at each terminal station.

The Schwenk Cement Works at Karlstadt, Bavaria, installed an electrostatic precipitator to handle the gases from a 3,000- to 3,600-ton-per-day cement kiln with preheater cyclones.

Fertilizers.—West German fertilizer production capacity was estimated at slightly less than 6 million tons annually. With a 1973 production of 4.8 million tons, the industry was operating at about 80% capacity.

Supply and distribution data for the fertilizer industry (fertilizer year-July through June) are given in the following tabulation in thousand tons.

	Nitrogen (N)		Phosphate (P_2O_5)		Potash (K_2O)	
	1972–73	1973–74 e	1972–73	1973–74 e	1972–73	1973–74 e
Beginning stocks [1]	337.8	352.3	163.4	152.5	421.6	297.3
Imports [2]	283.1	200.0	116.6	100.0	74.0	50.0
Production	1,470.6	1,400.0	986.0	920.0	2,371.3	2,350.0
Exports [2]	507.0	450.0	219.2	200.0	1,399.9	1,300.0
Delivered to agriculture	1,189.0	1,100.0	902.6	820.0	1,147.5	1,100.0
Ending stocks [1]	352.3	NA	152.5	NA	297.3	NA

e Estimate. NA Not available.
[1] Differences between beginning and ending stocks as shown and residual balance are due to losses, slight variances in individual company reporting dates, and product in transit between companies.
[2] Imports and exports includes product from and to East Germany.

In trade with the United States, total exports of fertilizer materials amounted to $3,398,000 in 1973 compared with $1,560,000 in 1972. Imports from the United States amounted to $2,506,000 in 1973 compared with $1,615,000 in 1972.

Production of processed potassium salts in 1973 amounted to 2,550,000 tons K_2O equivalent. Utilization of capacity was 85%. Potassium chloride (muriate) containing a minimum of 60% K_2O equivalent accounted for 58% of the production. Potassium chloride containing a minimum of 50% K_2O represented 16% of the total. The balance, in K_2O equivalent, consisted of 12% from potassium sulfate and 14% from low-grade potash.

Exports of potash in 1973 increased by 7% to 1,238,000 tons K_2O and accounted for 48.5% of total sales. Shipments to Poland amounted to 83,000 tons K_2O compared with 80,000 tons in 1972. Exports to the United States were 18,000 tons, 63.6% over those of 1972. As an exporter of potash, West Germany is second only to Canada. Because of West Germany's vast resources of potash, imports remained small, amounting to 45,000 tons K_2O, or 3.3% of domestic consumption in 1973. Consumption in 1973 from domestic production amounted to 1,316,000 tons K_2O. Of this amount, 90.4% was used in agriculture; the balance went to the chemical industry.

Expansion and modernization of the port facilities at Hamburg for potash shipments was announced by the industry. The Elbe-Seiten Kanal, scheduled for completion in 1975, will connect the Mittelland Kanal near Wolfsburg and the river Elbe near Lauenburg and will provide more economical transportation from the potash mines through the port of Hamburg than through the port of Bremen. Facilities at the latter port, which formerly handled two-thirds of West German potash exports, are scheduled to be closed.

Fluorspar.—Production of fluorspar rose from 84,000 tons in 1972 to 87,000 tons in 1973, an increase of 3.4%. Imports were 208,000 tons, 31.6% more than the 1972 amount of 158,500 tons.

West Germany is the largest user of fluorspar in Western Europe, consuming about 350,000 tons per year. Demand has increased over the past 10 years, owing partly to the increase in oxygen steelmaking and

partly to expansion of the aluminum and chemical industries. Most domestically produced fluorspar is acid grade; metallurgical grade material is nearly all imported.

Sulfur.—Sulfur recovered or obtained by chemical processes increased 52% to 333,000 tons in 1973. Elemental sulfur, including colloidal, imported in 1973 amounted to 491,000 tons, an increase of 18.3% over 1972 imports. Exports increased by 44.8% to 71,000 tons. Sulfuric acid production increased 6.8% to 5,064,000 tons (in terms of 100% H_2SO_4).

The new sulfuric acid plant of Chemiewerk Curtius AG at Duisburg (a joint venture of Concordiaberg AG and Fritz Hamm GmbH) began operating at full capacity of 288,000 tons H_2SO_4 per year at the beginning of 1973. The plant was designed and constructed by Polimex-Cekop, a Polish foreign trade organization, and is the first chemical plant to be entirely designed, engineered, and built by a Polish organization in Western Europe. The plant will be supplied with 100,000 tons per year of liquid sulfur from Poland, which will be shipped from Gdansk to Rotterdam and thence by barge, in heated tanks, up the Rhine to Duisburg.

The sour natural gas treatment plants in the Ems-Weser region of West Germany were producing a total of about 1,000 tons per day of recovered sulfur.

MINERAL FUELS

Just before the beginning of the oil crisis in the autumn of 1973, the Government had issued a new energy program for the Federal Republic. This was based on an estimated total West German energy consumption of 610 million tons standard coal equivalent (SCE) in 1985, assuming no changes in the world energy market. Petroleum was to account for 54% of primary energy requirements, natural gas 17%, nuclear energy 15%, lignite 8%, and the balance to other requirements. Annual coal production was expected to be reduced from the current 97 million tons to 83 million tons in 1978. Of this amount, 36% would go to power stations, 30% to the domestic steel industry, 18% to the steel industry of other members of the EC and 16% to other consumers.

In view of the oil shortage, it is expected that this program will be revised, to place greater reliance on domestic energy sources, particularly coal and lignite.

The percentage of energy requirements supplied by various sources in 1972 and 1973 follow:

Energy source	Percentage of total primary energy consumption	
	1972	1973
Anthracite and bituminous coal	23.6	22.2
Lignite and brown coal	8.7	8.7
Petroleum	55.4	55.2
Natural gas	8.6	10.2
Hydroelectric power	2.3	2.2
Nuclear energy	.9	1.0
Firewood, peat, other	.5	.5
Total	100.0	100.0

Source: Der Kohlenbergbau in der Energiewirtschaft der Bundesrepublik im Jahre, 1973. Essen, October 1974.

Coal and Lignite.—Production of anthracite and bituminous coal continued to decline, falling to a total of 97.3 million tons, 5.1% below that of 1972. Employment in the coal mining industry also declined, falling to 167,200 workers, 8.5% below the 1972 figure, but productivity increased by 1.1%.

Coal production in West Germany has been declining steadily since reaching a peak of 151.4 million tons in 1956. This downward trend has been the result of competition with other forms of energy. Relatively low cost fuel oil has been the largest competitor of coal, with natural gas becoming increasingly important in recent years. In the past decade, coal and lignite have dropped from supplying 63% of the country's energy requirements in 1962 to 32% in 1972. The overall gain in energy consumption in the same period was 36%.

West German coal exports in 1973 amounted to 13.9 million tons, 6.9% over the previous year's exports. Most of the coal exported, 13.3 million tons or 96%, went to EC countries. France received 5.9 million tons, or 42% of this, about the same as last year.

During the year, about 700,000 tons of coke was exported to the United States for use by the steel industry. The reason for the U.S. imports was that the rapid rise in steel demand exceeded the available capacity of U.S. coke plants. The coke exported to the United States amounted to only 7% of the 10.3 million tons of coke exported by West Germany in 1973. The bulk of the exports, 7.2 million tons or 70.5% went to EC countries.

Coal imports in 1973 amounted to 7.0 million tons, compared with 6.9 million tons in 1972. Poland was the principal

supplier, shipping 1.8 million tons, followed by the United Kingdom and the United States. Imports from Poland increased 15.5% over those of 1972, while an increase of 44% for the United Kingdom and a decrease of 38% for the United States were noted.

About 1,280,000 tons of coke were imported, 51% more than in 1972. Of this amount, 523,000 tons, or 40.8%, came from the United States.

Production of lignite increased by 7.4% over that of the previous year for a total of 118.6 million tons, reflecting the stronger demand by electric power stations. Employment in the lignite industry declined by 6.3% during the same period.

The utilization of lignite as boiler fuel for electric power generation received increasing attention as a result of the increased cost of oil and the worldwide energy shortage. Resources of lignite in the country are estimated at 62 billion tons, 55 billion of it in the Rhineland. About 85% of the lignite mined in the Rhineland area is used to generate electricity, while 26% of the electricity in West Germany is produced from plants fueled with lignite.

Lignite is also used in the form of briquets for heating some 7 million households in the Federal Republic, but this usage has declined in the past decade from 15.8 million tons to less than 6.5 million tons. However the decreased use of lignite for briquets was more than compensated for by its increased use for power generation. Six new 600-megawatt power stations, to be fueled with lignite, are being built in the Rhineland.

Table 10.—Federal Republic of Germany: Coal and lignite industry
(Production, productivity, and employment)

		1971	1972	1973
BITUMINOUS AND ANTHRACITE				
Production:[1]				
Ruhr	million tons	90.7	83.3	79.9
Saar	do	10.7	10.4	9.2
Aachen	do	6.6	6.2	6.0
Lower Saxony	do	2.8	2.5	2.3
Total	do	110.8	r 102.4	[2] 97.4
Output per man-shift:				
Ruhr:				
Underground	kilograms	3,893	4,081	4,126
Total mining	do	3,239	3,401	3,433
Federal Republic average:				
Underground	do	3,828	4,015	4,068
Total mining	do	3,158	3,308	3,346
Employment:				
Ruhr:				
Underground	thousand persons	107.9	100.4	91.3
Mine surface	do	r 24.0	21.0	19.9
Cleaning	do	r 12.5	r 11.2	10.0
Total including other workers and salaried employees	do	197.8	182.7	167.2
Federal Republic total:				
Underground	do	135.2	125.5	113.7
Mine surface	do	31.0	r 27.8	26.2
Cleaning	do	r 15.7	14.1	12.9
Total including other workers and salaried employees	do	247.8	229.7	210.3
LIGNITE AND SUBBITUMINOUS				
Production:				
Rhineland	million tons	90.5	95.7	101.7
Helmstedt, Hesse, Bavaria	do	14.0	14.7	16.9
Total	do	104.5	110.4	118.6
Employment:				
Rhineland:				
Open pit	thousand persons	4.6	4.4	4.2
All other	do	11.3	r 10.8	10.5
Total	do	15.9	r 15.2	14.7
Helmstedt, Hesse, Bavaria	do	r 6.0	r 5.6	4.8
Total	do	r 21.9	r 20.8	19.5
PECH COAL				
Production	million tons	.07	--	--
Employment	thousand persons	.3	.06	--

r Revised.
[1] Excludes small mines and leases.
[2] Due to rounding, figure does not agree with table 2.

Petroleum and Natural Gas.—Crude oil production in 1973 continued to decline, to 6.6 million tons as compared with 7.1 million tons in 1972, a decrease of 7.0%. Reserves were 75.5 million tons, all onshore.

Refinery capacity was 139.5 million tons per year, an increase of 7.3% over that of 1972. Refinery input was 116.5 million tons, 6.3% over that of 1972, while utilization of capacity at 83.5% was slightly lower than in the previous year.

Crude oil imports were 110.5 million tons, up 7.7% over 1972, and represented 69% of West Germany's total oil needs. In addition, 40.9 million tons of petroleum products were imported. These figures do not include purchases of 1.4 million tons from East Germany. Crude oil imports by country of origin, in thousand tons follow:

Country	1972	1973
Libya	28,482	25,649
Saudi Arabia	18,997	25,283
Iran	9,808	14,122
Algeria	11,430	13,557
Nigeria	10,890	10,249
Abu Dhabi	6,394	5,304
Kuwait	4,344	4,286
U.S.S.R	2,845	2,735
Dubai	--	2,588
Venezuela	3,727	2,162
Iraq	1,896	1,613
Gabon	460	936
Qatar	1,147	726
Syria	368	533
Norway	448	366
Egypt, Arab Republic of	r 144	204
Tunisia	1,036	119
Other	183	59
Total [1]	r 102,600	110,493

r Revised.
[1] Data may not add to totals shown because of independent rounding.

Source: Bundesampt für Gewerbliche Wirtschaft (Aussenstelle, Hamburg). Mineralölstatistik der Bundesrepublik Deutschland, 1973.

Domestic consumption of petroleum products totaled 134,637,000 tons, which was 6.8% over consumption for 1972. Consumption by refineries increased by 5.8%, bunker deliveries decreased by 7.6%, and exports increased by 13.6%.

At yearend, stocks of crude oil amounted to 7,799,000 tons, stocks of gasoline, 2,306,000 tons (63 days' supply), stocks of middle distillates, 9,638,000 tons (75 days' supply), and stocks of heavy fuel oil, 3,535,000 tons (71 days' supply).

Total refinery output of finished products was 5.9% above the output for 1972. Refinery output, by product, in tons follow:

Product	1972	1973
Refinery, heating, and town gas	4,413,059	4,487,789
Ethylene, propylene, butadiene, butylene	1,334,691	1,443,808
Other LPG	1,677,295	1,890,440
Motor gasoline (including aviation)	13,623,431	14,582,212
Naphtha and spirit	5,250,514	5,640,710
Kerosine and jet fuel	1,246,240	1,250,263
Diesel oil	9,978,398	10,717,283
Fuel oil, light [1]	30,557,364	32,386,013
Lubricating oil, grease	948,228	948,644
Fuel oil, heavy [1]	33,066,435	34,702,216
Paraffin, wax	134,158	133,772
Bitumen	4,673,072	4,550,226
Petroleum coke	730,528	778,511
Sulfur	72,900	97,654
Other products	1,038,265	1,552,456
Total	108,744,578	115,161,997

[1] Includes refineries' own consumption.

Source: Erdöl-Informationsdienst, Hamburg.

New refineries planned for completion (1975 or later), with their planned capacities in thousand tons per year, included Brünsbuttel (VEBA/Union Rheinische)—5,500; Gemersheim (British Petroleum)—8,000; Neustadt, Bavaria (Texaco)—5,000; Rheinberg (VEBA)—5,000; and Wilhelmshaven (Mobil)—8,000. In addition, a total increase in capacity of 53,400,000 tons was planned for existing refineries by 1975 or before.

As a part of its overall energy policy, the Federal Government was in the process of consolidating the major West German-controlled oil companies. The Government's main objectives were (1) to strengthen Germany's position in dealing with oil-producing countries, (2) to expand the role of German companies in supplying the domestic market, and (3) to increase the influence of the Government in the West German petroleum market.

One planned merger would combine the 40% government controlled Vereinigte Electrizitäts-und Bergwerks AG (VEBA) with Gelsenberg AG (now 48% owned by Rheinische-Westfälische Electrizitätswerke AG (RWE) and Union Rheinische Braun Kohlen Kraft-Stoff AG (Union Kraft-Stoff), an RWE subsidiary). VEBA has recently enlarged its holdings by the purchase of Erdölwerke Frisia AG from the Gulf Oil Co. These acquisitions would give VEBA majority control of ARAL AG, Germany's largest gasoline distributor. In addition, the combined firm would have a majority control of Deutsche Erdölvesorgungsgesellschaft eign oil exploration and exploitation commbH (DEMINEX), the West German for-

pany. The combined company would be the second largest in the Federal Republic. It would have a current refining capacity of over 30 million tons annually (about 23% of the total) and would control about 25% of West Germany filling stations.

The German North Sea Consortium, consisting at present of 10 companies, resumed seismic work and will drill 3 wells in the local North Sea sector, the first of them early next year.

Production of marketable natural gas (including production from the Ems estuary) increased 7.1% to 680,583 million cubic feet. Proven reserves at the end of the year were 12,360 billion cubic feet. Estimated recoverable resources amounted to 7,946 billion cubic feet.

As consumption of natural gas increased, foreign sources of supply for the future assumed considerable importance.

Natural gas supplies showed an overall increase of about 25%, owing to higher output from domestic fields, larger deliveries from the Netherlands, and the start in October of deliveries from the U.S.S.R. A contract for the delivery of 4,000 cubic meters of natural gas per year over a 20-year period has been negotiated between the U.S.S.R. and a West German consortium led by Ruhrgas AG. This will be in addition to the previously contracted 3,000 million cubic meters per year.

The Phillips oil group has concluded a 20-year contract to sell natural gas from the Ekofisk Field in the Norwegian sector of the North Sea to a consortium of European buyers. Ruhrgas AG will take 50% of the deliveries; the rest will be divided between Belgium, the Netherlands, and France. Deliveries are to be made through a 430-kilometer pipeline to the German coast near the port of Emden. Agreement in principle was also reached between Placid International and a North German group on a 24-year contract for delivery of 6,500 million cubic meters per year from the Dutch sector of the North Sea gasfields.

The Algerian state-owned oil and natural gas enterprise Société Nationale pour la Recherche, la Production, le Transport, la Transformation et la Commercialisation des Hydrocarbures (SONATRACH) has concluded a contract with three German firms, Bayerische Ferngas GmbH (Bayerngas), Gasversorgung Süddeutschland GmbH and Saar-Ferngas AG, as well as French and Belgian firms. This contract, to run for 20 years, will supply gas at a rate of 13 billion cubic meters annually, of which West Germany will receive 7,040 million cubic meters per year. The gas will be liquefied at the wells and shipped by tanker to pipelines starting either at Fos, near Marseilles, France, or Monfalcone, Italy.

Ruhrgas AG has started separate negotiations with SONATRACH for the import of 10,000 to 12,000 million cubic meters of gas per year, probably via Monfalcone.

A pilot plant is under construction at Wesseling to carry out experiments on the gasification of lignite. West Germany's lignite resources, estimated at 62 billion tons, should eventually be sufficient to supply nearly all her gas requirements. However, the first full-scale commercial plant is not scheduled until 1985.

Table 11.—Federal Republic of Germany: Shipments of petroleum products

(Thousand metric tons)

Commodity	1971	1972	1973
Domestic sales:			
Gasoline, all kinds	21,783	23,107	24,472
Kerosine, including jet fuel	1,892	2,057	2,045
Diesel oil	9,712	10,151	10,798
Fuel oils	72,467	76,654	81,669
Liquefied petroleum gas	2,329	2,605	3,052
Lube oil and greases	1,092	1,078	1,162
Petroleum coke	603	1,692	1,902
Bitumen	4,661	4,896	4,656
Refinery gases	2,402	1,866	1,800
Other products	1,592	1,933	3,079
Total	118,533	126,039	[1] 134,637
Consumption by refineries:			
Fuel oil	4,175	4,115	4,335
Refinery gas	3,266	3,513	3,727
Petroleum coke	238	239	264
Total	7.679	7.867	8.326
Bunker deliveries:			
Gas and diesel oil	794	829	738
Fuel oil	2,932	3,122	2,902
Lubricants	16	49	55
Total	3,742	4,000	3.695
Exports	8,374	7,775	8,835
Other shipments	1,628	2,372	2,009
Changes in refinery stock	+394	+191	+1,382
Balancing factor [2]	+270	−10	−67
Total products available	140,620	148,234	158,817

[1] Data may not add to total shown because of independent rounding.
[2] Apparently changes in nonrefinery stocks.

Source: Bundesampt für Gewerbliche Wirtschaft (Aussenstelle, Hamburg). Mineralölstatistik der Bundesrepublic Deutschland, 1973.

The Mineral Industry of Ghana

By Henry E. Stipp [1]

The Government of Ghana in 1973 continued its policy of acquiring up to 55% of the share equity of mining companies. Reportedly the Government's decision to acquire a majority interest in mining firms resulted from a desire to give Ghanaians optimum benefits from the exploitation of their natural resources. In early 1973, the Government published a White Paper, which stated Ghana's investment policy. It defined areas of the economy reserved for the state and those reserved for joint state and foreign ownership. Firms involved in joint state-foreign ownership include the following:

1. Timber and mineral industry—state equity participation of 55% in firms having an employed capital of at least $434,783 [2] or an annual turnover of at least $869,565.

2. Oil and alumina industry—oil, state participation of 20%; alumina, state participation of 30%.

3. Companies producing basic necessities such as salt, fertilizers, petroleum products —firms with employed capital of at least $434,783 or annual turnover of $869,565, state participation of 55%.

In May, British Aluminium Co. Ltd. and the Government agreed that retroactive to January 1, the Government would hold 55% of the equity of a new company incorporated in Ghana and named Ghana Bauxite Company Ltd. British Aluminium Co. will hold a 45% share equity in the new company.

The Government of Ghana and First International Natura Corp. (FINCO) of the United States signed an agreement allowing FINCO to prospect for diamonds in Ghana.

In May the Government notified African Manganese Co. to raise prices charged for manganese ore. Shipments of manganese ore were suspended until contracts were renegotiated. However, by November, shipments were returning to normal. At yearend a new firm, Ghana National Manganese Corp., was established by the Government to purchase and market all manganese ore and other minerals mined by African Manganese Co. at Nsuta. The Government of Ghana appointed the Netherlands mining firm, Caemi International of The Hague, as its exclusive worldwide sales agent for the marketing of manganese ore produced in Ghana.

The Governments of Ghana and Canada signed an agreement whereby Canada will provide a $869,565 loan to finance the second phase of a topographic mapping project in a 16,500-square-mile area of southeastern Ghana.[3]

The Ghanaian Government and the Bauxite Alumina Study Co., Ltd. (BASCOL), consisting of Kaiser Aluminum & Chemical Corp. and Aluminum Resources Development Co., Ltd. of Japan, signed a letter of intent for BASCOL to conduct a feasibility study of the alumina plant planned for the Kibi Area. The letter of intent listed arrangements between the Government and BASCOL for development of bauxite mining in the Kibi Area and its conversion to alumina. A group of Japanese firms headed by an official of Mitsubishi Chemical Industries, Ltd. visited Ghana and discussed with the Government plans to construct another aluminum smelter.

The United Nations Development Programme (UNDP) was engaged in a project to aid the State Gold Mining Corp. at Tarkwa and Dunkwa.

Kumasi University of Science and Technology reported that a new department would be created in the engineering school to train mining engineers and other professional mining personnel.

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[1] Physical scientist, Division of Ferrous Metals —Mineral Supply.

[2] Where necessary, values have been converted from the new Ghana cedi (Nc) to U.S. dollars at the rate of Nc 1.15 = US$1.00.

[3] Barclays International Review (London). General. July 1973, p. 19.

PRODUCTION

Mineral commodity (excluding petroleum refinery products) production in 1973 increased in value to an estimated $182 million compared with an estimated $141 million in 1972. The value of mineral production in 1973 constituted about 6.3% of the gross national product, which was valued at $2,902 million. Although production of manganese and bauxite decreased in quantity from that of 1972, the increase in prices for most mineral commodities accounted for the approximate 29% rise in the total value of mineral output. Production of aluminum increased 4.6% in quantity.

Figures on the quantity of minerals produced are shown in table 1.

Table 1.—Ghana: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Aluminum:			
Bauxite, gross weight	329,608	340,321	309,908
Metal, smelter production, primary	111,125	144,070	150,707
Gold ---thousand troy ounces	698	724	723
Manganese ore and concentrate, gross weight	598,562	498,340	318,211
NONMETALS			
Cement	531	415	[e] 450
Diamond: [e]			
Gem ---thousand carats	256	266	270
Industrial ---do---	2,306	2,393	2,430
Total ---do---	2,562	2,659	2,700
Salt	47,261	[e] 50,000	[e] 50,000
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline ---thousand 42-gallon barrels	1,684	1,669	1,726
Jet fuel ---do---	166	279	199
Kerosine ---do---	601	689	735
Distillate fuel oil ---do---	1,985	1,919	1,956
Residual fuel oil ---do---	2,165	2,459	2,039
Other ---do---	69	55	60
Refinery fuel and losses ---do---	347	385	367
Total ---do---	7,017	7,455	7,082

[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 general information is inadequate for the formulation of reliable estimates of output levels.

TRADE

Ghana's trade balance improved for the second consecutive year, mainly because the world prices of the country's export products (cocoa, timber, gold, and other mineral commodities) increased substantially. Overall, Ghana earned 28.7% more from exports in 1973 than in 1972, despite a generally lower volume of exports.[4] Outlook for the trade balance in future years is not good. It has been estimated that Ghana may have to spend over $87 million more for crude oil imports in 1974 than in 1973. Also sharp price rises in other imported items and shortages in such items as cement, iron reinforcing rods, steel pipe, and plastic raw materials have been noted.

[4] U.S. Embassy, Accra, Ghana. State Department Airgram A-74, July 18, 1974, 9 pp.

Table 2.—Ghana: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Bauxite and concentrate	353,733	316,232	United Kingdom 205,597; Canada 82,892.
Metal, including alloys:			
Unwrought	r 88,782	131,799	United States 31,347; Japan 29,456; United Kingdom 17,395.
Semimanufactures	27	2	All to Nigeria.
Gold bullion ____thousand troy ounces__	697	737	Switzerland 613; United Kingdom 124.
Iron and steel, metal:			
Scrap	518	--	
Semimanufactures	r 619	2,072	Italy 2,032.
Manganese ore and concentrate	418,843	475,251	Norway 169,886; Spain 90,983; United Kingdom 71,498.
Other nonferrous metal, scrap, n.e.s	5,516	2,728	Spain 1,229; West Germany 371; Italy 311.
NONMETALS			
Cement	r 2	415	Togo 374; Upper Volta 41.
Diamond, all grades __thousand carats__	2,367	3,193	United Kingdom 1,518; Netherlands 1,165; Belgium-Luxembourg 510.
Gypsum	203	--	
Salt	4	--	
MINERAL FUELS AND RELATED MATERIALS			
Petroleum:			
Crude and partly refined thousand 42-gallon barrels__	--	3	Mainly to United Kingdom.
Refinery products:			
Gasoline ____do____	36	39	United Kingdom 27; Dahomey 7; Togo 3.
Kerosine and jet fuel ____do____	29	26	United Kingdom 19; Dahomey 7.
Distillate fuel oil ____do____	173	11	Togo 6; Dahomey 5.
Residual fuel oil ____do____	r 1,248	1,698	Italy 1,269; Greece 152.
Lubricants ____do____	(1)	(1)	Mainly to Nigeria.

r Revised.
1 Less than ½ unit.

Table 3.—Ghana: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Oxide and hydroxide	184,522	311,037
Metal:		
Unwrought	514	141
Semimanufactures	3,225	2,045
Copper metal, including alloys, all forms	1,227	725
Iron and steel, metal:		
Ore	--	13
Scrap	7,567	--
Pig iron, ferroalloys, etc	1,682	835
Steel, primary forms	2,316	--
Semimanufactures	r 63,635	20,646
Lead metal, including alloys, all forms	532	475
Nickel metal, including alloys, all forms	2	15
Silver, platinum-group metals ---troy ounces--	4,731	1,664
Tin metal, all forms ---long tons--	176	10
Zinc metal, including alloys, all forms	1,224	484
Other, n.e.s.:		
Ore and concentrate	19,173	11
Scrap	4	2
Metal, including alloys	377	258
NONMETALS		
Abrasives, natural, grinding and polishing wheels and stones	r 89	335
Asbestos	681	1,494
Barite	30	--
Cement:		
Clinker	426,302	347,189
Portland	6,496	5,877
Chalk	14	--
Clays and clay products (including refractory):		
Clays, n.e.s	1,124	152
Products	7,275	4,415
Diamond, industrial ---carats--	63	--
Diatomite and other infusorial earth ---value, thousands--	r $51	$69
Fertilizers and materials:		
Crude	203	3,562
Manufactured	6,679	2,106
Ammonia	100	142
Gypsum and plasters	19,353	6,195
Lime	3,222	2,024
Mica, worked	25	8
Salt and brine	135	42
Sodium and potassium compounds, caustic soda	9,873	3,970
Stone, sand and gravel	1,622	1,411
Sulfur:		
Sulfur and unroasted iron pyrite	92	43
Sulfuric acid	1,768	212
Talc	676	123
Other nonmetals [1]	965	1,555
MINERAL FUELS AND RELATED MATERIALS		
Asphalt, natural	321	25
Coal and coke, including briquets	11,080	303
Petroleum:		
Crude and partly refined ---thousand 42-gallon barrels--	5,095	8,971
Refinery products:		
Gasoline ---do---	12	1
Kerosine and jet fuel ---do---	144	3
Residual fuel oil ---do---	(2)	--
Lubricants ---do---	r 147	98
Gas, natural and manufactured ---value, thousands--	r $60	(2)
Mineral jelly and wax ---thousand 42-gallon barrels--	39	14
Other ---do---	r 323	436
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	433	114

r Revised.
[1] Includes mica, meerschaum, amber, jet, and other unspecified commodities.
[2] Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—Ghana Aluminium Products, Ltd., located at Tema, planned to produce aluminum boats on a large scale for river transportation. The Ghana Pioneer Aluminum Ltd. factory wanted to import $1.3 million of raw materials to increase production. The company produces cutlery and other aluminum products. An aluminum rolling mill has been proposed for construction in addition to the alumina plant being studied for construction at Kibi.

Reportedly Volta Regional Authority is renegotiating the present power tariff agreement with Volta Aluminum Co., Ltd. (VALCO). Monetary returns on the dam have not been encouraging in view of the large sums of money invested in the project by the Government. VALCO announced that it planned to increase the capacity of its aluminum smelter at Tema by 25%.

Bauxite.—Shipments from Takoradi in 1973 totaled 307,161 tons compared with 387,736 tons shipped in 1972. The cost for construction of the 600,000-ton-per-year alumina plant proposed for Kibi has been estimated at $200 million. An international consortium will be formed to exploit the deposit at Kibi and operate the alumina plant, if the feasibility report being prepared by BASCOL is affirmative. The first phase of the study on mining and grade of bauxite deposits was reported to be very encouraging. The second phase of the study, relating to the feasibility of the proposed alumina plant, was scheduled to start in March with the final report to be submitted to the Government in November 1973. Reportedly Hungary was to participate in the Nyinahin bauxite project, Ashanti Region.

Gold.—The gold refinery that was scheduled to be constructed at Tarkwa in 1966 by the U.S.S.R. was abandoned shortly after the overthrow of the Nkrumah Government. The Government of Ghana requested the U.S.S.R. to study the project and submit a report by yearend on the feasibility of continuing it.

Ashanti Goldfields Corp., Ltd., and the Government were negotiating over compensation for the acquisition by the Government of an additional 35% of the share equity in the corporation. The Ghanian Government obtained 20% of the share equity of Ashanti in 1972. A substantial increase in the free market gold price was the main factor in the increased value of production by the company. The increased price has made profitable, large quantities of ore that previously were regarded as uneconomic.

A large heavy-duty fan capable of moving more than 10 tons of air per minute was ordered by Prestea Goldfields, Ltd., a member of the Ghanian State Gold Mining Corporation.[5]

Iron Ore.—A company was established to study the feasibility of exploiting the iron ore deposits in the Opon Mansi Area of the Western Region of Ghana. The company will be a joint venture of the National Investment Bank and a West German company, Friedrich Krupp Hüttenwerke A. G. Reserves at Opon Mansi have been estimated at about 150 million tons. An international consortium will be formed to mine the deposit if an economic study of the deposit is favorable.

Iron and Steel.—The Tema Steel Works reportedly will spend about $4.3 million to modernize the foundry, rolling mill, and other sections of the plant to boost capacity to over 30,000 tons per year. A ban has been placed on the export of iron and steel scrap in order to conserve raw material for furnace feed. A second foundry is to be constructed at Takoradi at a cost of over $2.6 million by the National Investment Bank and a West German firm. It will use locally produced iron and steel scrap.

Manganese.—At midyear, African Manganese Co. was instructed by the Government to increase the prices it charged for manganese ore and concentrate. As a result of this action, contracts had to be renegotiated and shipments of ore and concentrate were suspended temporarily. At yearend the Government and African Manganese reached agreement for the takeover of African Manganese by the newly created Ghana National Manganese Corp. Initially Ghana National was authorized to purchase and market all manganese ore and allied minerals mined by African Manganese at Nsuta, Western Region pending actual takeover by Ghana National. Shipments of ore which had been suspended were resumed in October. The Government appointed

[5] Mining Journal. Fan for Ghana Gold Mine. V. 281, No. 7210, Oct. 26, 1973, p. 346.

the Netherlands mining firm Caemi International as its exclusive worldwide sales agent for marketing manganese ore and concentrate.

A ferroalloys plant was being studied for construction at Nsuta.[6] Reportedly the manganese ore mined at the Nsuta deposit would be processed into ferromanganese and other manganese products.

NONMETALS

Clays.—The brick and tile factory at Weija, a division of the Ghana Industrial Holding Corp. (GIHOC), reportedly will be expanded with funds from a loan supplied by the African Development Corp.[7] The $3.5 million loan will be used also to expand two other divisions of GIHOC in addition to the ceramics products factory.

Diamond.—Three mining companies were recovering diamonds from the Birim River deposits, and a fourth firm, backed largely by U.S. investors, planned to enter the industry. The firms presently recovering diamonds in the Birim River Basin are Ghana Consolidated Diamonds Ltd., Cayco (Ghana) Ltd., and Amalgamated Diamond Corp. The other firm that planned to enter the field is FINCO, which will search for diamond in an area 24.56 miles from the confluence of the Birim and Pra Rivers.[8] The company planned to invest $25 million for diamond prospecting and has completed exploratory work prior to receiving a license to prospect. The Ghana Government will own 55% of the share equity of FINCO. In addition to the firms listed above, Dunkwa Goldfields recovers negligible quantities of diamond during its alluvial gold operations.

The number of licensed diggers (independent African miners) declined from 244 in 1968 to 60 in 1973. A sharp drop occurred in 1969 and 1970 after a number of aliens were forced to leave Ghana. Official output of the licensed diggers increased from 13,000 carats in 1968 to 90,500 in 1973. Although licensees are selling a greater number of the stones they recover to the Government-controlled Diamond Marketing Board, their total marketed output is small compared with the 1.2 million carats sold in 1960. Sizable quantities of Ghanian diamonds, especially gem-quality stones, are believed to be smuggled to Togo, Dahomey, and the Ivory Coast, where they command higher prices than in Ghana. The Government has tried to discourage smuggling; however, there is no indication that it has been curbed.

Stone.—*Limestone.*—The deposits at Nauli in the Western Region were being studied by the Ghana Geological Survey Department.[9] About 100 persons were engaged in determining the life of the deposit, if mined for the production of cement clinker. Preliminary studies indicate reserves of 400 million tons of limestone, estimated to supply Ghana's requirements for 200 years.

MINERAL FUELS

Petroleum.—The crude oil that was discovered 8 miles offshore from Saltpond, Central Region, in 1970 could be of commercial value, because of the sharp rise in the world price for crude oil.[10] A production rate of 3,600 barrels per day would be required.

Ghanaian-Italian Petroleum Co. Ltd. (GHAIP) planned to construct an oil refinery at Tema.[11] The crude oil throughput capacity of the new refinery would be 23,500 barrels per day.

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[6] Standard Bank Review (London). Mining. January 1974, p. 13.
[7] Barclays International Review (London). Ghana. September 1973, p. 20.
[8] U.S. Embassy, Accra, Ghana. State Department Airgram A-37, Apr. 16, 1974, 5 pp.
[9] Barclays International Review (London). Mining. April 1973, p. 22.
[10] Standard Bank Review (London). Development. February 1974, p. 7.
[11] Petroleum Times. Ghana. V. 77, No. 1953, Jan. 26, 1973, p. 13RS.

The Mineral Industry of Greece

By Scott F. Sibley [1]

The Greek economy in 1973 could best be characterized as expanding, as the gross national product (GNP) rose 10.5% over that of 1972 and the industrial production index registered an average increase of 16.6% over that of 1972. However, concurrent inflation increased equally as fast, with the average consumer price index rising 15.5% over that of 1972, and the wholesale price index exceeding that of 1972 by 23.4%. Rising wages kept pace with increasing prices, as the minimum wage increased by approximately 45% and civil servants' salaries rose by 15% to 20%. Excess money supply reportedly was considered responsible for some of the economic problems.

The Government undertook a series of measures designed to retard the economic boom and narrow what has been an increasing trade deficit. These measures included: (1) Austerity in government spending, whereby expenditures would increase only 2.4% in 1974 and (2) a drastic reduction in public investment (down 26.2% from that of 1972). In order to reduce excess liquidity, outstanding bank credits to the private sector were further restricted. In addition, an upper limit of 10% over the previous fiscal year's level was set on the distribution of dividends and profits by businesses. Interest rates were increased to encourage private savings deposits. The Government also planned to institute a modified price control system wherein price increases on certain basic commodities and services would be prohibited. In order to prevent local market price increases due to insufficient supply, as well as minimize import demand, export controls were imposed on a limited number of products. The energy crisis and international inflation further complicated the situation. Because of these factors, a goal of reduced GNP growth was set for 1974 and it was hoped there would be a reduction in the rate of increase in the cost of living in 1974.

During the 5-year period 1973 through 1977 the Greek Government planned to spend more than $14 million studying the geology of the Greek mainland and Continental Shelf, mapping the geology of Greece, and preparing a detailed inventory of mineral resources. Funds were to be allocated from the Public Investment Program to study and explore for such energy resources as lignite, petroleum, natural gas, and uranium. One important feature of this program was the establishment of a National Institute of Geology and Mineral Exploration as an independent state corporation.

A new mining law was signed by the Greek Deputy Premier in 1973 to replace the original law of 1910 which had become quite obsolete, causing a great deal of inconvenience to industry. The new law was less complex and resulted in administrative decentralization.

PRODUCTION

Substantial production gains in the Greek mineral industry were recorded for the following commodities: lignite (14%); magnesite (15%); pig iron and ferroalloys (51%); crude steel (80%); manganese ore (crude) (72%); nickel (mine output) (33%); perlite (crude) (88%); pumice (18%); and stone (marble) (41%).

[1] Physical scientist, Division of Ferrous Metals—Mineral Supply.

Table 1.—Greece: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Aluminum:			
Bauxite, gross weight ---thousand tons--	2,861	2,408	2,958
Alumina, gross weight ---do---	464	476	470
Metal, primary ---do---	[r] 116,006	131,277	143,269
Antimony, mine output, metal content ---do---	NA	3	84
Chromium, chromite:			
Crude ore, gross weight ---do---	46,446	56,666	42,894
Concentrates, gross weight ---do---	[r] 14,436	22,130	18,462
Iron and steel:			
Pig iron and ferroalloys ---do---	291,633	340,000	512,000
Crude steel ---do---	476,572	500,000	900,000
Steel semimanufactures [2] ---do---	661,580	[e] 700,000	1,161,026
Lead:			
Mine output, metal content ---do---	10,469	15,973	17,777
Smelter (refined): [3]			
Primary ---do---	19,457	26,919	20,800
Secondary ---do---	NA	17,330	18,818
Manganese:			
Ore, crude, gross weight ---do---	35,463	24,353	41,883
Concentrate, gross weight ---do---	6,127	5,305	6,200
Nickel:			
Mine output, metal content ---do---	10,700	[4] 19,702	[4] 26,254
Metal, content in alloys ---do---	10,573	11,270	13,946
Silver, smelter or refinery production ---thousand troy ounces--	456	315	588
Zinc, mine output, metal content ---do---	14,210	17,718	19,462
NONMETALS			
Abrasives, natural, emery ---do---	7,000	7,000	7,000
Barite:			
Crude ore ---do---	138,899	127,683	124,485
Concentrate ---do---	84,944	88,149	3,479
Cement, hydraulic ---thousand tons--	5,533	4,934	6,366
Clays:			
Bentonite:			
Crude ---do---	212,740	375,413	289,484
Processed ---do---	15,560	17,595	190,234
Kaolin:			
Crude ---do---	54,855	70,965	63,700
Processed ---do---	[r] 14,014	11,977	12,310
Fertilizers, manufactured, gross weight:			
Nitrogenous ---thousand tons--	353	NA	255
Phosphatic ---do---	642	NA	163
Potassic ---do---	NA	5	16
Fluorspar ---do---	450	--	--
Gypsum and anhydrite ---do---	325,154	399,751	400,000
Magnesite:			
Crude ---do---	952,523	931,658	1,068,610
Dead burned ---do---	274,832	250,791	274,860
Caustic calcined ---do---	37,735	52,891	71,438
Perlite:			
Crude ---do---	155,374	123,816	233,327
Screened ---do---	94,824	109,091	125,711
Pozzolan (santorin earth) ---do---	612,387	657,262	590,895
Pumice ---do---	419,081	533,632	631,465
Pyrite:			
Gross weight ---do---	383,370	403,235	430,000
Sulfur content ---do---	[r] 172,516	181,456	194,000
Salt, all types ---thousand tons--	114	[e] 115	NA
Silica (probably silica sand) ---do---	9,855	NA	6,612
Stone, marble ---cubic meters--	63,000	64,000	90,000
Talc ---do---	[r] 4,061	5,441	2,465
MINERAL FUELS AND RELATED MATERIALS			
Coal, lignite ---thousand tons--	[r] 10,929	11,579	13,214
Coke:			
Coke oven ---do---	161	269	400
Gashouse ---do---	14	13	10
Fuel briquets (lignite briquets) ---do---	88	91	105
Gas, manufactured:			
Gas works ---million cubic feet--	388	388	353
Blast furnaces ---do---	[r] 6,180	6,710	NA
Coke ovens ---do---	NA	5,121	NA

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity [1]		1971	1972	1973 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued				
Petroleum refinery products:				
Gasoline	thousand 42-gallon barrels	5,542	5,653	6,545
Jet fuel	do	2,952	2,688	3,680
Kerosine	do	581	1,225	852
Distillate fuel oil	do	12,749	14,562	25,812
Residual fuel oil	do	12,940	17,922	37,762
Lubricants	do	112	105	518
Other	do	3,099	4,431	12,817
Refinery fuel and losses	do	1,488	2,223	3,920
Total	do	39,463	48,809	91,906

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

[1] In addition to the commodities listed, other types of crude construction materials such as clays, sand, gravel, and stone are produced, but output is unreported and available information is inadequate to make reliable estimates of output levels. Cobalt is also produced but output is included with nickel.

[2] Black sheet, galvanized sheet and reinforcing bars only.

[3] Including antimonial lead and hard lead.

[4] Nickel plus cobalt contained.

TRADE

Greece experienced another relatively high trade deficit in 1973, based on Bank of Greece final data. Exports increased 47.3% to $1,230 million and imports rose by 65.8% to $4,047 million, resulting in a record merchandise deficit of $2,817 million. This represented an increase of 91% over the 1972 deficit (based on United Nations data). Of particular note was the jump in oil imports, which rose to $413 million in 1973. Compensating for the deficit was an increase of 35.4% in net services and donations amounting to $1,629. Therefore, the current accounts deficit was $1,188. This was covered by increased net private and official capital inflow, including tourism. The steep rise in imports was attributed to (1) high demand for foreign goods—a reflection of the impressive growth rate of the Greek GNP; (2) high liquidity of the economy; (3) reduced confidence in the drachma; and (4) higher international prices. The Androutsopoulos Government planned to minimize nonessential imports as one step in combatting Greece's perennial balance-of-payments problems.

Principal increases in mineral exports for 1973 were ores and minerals (33%), iron-nickel alloys and nickel (99%), and aluminum and alumina (12%), for a total value of $151.3 million, a 30% increase over the 1972 value for the same commodities.

Recent trends in mineral trade and total commodity trade are shown in the following tabulation:

	Value (million dollars)	
	Mineral commodity trade	Total commodity trade
Exports:		
1970	184.3	642.5
1971	150.6	662.5
1972	193.1	870.9
Imports:		
1970	310.8	1,958.3
1971	330.5	2,098.1
1972	449.3	2,345.8

In 1972 the principal increases in exports of selected mineral commodities occurred in petroleum (79%), manufactured fertilizer (218%), and iron and steel (82%). However, these increases were more than offset by increased imports of petroleum (54%), iron and steel (27%), and nonferrous metallics (44%). As a result, mineral commodity and total commodity trade deficits of $256 million and $1,475 million, respectively, were recorded for 1972.

Table 2.—Greece: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Bauxite and concentrate --thousand tons--	952	1,011	U.S.S.R. 471; Netherlands 166; France 105.
Oxide and hydroxide	217,658	236,666	United States 96,952; Netherlands 56,127; Romania 46,361.
Metal, including alloys:			
Unwrought	87,004	100,978	France 47,061; Italy 37,033; Belgium-Luxembourg 14,611.
Semimanufactures	4,782	7,228	West Germany 2,267; United States 815; France 657.
Chromium, chromite	26,805	17,850	West Germany 11,600; France 3,250; Norway 3,000.
Copper metal, including alloys:			
Scrap	--	450	NA.
Unwrought and semimanufactures	1,250	1,944	France 540; Iran 487; West Germany 322.
Iron and steel:			
Roasted pyrite	104,216	50,422	West Germany 24,267.
Metal:			
Scrap	--	645	Netherlands 368.
Pig iron, ferroalloys, and similar materials	3,662	22,182	West Germany 7,266; Sweden 5,314; United States 3,690.
Steel, primary forms	28,899	45,079	United States 20,654; Turkey 11,400; Syrian Arab Republic 5,998.
Semimanufactures:			
Bars, rods, angles, shapes, and sections	12,752	51,749	Mainly to Arab Republic of Egypt.
Universals, plates, and sheets	78,084	62,064	United States 37,759; Yugoslavia 12,890; West Germany 4,955.
Hoop and strip	503	2,813	Yugoslavia 2,000.
Wire	--	348	NA.
Tubes, pipes, and fittings	r 5,532	15,670	Libya 6,355; Cyprus 3,350; West Germany 2,176.
Lead ore and concentrate	11,790	12,050	All to Italy.
Manganese ore and concentrate	6,847	8,009	France 4,218; West Germany 3,520.
Nickel ore and concentrate	9,300	--	
Silver:			
Waste and sweepings --value--	$97,000	--	
Metal, including alloys --do--	$68,000	$296,000	All to France.
Zinc ore and concentrate	25,820	30,846	Italy 18,686; France 10,600.
Other:			
Ore and concentrate of base metals, n.e.s	142	4,010	NA.
Ash and residue containing nonferrous metals	1,017	2,250	NA.
NONMETALS			
Abrasives, natural, n.e.s	254,567	377,797	Mainly to United States.
Barite and witherite	120,568	79,352	United States 60,527.
Cement	648,969	801,753	Libya 540,020; Algeria 102,005; Yugoslavia 69,069.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	215,450	502,672	West Germany 109,880; Canada 89,572; United States 66,933.
Products	33,218	19,690	Yugoslavia 11,115; Libya 2,696; Cyprus 1,496.
Fertilizer materials, manufactured:			
Nitrogenous	--	16,995	Turkey 10,000; United Kingdom 6,995.
Phosphatic	15,150	10,050	All to Bulgaria.
Other	38,957	108,364	Turkey 31,500; Italy 24,238; Cyprus 16,077.
Lime	9,162	17,135	Mainly to Libya.
Magnesite	288,987	304,007	West Germany 109,395; United States 66,993; Netherlands 27,453.
Stone, sand and gravel	r 35,770	40,250	West Germany 13,016; Italy 12,567; Japan 3,384.
Sulfur:			
Elemental, other than colloidal	3,175	2,273	Mainly to Cyprus.
Sulfuric acid	25,067	49,989	Italy 24,562; Turkey 16,582.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Other nonmetals, n.e.s.:			
Crude	127,906	226,555	United States 60,527; France 50,777; West Germany 46,920.
Slag, dross, and similar waste, not metal bearing	5,702	7,281	Belgium-Luxembourg 869.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	32,224	22,122	Libya 5,330; Israel 5,147; Yugoslavia 4,977.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline ----thousand 42-gallon barrels--	139	45	Italy 18.
Kerosine ----------do----	1,126	2,143	United States 337; Lebanon 292; Switzerland 215.
Distillate fuel oil ----------do----	142	262	Cyprus 121.
Residual fuel oil ----------do----	150	424	Morocco 111; Liberia 93; Bulgaria 46.
Lubricants ----------do----	7	18	Liberia 5.
Other, bituminous mixtures -------do----	4	--	

r Revised. NA Not available.

Table 3.—Greece: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Oxide and hydroxide	1,525	590
Metal, including alloys:		
Scrap	481	709
Unwrought	534	2,943
Semimanufactures	1,377	2,450
Chromium oxide and hydroxide	210	190
Copper metal, including alloys:		
Scrap	182	388
Unwrought	12,884	15,629
Semimanufactures	569	1,078
Iron and steel:		
Ore and concentrate	432,148	426,771
Metal:		
Scrap	14,292	96,404
Pig iron, including cast iron	19,670	17,637
Sponge iron, powder and shot	417	486
Ferroalloys	3,140	6,085
Steel, primary forms	r 191,779	174,525
Semimanufactures:		
Bars, rods, angles, shapes, and sections	189,774	235,286
Universals, plates and sheets	128,656	142,921
Hoop and strip	27,772	62,283
Rails and accessories	7,958	34,275
Wire	12,639	14,561
Tubes, pipes, and fittings	r 23,995	25,022
Castings and forgings, rough	r 1,886	2,088
Lead:		
Ore and concentrate	20,475	20,309
Oxides	1,280	--
Metal, including alloys:		
Unwrought	8,720	19,458
Semimanufactures	154	133
Magnesium metal, including alloys, all forms	154	224
Manganese ore and concentrate	4,031	26,767
Nickel metal, including alloys, all forms	85	248
Platinum-group metals and silver, including alloys:		
Platinum group ----------value, thousands--	$112	$112
Silver ----------do----	$1,260	$2,075
Tin metal, including alloys, all forms ----------long tons--	254	281
Titanium oxides	4,196	4,736
Tungsten metal, including alloys, all forms	1	11
Zinc:		
Oxide	511	547
Metal, including alloys:		
Unwrought	7,436	11,731
Semimanufactures	116	147

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS—Continued		
Other:		
Ores and concentrates of nonferrous base metals, n.e.s	3,052	513
Oxides, hydroxides, and peroxides of metals, n.e.s	70	78
Metals, including alloys, all forms:		
Metalloids	156	175
Alkali, alkaline earth, and rare-earth metals	4,210	5,269
Base metals, including alloys, all forms, n.e.s	38	335
NONMETALS		
Abrasives, natural, n.e.s.:		
Dust and powder of precious and semiprecious stones value, thousands	$268	$492
Grinding and polishing wheels and stones	374	501
Asbestos	16,100	8,929
Boron materials, crude natural borates	1,087	1,106
Cement	1,188	1,034
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	59,556	72,333
Products:		
Refractory (including nonclay bricks)	33,441	22,547
Nonrefractory	4,676	3,697
Feldspar and fluorspar	5,200	6,372
Fertilizer materials:		
Crude:		
Phosphatic	295,780	261,967
Other	151	8,694
Manufactured:		
Nitrogenous	124,403	81,063
Potassic	22,328	24,017
Other, including mixed	2,188	1,875
Ammonia	3,546	17,956
Graphite, natural	318	292
Gypsum and plasters	--	1,470
Magnesite	1,761	1,101
Pigments, mineral, including processed iron oxides	1,310	1,615
Precious and semiprecious stones, except diamond, value, thousands	$98	$153
Pyrite (gross weight)	80,368	130,830
Salt	35,576	45,481
Sodium and potassium compounds, n.e.s	46,406	40,792
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	397	593
Worked	167	953
Dolomite, chiefly refractory grade	727	2,355
Gravel and crushed rock	4,191	--
Sand, excluding metal bearing	73,712	71,273
Sulfur:		
Elemental, all forms	104,467	88,329
Sulfuric acid, oleum	4,964	5,742
Talc, steatite, soapstone, and pyrophyllite	2,967	2,588
Other nonmetals, n.e.s.:		
Slag, dross and similar waste, not metal bearing	1,047	--
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	765	1,302
MINERAL FUELS AND RELATED MATERIALS		
Carbon black	2,950	2,018
Coal and briquets:		
Anthracite and bituminous coal	335,457	465,754
Briquets of coal	8,349	3,905
Coke and semicoke	54,177	62,117
Hydrogen and rare gases	173	181
Petroleum:		
Crude and partly refined, thousand 42-gallon barrels	35,122	50,802
Refinery products:		
Gasoline (including natural), do	787	1,700
Kerosine and jet fuel, do	514	1,138
Distillate fuel oil, do	2,525	4,017
Residual fuel oil, do	6,886	8,012
Lubricants, do	561	649
Other:		
Liquefied petroleum gas, do	75	298
Mineral jelly and wax, do	6	5
Nonlubricating oils, n.e.s, do	9	6
Bitumen and other residues, do	50	245
Bituminous mixtures, n.e.s, do	15	2
Pitch and petroleum coke, do	328	330
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	4,789	7,971

[r] Revised.

COMMODITY REVIEW

METALS

Aluminum.—Production of bauxite in 1973 totaled 2,958,000 tons compared with 2,408,000 tons in 1972. There were eight major companies mining bauxite in 1973, all located in the province of Central Greece, and five of these accounted for most of the country's production. The largest producer was Bauxite Parnasse Mining Co. of Eliopoulos Enterprises (1,500,000 tons of bauxite ore produced in 1973 from mines in the Parnassus-Giona-Oitis Region northwest of Athens). The other principal producers were: Eleusis Bauxite Mines, Inc. of the Scalistiri Mining Group (550,000 tons), producing from deposits in the Eleusis, Megara, and Mandra Areas; Hellenic Bauxite of Distomon, S.A. (300,000 tons), working at Distomon and Arakhova, near Itea; Delphi Bauxite Mines S.A. (200,000 tons) mining at Elaion near Amfissa; and Elikon Bauxite, G. Barlos A.C. (180,000 tons) producing from deposits in the Elikon Mountains, south of Levadia. There are about 100 million tons of proven bauxite reserves in Greece and an estimated 500 million tons of total reserves. Both production and exports have increased over the last few years and although exports are subject to a limit of 15 million tons per year, this figure is not likely to be approached for several years.

The Greek Ministry of National Economy set the 1973 total bauxite export quota at 1,265,000 tons as opposed to 1,275,000 tons for 1972. The quota for European Communities (EC) countries was increased from 420,000 tons in 1972 to 465,000 tons in 1973.

The major development during the year in aluminum was the breakthrough in negotiations between the Greek Government and Aluminum Company of America (Alcoa) for the establishment of a huge new aluminum complex. The production center was to be located at Megara, 25 miles west of Athens and will be built in two stages. The first stage was to include the construction of a 260,000-ton-per-year alumina plant and a 130,000-ton-per-year aluminum smelter. In the second stage, capacities of both the plant and smelter would be doubled. Although the agreement had not been finalized at yearend, all of the major differences were resolved, according to Deputy Premier Nicholas Makarezos. The principal obstacle to completion of the agreement was the issue of power costs. Electric power in Greece is relatively expensive and to be profitable the project required low-cost power. The impasse in negotiations was apparently broken when the Greek Government agreed to subsidize power costs out of its share of the profits. Power for the project will be supplied by a 300,000-kilowatt oil-fired power station due to start up in 1978 as part of the Public Power Corporation's (PPC) 1974–83 development plan.

The first stage of the Megara project was expected to be completed 18 months after signing of the agreement. However, by yearend no signing had taken place and it was uncertain how long the final negotiations would take to resolve minor points. The total cost of the project was expected to be about $350 million; $63 million will be put up by Alcoa and $42 million by the Greek Government; the $245 million balance was expected to be raised through international financing.

Virtually all of the aluminum production of Greece has come from the 150,000-ton-per-year St. Nicholas smelter of Aluminium de Grèce S.A. (ADG). Since Greece consumes only a small fraction of this amount, most of the production from the new complex at Megara will be exported.

Reynolds Metals Co. reportedly reached an agreement with the Greek Government to build a 500,000- to 600,000-ton-per-year alumina plant in Greece. Raw material was to be supplied by Bauxite Parnasse Mining Co., which planned to increase its bauxite output from 2 million to 3 million tons per year. The grade of bauxite ore being mined in 1973 ranged from 57% to 59% alumina, 18% to 22% iron, and more than 4% silica. No construction date for the new project was revealed, but the site selected for the plant reportedly is near the ADG smelter on the northern shore of the Gulf of Corinth, in the village of Distomon.

Bodossakis, the Greek mining and industrial group, and the French firm Sogerem, along with ADG, have formed a new company entitled Mining Company of Greece, S.A. The new firm was expected to be involved with all facets of the mining industry.

The Soviet Union reportedly was nego-

tiating with Greek Government officials in January 1973 for the establishment of a 450,000-ton-per-year alumina plant. Exports of alumina would pay for the plant. After paying off the plant, additional shipments of alumina would be made in exchange for a variety of Soviet goods and technology.

Copper.—The construction of a shaft for exploiting the copper deposits at the Kassandra mines of Hellenic Chemical Products and Fertilizers Co., Ltd. (HCPF) was completed in 1973. Production of 2% copper ore was expected to begin in 1974. Construction of a 200,000-ton-per-year mixed sulfide ore dressing plant at Kassandra was to be completed in 1973. Cost of the project was put at $2.6 million. Included in expansion plans for the industry was a copper pyrite dressing plant with a capacity of 60,000 tons per year to be constructed at the Hermioni mines of HCPF and to be completed early in 1974. Progress was also made on exploitation of the nearby copper deposits (2% Cu) at Olympias.

Iron and Steel.—Sider Hellas Co. of Greece appointed one American and one Greek firm to handle their investment in a plant to produce sponge iron. In support of this operation the company planned to import funds of $43 million to setup an iron ore beneficiation plant at Lavrion. Société Française des Mines, which owns the 67 million ton iron ore deposits, will construct the mining facilities. Of the expected 1.2 million-ton-per-year iron ore capacity, half was to go to the sponge iron plant and the other half was for export. The ore was to be converted into sponge by the use of natural gas instead of coke.

Ground was broken in May 1973 at Almyros, near Volos for a new steelworks to be built by Metallourgiki Halyps S.A. This project was part of the Greek Government's plan to ensure the creation of an integrated iron and steel industry sufficiently developed to supply domestic demand and offer export opportunities. Output from the Almyros works would substitute for imports worth $25 million per year. In addition, 300,000 tons of steel per year will be produced by a new electric furnace shop at the site, in the prefecture of Magnesia. Two electric arc furnaces, rated at 45- to 50-ton capacity per heat, will be installed. As part of the installation, the Schloemann Co. will supply a combination strip and wire rod mill. The 27-stand continuous mill would be made for strip up to 350 millimeters wide and for rounds 5.5 to 12.5 millimeters in diameter. Furnace throughput would be 60 tons per hour.

The Halyvourgia Thessalias Co. of Greece planned to proceed with construction of its Volos mini steelworks. Scheduled to begin operation in June 1974, the new works will have a capacity of 180,000 tons per year. A second phase is also planned in which rolling mills and possibly a shipbreaking yard will be installed. An electric arc furnace will be supplied by Tagliaferri S.p.A. of Italy.

The Greek firm Steelworks of Northern Greece brought a new rolling mill onstream and expanded the operation of its electric melting shop and continuous casting equipment.

Hellenic Steel Co., in conjunction with the Japanese firms Nippon Kokan K.K. and C. Itoh & Co. Ltd., planned to construct a tandem cold strip mill, an electric arc furnace, and a bar mill at Thessaloniki. Technical assistance will be provided by the Japanese. Nippon Kokan reportedly purchased a 29% interest in Hellenic Steel in May 1973. C. Itoh will also be involved in shipping about 400,000 tons of steel per year to Hellenic Steel from a new Midrex direct reduction plant, to be built at Gabes, Tunisia. Planned expansion of Hellenic's facilities costing about $43 million, was to raise the plant's capacity to 1 million tons. To carry out the expansions, a government license was issued for importation of $9 million in new equipment.

The U.S. company Bethlehem Steel Corp. reportedly established an affiliate in Greece, the Bethlehem Greek Mining Co. The activities of the new company were to include mineral exploitation and the establishment of plants for ore processing.

The Greek Government in 1973 reduced import duties on concrete reinforcing steel for public works due to shortages in domestic supply. The shortage had led to some hoarding by speculators.

Manganese.—The largest manganese mines in Greece are located in the Drama area in eastern Macedonia and belong to the Scalistiri Group (mining concerns). Battery-grade material is mined at this site. Total Greek reserves of manganese, including metallurgical grade ore (which is not

mined), are estimated at 2.5 million tons proven and 10 million tons probable.

An agreement was signed on November 8, 1973, for construction of a $17 million, 12,000-ton-per-year plant which will produce electrolytic manganese dioxide for use in dry cell batteries. The plant, a joint venture between Tekkosha Co., Ltd., and Mitsubishi Corporation, both of Japan, is scheduled to begin operation in mid-1975. The plant, which will obtain its ores from the Chalkidiki Peninsula, reportedly will be able to expand capacity to 36,000 tons per year.

Nickel.—A third rotary kiln for the production of iron and nickel was installed at the Larymna plant of Société Minière et Métallurgique de Larymna S.A. (LARCO). LARCO also expanded its open pit mines on the island Euboea and planned increases in production which would bring ore output up to 150,000 tons per year. These deposits (having no arsenic content) contain 1.1% to 1.3% nickel. Laterite ore reserves on Euboea reportedly total more than 200 million tons. The other major nickel mine in Greece, located at Hagios Ioannis, about 10 kilometers from the Larymna works, contained ore grading from 1.0% to 1.6% nickel. Proven ore reserves at this site reportedly contain approximately 35 million tons. At Politika, LARCO also built a 7-mile-long conveyor belt with an ore-carrying capacity of 3 million tons per year, to connect mining, grinding, and shipping areas.

NONMETALS

Asbestos.—The two largest asbestos occurrences in Greece are found in Epirus and in the western part of Macedonia, near Kozani. Asbestos Mining Company of Northern Greece (MABEM), owned 90% by Cerro Corporation of New York and 10% by Hellenic Industrial Development Bank (ETVA), mines ores at these locations grading 3% asbestos. Reserves are estimated at 50 million tons of chrysotile (slip fiber). Under the first phase of an expansion program, construction of a large-scale plant was expected to begin in 1974, and by 1975 capacity was expected to be brought up to about 50,000 tons of asbestos fiber per year. This would require about 1 million tons of ore to be mined each year. Under the second phase, expected to begin in 1978, capacity at the Kozani site would be doubled to 100,000 tons per year. The total cost of the project was estimated at $37 million. Twenty percent of the new plant's output reportedly will be blended with imported material. The balance will be exported, principally to Mediterranean countries. The Greek material will be equal in quality to asbestos imported from the Soviet Union and will therefore result in a considerable savings on imports.

Cement.—Domestic consumption accounted for between 85% and 90% of cement production in 1973. Nevertheless, exports of cement have risen steadily over the last several years. Seven plants, operated by four companies, produced cement. Two more plants were in the planning and construction stages. The largest producer, General Cement Co. Ltd., S.A., operated two factories, one at Drapezona (the Heracles plant) and one at Volos (the Olympus plant), which together produce more than 3 million tons of cement per year. Construction of a third plant at Methana was underway in 1973. This plant was to provide for rising domestic demand and increased exports but construction had to be delayed because of local opposition. Libya, Yugoslavia, Italy, Cyprus, and Malta have been the principal recipients of exports. A new cement-carrying vessel was ordered by General Cement from the Japanese shipyards of Ishikawajima Harima Heavy Industries Co. Ltd., Fukuoka. The 6,500-ton vessel was expected to be ready for delivery in Japan in March 1974.

Titan Cement Co. S.A. was the second largest producer, with three plants, located at Eleusis, Thessaloniki, and Patras. In order to raise capacity by 700,000 tons per year, a new rotary kiln was installed at the Patras plant. Chalkis Cement Co. S.A., and Halyps Cement Co. S.A. are smaller companies but produce significant quantities of cement. Chalkis was the larger of the two companies and was expanding rapidly in 1973. Capacity at its Mikro Vathi plant was recently raised to 1.7 million tons per year. Moreover, the company's third production unit, with a capacity of 1 million tons per year, came onstream in November 1973. A fourth unit, also with a capacity of 1 million tons per year, was planned and was expected to begin production in 1975. The unit's cost was estimated at $33 million. Expansions taking place at Halyps Cement were expected to raise capacity to 900,000 tons per

year. Other less significant developments that took place in the cement industry during 1973 were as follows: World Wide Shipping Company of New York planned to erect a 1 million-ton-per-year plant in Laconia Province, which was expected to be fully operational by the end of 1975 and Halkis Cement Co. S.A. of Athens planned to install a 1-million-ton-per-year unit. This latter expansion project would cost an estimated $20 million and raise total capacity to 2.6 million tons per year. Permission reportedly was granted by the Greek Government in 1973 for an investment of $3.1 million by the Indian Association of Businesses in a new cement producing plant in the Preveza area.

Bentonite.—Reserves of bentonite in Greece are estimated at 11 million tons proven and 17 million tons probable. Production has shown an upward trend since 1956, rising sharply in 1968. With Middle Eastern oilfields and Mediterranean vegetable oil processing industries conveniently nearby, exports have risen steadily to reportedly more than 200,000 tons annually.

The two largest producers of bentonite were expanding their plants on Milos Island. Silver and Baryte Ores Mining Co. (S and B), the largest, held reserves of 40 million tons of bentonite on the island. Its second bentonite plant on Milos was nearing completion at yearend 1973. Also under construction for S and B was a new 300,000-ton-per-year bentonite drying plant (with provision to increase capacity to 600,0000 tons per year). S and B's capacity was about 200,000 tons per year of dried bentonite in 1973 and expansions, at a cost of about $7 million, were expected to double this figure. Canada represented the largest market for S and B's ores.

Mykobar S.A., which also mined deposits on Milos, was going through a comprehensive expansion phase, with investments of $1.2 million. New facilities completed in August 1973 raised capacity by 40,000 tons per year to 100,000 tons per year. With these developments, material that was previously shipped to the neighboring island of Mykonos for processing, could be crushed, screened, and dried on Milos itself. In addition, a new pier was installed on the island and a second bentonite grinding facility reportedly was planned.

Magnesite.—There was much activity in the Greek magnesite industry in 1973. The Scalistiri Group opened a refractory brick plant with an annual capacity of 42,000 tons, at their Mantoudi, Euboea, installation. This type of expansion reflected the continuing policy of the Greek Government for vertical integration of the industry. In all, the Mantoudi operations had a dead-burned magnesite capacity of 280,000 tons per year. With the new refractory brick plant, the Scalistiri Group's activities spanned a complete spectrum of material development from mining and processing of raw materials to manufacture of intermediate products and the fabrication of refractory brick. Most of the manufactured brick will be exported. Officially opened in May 1973, the new brick plant cost an estimated $7 million. Refractory magnesite or chrome bricks, tar-bonded refractory bricks and tar-impregnated bricks could be made at the site. New port facilities, which included a loading bridge with a 1,000-ton-per-hour capacity, were also built for the factory at a cost of $1.7 million.

Macedonian Magnesite and Shipping Corp. (a Scalistiri Group Co.) was expected to complete facilities at Chalkidiki in June 1974 bringing its total capacity up to about 130,000 tons per year. A relatively new firm in the industry was Magnesite Mining Industrial and Trading Co., a joint venture of the Papastratis Group (45%), Bodossakis interests (45%), and the National Investment Bank for Industrial Development (10%). Initial output of this company was expected to be 50,000 tons per year.

General Mining Co., an affiliate of Magnomin, S.A., reportedly planned to establish a dead-burned magnesite plant at Chalkidiki, in which it will invest $8.5 million, in three phases. The first phase, covering the period 1973–74, was to cost $3 million, with the entire financing completed in 1977. This will include mining, ore beneficiation, burning, and loading installations for 60,000 tons of dead-burned and 30,000 tons of caustic calcined magnesite.

It was expected that by 1975 most expansion in Greece will be completed, reportedly raising total dead-burned magnesite capacity to 550,000 tons per year.

Perlite.—With an output of about 233,327 tons per year, Greece is the second largest producer of perlite in the world. The major deposits of high-quality perlite lie on the islands of Milos and Kos. The single major producer is S and B of the Eliopoulos Group. Output of the company's exten-

sive mining operations on the island of Milos was expected to reach 350,000 tons per year by 1975. This would nearly double Greece's perlite capacity. Another principal producer was N. Buras and Co. The company expanded mine and plant facilities in 1973, raising total investments by the company to about $200,000.

Pyrites.—The largest deposit of iron pyrites in Greece is found at Kassandra in Chalkidiki and is worked by HCPF. The Kassandra operations produce iron, zinc, and lead sulfide concentrates and will in the near future include a chalcopyrite flotation plant. A completely new complex sulfide zone at nearby Olympias, where HCPF hopes to be mining in 1975, was also to be exploited for the first time. In support of these new operations, a second new flotation plant will be built. In the Kassandra area, investments in 1973 totaled about $4.5 million, and output of pyrites reached about 180,000 tons. The new facilities were expected to raise pyrites production by an estimated 100,000 tons per year.

Another significant deposit, also mined by HCPF, is located at Hermioni on the eastern side of the Peloponnese Mountains and consists primarily of cupreous sulfides. Although major expansions, such as the installation of a 60,000-ton-per-year flotation plant for copper sulfide (due onstream in 1974) were taking place, the development was not as comprehensive as in the case of the Kassandra deposits. Reserves at Hermioni were reported as 700,000 tons and production in 1973 was about 50,000 tons of cupreous pyrites. After roasting the pyrites, about 30,000 tons of cupreous residues were produced annually, most of which were exported to West Germany for copper extraction.

No exports of crude pyrites have been recorded for several years, as their price made it uncompetitive on the international market. For this reason output has intentionally been restricted.

MINERAL FUELS

Coal.—*Lignite.*—Further development of the lignite fields at Megalopolis and Ptolemaís continued. At the Horemi mine in the Megalopolis region, development of the 360 million-ton open cast lignite field proceeded. The objective was to increase annual production from approximately 4.4 million tons in 1973 to 9 million tons in 1975. By that time a third lignite-fired power station was expected to be in operation in the region. Installation of new facilities was nearing completion at yearend at the Kardia mines, in the Ptolemaís Region and a study for the development of the 500 million-ton South Field was underway. Two power units (A′ and B′), which were begun in 1972, were expected to be completed in 1974 and 1975, respectively. Each unit will consume 4 million tons of lignite per year. When the Ptolemaís complex is completed in 1981, it is forecast that 28 million tons of lignite will be consumed annually. Total reserves in the Ptolemaís Region were estimated at 2 billion tons.

Geothermal Energy.—The Greek effort at exploiting geothermal resources met with moderate success after nearly 2 years of exploration. The total budget for the effort was only about $84,000, of which $35,000 went for electrical resistivity surveys, covering 100 square kilometers of territory. Seven areas were determined to appear favorable for exploration. The island of Milos appeared to hold the most promise, but the following areas were also considered favorable: The islands of Nysiros and Lesbos; the Methana Peninsula: the Sousaki Region; Thermopylai; and Northern Euboea. The only reported success was a hole 72 meters deep which intersected steam at a depth of 35 meters. The Greek Government was interested in utilization of geothermal resources primarily for the production of electricity, which has been growing at the rate of about 14% per year for the last 5 years. There is an abundance of hot spring localities in Greece, which appear to be controlled by a series of North-South and East-West trending faults. However, the best prospects for developing geothermal energy for the production of electricity reportedly were the volcanic islands in the Aegean Sea.

Nuclear.—Greek plans called for the establishment of 14 nuclear power generating plants, totaling 10,800 megawatts. The first six would be 600 megawatts each. The first plant would not begin operation until 1982. The PPC was in the process at yearend 1973 of concluding a consultant contract for the proposed plant. In conjunction with these plans, the Greek Government with United Nations assistance was continuing exploration for uranium in the most promising areas in Eastern Macedonia and Thrace.

Peat.—An agreement between the Soviet Union and Greece concerning the exploitation of peat deposits at Philippi and construction of a 375-megawatt peat-burning power station in Greece was signed in mid-April 1973. Building of the steam generated electric power station as well as construction of a mine, were to be undertaken. The PPC and ENERGO-MACHEXPORT, the official Soviet organization, were the signatories. Cost of construction, which includes costs for machinery, installations, and buildings, and other costs, was estimated at about $89 million, plus an expenditure for expropriation of land. About 47% of total expenditures for Soviet construction will be met through the exchange of tobacco and other Greek agricultural products, and about 43% will be paid in Greek currency. The balance had already been paid. The proposed expropriation of land for the project resulted in much protest from the farmers in the Philippi area. At yearend a review of the situation was still underway. Energy requirements in the Philippi area for the next 25 years would be met by the powerplant. The Philippi peat reserves were estimated at 4 billion cubic meters, of which only about 8% will be utilized for electric energy over the next 25 years. About 1,500 persons will be employed over the 4-year construction period, and about 820 persons will be working permanently when the powerplant and mine are in operation. The PPC administrator, P. Dimopoulos, expected that the three steam generating units, each of 125,000-kilowatt capacity, would be placed in operation some time in 1977. Three million tons of dried peat, with an average heating value of 1,900 calories and final moisture content of about 35% will be needed each year when operation begins. The average moisture content in the peat deposit in situ is about 84% and drying of the peat is accomplished in open air during a 48-hour period. The average yearly production of electrical energy from the station will amount to about 2.4 billion kilowatt hours.

Petroleum and Natural Gas.—Exploration for oil and gas continued in the Aegean Sea off the island of Thassos. A group comprised of five companies was carrying out the work. Colorado Oil Corp. was the operator through the first three exploratory wells and Oceanic Exploration Co. was the operator for all subsequent wells. The four other companies, holding interests of 12.5% each, were Coastal States Gas Producing Co., White Shield Exploration Corp., Fluor Corp. and Fundamental Oil Corp. Concession terms, agreed to in 1969, called for an exploration investment of $5 million within the first 5 years of the permit. Initial success in the discovery of crude oil and natural gas was reported for two wildcat wells, and exploration was continuing at yearend 1973. A decision was expected in July 1974 as to whether the hydrocarbon discovery could be economically exploited. A total of 7 agreements were in effect as of August 1973, involving a total investment of about $35 million. Other firms carrying on exploration projects were Anschutz Overseas Corp. of Denver and An-Car Oil Co. Inc. of Boston.

A major oil refinery, with a capacity of 30,000 barrels per day, was planned for the Patachi area. The $70 million installation would make Hellenic Oil Refineries, S.A. (STRAN), one of the major petroleum refiners in the eastern Mediterranean region. The refinery was to be built by Foster Wheeler Inc. of the United States.

A new refinery, owned by Petro Hellas, began operations in April 1973. The refinery, located on the Gulf of Eleusis, was capable of processing 5.5 million tons of crude petroleum yearly. Reservoirs at the refinery had a capacity of 3.63 million cubic meters, compared with a total storage capacity of about 2.1 million cubic meters in the rest of Greece thus making this the largest refinery in the country. Meanwhile, a permit for the construction of a proposed refinery in the Pakhi-Megara area was strongly opposed by residents of the area on the basis of environmental considerations. It was undecided at yearend where the refinery would be located.

There was no natural gas service in Greece in 1973, either through local production or pipelines from neighboring countries. Industrial energy needs were all met by local supplies of lignite and peat and by fuel oil from either (1) Esso's Thessaloniki refinery; (2) the state-owned Aspropygos refinery near Athens; (3) or the new Petro-Hellas refinery on the Gulf of Eleusis. The recent discovery of natural gas near the island of Thassos could therefore provide a more easily obtainable source of energy. About 10 million cubic feet per day of natural gas were tapped from the first successful well.

The Mineral Industry of Hungary

By Joseph B. Huvos [1]

Bauxite continued to be Hungary's most important mineral product in 1973 from the viewpoint of world standards, with output representing about 4% of the world's total. Mineral fuels and iron and steel were next in importance although their output levels were not significant on a world scale. Large-scale imports were needed to satisfy the expanding demand for many mineral commodities.

In 1973 Hungary's total gross national product (GNP) was estimated at 355 billion to 360 billion forints,[2] an increase of 9.1% to 10.7% over that of 1972.[3]

Investments in 1973 totaled 106.4 billion forints, 3% above last year's level, but short of the 113 billion plan target for the year.

In 1973, planned production and plan fulfillment of the mineral and related industries were as follows, in percent of 1972 figures:

Industry sector	Plan	Fullfillment
Mining	105.0	106.6
Energy industry	108.1	109.0
Metallurgy	105.3	107.0
Chemical industry	110.1	110.9
Building materials	104.3	106.7
Average all industries	105.5–106.0	107.2

Some of the more important mineral industry developments were the commissioning of the Friendship II pipeline, part of the Danube petroleum enterprises refinery, dedication of the Visonta Gagarin thermal powerplant, and commissioning of two continuous-casting plants, one at the Danube iron works and the other at the Ózd metallurgical works. Work continued on several plants under construction, such as the Hejöcsaba and Bélapátfalva cement plants, the hot strip mill at the Danube iron works, a stainless steel rolling mill at the Diósygör iron and steel works, a wire processing plant at the Salgótarján metallurgical combine, the 1,000-ton-per-day ammonia plant at the Pét nitrogen works, the Algyö natural gas processing plant, and the Paks nuclear powerplant.

PRODUCTION

Total production of coal, Hungary's most important domestic mineral commodity, increased 3.6% in 1973. The decline in output of brown and bituminous coal was offset by increased lignite production. This trend was in accordance with the policy of rationalizing the coal mining industry and increasing the use of indigenous lignite resources for the purpose of generating power.

Production of bauxite, Hungary's most important export mineral, increased substantially. Nitrogenous fertilizer production increased as did the production of phosphatic fertilizer. Iron ore production decreased while production of pig iron and crude steel increased slightly. Cement production increased substantially while production of other building materials decreased. Crude petroleum production showed a slight gain.

[1] Foreign mineral specialist, Division of Fossil Fuels—Mineral Supply.

[2] Values have not been converted from Hungarian currency units forints (fts) to U.S. dollars owing to the wide variation between the official exchange rate (fts 11.78=US$1.00) and the value actually used for some transactions.

[3] Népszabadság (Budapest). V. 32, No. 28, Feb. 3, 1974, p. 1.

Table 1.—Hungary: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Aluminum:			
Bauxite ---- thousand tons	2,090	2,358	2,600
Alumina ---- do	467	520	655
Metal, primary	67,037	68,183	67,885
Copper:			
Mine output, metal content [e]	1,200	1,200	1,200
Metal: [e]			
Smelter, primary	1,200	1,200	1,200
Refined, including secondary	12,000	17,000	17,000
Gold, mine output [e] ---- troy ounces	[r] 2,829	[r] 3,000	3,000
Iron and steel:			
Iron ore ---- thousand tons	687	695	681
Pig iron:			
Pig iron for steel ---- do	1,890	1,964	2,002
Pig iron for foundries ---- do	80	80	86
Total ---- do	1,970	2,044	2,088
Ferroalloys ---- do	14	26	NA
Crude steel ---- do	3,111	3,273	3,332
Steel semimanufactures, rolled only ---- do	2,063	2,220	2,280
Lead: [e]			
Mine output, metal content	1,735	2,368	2,500
Metal, refined, secondary	720	457	500
Manganese ore [2] ---- thousand tons	227	188	188
Silver [e] ---- thousand troy ounces	6	42	64
Zinc:			
Mine output, metal content [e]	4,800	4,800	4,800
Smelter, secondary	NA	733	NA
NONMETALS			
Cement, hydraulic ---- thousand tons	2,712	2,969	3,405
Clays:			
Bentonite ---- do	71	79	72
Kaolin, crude and washed ---- do	65	67	76
Fertilizer materials, manufactured:			
Nitrogenous:			
Gross weight ---- do	1,841	1,825	1,969
Nitrogen content ---- do	377	374	404
Phosphatic:			
Gross weight ---- do	922	951	1,002
Phosphorus pentoxide content ---- do	174	181	190
Lime, calcined ---- do	610	637	669
Perlite	40	85	96
Pyrite: [e]			
Gross weight	6,500	7,000	7,000
Sulfur content	2,800	2,800	2,800
Refractory materials, n.e.s.:			
Chamotte products ---- thousand tons	179	169	NA
Chrome magnesite products ---- do	55	45	NA
Sand and gravel:			
Gravel ---- thousand cubic meters	9,983	10,207	[e] 10,200
Sand, common ---- do	360	360	[e] 360
Sand, moulding ---- thousand tons	603	607	NA
Stone:			
Dimension, all types ---- do	3	4	NA
Other:			
Dolomite ---- do	819	805	[e] 805
Limestone ---- do	5,754	6,186	[e] 6,500
Quartzite ---- do	29	32	[e] 32
Sulfur:			
Elemental, byproduct	3,370	5,823	[e] 8,000
Sulfuric acid ---- thousand tons	468	566	648
Talc	16,000	[e] 16,000	[e] 16,000
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [e]	4,200	4,200	4,200
Coal:			
Bituminous ---- thousand tons	3,941	3,671	3,410
Brown ---- do	17,757	15,534	15,463
Lignite ---- do	5,726	6,636	7,908
Total ---- do	27,424	25,841	26,781
Coke:			
Coke oven coke ---- do	782	777	603
Gas Coke ---- do	378	363	[e] 360
Total ---- do	1,160	1,140	[e] 963
Fuel briquets ---- do	1,308	1,080	[e] 1,100

See footnotes at end of table.

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

Commodity [1]	1971	1972	1973 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued			
Gas:			
Manufactured ____ million cubic feet ____	[r] 24,266	24,508	[e] 24,500
Natural, marketed ____ do ____	131,123	144,295	169,968
Petroleum:			
Crude:			
As reported ____ thousand tons __	1,955	1,977	1,989
Converted ____ thousand 42-gallon barrels __	14,917	15,085	15,176
Refinery products: [3]			
Gasoline, including naphtha ____ do ____	8,874	10,319	10,795
Kerosine ____ do ____	31	4	[e] 4
Distillate fuel oil ____ do ____	16,337	18,367	20,560
Residual fuel oil ____ do ____	15,611	18,541	19,214
Lubricants ____ do ____	1,267	1,204	[e] 1,200
Liquefied petroleum gas [e] ____ do ____	740	740	750
Asphalt and bitumen ____ do ____	3,218	2,763	[e] 2,800
Paraffin and petroleum ____ do ____	259	275	[e] 280
Total ____ do ____	46,337	52,213	[e] 55,603

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] In addition to the commodities listed, gypsum and other crude construction materials, such as common clay, as well as natural gas liquids are produced but available information is inadequate to make reliable estimates of output levels.
[2] Ore contains 31% to 33% manganese.
[3] Excludes refinery fuel and losses.

TRADE

In 1972, the reference year for trade tables in this chapter, the pattern for Hungary's foreign trade in mineral commodities did not change substantially. Exports of alumina, aluminum, and various semimanufactured products were generally higher than those in 1971. The country continued to import most of its mineral requirements in steadily increasing quantities. Imports consisted mainly of nonferrous metals, iron ore, phosphates, potassium salts, rock salt, sulfur, high-rank coal, coke, and crude oil.

Hungary's total commodity trade (exports and imports) was valued at 69.7 billion devisa forints,[4] an increase at 8.1% over that of 1971. The total trade balance for 1972 had a surplus of 1.5 billion devisa forints. Hungary's major trading partners in 1972 were the U.S.S.R. and other East European countries, as shown in the following tabulation, in million devisa forints and percent of Hungary's total trade:[5]

Country	Exports Million divisa forints	Percent of total	Imports Million divisa forints	Percent of total
U.S.S.R	12,838.9	36.08	11,821.3	34.67
Germany, East	3,480.5	9.78	3,599.5	10.56
Czechoslovakia	2,955.2	8.30	2,908.8	8.53
Germany, West	2,560.3	7.20	1,954.9	5.73
Poland	2,524.7	7.10	1,788.7	5.25
Other	11,223.7	31.54	12,020.0	35.26
Total	35,583.3	100.00	34,093.2	100.00

In 1972, Hungary's trade in mineral related products in million devisa forints, follows:

Commodity	Exports	Imports
Fuels and electric energy __	2,740.3	378.9
Mining products ____	758.2	123.7
Metallurgical raw materials _	2,261.8	1,308.5
Chemical industry raw materials ____	1,317.9	261.1

[4] Devisa forints are values converted from other currencies to forints at the official Hungarian Exchange rate.
[5] Central Office for Statistics (Budapest). Statistical Yearbook, 1972. 1973 p. 310.

Table 2.—Hungary: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971 [1]	1972 [2]	Principal destinations, 1972 [3]
METALS			
Aluminum: [4]			
Bauxite ____ thousand tons	700	662	Poland 109.
Oxide and hydroxide	423,000	485,000	U.S.S.R. 244,000; Poland 142,182.
Metal and alloys:			
Scrap	r 16,367	20,551	West Germany 6,996; Italy 3,888.
Unwrought	62,514	74,695	NA.
Semimanufactures	12,486	16,600	Poland 3,222; Bulgaria 1,983.
Chromium oxide and hydroxide	150	503	Italy 373; Yugoslavia 130.
Copper metal and alloys:			
Scrap	1,767	995	West Germany 853; Belgium-Luxembourg 140.
Unwrought and semimanufactures	r 3,349	5,324	West Germany 2,783; Austria 1,482; Belgium-Luxembourg 848.
Iron and steel: [5]			
Scrap ____ thousand tons	26	130	Italy 64; Yugoslavia 38.
Pig iron and ferroalloys ____ do	133	162	Italy 44; Austria 21; Sweden 16.
Steel, primary forms ____ do	237	208	Yugoslavia 48; Austria 39; India 37.
Semimanufactures ____ do	721	905	Poland 109; Italy 92; West Germany 84.
Lead:			
Ore and concentrate	1,160	1,310	All to Belgium-Luxembourg.
Metal and alloys, all forms	(6)	1,670	Denmark 1,323; West Germany 347.
Manganese ore and concentrate	19,304	7,376	All to West Germany.
Nickel metal and alloys, all forms	511	892	Netherlands 404; West Germany 313.
Platinum-group metals and silver:			
Waste and sweepings value, thousands	$1,197	$1,164	All to West Germany.
Metal, including alloys, all forms do	--	$145	All to Netherlands.
Tin metal, including alloys long tons	24	--	
Zinc ore and concentrate [7]	6,652	5,643	All to Poland.
Other:			
Ash and residues containing unspecified nonferrous metals	15,939	14,081	Belgium-Luxembourg 4,855; Austria 3,616; Italy 3,524.
Metals, including alloys, all forms:			
Metalloids	235	--	
Base metals, including alloys, all forms, n.e.s	1	1	Mainly to Belgium-Luxembourg.
NONMETALS			
Cement, hydraulic [4]	17,000	26,000	NA.
Clays and products:			
Crude, bentonite [4]	25,118	25,422	NA.
Products:			
Refractory (including nonclay brick) [4]	27,044	25,753	Italy 2,173.
Nonrefractory	735	728	All to Yugoslavia.
Diamond, gem and industrial value, thousands	$332	$761	All to Belgium-Luxembourg.
Diatomite and related materials	1,769	--	
Fertilizer materials, manufactured, all types [4]	130,000	210,000	West Germany 37,373; Yugoslavia 11,042.
Pyrite, unroasted	3,998	--	
Stone, sand and gravel:			
Dolomite ____ value, thousands	$32	--	
Gravel and crushed rock	139,076	80,576	All to Yugoslavia.
Limestone	10,079	--	
Quartz and quartzite	8,390	4,938	All to Yugoslavia.
Sand, excluding metal bearing	27,145	26,705	Do.
Sulfur, elemental	r 223	--	
Other:			
Crude	22,666	27,880	West Germany 19,573; Austria 5,730.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	666	760	All to Austria.
MINERAL FUELS AND RELATED MATERIALS			
Coal, brown [4]	104,936	76,924	NA.
Coke from bituminous coal [4]	--	58,418	
Peat and briquets	1,050	--	

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971 [1]	1972 [2]	Principal destinations, 1972 [3]
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	657	182	Austria 152; Yugoslavia 30.
Refinery products: [8]			
Gasoline [4] do	1,964	2,074	NA.
Kerosine [4] do	140	132	
Distillate fuel oil [4] do	560	642	
Residual fuel oil [4] do	87	1,385	
Lubricants do	r 171	158	
Other:			
Mineral jelly and wax [4] do	r 71	111	NA.
Nonlubricating oils, n.e.s. do	2	3	All to Switzerland.
Bitumen [4] do	73	309	NA.
Crude chemicals from coal, oil, or gas distillation value, thousands	$35	$138	All to Yugoslavia.

r Revised. NA Not available.

[1] Compiled from 1971 edition of Supplement to the World Trade Annual, v. 1 (Eastern Europe), Walker and Company, New York, 1974 (prepared by the Statistical Office of the United Nations), unless otherwise noted. These data represent imports from Hungary as reported by selected trading partner countries.

[2] Compiled from United Nations Statistical Office. World Trade Annual, 1972 ed. vs. 1, 2, and 3, 1974, unless otherwise noted.

[3] Detail represents imports from Hungary as reported by selected trading partner countries.

[4] Official export statistics of Hungary.

[5] United Nations Economic Commission for Europe. Annual Bulletin of Steel Statistics for Europe. V. 1, 1973, New York, 1974.

[6] Revised to none.

[7] Official imports statistics of Poland.

[8] In addition to information given on destinations by individual product, Poland reportedly received approximately 966,000 barrels in 1971 and 938,000 barrels in 1972 (distribution by product not reported).

Table 3.—Hungary: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971 [1]	1972 [2]	Principal sources, 1972 [3]
METALS			
Aluminum:			
Oxide and hydroxide	54,190	39,628	All from United States.
Metal, including alloys, all forms [4]	123,778	126,734	U.S.S.R. 91,000.
Chromite [5]	21,000	17,000	All from U.S.S.R.
Cobalt oxides and hydroxides	6	--	
Copper: [4]			
Copper sulfate	3,970	4,346	Yugoslavia 1,303; West Germany 813.
Metal, including alloys, all forms	17,905	31,771	U.S.S.R. 29,200.
Iron and steel:			
Iron ore [4] thousand tons	3,156	3,526	Mainly from U.S.S.R.
Pig iron, ferroalloys and similar materials [4] do	r 234	228	Do.
Steel, primary forms [6] do	267	357	U.S.S.R. 142; Poland 24.
Semimanufactures [6] do	757	761	U.S.S.R. 436.
Lead:			
Oxides	1,536	2,321	Austria 1,448; France 727.
Metal, including alloys, all forms [4]	14,875	11,208	U.S.S.R. 9,700.
Magnesium metal, including alloys, all forms	458	401	All from U.S.S.R.
Molybdenum metal, including alloys, all forms	13	10	All from Austria.
Nickel metal, including alloys, all forms	r 542	339	Canada 193; West Germany 139.
Platinum-group metals, including alloys value thousands	$1,158	$915	West Germany $842.
Silver metal, including alloys do	$1,292	$69	All from West Germany.
Tin metal, including alloys [4] long tons	r 1,553	1,128	United Kingdom 661; Denmark 160.
Titanium oxides	2,931	3,052	Italy 2,786.
Tungsten ore and concentrate	20	--	
Zinc:			
Oxide	330	941	Yugoslavia 775; United Kingdom 166.
Metal, all forms [4]	22,957	21,402	U.S.S.R. 7,422; Poland 4,515.
Other:			
Ores and concentrates, n.e.s. [4] [7]	60,365	22,116	NA.

See footnotes at end of table.

Table 3.—Hungary: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971 [1]	1972 [2]	Principal sources, 1972 [3]
METALS—Continued			
Other—Continued			
Oxides, hydroxides, peroxides of metals, n.e.s	9	--	
Metals, including alloys:			
Metalloids, n.e.s	130	316	Mainly from Yugoslavia.
Base metals, n.e.s	71	79	France 41; Belgium-Luxembourg 36.
NONMETALS			
Abrasives, natural, n.e.s., grinding and polishing wheels and stones	656	857	Austria 300; Yugoslavia 169; West Germany 135.
Asbestos [4]	r 20,198	19,780	U.S.S.R. 16,800.
Barite and witherite	17,448	12,903	Yugoslavia 11,403.
Cement, hydraulic [4] thousand tons	1,478	1,182	U.S.S.R. 371; Romania 140; Austria 113; Italy 87.
Chalk	2,047	--	
Clays and clay products: [4]			
Fire	63,833	75,427	NA.
Kaolin	r 19,244	23,632	NA.
Crude, n.e.s	55,795	61,550	NA.
Products, refractory	r 17,914	22,346	U.S.S.R. 8,104; Italy 5,163; Austria 3,002.
Diamond, gem and industrial value, thousands	$472	$718	All from Belgium-Luxembourg.
Diatomite and other infusorial earth	626	720	All from Iceland.
Feldspar and fluorspar	7,020	3,621	All from Yugoslavia.
Fertilizer materials: [4]			
Crude, phosphatic thousand tons	638	504	U.S.S.R. 398.
Manufactured:			
Nitrogenous do	253	366	U.S.S.R. 218.
Phosphatic do	308	390	U.S.S.R. 148; Yugoslavia 45.
Potassic do	739	792	NA.
Mixed do	180	120	Yugoslavia 88.
Fluorspar and cryolite [5]	1,039	969	All from U.S.S.R.
Graphite, natural	125	180	All from West Germany.
Gypsum, calcined [4]	43,232	46,799	NA.
Lime	9,390	--	
Magnesite, calcined [4]	91,356	77,749	Austria 9,874.
Mica, worked	19	26	All from Switzerland.
Pigments, mineral, iron oxides and hydroxides	2,085	1,592	All from West Germany.
Precious and semiprecious stones, except diamond value, thousands	$215	$137	West Germany $74; Austria $63.
Pyrite, gross weight [4] thousand tons	135	87	All from U.S.S.R.
Salt [4] do	r 413	387	Romania 265; U.S.S.R. 74.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	240	1,378	All from Yugoslavia.
Worked	77	--	
Quartz and quartzite value, thousands	$33	$104	All from Netherlands.
Sand, industrial [4]	57,067	82,141	NA.
Sodium compounds:			
Caustic soda	r 63,165	117,087	West Germany 67,298; Romania 30,400.
Soda ash	54,114	58,710	Romania 46,000; Bulgaria 12,710.
Sulfur: [4]			
Elemental thousand tons	110	149	U.S.S.R. 81; Poland 68.
Sulfuric acid	53,637	11,330	Mainly from U.S.S.R.
Talc and natural steatite	2,282	--	
Other nonmetals, n.e.s.:			
Crude, other than meerschaum	862	1,009	All from West Germany.
Oxides and hydroxides of magnesium, strontium, barium	273	173	All from France.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	99,244	12,060	Italy 4,914; Greece 3,254; Yugoslavia 2,092.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black [4]	r 13,622	12,743	U.S.S.R. 8,938; Romania 2,600.
Coal, anthracite and bituminous [4] thousand tons	1,911	1,660	U.S.S.R. 338.
Coal briquets [4] do	532	441	NA.
Coke, all types [4] do	1,307	1,228	U.S.S.R. 629.
Gas, natural [4] million cubic feet	r 7,310	7,028	All from Romania.

See footnotes at end of table.

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

Commodity	1971 [1]	1972 [2]	Principal sources, 1972 [3]
MINERAL FUELS AND RELATED MATERIALS—Continued			
Hydrogen, helium, rare gases value, thousands	$61	$154	All from France.
Petroleum:			
Crude [4] thousand 42-gallon barrels	r 35,956	44,578	Mainly from U.S.S.R.
Refinery products:			
Gasoline [4] do	r 1,270	1,117	NA.
Kerosine [4] do	938	884	
Distillate fuel oil [4] do	1,835	2,335	
Residual fuel oil [4] do	1,485	486	
Lubricants [4] do	96	98	Austria 44; Netherlands 13.
Other:			
Mineral jelly and wax do	3	--	
Nonlubricating oils, n.e.s do	8	8	Netherlands 4; Austria 3.
Bitumen and other residues do	35	--	
Bituminous mixtures, n.e.s do	3	2	All from West Germany.
Crude chemicals from coal, petroleum, or gas distillation	r 17,629	30,319	Austria 14,581; U.S.S.R. 14,150.

r Revised. NA Not available.

[1] Compiled from 1971 edition of Supplement to the World Trade Annual, v. 1 (Eastern Europe). Walker and Company, New York, 1974 (prepared by the Statistical Office of the United Nations), unless otherwise noted. These data represent exports to Hungary as reported by selected trading partner countries.

[2] Compiled from United Nations Statistical Office. World Trade Annual, 1972 ed. vs. 1, 2, and 3, 1974, unless otherwise noted.

[3] Data represent exports to Hungary as reported by selected trading partner countries.

[4] Official import statistics of Hungary.

[5] Official export statistics of U.S.S.R.

[6] United Nations Economic Commission for Europe. Annual Bulletin of Steel Statistics for Europe. V. 1, 1973. New York, 1974.

[7] Figures may duplicate data on chromite ore from export statistics of trading partner countries presented elsewhere in this table.

COMMODITY REVIEW

METALS

Aluminum.—Hungary operated three primary reduction plants with a total capacity as of January 1, 1974, of 70,000 tons. Output of primary metal was 67,885 tons in 1973, a 0.4% decrease from that in 1972. Previously there were plans to increase production to 90,000 tons,[6] but these goals now have been apparently abandoned.

At present Hungary's aluminum supply comes from the Ajka, Tatabánya, and Inota reduction plants, with substantial amounts imported from the Volgograd reduction plant in the U.S.S.R., which is supplied with Hungarian alumina on a continuing basis.[7]

The aluminum supply position in 1973 in thousand tons follows:

Production of primary aluminum	67,000
Production of secondary aluminum	e 7,000
Imports of primary aluminum	e 90,000
Exports of primary aluminum	86,256
Apparent consumption	78,629

e Estimate.

Hungary operated four alumina plants—Ajka, Inota, Almásfüzitö, and Moson-Magyaróvár—with a total capacity of 700,000 tons as of January 1, 1974. Output of alumina was 655,000 tons in 1973, a 26% increase over that of 1972. This was due to the commissioning of new plant capacity at Ajka. The alumina supply position in 1973 in thousand tons follows:

Production	655
Imports	--
Exports	604
Apparent consumption	51

Hungary's bauxite supply comes from the following mines in Transdanubia: Darvastó, Izamajor, Halimba Kislöd, Gánt, and Kincsesbánya.[8]

[6] Dobos, G. Situation and Trends in Hungary's Aluminum Industry. Metal. Soc. of AIME, New York, Paper No. A69-4, 1973, p. 6.

[7] Rabi, B. (Hungarian-Soviet Alumina-Aluminum Agreement.) Bányászati és Kohászati Lapok-Kohászat (Budapest), v. 106, No. 3, 1973, p. 86.

[8] Szönyey, B. (Dewatering of the Nyirád Bauxite mines.) Bányászati és Kohászati Lapok-Bányászat (Budapest), v. 106, No. 4, 1973, p. 247.

Bauxite production was 2.6 million tons in 1973, an increase of 10.3% over that of 1972. This makes Hungary the eighth largest producer of bauxite in the world, accounting for about 4% of world output. Bauxite production was scheduled to reach 3 million tons per year by 1975, the end of the current 5-year plan (1971–75). According to the development program approved by the Hungarian Government in its 1970 resolution for the current 5-year plan (1971–75), development of Hungary's aluminum industry has passed the stage of large-scale expansion of its raw materials base. The quality of Hungarian bauxite precludes further expansion of mining operations. Individual bauxite deposits become increasingly smaller, are at greater depth, and are below ground water levels. Quality is average or less than average by international standards, with silica content up to 7% to 8%.[9]

Bauxite is the only nonferrous metal ore that could be exported from Hungary in significant quantities. In 1973, Hungary exported 604,000 tons of bauxite, of which 270,000 tons were shipped to Czechoslovakia, 192,000 tons to East Germany, 112,574 tons to Poland, and 9,940 to West Germany.

Europe's largest bauxite mine, the Halimba No. 3, north of Lake Balaton was commissioned in September, after an 8-year, 750-million-forint development expenditure. In 1974 production is scheduled to reach 600,000 tons.[10]

Significant high-quality bauxite deposits underlying coal were found near Tatabánya in the Nagyegyháza, Csordakút, and Mány Basins.[11]

Hungarian alumina technology was exported to other countries. Trial runs have started at the Tulcea (Romania) alumina plant. The plant was designed, engineered, and equipped by Aluterv, of the Hungarian aluminum industry designing institute, on the basis of 1970 and 1972 contracts. Romanian personnel was trained in Hungarian plants.[12]

Alumina plants built in Yugoslavia by Aluterv and due to be commissioned in 1976 are the 300,000-ton-per-year, $42 million plant in Obrovac and the 600,000-ton-per-year plant at Vlasenica.[13]

Copper.—Hungary's primary copper output was at insignificant levels. The only Hungarian production is a copper concentrate from a complex sulfide lead-zinc ore mined at Gyöngyösoroszi. After the shutdown of the Recsk copper mine, fire refining takes place at the Metallo-Chemia Vegyi és Kohómüvek in Nagytétény, while electrolytic refining is performed at the Csepel iron and steel works in Csepel. Copper refined in this plant is mostly of secondary origin.

A new complex, nonferrous metal deposit with commercial copper content was said to be developed at Rudabánya, not far from existing iron ore workings.[14]

Iron and Steel.—With a production of 3.3 million tons of crude steel in 1973, the steel industry is the most important branch of Hungary's metal industries. Output of pig iron rose by 2.2% over that of 1972; steel increased by 1.8%; steel semimanufactures (rolled products only) increased 2.7%. Moderate production of steel products could not satisfy demand. Therefore, large quantities had to be imported, mainly from East Europe and the U.S.S.R.

Hungary produced some limonitic and carbonaceous iron ore from its only existing mine located at Rudabánya. Production has been relatively stable in recent years but decreased 2% during 1973. Domestic ore supplies only 16% of Hungary's iron ore demand, the rest is imported, mainly from the Soviet Union's Krivoy Rog Area. Imports average about 3.2 million tons per year.

In 1973 construction continued on several new iron and steel plants. The No. 1 unit of a new, continuous-casting plant was commissioned at the Danube iron works. The cost was more than 1 billion forints for the two-unit, 800,000-ton-per-year plant. In its first stage the recently inaugurated plant has a 400,000-ton-per-

[9] Zámbó, J. (Problems in Aluminum Industry.) Magyar Tudomány (Budapest), No. 2, February 1973, pp. 96–99.
[10] Népszabadság (Budapest). (Halimba No. 3.) V. 31, No. 206, Sept. 4, 1973, p. 1.
[11] Népszabadság (Budapest). V. 32, No. 38, Feb. 15, 1974, p. 9.
[12] Bányászati és Kohászati Lapok-Kohászat (Budapest). (Technical and Economics News.) V. 106, No. 12, 1973, p. 570.
[13] Engineering and Mining Journal. String of Alumina Plants. V. 174, No. 9, September 1973, p. 277.
[14] Népszabadság (Budapest). (Copper Mine Exploited.) V. 31, No. 189, Aug. 8, 1973, p. 8.

year capacity.[15] The plant was designed by the Soviet Union's Gipromez Institute.[16]

Another continuous casting plant was commissioned at the Ózd metallurgical works, which is now in its first 325,000-ton-per-year stage. The second stage will comprise a new wire mill which according to plans should be in operation by 1975.[17] Plant design and engineering was by the Concast-Schloemann Company.[18]

The wide, hot-strip mill of the Danube iron works was further developed. This is Hungary's only other hot-rolling facility in addition to the Lörinc rolling mill and the Borsodnádasd plate mill.[19]

Work continued on the 2.7-billion-forint stainless steel rolling mill at the Lenin metallurgical works in Diósgyör. East German equipment was assembled by Hungary's plant and equipment mounting enterprise for commissioning by 1975.[20] Diósgyör is Hungary's second largest industrial center after Budapest.

A new wire processing plant was built at the Salgótarján metallurgical works. Cost was 200 million forints; equipment and engineering were from West Germany and Austria. Commissioning is scheduled for 1974.[21]

A 788-million-forint, 18,000-ton-per-year, special steel casting plant was commissioned at the Hungarian railroad car and machine factory in Györ. Equipment originated in both East and West Germany.[22]

Lead and Zinc.—Some lead and zinc concentrates were produced at the Gyöngyösoroszi mine complex sulfide ore flotation plant. Concentrates of zinc are mostly exported. The country's only lead smelter is located at the Metallo-Chemia Vegyi és Kohómüvek plant in Nagytétény-Diósd. This plant is processing mostly secondary materials.

Manganese Ore.—In 1973 manganese ores continued to be mined in the Transdanubia region, particularly in Urkút and Csárdahegy. Production was estimated at 188,000 tons, unchanged from 1972. The washed Urkút ore contained 31% to 33% manganese; the carbonaceous ore from the same mine about 15%; and the Csárdahegy ore about 23%.[23]

Some blast furnace ferromanganese was produced at the Ózd metallurgical combine from Hungarian manganese ores.[24]

NONMETALS

Hungary was self-sufficient only in the following nonmetallic minerals: Lime, bentonite, perlite, diatomite, and sand and gravel. Other nonmetallic minerals such as asbestos, cryolite, graphite, crude phosphates, rock salt, sulfur, and pyrites had to be imported to meet most or all requirements.

Cement.—Cement output was 3.4 million tons, or almost 15% over that of 1972. There are four operating cement plants in Hungary, built since 1960; the two major one's are the 1-million-ton-per-year Danube cement works at Vác, north of Budapest, and the 1-million-ton-per-year Beremend plant on Hungary's southern border. During the year construction started on the 1.2 million-ton-per-year Bélapátfalva plant to be located near the northern border of Hungary due onstream by 1978. This 6-billion-forint ($27 million) project is said to be near limestone deposits, with reserves capable of supplying the plant for 60 years. Another 1.5-million-ton-per-year cement plant is under construction at Hejöcsaba, near Miskolc, and is due to be commissioned in 1974. This would bring cement output to 4.5 million tons per year by 1975, and a planned 5.7 million tons per year in 1978, Hungary will be self-sufficient in cement. In 1974, Hungary expects to import about 1 million tons to satisfy

[15] Népszabadság (Budapest). (Production at the Danube Iron Work's New Casting plant. V. 31, No. 190, Aug. 15, 1973, p. 1.

[16] Dolgos, L. (Problems with Hungary's First Continuous Casting Plant.) Bányászati és Kohászati Lapok-Kohászat, v. 107, No. 1, January 1974, p. 1.

[17] Népszabadság (Budapest). (New Continuous Casting Plant Commissioned at Ozd.) V. 31, No. 202, Aug. 30, 1973, p. 1.

[18] Work cited in footnote 16.

[19] Réti V. (Development of the Hot-Strip Mill at the Danube Iron Works.) Bányászati és Kohászati Lapok-Kohászat, (Budapest), v. 106, No. 7, July 1973, p. 289.

[20] Népszabadság (Budapest). (Rolling Mill Construction in Diósgyör.) V. 31, No. 152, July 1, 1973, p. 1.

[21] Népszabadság (Budapest). (Construction of Wire Treatment Plant.) V. 34, No. 90, Apr. 14, 1974, p. 5.

[22] Népszabadság (Budapest). (New Steel Casting Plant.) V. 33, No. 168, July 7, 1973, p. 8.

[23] Halász, J., and J. Polencsik. (Ferromanganese Processing at the Ozd Metallurgical Combine.) Bányászati és Kohászati Lapok-Kohászat, v. 106, No. 5, May 1973, p. 202.

[24] Work cited in footnote 23.

demand, with the Soviet Union providing the largest share.[25]

Clays.—*Bentonite.*—Hungary produced some bentonite, partly in the Nagytétény Area. The product was mainly calcium bentonite, which was converted by sodium exchange and was used mostly for foundry molds.

Diatomite.—Diatomite was mined at a rate of about 20,000 tons per year near Erdöbénye in the Zemplén Mountains, near Hungary's northern border. Exploration located reserves sufficient to maintain present production rates for 50 years. The diatomite was exported mainly to Austria and Italy.[26]

Fertilizer Materials.—Fertilizer production totaled 2,971,000 tons, containing 594,000 tons of active substance (nitrogen and phosphorus pentoxide), an increase of 7% over that of 1972. Nitrogen fertilizers constituted 68% of the total; the rest was phosphatic.

In spite of steadily increasing plant capacity and production, demand for fertilizers could not be met and increasing amounts had to be imported. In 1973 Hungary imported 459,000 tons of nitrogenous fertilizer, an increase of more than 25% compared with 1972 imports. Hungary has in the past imported all phosphatic raw materials requirements to satisfy fertilizer materials production, mostly Kola concentrate from the U.S.S.R. and some phosphate rock from North African countries. Potassic fertilizer materials were imported also, with East Germany and the Soviet Union providing most of the imports.

In 1973 Hungary used fertilizer containing more than 1.1 million tons of active substance, corresponding to 171 kilograms per hectare. In 1974 this figure is expected to reach 215 kilograms per hectare.

Construction continued on a new 1,000-ton-per-day, 9-billion-forint ammonia plant at the Pét nitrogen works. Commissioning is expected during 1975. Downstream facilities will include the output of carbamide [27] and other nitrogen products. At the beginning of the year a Soviet-built nitric acid plant was commissioned at Pét. Feedstock for the Pét ammonia plant, will be natural gas piped in from the Szeged gasfields located in the South.

Parallel to the development of the nitrogenous fertilizer industry, Hungary is expanding its phosphatic fertilizer industry. An additional 80,000-ton-per-year, 25-million-forint superphosphate plant will be built at the Szolnok plant of the Tisza chemical works.

Perlite.—In 1973 Hungary, with an estimated annual output of 96,000 tons, was the fifth largest producer of perlite, following the United States, Greece, Italy, and the U.S.S.R., in that order. Hungary is experienced in mining and expanding perlite and will deliver several perlite expansion plants to the U.S.S.R. In 1973, Hungary exported perlite to West Germany, Czechoslovakia, Austria, and Yugoslavia.[28]

Stone.—*Dolomite.*—Hungarian output of dolomite was estimated at 805,000 tons in 1973, unchanged from that of 1972. About one-half million tons of this quantity came from the Pilisvörösvár mine, where Japanese stone excavating equipment was used, eliminating drilling and blasting.[29]

Limestone.—Hungary's estimated total output of limestone was 6.5 million tons in 1973, an increase of 5% over that in 1972. Much of the limestone mined in Hungary was used for producing hydraulic cement.

Sulfuric Acid.—In 1973 Hungarian sulfuric acid production was 648,000 tons, an increase of 14.5% over that of 1972. This was due to the commissioning of the 200,000-ton-per-year Szolnok plant using Polish sulfur. This plant's capacity was to be increased during the year by an additional 16,000 tons.[30]

MINERAL FUELS

Hungary's primary energy production from fossil fuels, fuelwood, and hydroelectric power rose from 19.3 million tons of standard fuel equivalent in 1972 to an estimated 20.3 million tons in 1973. The output of crude oil increased from 1.97

[25] Népszabadság (Budapest). Cement Plant in Bélapátfalva. V. 32, No. 20, Jan. 25, 1974, p. 9; New Cement Plant in Hejöcsaba. V. 32, No. 37, Feb. 14, 1974, p. 5; Six Percent Excess Production. V. 32, No. 13, Jan. 17, 1974, p. 1; Beremend Cement Plant to be Commissioned. V. 31, No. 257, Nov. 2, 1973, p. 4; More Limestone for Miskolc. V. 31, No. 161, July 12, 1973, p. 9.

[26] Rock Products. V. 76, No. 11, November 1973, p. 94.

[27] Népszabadság (Budapest). (New Pét Fertilizer Plant.) V. 31, No. 166, July 18, 1973, p. 8.

[28] World Minerals & Metals (London). Perlite in Forefront of Hungarian Mine Plans. No. 12, March–April 1973, p. 28.

[29] Work cited in footnote 28.

[30] Népszabadság (Budapest). (More Sulfuric Acid). V. 31, No. 158, July 8, 1973, p. 3.

million tons to 1.98 million tons and that of natural gas from 144,295 million cubic feet to 169,968 million cubic feet. The share of these two fuels in Hungary's primary energy supply rose from 53.3% to about 56.2% during the 1972–73 period. In 1973 Hungary produced 26.8 million tons of coal and lignite. The share of coal (bituminous and brown coal and lignite) in the primary energy supply declined from 43.2% in 1972 to 40.3% in 1973. While the production of natural gas has been increasing moderately in the past, in the future the output of crude oil and coal will change little. The share of all coal in the energy balance is to decline as the contribution from bituminous and brown coal declines and that of lignite increases. Although the share of liquid and gaseous hydrocarbons steadily gained in importance, coal was still the major source of energy consumed in Hungary and will be so for a number of years.

Among the Hungarian fuel and energy sources of lesser significance in the energy economy in 1973 were hydroelectric power and fuelwood. Nuclear power was in its development stage and production was scheduled only for 1980 and thereafter at the Paks nuclear power plant under construction.

Hungary's small hydroelectric power generating plants have a total capacity of 20,000 kilowatts, with the plants located mostly on the Tisza River and its tributaries. Some increase in generating capacity can be expected with the commissioning of further stages of the Tisza River project.

Hungary supplies most of its own fuelwood amounting to 388,000 tons of standard fuel equivalent in 1972, or 1.9% of its total energy supply in 1973.[31] During the last 5 years fuelwood imports were almost completely discontinued.

In 1973 Hungary produced 17.6 billion kilowatt-hours of electricity, 8.0% more than in 1972. Thermal powerplants generated 17.5 billion kilowatt-hours (99.4%), and hydroelectric powerplants, 0.1 billion kilowatt-hours (0.6%). Installed capacity of electric powerplants in the country at yearend totaled 3.4 million kilowatts. In 1973, Hungary's industry consumed about 78% of all fuel supplied and 71.6% of electrical energy produced.

Total primary energy balances of Hungary for 1972 and 1973 are shown in table 4.

Table 4.—Hungary: Total primary energy balance for 1972 and 1973
(Million tons standard fuel equivalent)

Year	Total primary energy	Coal (lignite, brown, bituminous, and coke)	Crude oil and petroleum products	Natural and associated gas	Fuelwood	Hydroelectric
1972:						
Production	19.257	10.853	2.579	5.425	0.388	0.012
Imports	10.608	1.660	7.995	.265	--	.688
Exports	.884	--	.807	--	--	.077
Apparent consumption	28.981	12.513	9.767	5.690	.388	.623
1973:						
Production	20.296	10.899	2.586	6.411	.388	.012
Imports	11.166	1.471	8.679	.266	--	.750
Exports	.803	--	.723	--	--	.080
Apparent consumption	30.659	12.370	10.542	6.677	.388	.682

Source: Production and trade data for 1972 and 1973 from monthly statistical publications, Central Statistics Office (Budapest), 1974, Nos. 2–3. Statistical Yearbook 1972 and 1973, 556 pp.

Coal.—Coal was mined in 11 coal basins, and output totaled 26.8 million tons, an increase of 3.6% over that of 1972. Of this amount bituminous coal accounted for 3.4 million tons, a decrease of 7.1% compared with 1972 figures; brown coal accounted for 15.5 million, a decrease of 0.5%; while lignite accounted for 7.9 million tons, an increase of 19.2%.

Of the 29 million tons of coal available to the economy in 1973, industry used 22.9 million: (of which electric powerplants used 16.8 million tons); railroads, 1.1 million tons; the remainder was used in household heating.

During the first quarter of 1973, 89,733

[31] Central Statistical Office (Budapest). (Statistical Yearbook 1972.) 1973, p. 182.

were employed by the coal mining industry, 6.4% less than in the corresponding period in 1972. Of the total employed, 71,867 were bluecollar workers. During the first quarter of 1973, the output of all workers averaged 82.69 tons, 9.8% more than during the same period in 1972. The average heating value of all coal mined was 2,962 kilocalories per kilogram (5,500 Btu per pound), 3% lower than that of 1972 and 9.4% lower than that of 1970. About 29.5% of all coal was strip-mined, the rest came from underground operations.

Hungary had to import substantial quantities of high-rank coal in 1973 in order to meet demand. Coal imports, amounting to 1.471 million tons of anthracite and bituminous coal, came from other Eastern European suppliers. Coke production was 963,000 tons, a decrease of 15.5% from that of 1972, and was supplemented by imports of 1.127 million tons during the year. Hungary also imported about 450,000 tons of lignite briquets from East Germany.

Lignite mining in Hungary was developed during the last decade. From an output of about 4 million tons in 1963, production rose to 7.9 million tons in 1973. The Visonta (Thorez) strip mine, was developed to supply the 800-kilowatt, Gargarin minemouth powerplant, which was dedicated during the year.[32]

Other areas where large-scale lignite mining is done is in Bükkábrány, at the foot of the Bükk Mountains and in the area between Szombathely in the West and the Austrian-Hungarian border, where the development of an area of almost 150 square kilometers is planned.[33]

At Visonta, two East German type SRs 1200, bucket-wheel excavators were used for stripping, while a third, an SRs 1400 was being prepared for startup. Coal is produced with ERs 560 and ERsH dredges. At places the overburden included a layer of sandstone 0.6 to 1 meter thick which damaged the machinery downstream, reducing the rate of production by one-half and necessitating extensive modification of the excavators.[34]

From 1966 to 1973, the Hungarian coal industry followed a policy of phasing out uneconomic coal mines. Although this policy officially ended in 1973, it caused a serious displacement of labor. Nógrád County was the area hardest hit by the shutdowns, there were 14,000 miners in the county 8 years ago, now only 6,500 remain, the rest were retrained in other skills. The average age of miners in Nógrád County is 44, while in other parts of the country it is 39. In the Oroszlányi coal mines in the Tata coal basin, the average length of a longwall face was 95 meters; the daily rate of advance was 1.58 to 2.08 meters; the daily production per current meter of the front was 6.2 tons while the average cost of production was 60.48 forints per ton.

Natural Gas.—In 1973 three areas in Hungary produced 170 billion cubic feet of natural gas (including deliveries, plant use, and amounts reinjected into the formation), an increase of 17.8% over 1972 production. To supplement production, gas from petroleum refining was also produced at an estimated rate of 694 million cubic meters in 1973, unchanged from the previous year.

Imports of natural gas amounted to 200 million cubic meters via an existing pipeline from Romania. By 1975, the new "Brotherhood" pipeline will carry over 1 billion cubic meters of Soviet natural gas per year. The pipeline is to reach Lenin City in 1975 and is to be extended to Budapest thereafter.

Work continued on the construction of a second 6.2-million-cubic-meter-per-day, 270-million-forint gas-treating unit at the Algyö gas treating complex.[35] In 1973 there were 33 producing gas wells in Algyö.

In Barlahida, Zala County, a new well tested 47,000 cubic meters per day of gas and significant quantities of oil. Underground storage in exhaused gas deposits recevied new interest, with plans for storing gas in the Algyö Area in summer for use during the cold season.

Petroleum.—In 1973 Hungary produced 1.98 million tons of crude oil, an increase of 0.6% over 1972 production, which has been almost unchanged for the last 5 years and is expected to remain at this level for the next 10 years. Hungary's demand far

[32] Népszabadság (Budapest). (Gagarin Thermal Powerplant Dedicated.) V. 31, No. 121, May 26, 1973, p. 1.

[33] Benedek, M., and Szabolcs, R. (Possibilities for Producing Electric Power From Lignite in the Bükk-Mountains and in Western Hungary.) Bányászat (Budapest), v. 104, No. 11, 1971, pp. 736–741.

[34] Neue Bergbautechnik (East Berlin). (Productive and Technological Analysis of the Visonta Lignite Mine.) V. 3, No. 8, August 1973, pp. 573–578.

[35] Népszabadság (Budapest). (Second gas plant readied in Algyö.) V. 31, No. 273, 1973, p. 1.

outstripping production was met by increasing imports, which came mainly from the Soviet Union and amounted to 48,179,000 tons in 1973, an increase of 8% over 1972 imports. Hungary's proved crude oil reserves in the Transdanubia and Algyö Areas amounted to 21 million tons in 1972.[36]

In 1972 drilling totaled 237,000 meters, down 36.5% from that in 1971. To reverse this trend and to bridge the existing gap in Hungary's crude oil supply, until the commissioning of the Adria pipeline, emergency funds were granted for oilfield development. The State Planning Commission allocated 2 billion forints on a priority basis to petroleum exploration.[37]

In 1973, an agreement was signed with Yugoslavia for a petroleum pipeline from the Adriatic to Yugoslavia, Hungary, and Czechoslovakia. The pipeline is 600 kilometers long, starting on the island of Krk, where supertankers from the Middle East will be unloaded. Yugoslavia is to receive 24 million tons per year through the pipeline, and Hungary and Czechoslovakia will each receive 5 million tons per year. Construction costs were estimated at $350 million to which Hungary and Czechoslovakia each are to contribute $25 million. The pipeline will branch at Susak, with one line leading to the Croatian refineries and the other leading to Hungary at Csurgó and thence to the Danube Petroleum Enterprise in Százhalombatta and to Bratislava, Czechoslovakia.[38] The Hungarian sector of the pipeline will be 600 millimeters in diameter.

The Friendship II pipeline was commissioned during 1973. The 600-millimeter-in-diameter, 300-kilometer-long pipeline has an annual capacity of 10 million tons. The pipeline terminates at the Danube petroleum enterprise in Százhalombatta. It supplies the third and largest 3-million-ton-per-year vacuum distillation unit, which was commissioned with the pipeline. The unit was built with Soviet, West German, and Hungarian equipment. The Danube thermal powerplant is also supplied by fuel oil from the same vacuum distillation unit.[39]

Some oil was produced in the Eger Area marginal oilfields by augmenting the hydrostatic pressure in the formation by in situ combustion. Two new oil wells were drilled in the Zala region, one at Pusztaapáti and the other at Szilvágyi (No. 33). Depth was 3,400 meters.[40]

[36] World Oil. Crude Oil, (Hungary). V. 177, No. 3, Aug. 15, 1973, p. 180.
[37] Magyar Hirlap (Budapest). (Emergency Fund Granted for Petroleum Development.) May 5, 1974, p. 4.
[38] Népszabadság (Budapest). (Hungarian Sector of the Adria Pipeline Determined.) V. 32, No. 5, Jan. 8, 1974, p. 1.
[39] Figyelö (Budapest). (The Danube Petroleum Enterprise.) V. 17, No. 44, Oct. 31, 1973, p. 2.
[40] Népszabadság (Budapest). (New Oilwells in Zala.) V. 31, No. 220, Sept. 20, 1974, p. 6.

The Mineral Industry of India

By Harold A. Taylor, Jr.[1] and Charles W. Sweetwood [2]

The mineral industry in India did not change significantly from its 1972 pattern, in terms of most measures of quantity and value. The changes that did occur were usually related in some way to the energy crisis. Crude mineral output was valued at $813 million[3] in 1973, a 17% increase over the revised 1972 total of $692 million. However, this increase in value was largely due to increased world petroleum prices, which resulted in an increase in the unit value of petroleum to $4.75 per barrel in 1973 compared with a value of only $2.06 in 1972. Exports of minerals, metals, and ores were valued at $382 million in 1973, up 4% over the revised 1972 total of $366 million. Imports of minerals, metals, ores, and crude petroleum were valued at $1 billion in 1973, a 41% increase over the revised 1972 total of $711 million.

Mining accounted for about 0.7% of the Indian gross national product (GNP) of $76.5 billion for the fiscal year ending March 31, 1974. The inclusion of mineral processing would multiply by several times the mineral industry contribution to the total GNP.

Preliminary mine employment data for 1973 showed that the Indian metals and minerals industry employed 1.43 million persons—678,000 in mines and quarries; 287,000 in the basic metal industries (mostly iron and steel plants); 258,000 in the nonmetallic mineral product industries; and 212,000 in the metal product industries. In addition, the petroleum industry directly employed 60,320 persons, of which 25,950 were in exploration and production, 19,840 in marketing, 11,380 in refining, and the balance in other activities. The data also indicated that of the 678,000 employed in mines and quarries in 1973 (compared with 638,000 in 1970), 62% mined coal (61% in 1970), 8% mined limestone and dolomite (same as in 1970), 8% mined iron ore (same as in 1970), about 5% mined manganese ore (same as in 1970), 4% mined copper, lead, and zinc (1% in 1970), 2% mined mica (same as in 1970), 2% mined gold (same as in 1970), 1% mined stone (2% in 1970), and the balance mined other minerals. In 1970, the latest year for which detailed data are available, only 86 mines (out of 2,850) employed more than 1,600 persons, of which 58 mines produced bituminous coal, 7 produced limestone, 6 produced iron ore, and the remainder produced other minerals. In 1969, 1,360 mines out of 2,935 indicated that they worked their mines without the aid of mechanical power; 93% of the gypsum mines so stated, as did 63% of the bauxite mines, 62% of the manganese ore mines, 56% of the limestone producers, 53% of the iron ore mines, and 44% of the mica mines, to cite a few examples from the more significant mineral commodities in India.

The coal mining industry probably lost more man-days in 1973 than in 1972, although figures are not yet available.

On March 31, 1973, the Government had a total investment of $8.1 billion in public sector industries, of which $2.6 billion was invested in the steel industry, $800 million was invested in the metals and minerals industry, $630 million was invested in the petroleum and petrochemical industries, and the balance was invested in other (nonmineral) industries.

The draft of the fifth 5-year plan (April 1, 1974 to March 31, 1979) provided for

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[3] Where necessary values have been converted from Indian rupees (Rs) to U.S. dollars at the rate of Rs1=US$0.125 for 1973 data and Rs1=US$0.133 for 1972 and earlier data.

the investment of $16.9 billion in the industrial and mining sectors, with $10.4 billion of this in public sector projects. The draft emphasized rapid growth in core sector industries and in production for export; for example, of the $10.4 billion being invested in public sector projects, $2.0 billion is to be invested in public sector steel projects, $1.4 billion in fertilizer projects, $1.2 billion in petroleum refining, distribution, and exploration projects, $900 million in coal projects, and $600 million in nonferrous metals projects. Typical production targets for the last year of the plan (1978–79) included 12.8 million tons of steel ingots (1973–74 fiscal year production: 7.1 million tons), 4.0 million tons N content of nitrogenous fertilizers (1973–74: 1.2 million), 1.3 million tons P_2O_5 content of phosphatic fertilizers (1973–74: 350,000), 87.0 million barrels of crude petroleum (1973–74: 55.9 million), 135 million tons of coal (1973–74: 79 million), 370,000 tons of aluminum (1973–74: 190,000), 45,000 tons of copper (1973–74: 18,000), and 100,000 tons of zinc (1973–74: 28,000). The draft plan has been criticized as overly ambitious and unrealistic and may be revised. Any revisions are most likely to occur in the energy area and because of the oil crisis, a greater reliance on domestic energy sources is likely.

While India had not felt the full impact of the energy crisis by the end of 1973, the outlook was grim. At the new prices ($9.00 to $10.00 per barrel), India's costs for importing crude petroleum would almost triple to approximately $1 billion in 1974, assuming the present volume of imports. The Government has several options, all of them unsatisfactory: reduce crude petroleum imports, reduce petroleum product imports, and arrange special credits or deferred payments with the oil producing countries. The longer range outlook is somewhat better, since some of India's various oil exploration programs may produce results.

PRODUCTION

The following tabulation shows the change in value of crude mineral output for 1971 through 1973, by commodity group:

Commodity group	Value (million dollars)		
	1971	1972	1973
Metallic minerals:			
Ferrous	68.32	r 71.39	66.35
Nonferrous	23.22	r 28.32	27.52
Total metallic minerals	91.54	r 99.71	93.87
Nonmetallic minerals [1]	89.12	r 97.82	81.81
Mineral fuels:			
Bituminous coal	339.62	357.00	353.80
Lignite	13.82	r 14.96	15.10
Petroleum, crude [2]	101.28	117.35	263.09
Gas, natural	4.85	[3] r 5.50	[3] 5.42
Total mineral fuels	459.57	r 494.81	637.41
Grand total	640.23	r 692.34	813.09

r Revised.
[1] Does not include crude nonsalable china clay.
[2] Estimated, applying a value of $1.85 per barrel produced in 1971, $2.06 per barrel in 1972, and $4.75 per barrel in 1973.
[3] Estimated on the basis of the 1971 value.

All of the commodities in the ferrous subgroup decreased in value in 1973, except iron ore. Iron ore comprised about 80% of the ferrous metal value in the above tabulation. Most of the commodities in the nonferrous subgroup increased in value in 1973. Gold ore accounted for 40% and copper ore for 29% of the nonferrous metal value for 1973 compared with 40% for gold ore and 27% (revised) for copper ore in 1972. The commodities in the nonmetallic mineral group showed no clear trend in values in 1973 when compared with 1972. Limestone accounted

for 36%, salt for 21%, and all kinds of mica for 21% of the 1973 nonmetallic mineral value compared with 38% (revised) for limestone, 15% (revised) for salt, and 26% (revised) for all kinds of mica in 1972. Bituminous coal output increased both in quantity and in value when expressed in rupees; the decrease in value when expressed in dollars is the result of the change in the average rupee-dollar exchange rate. Lignite output increased both in quantity and in value. Crude petroleum output decreased slightly in quantity and increased greatly in value per barrel. Marketable natural gas output decreased in both quantity and value.

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

Commodity [1]	1971	1972	1973 [p]
METALS			
Aluminum:			
Bauxite, gross weight ---- thousand tons	1,517	1,684	1,270
Alumina, gross weight [e] ---- do	362	363	313
Metal, primary only ----	178,256	179,103	153,805
Antimony metal, regulus ----	607	894	517
Beryllium, beryl, gross weight [3] ----	NA	NA	NA
Cadmium metal ----	29	34	31
Chromium, chromite, gross weight ----	273,060	294,500	267,200
Copper:			
Mine output, metal content ----	10,766	12,744	14,592
Metal, refined primary only ----	9,678	10,467	10,950
Gold, smelter ---- troy ounces	118,572	105,776	106,097
Iron and steel:			
Iron ore and concentrate, gross weight thousand tons	34,261	35,476	35,430
Pig iron ---- do	6,672	7,020	7,342
Ferroalloys:			
Ferrochrome ----	10,519	1,894	6,504
Ferromanganese ----	162,106	163,475	141,098
Ferrosilicon ----	25,629	35,676	24,182
Other ----	11,111	3,539	4,764
Steel ingots ---- thousand tons	6,215	6,842	6,882
Steel castings ---- do	[3] 84	90	84
Steel semimanufactures:			
Angles, shapes, sections ---- do	791	879	685
Bars and rods ---- do	1,623	1,831	1,982
Plates and sheets:			
Uncoated ---- do	599	642	587
Galvanized ---- do	173	154	155
Tinplate ---- do	114	120	84
Hoop, strip, skelp ---- do	439	466	472
Rails and accessories ---- do	465	452	365
Wire ---- do	216	231	286
Special steels, form not specified ---- do	200	164	235
Total ---- do	4,620	4,939	4,851
Lead:			
Mine output, metal content ----	1,556	2,538	4,289
Metal, primary only ----	1,549	2,740	2,855
Manganese ore and concentrate, gross weight thousand tons	[r] 1,842	1,642	1,535
Rare-earth metals, monazite concentrate, gross weight [e] ----	3,882	4,086	3,500
Silver, mine and smelter output ---- thousand troy ounces	121	142	138
Titanium:			
Ilmenite concentrate, gross weight ----	66,000	91,070	77,191
Rutile concentrate, gross weight ----	2,912	3,065	3,400
Tungsten, mine output, metal content ----	15	17	11
Zinc:			
Mine output, metal content ----	[r] 8,245	8,869	12,412
Metal ----	21,267	25,227	12,710
Zircon [e] ----	4,660	4,900	6,200
NONMETALS			
Abrasives, natural, n.e.s.:			
Corundum, natural ----	318	391	248
Garnet ----	1,391	3,235	2,835
Asbestos ----	13,581	12,359	11,300
Barite ----	58,695	48,348	116,600
Cement, hydraulic ---- thousand tons	14,894	15,700	15,000
Chalk ----	48,840	60,053	62,320
Clays:			
Ball clay ----	12,620	17,491	15,600
Diaspore ----	4,881	5,198	7,940
Fire clay ----	612,000	722,000	730,000
Kaolin (china clay) [4] ----	567,000	629,000	[e] 620,000
Other ----	NA	142,000	193,000

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
NONMETALS—Continued			
Diamond: [e]			
Gem ____ thousand carats	16	17	18
Industrial ____ do	3	3	3
Total ____ do	19	20	21
Diatomite	77	NA	NA
Feldspar	44,236	52,801	39,800
Fertilizer materials:			
Crude, phosphatic:			
Apatite	11,307	11,613	9,980
Phosphate rock	232,170	216,693	135,540
Manufactured:			
Nitrogenous, nitrogen content [5] ____ thousand tons	745	949	916
Phosphatic, P_2O_5 content [6] ____ do	102	131	130
Fluorspar, all grades	3,107	3,301	2,810
Gem stones, excluding diamond:			
Agate (including chalcedony pebble)	728	798	1,040
Emerald, crude ____ carats	22,520	21,370	3,200
Garnet ____ kilograms	2,962	1,883	800
Gypsum ____ thousand tons	1,088	1,105	884
Kyanite and related materials:			
Kyanite	63,482	67,897	52,720
Sillimanite	4,326	4,046	3,190
Lime	535,000	338,000	[e] 340,000
Magnesite	296,000	251,000	190,000
Mica:			
Crude (reported output total, actual production exceeds this quantity)	14,400	13,200	13,200
Processed: [7]			
Blocks	1,301	1,484	989
Splittings	7,465	7,179	4,833
Condenser film	92	159	22
Other	23,017	25,033	32,208
Total	31,875	33,855	38,052
Pigments, natural mineral, ocher	53,018	67,409	46,700
Pyrite:			
Gross weight	40,886	30,723	41,500
Sulfur content	15,130	11,370	15,360
Salt, all types ____ thousand tons	5,430	6,520	7,004
Stone, sand and gravel:			
Calcite	20,425	28,633	19,725
Dolomite ____ thousand tons	1,320	1,348	1,400
Limestone ____ do	25,073	25,946	23,700
Quartz and silica ____ do	336	330	313
Sand, calcareous ____ do	1,028	960	1,010
Sand, other ____ do	1,473	1,345	1,333
Slate	725	1,114	1,105
Talc and related materials:			
Pyrophyllite	11,780	15,036	14,150
Steatite (soapstone)	177,000	211,000	193,000
Vermiculite	537	1,541	2,750
Wollastonite	2,042	3,326	483
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	38,000	[e] 40,000	[e] 45,000
Coal:			
Bituminous ____ thousand tons	71,499	74,771	77,000
Lignite ____ do	3,660	3,067	3,300
Total ____ do	75,159	77,838	80,300
Coke:			
Coke oven and beehive ____ do	8,975	9,115	[e] 9,175
Gashouse ____ do	80	79	[e] 40
Other, soft ____ do	3,494	3,310	[e] 3,500
Total ____ do	12,549	12,504	[e] 12,715
Gas, natural:			
Gross production ____ million cubic feet	[r] 53,290	55,224	59,124
Marketable production ____ do	[r] 26,886	32,736	32,242
Petroleum:			
Crude oil ____ thousand 42-gallon barrels	54,748	56,965	55,338
Refinery products: [8]			
Gasoline [e] ____ do	14,400	13,600	14,400
Jet fuel and kerosine [e] ____ do	30,400	27,200	28,700
Distillate fuel oil [e] ____ do	40,900	40,300	42,500
Residual fuel oil [e] ____ do	27,200	23,200	24,500

See footnotes at end of table.

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

Commodity [1]		1971	1972	1973 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued				
Petroleum—Continued				
Refinery products—Continued				
Lubricants [e]	thousand 42-gallon barrels	2,800	3,500	3,600
Other [e]	do	23,409	[r] 24,658	26,205
Refinery fuel and losses	do	7,722	10,864	9,711
Total	do	146,831	143,322	149,616

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] In addition to the commodities listed, India also produces bromine, other clays (bentonite, fuller's earth, and common clay), other varieties of gem stones (aquamarine, ruby, and spinel), uranium and natural graphite, but production data are not available.
[2] Apparently, production of industrial beryl has been terminated in India, with remaining output being confined to insignificant unreported quantities produced as a byproduct of mica production and relatively inconsequential output of gem quality material. No beryl has been reported among exports from India since 1967.
[3] Data incomplete, includes output for last 9 months only.
[4] Data given are total crude production; includes directly salable crude as follows in tons: 1971—184,000; 1972—218,000; 1973—256,000 (estimated). Balance of output in each year is classified as "nonsalable crude", material which requires beneficiation prior to sale. Processing of nonsalable crude resulted in the production of the following quantities of processed china clay in tons: 1971—106,000; 1972—115,000; 1973—113,000.
[5] Nitrogen content of ammonium sulfate, nitrophosphate, and urea.
[6] P_2O_5 content of superphosphates only.
[7] Exports.
[8] Details on refinery production by product type are not available; estimates supplied are based on available information on refinery facilities and 1970 performance of these facilities. Data on refinery fuel and losses and on total refinery throughput are reported.

TRADE

Total Indian exports had a value of $2.8 billion in 1973, of which 13.5% or $382 million consisted of ores, minerals, and metals. Indian exports of ores, minerals, and metals were valued at $366 million (revised) in 1972. Iron ore was the most important export in this minerals group in 1973, accounting for 41.7% of the total group value, followed by diamonds with 20.4% of the total, iron and steel with 7.4%, pig and cast iron with 7.3%, and mica with 4.1% of the total. Incomplete data indicated that Japan was probably the most important destination for exports.

India's imports had a total value of $2.9 billion in 1973, 34.5% or $1 billion of which consisted of ores, minerals, metals, and crude petroleum. Crude petroleum was the most important import in the above grouping, accounting for 46.6% of the total value in 1973, followed by iron and steel with 27.4% of the total, copper with 7.1%, gem diamonds with 5.1%, and zinc with 2.8% of the total. The more important sources of India's imports included Iran and Saudi Arabia (crude petroleum), the United Kingdom, Japan, the United States, and Zambia, not necessarily in that order.

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

Commodity	1972 [r]	1973
METALS		
Aluminum:		
Bauxite	15,779	28,494
Aluminum oxide and hydroxide	27	37
Metal and alloys:		
Unwrought	5	6
Semimanufactures	8,332	5,887
Antimony ore and concentrate	--	81
Chromium ore and concentrate	109,410	221,243
Copper:		
Ore and concentrate	300	--
Copper sulfate	3	1
Metal and alloys:		
Unwrought	15	102
Semimanufactures	4,808	4,564

See footnotes at end of table.

Table 2.—India: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1972 r	1973
METALS—Continued			
Iron and steel:			
Iron ore [1]	thousand tons	21,468	20,830
Iron ore concentrate	do	395	455
Scrap	do	86	124
Pig iron, shot, pellets	do	264	563
Ferroalloys:			
Ferrochrome		1,605	917
Ferromanganese		52,586	46,430
Ferrosilicon		2,001	989
Other, including spiegeleisen		229	--
Steel ingots and equivalent, primary forms	thousand tons	7	13
Semimanufactures:			
Bars, rods, angles, shapes, sections	do	87	39
Plates and sheets	do	3	3
Hoop and strip	do	(2)	(2)
Rails and accessories	do	28	19
Wire	do	(2)	1
Pipes, tubes, fittings	do	96	102
Castings and forgings, rough	do	1	1
Lead:			
Oxides		405	355
Metal and alloys, all forms		32	133
Manganese ore and concentrate:			
First grade ore		31,585	25,148
Second grade ore		275,977	203,735
Ferruginous manganese ore [3]		552,725	462,015
Peroxide ore, below 86% MnO_2		1,725	1,000
Manganese sludge		34	250
Manganese oxide		11	1,047
Molybdenum metal, all forms	kilograms	--	15
Nickel matte		--	1
Selenium, elemental	kilograms	--	22
Silicon, elemental	do	--	200
Tin metal, including alloys, all forms	long tons	28	171
Titanium ores and concentrates:			
Ilmenite		78,070	75,055
Other		10	--
Tungsten metal, all forms	kilograms	4	18
Zinc metal, including alloys:			
Oxide		4,587	5,155
Scrap		377	--
Dust		996	123
Unwrought and semimanufactures		43	247
Other:			
Ores and concentrates:			
Of rare-earth metals		(2)	1
Of vanadium, molybdenum, columbium, tantalum, zirconium		1,850	12,861
Other, n.e.s		(2)	--
Oxides and hydroxides, n.e.s		1,087	1,519
Metal-bearing residues		584	258
NONMETALS			
Abrasives:			
Natural emery, crude		57	--
Natural, n.e.s		60	345
Natural or synthetic dust and powder of gem stones, except diamond		100	--
Abrasive wheels, stones, powder		731	1,419
Asbestos		23	22
Barite and witherite		40,768	34,593
Boron materials:			
Borates, crude natural		6	2
Boric acid		186	560
Bromine, elemental	kilograms	--	150
Cement, hydraulic		247,407	261,280
Chalk		24	162
Clays and clay products (including all refractory brick):			
Crude:			
Ball clay		(2)	54
Bentonite		3,640	5,752
Earth clay		2	3
Fire clay		44	2,297
Fuller's earth		14	4
Kaolin		991	759
Other, n.e.s		209	166
Products:			
Refractory (including nonclay refractory products)		2,446	4,576
Nonrefractory		4 1,088	4 989
Diamond, gem:			
Uncut	value, thousands	$2,740	$2,138
Cut	do	$65,649	$90,569

See footnotes at end of table.

Table 2.—India: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1972 r	1973
NONMETALS—Continued			
Feldspar		11,304	8,662
Fertilizer materials:			
Manufactured:			
Nitrogenous		--	7,250
Potassic		--	110
Other and mixed		55	--
Ammonia, anhydrous and aqueous		NA	NA
Gem stones except diamond:			
Natural:			
Uncut:			
Emerald	value, thousands	$740	$924
Feldspar	do	$38	$6
Other	do	$1,555	$3,314
Cut	do	$15,427	$16,291
Synthetic and reconstituted:			
Uncut	do	$871	$917
Cut	do	$24	$18
Graphite, natural		199	150
Kyanite and related materials:			
Kyanite, calcined		17,704	9,141
Kyanite, other		11,279	15,951
Sillimanite		714	1,003
Other		373	512
Lime, quicklime and hydraulic lime		673	4,920
Magnesite:			
Crude		1	109
Calcined, excluding dead-burnt		50,790	14,107
Dead-burnt		--	181
Mica:			
Crude:			
In blocks		1,325	944
Condenser film		164	158
Splittings		6,151	5,279
Scrap and waste		13,339	14,410
Powder		3,337	1,903
Manufactured:			
Condenser film plates		17	11
Washer discs		155	23
Cut sheets and strips		54	86
Micanite and other built-up		14	16
Powder		--	5,107
Pigments, mineral:			
Natural, not further described		1,067	611
Iron oxide		4,361	2,776
Salt		272,542	256,121
Sodium and potassium compounds, n.e.s.:			
Caustic soda		948	470
Caustic potash		509	962
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Slate		2	73
Marble		74	605
Other		30,393	61,701
Worked, all types		1,585	2,102
Crushed stone, broken stone, gravel:			
Dolomite		3,769	8,733
Limestone for lime manufacture		2,343	71,534
Quartz		1,884	3,158
Other		2	35
Sand, excluding metal bearing		730	182
Sulfur:			
Elemental		4	1,263
Sulfuric acid		1,702	756
Talc, steatite, soapstone		6,807	10,106
Other:			
Crude		3,119	923
Slag and wastes, not metal bearing		5,911	11,670
Oxides and hydroxides of strontium, barium, magnesium		81	81
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural		5,356	5,615
Carbon black		2,218	4,208
Coal:			
Anthracite		3,565	1,485
Bituminous		262,963	490,991
Lignite and lignite briquets		50	--

See footnotes at end of table.

Table 2.—India: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1972 r	1973
MINERAL FUELS AND RELATED MATERIALS—Continued			
Coke		12,615	17,782
Petroleum:			
Crude	thousand 42-gallon barrels	--	6,859
Refinery products:			
Gasoline	do	192	244
Kerosine and jet fuel	do	328	475
Distillate fuel oil	do	335	416
Residual fuel oil	do	30	12
Lubricants	do	64	14
Other	do	54	18
Crude chemicals produced from the distillation of coal, oil, and/or natural gas		232	3

r Revised. NA Not available.
1 Including manganiferous iron ore containing up to 10% Mn.
2 Less than ½ unit.
3 Grade: 10% to 35% Mn.
4 Partial figure; excludes materials not reported quantitatively valued at $26,558 in 1972 and $18,681 in 1973.

Table 3.—India: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity		1972 r	1973
METALS			
Aluminum:			
Alumina		552	487
Metal and alloys, all forms		2,368	1,282
Antimony:			
Ore and concentrate, gross weight		1,334	1,240
Oxides		53	38
Metal and alloys, all forms		91	26
Arsenic:			
Crude sulfides		3	4
Oxide and acid		374	638
Elemental		254	77
Beryllium metal and alloys, all forms	kilograms	--	10
Bismuth metal and alloys, all forms		48	15
Cadmium:			
Oxide		2	10
Metal and alloys, all forms		227	46
Chromium:			
Oxide and hydroxide		1	--
Metal and alloys, all forms		49	50
Cobalt:			
Oxide and hydroxide		9	17
Metal and alloys, all forms		115	179
Copper metal and alloys:			
Scrap		774	30
Unwrought		49,451	50,708
Semimanufactures		3,406	4,434
Iron and steel:			
Iron ore		218	275
Scrap		12,011	21,108
Pig iron, sponge iron, iron and steel powder		513	742
Ferroalloys		1,604	415
Steel ingots and equivalent, primary forms		92,043	45,594
Semimanufactures:			
Bars, rods, angles, shapes, sections		147,205	137,060
Sheets and plates		904,341	684,881
Hoop and strip		55,258	74,461
Rails and accessories		28	2,706
Wire		8,019	8,950
Pipes, tubes, fittings		30,533	52,489
Castings and forgings, rough		5,875	6,466
Lead:			
Ore and concentrate		9	28
Oxide		4	5
Metal:			
Scrap		2	--
Unwrought		37,637	65,326
Semimanufactures		634	552
Magnesium metal and alloys, all forms		570	397
Manganese:			
Ore and concentrate		5,298	4,123

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity		1972 [r]	1973
METALS—Continued			
Manganese—Continued			
Oxides		387	201
Metal and alloys		150	329
Mercury	76-pound flasks	5,423	6,881
Molybdenum metal and alloys, all forms		14	17
Nickel:			
Ore and concentrate		--	(1)
Matte		--	1
Metal and alloys:			
Scrap		126	506
Unwrought		1,094	677
Semimanufactures		1,279	1,798
Platinum and silver:			
Waste and scrap		9	8
Platinum metal, unwrought and semimanufactures	troy ounces	7,265	16,979
Silver metal, unwrought and semimanufactures	do	49,766	74,856
Selenium, elemental		18	17
Silicon, elemental		1,053	1,068
Tantalum metal and alloys, all forms	kilograms	262	335
Tin:			
Oxide	long tons	11	21
Metal and alloys:			
Scrap	do	3,805	2,070
Unwrought	do	1,664	2,690
Semimanufactures	do	5	2
Titanium oxide		3,864	10,516
Tungsten:			
Ore and concentrate		339	276
Metal, all forms		12	10
Zinc:			
Ore and concentrate		37,756	34,751
Oxide		4	2
Dust		1,252	1,841
Metal and alloys:			
Unwrought		76,474	63,228
Semimanufactures		448	706
Other:			
Ores and concentrates of vanadium, molybdenum, columbium, tantalum, zirconium		1	8
Scrap and other wastes, n.e.s		--	1
Metalloids, n.e.s		17	90
Metals, unwrought and semimanufactures, n.e.s		45	154
NONMETALS			
Abrasives:			
Tripoli earth		528	28
Other, natural		2	3
Dust and powder of natural or synthetic gem stones (except diamond)	kilograms	7	24
Grinding and polishing wheels and stones		4,051	2,523
Asbestos		45,379	43,643
Barite and witherite		16	--
Boron materials:			
Borates, crude natural		4,048	--
Boric acid		16	9
Bromine, elemental		107	105
Cement, hydraulic		500	--
Clays and clay products (including all refractory brick):			
Crude clays:			
Ball clay		1,095	378
Bentonite		7	5
Earth clay		14	101
Fire clay		4	5
Fuller's earth		5	2
Kaolin		239	92
Other		78	629
Clay products:			
Nonrefractory		14	1
Refractory		36,115	27,343
Diamond:			
Gem	value, thousands	$41,351	$77,568
Industrial	thousand carats	e 380	455
Diatomite (Kieselguhr and infusorial earth)		1,409	880
Fertilizer materials:			
Crude, natural:			
Nitrogenous, sodium nitrate		2,000	2,000
Phosphate rock		809,476	874,746

See footnotes at end of table.

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

Commodity		1972 [r]	1973
NONMETALS—Continued			
Fertilizer materials—Continued			
Manufactured:			
Nitrogenous		NA	(2)
Potassic		297,604	462,754
Mixed		530,411	720,369
Feldspar, leucite, nepheline, nepheline syenite		--	3
Fluorspar, cryolite, chiolite		10,156	677
Gem stones (except diamond):			
Natural:			
Uncut:			
Emerald	value, thousands	$4,871	$7,827
Feldspar	do	$1	$84
Other	do	$1,194	$714
Cut, all types	do	$80	--
Synthetic and reconstituted:			
Uncut	do	$151	$62
Cut	do	$5	--
Graphite, natural		1,704	1,074
Gypsum and plasters		2	10
Iodine, elemental		146	214
Lime, quicklime and hydrated lime		6	9
Magnesite, crude		51	81
Mica, worked		4	55
Pigments, mineral:			
Iron oxide		985	1,150
Other		266	168
Pyrite, unroasted		4	--
Salt		422	917
Sodium and potassium compounds, n.e.s.:			
Caustic soda		754	2,735
Caustic potash, potassium, sodium peroxide		16	2
Stone, sand and gravel:			
Dimension stone, crude and partly worked		61	134
Gravel and crushed stone:			
Quartz		2	4
Other		22	56
Sand, excluding metal bearing		4	4
Sulfur:			
Elemental		559,422	551,396
Sulfuric acid		7	1
Other:			
Crude nonmetal ores		2,561	10,822
Slag and ash, not metal bearing		--	338
Oxides and hydroxides of barium, strontium, magnesium		176	91
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural		405	266
Carbon black and gas carbon		4,237	1,722
Coal, anthracite		434	6,738
Coke, all types		391	1,051
Petroleum:			
Crude oil	thousand 42-gallon barrels	90,225	98,034
Refinery products:			
Gasoline	do	475	300
Kerosine and jet fuel	do	6,176	7,099
Distillate fuel oil	do	3,897	4,535
Residual fuel oil	do	12,320	13,038
Lubricants	do	1,082	638
Other	do	250	1,590
Crude chemicals derived from the distillation of coal, oil, and/or natural gas		1,771	1,874

[e] Estimate. [r] Revised. NA Not available.
[1] Less than ½ unit.
[2] Data for various types of nitrogenous fertilizers are reported in such a way that they cannot be added; imports include 679,670 metric tons of contained nitrogen in ammonium nitrate, ammonium sulfate, and urea (gross weight not reported), and 191,504 metric tons (gross weight) of other nitrogenous fertilizers (nitrogen content not reported).

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—The Government was finally able to enter the aluminum industry by bringing its 200,000-ton-capacity alumina plant at Korba on-stream at a level that was half of total capacity. The Government had to suspend production at the alumina plant towards the end of the year because of stock surpluses. The alumina will be consumed at the Korba smelter, which is to come on-

stream in 4 stages of 25,000 tons each over the next few years. The Korba alumina plant will obtain its bauxite input from the Amarkantak mine (420,000-ton capacity) and the Phutkapahar mine (130,000-ton capacity).

In spite of some new expansions in aluminum capacity that came onstream in 1973, actual aluminum production declined because of a shortage of electric power. The shortage affected aluminum plants in Uttar Pradesh and several other states and was the result of cuts in hydroelectric power generation caused by drought, problems with labor and equipment deterioration at the generating plants, and poor implementation of planned expansions in generating capacity.

India produced a total of 1,270,000 tons of bauxite in 1973, 35% of which came from Bihar, 23% from Gujarat, 20% from Maharashtra, 18% from Madhya Pradesh, and the balance from other jurisdictions. The manufacture of alumina and aluminum metal consumed 922,830 tons of bauxite, and the manufacture of chemicals, refractories, abrasives, cement, and steel consumed 310,041 tons of bauxite.

The production and capacity of the Indian aluminum industry, in thousand tons, follow:

Company, plant, and location	1973		1975 proposed capacity
	Output	Capacity	
Aluminium Corp. of India Ltd.:			
Asansol, West Bengal	5	9	9
Koraput, Orissa	--	--	--
Bharat Aluminium Co. Ltd.:			
Korba, Madhya Pradesh	--	--	100
Ratnagiri, Maharashtra	--	--	--
Hindustan Aluminium Corp. Ltd.:			
Renukoot, Uttar Pradesh	63	95	120
Indian Aluminium Co. Ltd.:			
Alwaye, Kerala	16	16	16
Belgaum, Karnataka	40	40	60
Hirakud, Orissa	20	20	20
Madras Aluminum Co. Ltd.:			
Mettur, Tamil Nadu	9	15	25
Total	153	195	350

The Government's proposed Koyna project has been rescheduled to 1980 and has had its site moved to Ratnagiri, both sites being located in Maharashtra. A proposal for an alumina plant, to be jointly owned by the Governments of India and Gujarat, has been abandoned.

Apparent consumption of aluminum was 185,000 tons in 1973, or 55,000 tons less than the Planning Commission's estimated demand.

Indian sources estimated that 60% of total aluminum consumption in India was in electrical uses, 20% in consumer durables, 8% in transportation, and the remainder was consumed in other uses.

Copper.—Two new copper operations came into operation in 1973. Although hindered by a 3-month shutdown caused by lack of electric power, the Khetri-Kolihan copper complex was finally able to produce some copper concentrate in 1973. Karnataka (formerly Mysore) State's new copper concentrator near Chitaldrug, formally commissioned in April, was also in production. These new sources, plus 2 other minor ones, are not likely to yield more than a total of 6,000 tons of copper per year by 1979.

While the recently discovered Malanjkhand deposits have received a great deal of attention from the Government of India, production is being held up pending a re-examination of the data gathered so far. The Malanjkhand deposits are large enough to support an open pit mining operation that could yield a minimum of 10 million to 28 million tons of ore with an average content of 0.90% Cu.

As in previous years, the Ghatsila smelter was India's only producer. Its production of 10,950 tons of primary refined metal was obtained from 12,064 tons of copper in ore from the Mosabani mine, 2,157 tons of copper in ore from the Khetri-Kolihan complex, 350 tons of copper in ore from Karnataka State's Chitaldrug project, and 66 tons of copper in ore from the Dariba project, a small operation in Rajasthan with a capacity of 300 tons of contained copper per year as concentrate.

Demand for copper was 83,000 tons in 1973, most of which was met by imports. Imports totaled 55,142 tons of copper metal (92% as electrolytic wire bar) worth $67.6 million, of which 31,351 tons came from Zambia, 4,895 tons from Tanzania, 4,206 tons from West Germany, 3,528 tons from Zaire, and the balance from other sources. Since only about 62,000 tons of copper metal were available for consumption, there was an apparent deficit of over 21,000 tons of metal.

Latest available information from the Indian Bureau of Mines indicated that 75% of total copper consumption was used for wire bar production, almost 25% for making alloys such as brass, and the small balance for other uses.

Gold.—The Government's previously reported consolidation of India's two gold producers did not take place. Instead, the Government expanded the land holdings and the role of the Kolar organization, renaming it Bharat Gold Mines, Ltd., and left the Hutti mines under the ownership of Karnataka (formerly Mysore) State. The Government has alloted more funds to its Kolar operation, and the Geological Survey of India is helping Bharat Gold Mines to explore and develop two of its mines and some sites for prospective mines.

Production of gold ore in 1973 increased in quantity and grade from 1972. The Kolar mines produced 340,546 tons of ore averaging 0.17 troy ounce of gold per ton in 1973, and the Hutti mines produced 222,078 tons of ore averaging 0.22 troy ounce per ton in the same year. Bharat Gold Mines lost $7.1 million in the fiscal year ending March 31, 1974, and had production costs of $156 per troy ounce in this period.

Ilmenite, Rutile, and Monazite.—India produced 77,191 tons of ilmenite, 6,200 tons of zircon, 3,500 tons of monazite, and 3,400 tons of rutile from South Indian mineral sands. In 1973, Travancore Titanium Products Ltd. consumed about 12,500 tons of ilmenite to make about 5,000 tons of titanium dioxide, and four small ferrotitanium producers consumed 400 tons of ilmenite to make 125 tons of ferrotitanium. Ilmenite exports were 64,291 tons valued at $1.4 million in 1973, of which 50,853 tons went to Japan, 12,735 tons to the United States, and the balance to various European destinations.

Iron Ore.—Not much progress was made towards expanding iron ore production in 1973. Work continued on the expansion of the Bailadila mine, but was beset with continuing delays. Efforts to expand the Kiriburu mine continued to be made, although operational difficulties have held actual output to levels far below the present capacity; Kiriburu produced at 23% of capacity in 1973. The Government of India has given Chowgule and Co. Ltd. permission to build another 2-million-ton-capacity iron ore pellet plant, which is to be completed in 1977.

No significant change occurred in the amount of iron ore produced in India in 1973. The Union Territory of Goa accounted for 32.7% of iron ore production in 1973, Madhya Pradesh for 23.4%, Orissa for 18.0%, Bihar for 14.3%, Karnataka (formerly Mysore) for 10.2%, and other states for the balance. Production was reported at 257 iron ore mines in 1973, 24 of these being in the public sector.

Domestic iron ore consumption was 11.2 million tons in 1973, 4.0 million tons of which was consumed by the Bhilai plant, 2.5 million tons by the plant of Tata Iron and Steel Co. (TISCO), 1.6 million tons by the Rourkela plant, 1.3 million tons by the Durgapur plant, and the balance by other plants. The draft of the fifth 5-year plan provided for a domestic consumption of 23.0 million tons and exports of 35.0 million tons by 1978.

Iron ore exports in 1973 totaled 21.29 million tons in quantity and $159 million in value and went to the destinations shown in table 4. The Minerals and Metals Trading Corp. (MMTC) exported 12.1 million tons of the total, and Goan private-sector firms exported the balance.

Table 4.—India: Exports of iron ore
(Million metric tons)

Destination	1972	1973
Belgium	0.23	0.14
Bulgaria	.15	.30
Czechoslovakia	.73	.41
Hungary	.11	.12
Japan	r 17.95	18.12
Poland	r.48	.45
Romania	1.43	1.10
Yugoslavia	.18	--
Other	r.60	.65
Total	r 21.86	21.29

r Revised.

Iron and Steel.—The Government's new holding company for steel and associated industries, the Steel Authority of India, Ltd., started functioning early in 1973. The holding company was modeled after one in Italy and was intended to remove governmental interference in operating decisions; the Government's only intended role is to set a production target and to help with financing when necessary.

Indian plans for expanding steel capacity inched along in 1973. With completion of the first oxygen converter in December 1973, the Bokaro plant was able to produce crude steel. The remaining coke-oven batteries and blast furnaces of Bokaro's first 1.7-million-ton-capacity stage were not expected to be ready before mid-1975. The crude steel ingots will be finished at other plants until the rolling and slabbing mills come onstream in the next few years. After lengthy and difficult negotiations, Nippon Steel Corp. agreed in mid-1973 to perform a feasibility study for the proposed steel plant of TISCO. The Mysore Iron and Steel Co. Ltd. (MISL), owned by Karnataka (formerly Mysore) State, made some proposals for plant expansion, the most likely of which involved rounding out its facilities to increase capacity from 70,000 tons to 110,000 tons of alloy and special steels per year. Since the Government began the program a few years ago, it has licensed 1.7 million tons of additional electric furnace continuous casting steel plant capacity. However, a coking coal shortage that developed near the end of the year will probably help to prevent any increase in total steel production for several years.

India's 43 commercial steel foundries produced only 90,000 tons of steel castings in 1972, even though their total installed capacity was 143,000 tons. The reasons for this under utilization of capacity were that demand for the types of steel castings used in railroad rolling stock has been falling and that a large number of foundries have been using some of their capacity to produce steel ingots. India's 51 commercial cast iron foundries produced only 137,000 tons of iron castings in 1972, even though their total installed capacity was 398,000 tons. This low utilization of capacity was caused by falling demand for general types of castings such as those used by the railroads.

Indian production of pig iron and ingot steel increased in 1973. Production of most ferroalloys, with the significant exception of ferrochrome, decreased in 1973. Production of ferromolybdenum decreased to 80 tons in 1973 compared with 238 tons in 1972.

A slight increase in imports combined with a sizable increase in exports, especially of pig and cast iron, made India less of a net importer of ferrous metals (in terms of value of iron, steel, scrap, and ferroalloys) in 1973 than in 1972. In 1973 it was a net importer of $208.4 million worth of ferrous metals compared with $234.9 million (revised) in 1972.

Information from the Joint Plant Committee of the Government of India indicated that 27% of the steel supplied by the main plants was resold to other users in 1973, 24% was used by the mining and iron and steel industries, 11% was used by the railways, 7% was used in power equipment and projects, 6% was used to make fasteners and wire products, and the balance was consumed in other end uses.

Lead and Zinc.—In 1973, India's only lead-zinc mine at Zawar produced 424,630 tons of ore with a metal content of 1.01% Pb and 3.52% Zn. Production of lead

concentrate was 7,760 tons in 1973 compared with 5,005 tons (revised) the previous year. Production of zinc concentrate was 23,870 tons in 1973, compared with 17,055 tons (revised) in 1972 and 15,855 tons (revised) in 1971.

India imported 65,878 tons of lead metal worth $15.1 million in 1973, of which 23,316 tons came from Australia, 14,518 tons from the United Kingdom, 2,527 tons from Canada, and the balance from other sources. India imported 34,751 tons of zinc concentrate worth $4.4 million in 1973, of which 24,020 tons came from Canada, and the balance from Australia. India's imports of zinc metal declined to 63,934 tons valued at $28.1 million in 1973—19,351 tons of which came from Australia, 15,530 tons from the U.S.S.R., 8,453 tons from the United States, 6,232 tons from Japan, 6,149 tons from Zaire, 3,063 tons from Canada, and the balance from other sources.

Manganese.—Alarm at the rate of manganese ore depletion resulted from recent reports that proved ore comprised only 7 million tons out of the 108 million tons total for manganese ore reserves. In response, on April 1 the Government of India placed a complete ban on exporting first-grade manganese ore (ore containing over 48% Mn), except for existing commitments, and agreed to reduce gradually the exports of second-grade ore (ore containing 35% to 48% Mn). However, it would appear that 108 million tons might be more expressive of the true reserve than is the 7 million tons. Nevertheless, the Government seems to have begun a withdrawal from the world manganese marketplace.

Both production and exports of manganese ore were lower than last year. Orissa supplied 31% of India's 1973 production of manganese ore, followed by Karnataka (formerly Mysore) with 28%, Madhya Pradesh with 15%, Maharashtra with 12%, and other jurisdictions with the remainder. Estimates indicate that 67% of the ore produced was ferruginous grade (ore containing under 35% Mn), 28% was second-grade ore, 5% was first-grade ore, and 0.1% was "peroxide ore" (86% MnO_2 and below). A total of 370 mines were registered in 1973, of which 350 were in the private sector and the remaining 20 were under Government ownership; during a normal year, such as 1973, about 310 to 315 of these mines record some manganese ore production. Table 5 shows the exports of manganese ore by type. Domestic manganese ore consumption was 749,000 tons in 1973 and ore added to stocks totaled 52,827 tons compared with 787,240 tons (revised) consumed in 1972 and 900 tons (revised) removed from stocks. Of the total ore consumed in 1973, 390,000 tons were used in iron and steel, 345,000 tons were used to make ferromanganese, and the remainder was mostly used in batteries.

Table 5.—India: Exports of manganese ore, by type
(Thousand metric tons)

Type	1972	1973
Type:		
Ore, 48% manganese or higher	24	25
Ore, 35% to 48% manganese	245	204
Ore, ferruginous, below 35% manganese	541	462
Peroxide and other processed oxides	2	1
Total	812	692

The Study Group on Iron and Steel estimated that Indian steel plants would require 753,260 tons per year of low-grade (30% Mn minimum) manganese ore by 1973–74 and for the next few years after that, and of this amount 145,800 tons per year would be supplied by captive mines. Of the total, 228,000 tons would be required by the Rourkela plant (50,000 tons of which would be supplied from captive mines); 180,000 tons by the Bhilai plant; 130,000 tons by the Bokaro plant; 72,800 tons by the Jamshedpur plant of TISCO (all from captive mines); 64,600 tons by the Durgapur plant; 59,860 tons by the Burnpur (former Indian Iron and Steel Co.) plant; and 18,000 tons by the Bhadravati plant of MISL.

Vanadium.—The Geological Survey of India analyzed some groove samples from

a titanomagnetite deposit in the Chennagiri Taluk area of Shimoga District, Karnataka State, and found that the samples ranged from 0.43% to 0.76% vanadium. Earlier work on a bulk sample of titanomagnetite ore from Devaranarasipur, near Bhadravati in Shimoga District, showed a content of 0.50% vanadium.

NONMETALS

Cement.—Indian cement production dropped to 15.0 million tons in 1973, which was only 76% of total capacity, and which has been attributed to electric power and coal shortages, and erratic rail car deliveries. Of the installed 19.75 million-ton-cement capacity at yearend 1973, 6.90 million tons belonged to the private sector Associated Cement Companies, 1.87 million tons to the private sector Sahu Jain Group, 1.83 million tons to the private sector Birla Group, 1.17 million tons to the private sector Dalmia Group, 5.67 million tons to other private sector companies, and 2.31 million tons to various State and Central Government-owned entities. Cement was scarce in 1973, and the Government's price controls, new distribution plan, and encouragement of exports helped to augment the already thriving black market. The draft of the fifth 5-year plan has called for a cement production of 25 million tons by 1978, or 86% of a 29 million ton installed capacity. India exported 261,280 tons of cement in 1973.

Fertilizer Materials.—*Nitrogen.*—In 1971–72, India produced 1,237,000 tons of urea, 622,000 tons of ammonium sulfate, 410,000 tons of calcium ammonium nitrate, 237,000 tons of urea ammonium phosphate, 96,000 tons of ammonium phosphate, 53,000 tons of diammonium phosphate, and lesser amounts of several nitrogen-containing fertilizers.

The Government continued to actively plan nitrogen fertilizer plants that would use raw materials other than naphtha. The Government-owned Fertilizer Corp. of India Ltd. has contracted with several West German firms for a 300,000-ton-per-year-capacity ammonia plant which would use a fuel oil feedstock and for an associated urea synthesis plant, all to be built at Nangal, Punjab State. In April, the Prime Minister laid the foundation stone for a coal-based urea plant at Korba. The coal-based urea plant at Ramagundam may be onstream sometime in 1974. Toward the end of 1973, the Government began negotiating with Imperial Chemical Industries, Ltd. (ICI) for the construction of a 300,000-ton-per-year-capacity ammonia plant, to be linked with a urea plant, which would use a feedstock of noncoking coal. The plant would use the same technology as a much smaller coal-based urea plant in the Republic of South Africa that belongs to an ICI affiliate. Financing is said to be readily available.

Phosphate Rock.—Production of phosphate rock declined to 135,540 tons in 1973, 89% of which came from the Jhamar Kotra mine in Rajasthan. The decline in output reflected the deterioration of old equipment at Jhamar Kotra. Demand for phosphate rock apparently exceeded supply in 1973, for a shortfall of 570,000 tons; this compares with a shortfall of 500,000 tons (revised) in 1972. India imported 874,746 tons of phosphate rock valued at $15.51 million in 1973.

Fluorspar.—Indian fluorspar production was about 2,810 tons in 1973, of which 80% originated in Gujarat. The Government's Planning Commission estimated that 22,550 tons of fluorspar were consumed in 1973, of which 18,500 tons were used to make chemicals such as aluminum fluoride, synthetic cryolite, and refrigerant gases; 2,500 tons were used by the iron and steel industry; and the balance by other industries.

Imports of fluorspar totaled 677 tons in 1973, only a fraction of the previous years' imports, which was probably the result of the Government's policy shift late in 1972 favoring domestic production while terminating imports.

Gypsum.—India's production of gypsum balanced consumption and decreased to 884,000 tons valued at $1.2 million in 1973, with 92% of the production originating in Rajasthan. Of the total amount of gypsum consumed, 650,000 tons were used to make fertilizers at Sindri, 220,000 tons were used to make cement, and 14,000 tons were used for other purposes.

Kyanite and Sillimanite.—Indian production of kyanite totaled 52,720 tons valued at $1.2 million, of which 74% came from Bihar, 25% from Maharashtra, and a very small fraction from Karnataka. India exported 25,092 tons of kyanite worth $1.4 million in 1973, of which 9,153 tons went to Japan, 4,123 tons to Italy, 3,027

tons to the United Kingdom, 2,433 tons to Belgium, and the balance to other nations, mostly European. Latest available information from the Indian Bureau of Mines indicated that from 65% to 80% of total kyanite consumption is usually consumed in refractories and all of the remainder in ceramics.

Sillimanite production was 3,190 tons worth $0.14 million in 1973—1,718 tons from Meghalaya, 1,015 tons from Kerala, and the balance from other states. Consumption totaled 2,359 tons, with 2,130 tons of sillimanite being used by the refractories industry and the balance by the asbestos and glass industries. All of the 1,003 tons of sillimanite exported went to Japan.

Mica.—The Government's official mica exporting organization, MMTC, continued to run into buyer dissatisfaction in 1973. The MMTC has taken over negotiation of all contracts but will allow the buyer to pick his preferred private sector supplier for 70% of his order. However, the MMTC will ultimately assume complete control of the industry, possibly in 1974. The MMTC has admitted to "internal difficulties" in response to complaints from buyers from the United States, the U.S.S.R., and some East European countries.

India continued to be a major world producer and exported most of its production. Domestic consumption of mica totaled 9,600 tons, of which 7,500 tons was used in refractories, 800 tons in electrodes, 600 tons in rubber, and the balance in other uses. Table 6 shows the amount of mica exported in 1972 and 1973. Total mica exports were valued at $15.7 million, of which $4.4 million was in the form of splittings, $4.3 million in the form of blocks, $3.4 million in the form of washers and discs, $1.1 million in the form of scrap and waste, and the balance in other forms. Of the same total, $3.7 million was exported to the United States, $2.4 million to Japan, $1.6 million to the United Kingdom, $1.0 million to East Germany, $0.8 million to the Netherlands, $0.8 million to the U.S.S.R., and the balance to other nations.

Table 6.—India: Mica exports, by type
(Metric tons)

Type	1972	1973
Block	1,484	944
Film	159	158
Cut condenser film and plate	16	11
Cut sheet and strip	51	86
Washer and disc	103	23
Splittings	6,179	5,279
Scrap and waste	14,350	14,410
Powder	2,996	7,010
Micanite and built-up mica	17	16
Total	25,355	27,937

Sand and Quartzite.—Indian production of calcareous sand was 1.01 million tons in 1973 compared with 0.96 million tons in 1972. Production of construction sand was 0.89 million tons in 1973, the same as in 1972. Production of glass sand was 0.37 million tons in 1973 compared with 0.39 million tons in 1972.

Latest available information from the Indian Bureau of Mines indicated that 27% of total quartz, quartzite, silica sand, and molding sand consumption was used to make glass, 26% was used in foundries for molding purposes, 25% was used in the iron and steel industry, 10% was used to make refractories, and the balance was used for other purposes, such as making ferrosilicon or ceramics.

Sulfur and Pyrite.—Production of pyrite from India's only source, the Amjhore-Ghoga deposit, totaled 41,500 tons of ore (quality unavailable) in 1973 compared with 30,723 tons in 1972. Output of by-product sulfuric acid, all from the lead-zinc smelters, totaled 29,000 tons in 1973. India imported 551,396 tons of elemental sulfur valued at $17.4 million in 1973, of which 180,920 tons came from Iran, 147,228 tons from Poland, 129,110 tons from Canada, 60,264 tons from Iraq, and the balance from other sources.

An Indian source estimated that 84% of the total elemental sulfur consumed in 1972–73 was used to make sulfuric acid, 7% was used to make carbon disulfide, and the balance was used to make other

products such as sugar, paper, or rubber. The same source also estimated that 63% of the total (from all sources) sulfuric acid consumed in 1972 was used to make phosphate fertilizers, 14% was used to make viscose rayon and tire yarn, 8% was used to make ammonium sulfate, 4% was used to make aluminum sulfate and alum, almost 4% was used to pickle iron and steel, and the balance was used to make other products.

MINERAL FUELS

Coal.—Parliament completed the nationalization of noncoking coal mines during 1973, after having taken over the management of these mines on January 30. Of the 738 noncoking coal mines originally involved, 27 were closed for economic reasons, 184 were placed under the management of the Government-owned Bharat Coking Coal Ltd., and the remainder were put under a new public sector organization, the Coal Mines Authority Ltd. (CMAL). CMAL was also assigned the management of the National Coal Development Corp. and its 44 noncoking coal mines.

The energy crisis caused the Government to reverse its policy of de-emphasizing coal production and use, in favor of other energy sources such as petroleum. However, any significant increase in coal usage would depend on mechanizing and modernizing the mines and means of transportation, converting oil-consuming industries to coal where possible, and designing new energy-consuming plants with the use of coal in mind.

Production of coal, India's most important mineral commodity in terms of value, rose in both quantity and total value in 1973 over the previous year. The average value per ton of coal in 1973 was $4.59 compared with $4.77 in 1972. Pithead stocks were 5.5 million tons in 1973 compared with 7.1 million (revised) in 1972.

Bituminous.—Indian production of bituminous coal was 77.0 million tons in 1973. Almost all of the coal was produced by two government firms, CMAL and Bharat Coking Coal, except for 2.5 million tons produced by private sector TISCO and 5.2 million tons produced by public sector Singareni Collieries Co. Ltd. Underground mines accounted for about the same proportion of the total output as in previous years, and open pit mines accounted for the balance. India's leading coal-producing state was Bihar, with 43.2% of the output, followed by West Bengal with 25.1%, Madhya Pradesh with 19.1%, and the other states with the balance. Coal production increased in 1973 in spite of problems with electrical power interruptions, shortages of explosives, labor disputes, availability of rail cars, and heavy rains.

Indian coal consumption in 1973 was 78.0 million tons, of which thermal powerplants consumed 21.0 million tons; the railways, 13.0 million tons; steel plants, 11.6 million tons; cement plants and brick kilns, 7.1 million tons; merchant coke ovens and soft coke plants, 6.6 million tons; and other consumers, the remainder.

India exported 492,476 tons of coal worth $5.7 million in 1973.

Lignite.—The mine of the Neyveli Lignite Corp., Ltd., was the only producer of lignite. The associated lignite-consuming industries at Neyveli in turn produced 450 megawatts of electricty in 1973 compared with 300 megawatts in 1972; 44,500 tons of urea fertilizer in 1973 compared with 45,782 tons in 1972; and 30,000 tons of carbon briquets in 1973 compared with 17,413 tons in 1972. Rather than expanding capacity at the existing pit by buying new equipment, the company is making more costly plans to open a second pit.

Natural Gas.—Gross natural gas production increased in 1973 over the previous year; marketable natural gas output declined, however. Proved reserves of natural gas were 2,340 billion cubic feet as of December 31, 1973, with Assam accounting for 65% of the total and Gujarat for the balance.

Petroleum.—While the energy crisis had a devastating effect on India's petroleum supplies (as mentioned in the introduction), the petroleum industry appeared to be making some progress, mostly in offshore exploration for petroleum and natural gas. Production of crude petroleum decreased to 55.3 million barrels in 1973, 51% of this originating in Gujarat and the balance in Assam. Imports of crude petroleum increased to 98.0 million barrels in 1973, with 68.1 million barrels of this coming from Iran, 25.2 million barrels from Saudi Arabia, and 4.7 million barrels from Iraq. The private sector refineries (except Digboi), as well as the Government's refineries at Cochin and Madras, import all of their crude petroleum re-

quirements. Indian refineries had a throughput of 149.6 million barrels and an output of 139.9 million barrels, excluding plant fuel and losses. Imports of refined products in 1973 were greater than in the previous year. Export data for petroleum products were not available, although it is known that these exports went only to Nepal and Bangladesh.

Exploration and Drilling.—The tempo of exploration picked up in 1973, and results seemed likely to be forthcoming. Results so far of the exploratory drilling program in Tripura are a half-completed well near Agartala that has reached a depth of 7,330 feet. A significant amount of work was also done in the Cauvery River Basin, where 15 dry wells have been completed in the last 8 years. The Government accepted delivery of its self-propelled jackup drill platform on April 1, 1973. After a delay because of bad weather and insufficient sea floor data, the first well was spudded in on October 10 in the Tarapur structure northwest of Bombay in the Arabian Sea. After having been drilled down to 9,128 feet, the well proved to be a nonproducer. However, the next well, which was on the Bombay High in 202 feet of water west of Bombay, identified 3 oil-bearing horizons above a depth of 5,860 feet.

On April 16, the Government began entertaining bids for offshore oil and gas exploration contracts, preferably on an Indonesian-type profit-sharing basis. Nine areas off the various coasts of India and the Andaman and Nicobar Islands were opened for bidding. Only the previously reserved Bombay High Area was excluded. About 40 foreign firms responded, most of whom had dropped out by the end of 1973.

The Oil and Natural Gas Commission (ONGC) completed 52 wells for a total of 362,770 feet drilled—significantly less than the previous year. At the end of 1973, India had 1,075 producing oil wells, 104 gas wells, 111 wells under test, 38 water injection holes in operation, and about 989 dry, abandoned, or shutdown wells.

Refining.—No new public sector refinery capacity came onstream in 1973; the Cochin refinery expansion was rescheduled to some undetermined date. The following tabulation shows refinery output for 1972 and 1973, in million barrels:

Refineries	1972	1973
Private:		
Digboi	3.6	3.6
Burmah-Shell	25.2	31.5
Exxon	17.1	19.9
Caltex	7.7	7.5
Total private	53.6	62.5
Government-controlled:		
Gauhati	5.4	4.7
Barauni	15.0	18.3
Koyali	25.2	24.2
Cochin	16.0	13.7
Madras	17.4	16.4
Total government-controlled [1]	78.9	77.4
Grand total	132.5	139.9

[1] Data may not add to totals shown because of independent rounding.

The increase in output from private sector refineries was the result of the Government allowing the refineries to exceed their licensed capacity of 56.7 million barrels and approach their installed (actual) capacity of 75.4 million barrels.

India's consumption of petroleum products totaled 159.5 million barrels in 1973, some 3% or 4% below what had been forecast before petroleum prices increased so sharply.

Pricing.—The Government found itself unable to negotiate on proposed price changes in 1973; it had a choice of either accepting the higher prices demanded by the producing nations or going without crude. Prices were raised 9 times during the year and reached stratospheric heights. For example, the crude price for Exxon's refinery was $1.99 per barrel on January 1, 1973, and had risen to $8.29 per barrel by January 1, 1974; similarly, the crude price for the Government's refinery at Madras was $2.30 per barrel on January 1, 1973, and had risen to $11.29 per barrel by January 1, 1974. However, retail prices for most petroleum products increased at a much more modest rate.

Marketing.—The Government-owned Indian Oil Corp. (IOC) sold about 63% of all petroleum products in India during 1973 compared with 60% during the previous year. The increase in the share of the public sector resulted from the same factors as in previous years. IOC's marketing division had 359 upcountry depots, 68 airfield stations, and 3,311 retail outlets as of December 31, 1973.

The Mineral Industry of Indonesia

By Walter Pajalich [1]

Indonesia's first 5-year economic plan known as Repelita I will expire in April 1974. So far under Repelita I investment has increased by more than 15% per year, and gross foreign exchange earnings from exports have increased more than 50% per year. This was due mainly to increased oil production. Repelita II is expected to follow along the same lines as Repelita I, which has consisted of maximizing investments, freeing private capital from controls, balancing budgets, and having relatively low tariffs. Investment activity continues to be high. In areas of petroleum, mining, manufacturing, and forestry, investors may find that in the future the Government will be seeking a bigger return for Indonesia. Japanese firms were showing a greater interest in Indonesia's investment opportunities. Japan has replaced the United States as the leading foreign investor in value of approved projects. Since 1967 approved U.S. nonoil investments totaled $462 million, while approved Japanese nonoil investments totaled $468 million. The total value of approved, private investment projects, in addition to oil and gas, amounted to more than $2.5 billion.

With increasing exploration and rising production, the petroleum sector continued to spark the economy. One of the major developments in the petroleum sector was an agreement between the State-owned petroleum company Pertamina, and Pacific Lighting Co. of the United States for the delivery of 550 million cubic feet per day of liquefied natural gas (LNG) to the U.S. west coast for 20 years starting in 1978. The Arun oilfield of Mobil Oil Indonesia, Inc. would be the main source of the natural gas. The project undertaken by Pertamina and Mobil will involve expenditures in excess of $600 million over the next few years for field development, liquefaction plants, and loading facilities. Pertamina was also discussing with various companies numerous other projects involving refineries, oil storage, support facilities, petrochemical complexes, and fertilizer plants.

Prospective investors in mining are awaiting the outcome of the revised "Third Generation" mineral leasing contract. It was expected that the Indonesian Government will place increasing importance on processing of minerals within the country, on the greater use of Indonesian goods and services, and on greater equity participation in mining ventures.

Production from state-owned mining enterprises continued to increase at a moderate rate. Much of the tin production increases were the result of renovated and rehabilitated mines and equipment.

PRODUCTION

The mineral industry of Indonesia is stable and growing. Increases in nonfuel mineral production reflected improved mining conditions and development of new deposits. In 1973 gold production increased, 4%; silver, 2%; manganese, 113%; and iron sands, 6%. Output of tin-in-concentrates increased 5% while tin metal increased 22%. Copper concentrate production increased from 9,750 tons in 1972 to 137,700 tons in 1973. The largest decreases in mineral production were in

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coal and rock asphalt, 17% each, nickel ore 7% and bauxite 3%.

Crude oil production totaled about 489 million barrels in 1973. This was an increase in production of 23.7% over that of 1972. Excluding centrally controlled economies,[2] this level of production made Indonesia the tenth largest oil producing country in the world. Natural gas production in 1973 totaled 186,137 million cubic feet, a 27% increase over that of 1972.

P. T. Caltex Pacific, the largest producer, accounted for about 72% of the crude oil production, followed by Pertamina 8%, P. T. Stanvac Indonesia 4.7%, Union Oil Co. of Indonesia and Atlantic Richfield Indonesia, Ltd., each 4.3%, Independent Indonesian American Petroleum Co. 2.7%, and the remaining 4% was produced by other oil companies in the country.

[2] Includes Albania, Bulgaria, Czechoslovakia, the German Democratic Republic, Hungary, Poland, Romania, the U.S.S.R., Yugoslavia, Cuba, Mongolia, North Korea, North Vietnam, and the People's Republic of China.

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

Commodity [1]	1971	1972	1973 [p]
METALS			
Aluminum, bauxite, gross weight ____ thousand tons __	1,238	1,277	1,229
Copper, mine output, metal content ____	--	5,000	37,900
Gold metal [2] ____ troy ounces __	10,600	10,899	11,322
Iron and steel, iron sand ____	270,900	264,915	280,938
Lead, mine output, metal content [e] ____	200	200	200
Manganese ore ____	11,958	7,538	16,085
Nickel, mine output, metal content [3] ____	19,800	22,442	20,816
Silver ____ thousand troy ounces __	285	279	284
Tin:			
Mine output, metal content ____ long tons __	19,411	20,992	22,135
Metal ____ do ____	9,074	11,819	14,401
NONMETALS			
Cement hydraulic ____ thousand tons __	[r] 487	596	830
Clays, kaolin powder ____	[e] 10,000	6,013	29,054
Diamond:			
Industrial [e] ____ thousand carats __	3	3	3
Gem [e] ____ do ____	12	12	12
Total [e] ____ do ____	15	15	15
Fertilizer materials:			
Manufactured:			
Nitrogenous ____	104,750	116,727	[e] 115,000
Other, including mixed ____	--	29,389	[e] 40,000
Ammonia ____	2,398	2,637	[e] 3,000
Gypsum [e] ____	8,000	8,000	8,000
Iodine ____ kiligrams [4] __	[e] 1,000	10,035	19,357
Salt, all types [e] ____ thousand tons __	[5] 180	180	200
Stone:			
Limestone ____	NA	838,240	995,767
Quartz ____	NA	52,388	52,805
Sulfur, elemental ____	[e] 1,500	2,400	1,951
MINERAL FUELS AND RELATED MATERIALS			
Asphalt rock, bitumen content [e] ____	43,000	34,500	28,500
Coal ____ thousand tons __	198	179	149
Gas, natural:			
Gross production ____ million cubic feet __	121,160	146,481	186,137
Marketed ____ do ____	43,839	43,658	53,296
Natural gas liquids:			
Propane and butane ____ thousand 42-gallon barrels __	[r] 36	[e] 10	10
Natural gasoline ____ do ____	NA	30	33
Petroleum:			
Crude ____ do ____	[r] 325,614	394,806	488,537
Refinery products:			
Gasoline ____ do ____	12,811	11,412	12,870
Jet fuel ____ do ____	1,030	1,181	960
Kerosine ____ do ____	14,856	15,328	19,495
Distillate fuel oil ____ do ____	10,364	12,877	14,904
Residual fuel oil ____ do ____	14,099	12,620	3,394
Lubricants (including grease) ____ do ____	13	31	32
Other:			
Liquefied petroleum gas ____ do ____	81	71	104
Petroleum wax ____ do ____	635	568	760

See footnotes at end of table.

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

Commodity [1]		1971	1972	1973 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued				
Petroleum—Continued				
Refinery products—Continued				
Naphtha	thousand 42-gallon barrels	47	1,467	1,225
Unfinished oils requiring further processing	do	26,863	45,112	58,937
Unspecified	do	580	1,235	702
Refinery fuel and losses	do	8,599	1,626	4,393
Total	do	89,978	103,528	117,776

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] In addition to the commodities listed, a variety of crude construction materials (such as clays, stone, sand, and gravel) are also produced, but available information is inadequate to make reliable estimates of output levels.
[2] Officially reported Indonesian statistics representing government output; private production by small unorganized producers may be as much as 30,000 troy ounces per year.
[3] Includes a small amount of cobalt which is not recovered separately.
[4] Previously reported incorrectly as metric tons. Revised to kilograms.
[5] Official Indonesian sources report only 42,198 metric tons, but this is believed to be only a partial figure.

TRADE

Mineral commodity exports remained an important part of Indonesian trade, contributing 55.4% of the total value of 1973 exports. Petroleum alone accounted for 50% of the total 1973 exports value.

Petroleum dominated Indonesian exports. The petroleum sector contributed 7% to the gross national product (GNP), accounted for 40% of the Government's "revenue" receipts, half of the export earnings, and a very large part of total investment expenditures.

As a result of increasing production, higher oil prices, modification of Contracts of Work and Production Sharing Contracts, the Government's income from oil will increase substantially in the future. Oil and gas will play an increasingly important role in Indonesia's future exports.

Freeport Indonesia Inc., a subsidiary of the Freeport Minerals Co., was one of the first mining companies to enter into a Contract of Work Agreement with the Indonesian Government. The year 1973 was Freeport's first full year of operation of its Ertsberg mine in the contracted area. The company shipped 137,000 tons of copper concentrate, containing 83.5 million pounds of copper, 37,000 troy ounces of gold, and 485,000 troy ounces of silver to Japan and West Germany. These exports brought a gross revenue return of more than $60 million.

Table 2.—Indonesia: Exports of mineral commodities [1]
(Metric tons unless otherwise specified)

Commodity	1971	Principal destinations, 1971
METALS		
Aluminum, bauxite and concentrate	1,048,000	Japan 986,486; United States 50,850.
Copper metal, including alloys, scrap	4,763	Hong Kong 1,207.
Iron and steel metal, scrap	32,202	Singapore 21,947.
Manganese ore and concentrate	231,566	Japan 219,805.
Nickel ore and concentrate	812,869	Japan 812,759.
Silver metal, including alloys value	$331,000	Singapore $309,000.
Tin metal, including alloys, unwrought long tons	5,983	Netherlands 2,500; United States 1,848; Japan 1,586.
Other, ore and concentrate	276	NA.
MINERAL FUELS AND RELATED MATERIALS		
Petroleum:		
Crude and partly refined thousand 42-gallon barrels	205,906	Japan 152, 265; United States 37,027; Philippines 11,786.
Refinery products:		
Gasoline, motor do	209	Japan 61.
Kerosine, white spirit do	99	NA.

See footnotes at end of table.

Table 2.—Indonesia: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971	Principal destinations, 1971
MINERAL FUELS AND RELATED MATERIALS—Continued		
Petroleum—Continued		
Refinery products—Continued		
Distillate fuel oil thousand 42-gallon barrels	639	Singapore 316; Liberia 116; Panamá 49.
Residual fuel oil	16,757	Japan 12,141; Singapore 2,616; Australia 440.
Mineral jelly and wax do	192	Singapore 89; Philippines 41; Hong Kong 34.

NA Not available.

[1] This table has been compiled from official trade statistics of Indonesia, unlike the trade table in the previous edition of this chapter which was compiled from trade returns of trading partner countries. As a result, all data for 1971 differs from that in the previous edition.

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

(Metric tons unless otherwise specified)

Commodity	1970	1971	Principal sources, 1971
METALS			
Aluminum metal, including alloys, unwrought and semimanufactures	10,708	24,010	Singapore 13,084; Japan 7,379; Netherlands 518.
Copper metal, including alloys, unwrought and semimanufactures	3,509	3,494	Japan 2,098; West Germany 601; Netherlands 308.
Iron and steel metal:			
Pig iron, including cast iron	1,358	8,317	Republic of Korea 1,316; Netherlands 812.
Semimanufactures:			
Bars, rods, angles, shapes, and sections	151,098	208,262	Japan 57,167; West Germany 14,208; Singapore 6,623.
Universals, plates, and sheets	160,029	193,246	Japan 143,952; Australia 11,495; United States 5,804.
Hoop and strip	5,261	4,877	Japan 3,765; Singapore 514.
Rails and accessories	6,977	5,088	France 1,286; United Kingdom 1,207; West Germany 610.
Wire	46,369	62,298	Japan 50,055; People's Republic of China 7,209; Singapore 1,434.
Tubes, pipes, and fittings	61,169	74,388	Japan 43,712; Thailand 5,943; Singapore 4,209.
Castings and forgings, rought	--	375	Japan 334.
Lead metal, including alloys, unwrought and semimanufactures	968	470	Australia 359.
Nickel metal, including alloys, unwrought and semimanufactures	--	682	West Germany 274; Japan 203; Australia 181.
Tin metal, including alloys, unwrought and semimanufactures long tons	199	396	NA.
Zinc metal, including alloys:			
Unwrought	1,840	12,524	Australia 10,360; Japan 1,968.
Semimanufactures	5,466	3,122	Australia 1,015; Japan 430; West Germany 336.
Other:			
Ore and concentrate	318	870	Japan 279.
Metals, including alloys, all forms	--	102	NA.
NONMETALS			
Abrasives, natural, n.e.s	923	170	NA.
Asbestos	--	1,350	Canada 1,049.
Cement	551,470	898,633	Japan 478,724; Republic of Korea 178,575; Philippines 91,099.
Clays and clay products (including all refractory brick), products	6,989	8,933	Japan 3,080; United States 695; Italy 542.
Diamond, gem, not set or strung value	--	$423,000	Hong Kong $405,000.
Fertilizer materials:			
Crude, nitrogenous	--	1,446	NA.
Manufactured:			
Nitrogenous	161,016	367,244	Japan 205,340; Netherlands 97,351; West Germany 26,470.
Phosphatic	27,294	19,523	Australia 8,870; Japan 4,640; West Germany 3,475.
Potassic	13,825	27,783	West Germany 20,800; France 2,310; Singapore 1,902.

See footnotes at end of table.

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

Commodity	1970	1971	Principal sources, 1971
NONMETALS—Continued			
Fertilizer materials—Continued			
Manufactured—Continued			
Other, including mixed	57,900	49,040	West Germany 16,550; Japan 12,125; Netherlands 11,527.
Pigments, mineral, including processed iron oxides	1,575	1,466	Australia 453; West Germany 441.
Salt and brine	9,620	--	
Stone, sand and gravel	35,305	39,887	Australia 14,557; Singapore 12,808; United States 1,658.
Sulfur:			
Elemental, other than colloidal	21,324	6,539	West Germany 2,621.
Sulfuric acid	1,696	--	
Other nonmetals, n.e.s.:			
Crude	6,040	12,795	People's Republic of China 3,737; Japan 3,024; United States 1,905.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	3,834	8,098	Singapore 2,551; Belgium-Luxembourg 1,635; Australia 591.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	5,610	--	
Coal and coke, including briquets	1,846	33,529	West Germany 15,397; Australia 10,159; Japan 3,053.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	241	2,348	Kuwait 1,997; Japan 141; Democratic Republic of Yemen 114.
Refinery products:			
Gasoline, motor spirit do	116	63	Singapore 9.
Kerosine, white spirit do	244	1,490	Kuwait 757; U.S.S.R. 249; Japan 151.
Distillate fuel oil do	85	68	Singapore 22; Japan 12.
Lubricants do	312	321	Netherlands Antilles 75; Netherlands 65; Singapore 63.
Other:			
Mineral jelly and wax do	12	14	West Germany 7.
Unspecified do	1,149	1,161	Singapore 676; Japan 182; United States 85.

NA Not available.
[1] This table has been compiled from official trade statistics of Indonesia, unlike the trade table in the previous edition of this chapter which was compiled from trade returns of trading partner countries. As a result, all data for 1970 and 1971 differ from that in the previous edition.

COMMODITY REVIEW

METALS

Aluminum.—Nippon Light Metal Co., Ltd., Showa Denko K. K. and Sumitomo Chemical Co., Ltd., have agreed to increase their imports of bauxite mined by P. N. Aneka Tambang, the State mining corporation on Binton and Riau Islands. Imports will increase from 1 million to 1.2 million tons per year starting in 1974 and continuing through 1978. The initial agreement between P. N. Aneka Tambang and the Japanese was for the purchase of 9,600,000 tons of bauxite over a 10-year period from 1969 through 1978.

The Asahan River Basin in north Sumatra has long been considered to have great potential for generating hydroelectric power. The development of this project has been a cherished dream of Indonesia. It is considered as one of the few remaining hydroelectric resources in the world where cheap electric power could be available. The estimated cost per kilowatt-hour would be about 2 mills. The potential of the river basin is about 1 million kilowatts. This is sufficient to support two 200,000-ton-per-year aluminum smelters.

In December a provisional agreement was signed between Indonesia and five Japanese aluminum refiners and two American refiners for construction of a powerplant and an aluminum refinery. The Japanese firms were Sumitomo Chemical Co., Ltd., (15%); Nippon Light Metal Company, Ltd., (15%); Showa Denko K. K., (15%); Mitsubishi Chemical Industries, Inc. (15%); and Mitsui Aluminium Co. Ltd., (10%). The American partners were Aluminum Company of America (Alcoa) (15%) and Kaiser Aluminum & Chemical Corp. (15%).

The agreement called for a powerplant with a generating capacity of 480,000 kilowatts to be constructed at a cost of $190 million; an aluminum refinery with an annual capacity of 225,000 tons to be built at a cost of $300 million; the nationalization of the electric powerplant after 30 years on the condition that the power will be supplied at the same price as before nationalization; and the repayment of the value of the powerplant by the Indonesian Government. Construction work on the powerplant and aluminum refinery will be completed in 6 to 7 years after the signing of the formal agreement sometime in the early part of 1974.

Copper.—Copper in the years ahead may rival the foreign exchange earnings of the leading hard mineral tin. Projected earnings for copper in 1974 are estimated at $74 million. All of the copper produced in Indonesia thus far is from the Ertsberg copper deposit. The deposit is located in Irian Jaya at an elevation of 3,700 meters. Although the deposit was first discovered in 1936, exploration did not take place until 1967. Construction of the project was completed in 1972 and the first shipment of concentrates went to Japan in December of the same year. Ore reserves are estimated at 30 million tons averaging 2.50% copper, 0.75 gram of gold, and 9 grams of silver per ton. Operating capacity of the plant is 2.27 million tons per year. The upper part of the ore body is being worked in a series of 6-meter benches. The ore is trucked 600 meters to a primary crusher. The crushed ore is conveyed to a dual jig-back tramway. The coarse ore is trammed to the millsite stockpile at an elevation of 2,900 meters. Following conventional milling and flotation, concentrates are pipelined to sea level 110 kilometers away. After dewatering and drying they are stored and ready for periodic shipments. Because of limited draft at the port entrance, ships are partially loaded at portsite (9,000 to 11,000 dry tons). Loading to 18,500 dry tons is completed offshore by 2,000-ton lighters.

The ore tramway system has experienced some technical and operational problems and a third aerial tramway will be erected. The new tramway, together with modifications to the existing tramways, will enable the system to move more ore to the mill. The mill will then be able to operate at its designed capacity. The new tramway together with modifications to the existing system and other project facilities raised the total estimated cost of the entire project from $150 million to $162 million.

Long-term contracts with Japanese and West German buyers account for the entire projected output of the mine. The first shipment of concentrates was to Mitsui Mining & Smelting Co., Ltd., Nittetsu Mining Co., Ltd., and Furukawa Mining Co., Ltd. in Japan.

Two other possible copper mineralizations have been discovered east of Gorontalo, Minahassa Peninsula on Sulawesi Island, by P. T. Tropic Endeavour Indonesia, an Australian company. Based on geochemical anomalies the first area covers about 25 square kilometers with the copper values exceeding 0.2%. The second area, about 20 kilometers away, covers 30 square kilometers with copper values of 0.1%. Endeavour has been prospecting in a 16,000-square-kilometer area since 1971.

Gold and Silver.—A 1-year exploration and development lease has been granted by the Government to Consolidated Mining Industries Ltd. of Australia. The 5,000 acre lease covers old alluvial gold deposits and a lead, zinc, and gold mining district which had a productive history prior to World War II. The gold and silver mine operated by P. T. Aneka Tambang at Cikotok, southern Baten, West Java, is still the only commercial source of these metals in the country. The deposit is becoming depleted and a vigorous exploration program is underway to expand reserves.

Domestic demand for gold is about 2,000 kilograms per year. The Cikotok mine produces about 360 kilograms and the rest is imported according to domestic needs.

Iron and Steel.—P. T. Aneka Tambang's iron sand project at Cilacap, Java, has not achieved its planned capacity of 300,000 tons annually during its first 2 years of operation. The problem is attributed to the uneven iron content of the beach sands, necessitating unanticipated additional processing. The average content of the concentrates is 39% iron. P. T. Aneka Tambang has been conducting studies on these titaniferous iron sands as a possible source for future steelmaking in Indonesia.

Iron and steel production in Indonesia is

dependent on remelting steel and on imported steel processed at foundries and rerolling mills (table 4). Smaller steel-consuming plants such as wire rope, steel structurals, and nut and bolt have capacities from 2,000 to 10,000 tons of product per year. Indonesia's iron and steel consumption is about 600,000 tons per year. This is expected to increase to 1 million within the next few years. It has been the Government's objective to promote a basic steel industry in the country.

P. T. Krakatau, a government-owned enterprise under Pertamina, was formed to provide guidance and resources for the development of the Indonesian iron and steel industry. The original Soviet design for a 100,000-ton open-hearth steelmaking furnace at Cilegon has been abandoned. With the help of the British consultant firm of Maderstam, some of the Soviet equipment at Cilegon is being rehabilitated.

Table 4.—Steel plants in Indonesia

Type of steel operation	Number of plants	Annual capacity (tons)
Steel making and rolling plants:		
Plants in operation	4	192,000
Plants under construction	3	350,000
Plants under consideration	5	306,000
Steel rolling plants:		
Plants in operation	7	136,000
Plants under construction	2	14,000
Plants under consideration	14	347,000
Galvanizing plants:		
Plants in operation	8	155,000
Plants under construction	2	27,200
Plants under consideration	9	112,760
Pipe and tube mills:		
Plants in operation	9	194,000
Plants under construction	4	63,880
Plants under consideration	2	38,000
Wire drawing and galvanizing plants:		
Plants in operation	4	47,900
Plants under construction	4	71,000
Plants under consideration	2	17,000

P. T. Krakatau of Indonesia, in a joint venture with Ferrostahl, along with Klöckner GmbH, and Thyssen, from the Netherlands, plan to produce one-half of a million tons of steel annually by direct reduction using imported Australian iron ore. The investment in the project is expected to be $70 million. The direct reduction plant will use the Purofer or possibly the American HyL process. The plant is expected to be completed in 1974. Eventual capacity of the plant is expected to be 2 million tons of steel annually by 1984. One of the major factors which can affect the success of a basic steel industry in Indonesia is the supporting infrastructure. Investment in site preparation, harbor development, power, and water supply may well be double the cost of the steel plant.

Manganese.—The West Java provincial administration, through its mining corporation P. D. Pertambangan Jabar, controls about 34 small manganese operations south of Tasikmalaya in the Karnanunggal District. Combined production from these operations is small. About 16,000 tons was produced in 1973.

Nickel.—Although there are several large nickel development projects underway, only P. T. Aneka Tambang produced nickel ore from its Pomalaa mine near Kendari in South Sulawesi. An agreement has been reached between P. T. Aneka Tambang and Sulawesi Nickel Development Corporation (Sunideco) of Japan to decrease the purchase price of nickel ores produced by 11.61 cents per kilogram of nickel content. The import volume of 800,000 tons was expected to remain the same. Sunideco is a firm made up of five Japanese ferronickel producers.

In an agreement between the Governments of Japan and Indonesia, approximately $32 million in Japanese assistance loans will be used by P. T. Aneka Tambang for the construction of a smelter to

process lower grade nickel ores into ferronickel. Taiheiyo Kinzoku Co. (Pacific Metals Co.) of Japan contracted to build the ferronickel plant in the Pomalaa Area. The plant is expected to be completed by 1975 with a projected annual capacity of 20,000 tons of ferronickel. This production is committed under long-term sale contracts to Sunideco.

The Indonesian Nickel Development Co. Ltd. (Indeco) exploration program at Obi and Gebe, in the Halmahera Area has discovered an estimated 240 million tons of laterite with a nickel content ranging from 1.3% to 1.4%. It will take another year to complete the exploration survey. Indeco is a consortium of four Japanese ferronickel producers—Sumitomo Metal Mining Co., Ltd., Nippon Mining Co., Ltd., Nippon Yakin Kogyo Co., Ltd., and Taiheiyo Kinzoku Co. A study has been started for the development of refining techniques for the nickel ore. The company plans to construct a ferronickel smelter by 1980.

P. T. Pacific Nickel Indonesia with deposits of laterite on Waigeo and Gag Islands, off the coast of West Irian, has contracted Pacific Bechtel Corp. to do a feasibility study on mining and construction of a refinery. The capital investment in the project, which is expected to exceed $500 million, would result in a mine and refinery capable of producing 100 million pounds of metallic nickel and 4 million pounds of cobalt and mixed sulfides. During the construction phase 6,000 to 7,000 persons will be employed and when the project is completed about 2,000 persons will be employed. Export earnings are expected to be about $180 million. The company's expenditure to date on the exploration and project preparation has been about $13 million.

P. T. International Nickel of Indonesia, a subsidiary of International Nickel Co. of Canada (INCO) and its consortium of Japanese partners, have explored a contract area of 6.6 million hectares on Sulawesi Island. Following their exploration program, they limited their holdings to 1.2 million hectares in the district of Bahudopi, Lasolo, Kolonedale, and Poso Regency, where the nickel content of the ore is 1.2% to 1.6%. Contracts have been awarded to Dravo Corp., Pittsburgh, Pa., to design and construct the processing plant and project infrastructure. Montreal Engineering Co. Ltd. has been awarded the contract to design and construct the powerplant. The mines and smelter will be on the south shore of Lake Matano at Soroako, Sulawesi. The project will be completed in the first half of 1976 and will produce 30 million pounds of nickel annually in the form of a 75% nickel matte. The cost of the first phase of this project was estimated at over $135 million. Ore reserves are large enough to permit future increases in production to 100 million pounds. The construction phase, which was started in April, employs more than 1,300 persons. When in production 1,100 persons will be employed.

Sumitomo Metal Mining, Shimura Kako Co., Tokyo Nickel Co., Ltd., Mitsui & Co., Ltd., Nissho-Iwai Co., Ltd. and Sumitomo Shoji Kaisha, Ltd., have paid their first investment of $6.2 million to P. T. International Nickel of Indonesia for development of the Soroako deposit. Arrangements have also been completed for the lending of $36 million to the Indonesian firm for financing development of the project.

Tin.—Indonesia has made great progress in the production of tin. From 1966 to 1972 mine output increased 70%. The tin industry is controlled by the Indonesian State Tin Enterprise, Perusahaan Negara Tambang Timah, better known as P. N. Timah. Tin was the fourth most valuable export after oil, timber, and rubber.

Since 1968 the dredging fleet has been rehabilitated and modernized, new mines have been opened and private investment capital in both land and offshore mining ventures has been welcomed. The use of new offshore bucket dredges was being considered—*Bangka II* and *Bangka III*. These dredges would be designed to dredge deeper than 40 meters. All of this is part of the plan to increase tin production to 25,000 tons per year by 1979.

The exploration program which started in 1968 has been successful. The presence of offshore tin reserves that could be exploited for the next 25 years has been established in the areas of Jebus Utara, Tampilang, Penangan, and Lepar Pongok. Most of the reserves are at a depth of 50 to 60 meters. Indonesian tin reserves are estimated to be between 500,000 to 600,000 tons.

Exploration methods have improved.

Barge-mounted drilling equipment built by Ocean Science Engineering Co. of Long Beach, Calif., was used. The barge-mounted mechanized drill could drill six or seven holes from one barge in 1 day in contrast to one hole per day by the long-used "Bangka drill." The new drills use counter-flushing to obtain samples. Other exploration programs have been undertaken jointly by Timah and the Institut Gechnologi Bandung in the offshore area of Merawang and Belinyu Islands. In addition to the offshore exploration, intensive land-based drilling has been going on to determine how much tin remains on the main tin islands.

Indonesia and Malaysia have agreed to conduct joint geological studies on tin resources in the Straits of Malacca.

Central mineral dressing installations have been improved and expanded. The new plants will increase recovery of tin as well as separate the rare-earth minerals.

Since 1967, foreign companies have been permitted to obtain rights to explore and develop mineral resources on the basis of "contract of work" agreements. Three such contracts have been awarded. N. V. Billiton Maatschappij, a subsidiary of the Royal Dutch Shell Group, signed a 40-year contract that covers two offshore areas near Bangka and Singkep Islands and off Karimata between Belitung and Kalimantan Islands, and a portion of land on the island of Pulau Tudju. The total area is nearly 28,000 square miles.

The second contract was awarded to The Broken Hill Pty. Co. Ltd. to explore and develop tin deposits on Belitung and Kelapa Kampit Islands. The contract is for 7 years of exploration and 30 years of production. Once production begins, the company must offer 20% of the shares to Indonesian partners and employ a 75% Indonesian staff in 5 years.

The third contract was awarded to P. T. Koba Tin, a consortium of three Australian companies: Colonial Sugar Refining Co., Blue Metal Industries Ltd., and Ready Mixed Concrete Ltd. The first two companies are affiliates of the third company. The contract provided Indonesia with a 25% interest in the venture and P. T. Koba Tin with 75%. The onshore and offshore contract area covers 585 square miles. Koba mining operations, which started this year, produced 400 tons of tin concentrates.

Indonesia is one of the seven producing members of the International Tin Council (ITC). The ITC decision, effective in January of this year, to impose export controls limiting sales to the 1972 level, was not to Indonesia's liking, since the national development program calls for continuing the expansion of the tin industry.

NONMETALS

Cement.—Morrison-Knudsen International Co, received a contract from P. T. Semen Cibinong of Jakarta for the construction of a 500,000-ton cement plant. The plant will be located near the city of Cibinong 40 kilometers south of Jakarta, West Java. Construction of the $6.3 million plan is expected to be completed in about 20 months and will include raw and finishing mills, concrete silos, utilities, and other supporting facilities. The plant will use the dry process of cement making.

Fertilizer Materials.—With the increasing price of fertilizers, urea up 90%, and diammonium phosphate and triple superphosphate up 40% since 1972, Indonesia was stepping up plans to reduce its shortage of fertilizer and eliminate its dependence on European and Japanese suppliers by building its own plants.

Indonesia is in an excellent position to move into fertilizer production because of its large natural gas reserves. Two large natural gas discoveries were made in northern Sumatra and east Kalimantan. These are additional reserves to those already in western Java.

Pertamina was planning to build a 1,500-ton-per-day ammonia plant north of Balikpapan in east Kalimantan. Natural gas would be supplied from two nearby fields discovered by the production-sharing oil contractors Roy M. Huffington, Inc./Virginia International Co. (Vico/Huffington) and Total Indonesie (Total). In western Java, Pertamina was planning a urea-ammonium phosphate fertilizer complex using natural gas from its onshore Jatibarang Field and from ARCO's offshore field. The plant would produce 400,000 tons per year and would cost $120 million. Pertamina also had hopes of constructing an ammonia-urea plant in north-

ern Sumatra using the gas from Mobil's Arun Field.

Using the phosphate ore from Nauru Island, Petrochemical, a government-owned company, and Mitsubishi have started constructing a fertilizer plant at Gresik, east Java. The plant will produce 200,000 to 275,000 tons of triple superphosphate. Mitsubishi has a 40% interest and Petrochemical has a 60% interest in the new plant. Completion date is set for 1975.

P. N. Pupik Sriwidjaja (Pusri) another State enterprise, now producing 100,000 tons per year of triple superphosphate at Palembang, southern Sumatra, has contracted M. W. Kellogg Co. of Houston to construct additional facilities enabling the annual production to quadruple by the end of 1975. Due to redesign of the project's gas system and additions to the fertilizer plant, as well as currency realignments in 1971 and 1973, the cost of the project increased to an estimated $113 million.

Clay.—*Kaolin.*—The firm of P. T. Keramika Indonesia Asosiasi, the principal domestic consumer of kaolin, obtains its supplies from Bangka and Belitung Islands. Clay mined at Togaret, Minahasa Regency, in Sulawesi, by P. T. Usis in partnership with Kanematsu-Gosho Ltd., is exported to Japan from the port of Bitung.

Salt.—A feasibility study was underway by Akzo Zout Chemie of the Netherlands for the construction of a sea salt plant on Madura Island. Construction cost would be about $4 million and the plant would be able to produce 300,000 tons of salt per year. The plant would be an important part of the Indonesian plan to establish a chemical industry by 1980.

Stone.—*Granite.*—P. T. Karimun Granite quarry on the island of Karimun Besar was the first project contracted under the basic mining legislation, Law No. 11 of 1967, to reach production stage. Its production is expected to increase from 80,000 tons in the initial year of operation to 2.4 million tons in 1978.

MINERAL FUELS

Asphalt.—The state-owned asphalt company of P. N. Aspal Negara was expected to increase production to 360,000 tons annually to meet its share of national demand for asphalt. Some of the remainder of the annual demand of 600,000 tons of asphalt for road construction is produced at a small refinery at Wonokromo, East Java, and an asphalt plant near Pertamina's Plaju refinery in South Sumatra.

Coal.—The state-owned coal enterprise of P. N. Tambang Batubara signed a 2-year coal exploration agreement involving 71,480 square kilometers near one of the principal coal producing areas of Bukit Asam in southern Sumatra. The agreement calls for an exploration expenditure of $1 million. The agreement also calls for exploration within the Government-owned concession of Bukit Asam, plus technical assistance for the rehabilitation of the existing P. T. Tambang Batubara mines at Bukit Asam.

Rio Tinto Bethlehem operating under a general mining contract agreement announced the discovery of a moderately large coal deposit in the Jambi Area of South Sumatra.

With the increasing world demand for oil, Indonesia was reviewing its vast coal deposits in an attempt to arrive at a more rational national policy for the use of this energy source in place of the high-value, low-sulfur crude oil.

Petroleum.—Petroleum is the most important industry in the Indonesian economy. Roughly it contributes two-thirds of the tax revenues and foreign exchange earnings. The industry has grown about five times more rapidly than the economy as a whole. This industry's growth helped accelerate developments in the rest of the economy by providing $581 million in tax revenues and foreign exchange earnings. In 1972 the value of petroleum exports was $965 million, and in 1973 the value of petroleum exports was $1,708 million. In 1973 crude oil production was 1.34 million barrels per day, or about 489 million barrels per year. This was a 24% increase over 1972 production. About 71% of the crude exports went to Japan and about 22% to the United States. Exploration and production investment expenditures by foreign oil contractors have increased from $38 million in 1968 to over $1.2 billion in 1973. The Government of Indonesia recently concluded an agreement with the Government of Japan to provide 58 million kiloliters of low-sulfur crude oil over a 10-year period over and above existing supply commitments to Japan. In

return Japan would provide a yen loan equivalent to $224.7 million on concessional terms of 25-year repayment, a 7-year grace period and 3% interest. The credit agreement was signed in Jakarta and Tokyo on March 30, 1973. The credit will be used by Pertamina to purchase equipment and services to increase Indonesia's petroleum production. During the first year Japan will provide $87 million for 16 to 17 oil-related projects.

Indonesia has taken the lead in negotiating offshore oil exploration boundary agreements with its neighbors in an attempt to resolve possible differences before they become political problems. Indonesia has already signed agreements with Malaysia, Thailand, Australia, and Singapore. Discussions have also taken place with the Philippines and South Vietnam concerning boundaries in the Celebes and South China Seas.

Pertamina engages in all aspects of Indonesia's petroleum activities, exploration, production, refining, distribution, and marketing. It is also responsible for the operation of more than 30 oil companies, which have signed 51 production-sharing contracts of work since 1967. Pertamina, through subsidiaries and joint ventures, engages in numerous activities to support petroleum sector operations that include services and facilities such as office space, telecommunications, housing, medical facilities, schools, and recreational facilities for foreign companies.

As a state enterprise in charge of all petroleum exploration and development, Pertamina is responsible to the Government of Indonesia Board of Commissioners for all of its activities and to the Ministry of Mining for management aspects of its operations.

Pertamina has four subsidiaries and joint venture affiliations with seven companies. The subsidiaries are as follows: P. T. Elektronika Nusantara (telecommunications); P. T. Pertamina Tongkang (nontanker operations); P. T. Perlita Air Service (airline services); and P. T. Parta Jasa (provides oil facilities).

Pertaminas affiliations are as follows: Ocean Petrol Ltd. (international shipping fleet); P. T. Krakatau (Cilegon steel mill project); Far East Oil Trading Co. (markets crude oil in Japan); Tugu Insurance Co. Ltd. (provides insurance); Pertamina Gulf Industrial Processing (packages fertilizer and petrochemical products); Japan Indonesian Oil; Kabushiki-Kaisha (supply crude oil to Japan); Nippon Steel Corp. Indonesia (produce finished steel products); P. T. Brown, and Root Indonesia (fabrication of offshore structures).

Most of the above companies provide services to the petroleum sector in the country.

In a joint venture, P. T. Nippon Steel Corp., Indonesia, will do structure fabrication, pipe coating and perform supply and storage functions. Vickers Ruwolt Pty., Ltd., Australia, is a joint venture to provide supporting services for oil drilling activities and will be located on Batam Island.

Exploration and production expenditures by foreign contractors and Pertamina were estimated to be in excess of $270 million for the year. More than 500 wells were drilled of which about 155 were exploration wells. The success ratio of discovery wells to exploration wells, both onshore and offshore, is improving and was above the worldwide industry average. Most of the oil and gas discoveries were onshore. Indonesia's oil reserves have been estimated between 10 and 15 billion barrels. This was about 2% of the total world reserves.

New sources of low-sulfur crude oil were discovered by Caltex at the Pudu, Jorang, Pinggir, Southeast Balam, Benar, and Pedada Fields; by Pertamina at the Diski, Benakt, and Sangatta Fields; by Stanvac in the Rumbutan, Tjandi, and N.E. Toras Fields; by Asian American Exploration Refining Association (Asamera) in the Alurcimon, Tualang, and S.E. Alur Cimon Fields; by ARCO in the "X" and "L" structures; by Independent Indonesian American Petroleum Co. (IIAPCO) in the Gita, East Kitty, and Nora Fields; by Union Oil in the Melahin and Sepingaan Fields; by Total Indonesie in the Bekapai Fields; and by Petromer Trend Corp. in the Kasim and Jaya Fields.

Mobil Indonesia, operating in Aceh, North Sumatra, and Huffco, operating in East Kalimantan, continued drilling to determine the extent of their previously discovered natural gas condensate and oil reserves. Various foreign companies have indicated interest in Indonesia's liquefied natural gas (LNG) project. The invest-

ment in the project could amount to more than $2 billion. There are indications that the project will develop rapidly.

Three new production sharing contracts were signed by Pertamina with Total Indonesie (CFP) for an onshore area (3,185 square kilometers) in Central Sumatra; Mobil Indonesia for an area (20,000 square kilometers) offshore East Kalimantan in the Makassar Straits; and Stanvac for an area (3,235 square kilometers) onshore in South Sumatra.

Although millions of square kilometers have been leased to various companies, many millions more have not yet been contracted. Pertamina continued to negotiate for leasing new areas as well as areas being relinquished as required by the production-sharing contracts. Of the 1.7 million square kilometers of land area and 3.4 million square kilometers of water area, only 172,000 square kilometers of land area and 1.9 million square kilometers of water have been extensively explored. Of the remaining land area, 260,000 square kilometers was being explored and 1.3 million square kilometers is awaiting exploration. Most of the 1.5 million square kilometers of remaining water area is available for exploration.

There were 14 offshore and 70 onshore rigs doing exploratory drilling throughout Indonesia in search of additional oil and gas reserves. Exploratory drilling costs around Kalimantan range from $190 to $220 per foot in water depths from 90 to 220 feet.

Caltex produced 350 million barrels of crude oil in 1973. This was about 72% of the country's production. Because of its active exploration and development program, Caltex's production position should not be seriously challenged for some time. Pertamina's production from its 5 units was about 38 million barrels per year, making the company the second largest producer in the country, and accounting for about 8% of the country's production. With the addition of 40,000 to 50,000 barrels per day production from the Jatibarang Field in West Java, Pertamina's production is expected to increase substantially in the future. Projects undertaken under the Japanese oil loan will also increase output. Stanvac was the third largest producer with an output of 23 million barrels per year. Associated Australian Oilfields (formerly Gulf & Western), produced about one-half million barrels per year from its fields on Ceram Island. Asamera and Tesoro Petroleum Corp., whose production was reported by Migas, within the Pertamina total, have been producing about 17,000 and 2,000 barrels per day respectively. Petromer Trend is the new onshore producer with an initial expected production from the Kasim Field of 30,000 to 40,000 barrels per day.

Union, in a joint effort with Japex, plan to steadily increase their production capacity to 100,000 barrels per day, thereby putting Union and Japex in a position to vie for the title of Indonesia's second largest producer.

Indonesia's offshore production is expected to increase as the present producers such as IIAPCO, ARCO, and Union develop new fields and as potential new producers such as Cities Service and Total together with Pertamina make decisions on the development of recent discoveries.

Table 5.—Major oil producing areas in Indonesia
(Thousand barrels)

Area	Production, 1972
Rantau (Sumatra)	19,200
Minas (Sumatra)	291,552
Duri (Sumatra)	12,274
Lirik (Sumatra)	9,369
South Sumatra	27,728
Jambi (Sumatra)	1,726
Kawengan (Java)	369
Kruka (Java)	72
Bongas (Java)	20
Tanjung (Kalimantan)	4,174
Tarakan (Kalimantan)	782
Bunyu (Kalimantan)	1,531
Klamono (Irian Jaya)	493
Bula (Maluku)	522
Cinta (offshore South Sumatra)	13,338
Arjuna (offshore Northwest Java)	10,732
Attaka (offshore Eastern Kalimantan)	974
Total	394,806

Japan continued to be Indonesia's principal market, followed by the United States, Trinidad, Belgium, England, Italy, Philippines, and Australia.

Late in 1973 the price of Indonesia's crude oil increased to $6.00 per barrel.

There were eight refineries in Indonesia: (1) Pladju, South Sumatra, 110,000-barrel-per-day capacity; (2) Dumai, Riau Province, Central Sumatra, 100,000-barrel-per-day capacity; (3) S. Pakning Riau Province, Central Sumatra, 50,000-barrel-

per-day capacity; (4) S. Gerong, South Sumatra, 79,000-barrel-per-day capacity; (5) Balikpapan, East Kalimantan, 75,000-barrel–per-day capacity; (6) P. Braden, North Sumatra, 2,000-barrel-per-day capacity; (7) Wonokromo, East Java, 4,000-barrel-per-day capacity; and (8) Cepu, East Java, 4,000-barrel-per-day capacity.

There were plans for the construction of a 100,000-barrel-per-day refinery with a lube oil plant at Cilacap on the southern coast of Central Java to begin operation in January 1976. Pertamina, Pacific Bechtel and Nissho–Iwai formed a joint venture to develop a master plan for the overall development of Batam Island located south of Singapore. The project would include one to three large (100,000 to 300,000 barrels per day) export refineries. The project complex includes metal fabricating plants, tourist facilities, agricultural development, an airport, an industrial free trade zone, and supporting infrastructure. There were also discussions concerning the construction of a large storage terminal and refinery at Semangka on the southern tip of Sumatra where waters are reportedly deep enough to accommodate the supertankers plying the Persian Gulf-Japan route.

The Mineral Industry of Iran

By Bernadette Michalski [1]

Revenues from the petroleum and natural gas industries sustained the development of the Iranian economy. Iran successfully concluded its Fourth National Development Plan in March, which entailed diversified investments in iron and steel, copper, aluminum, and lead and zinc operations. The Fifth National Development Plan was launched in March, with development allocations of $32 million and anticipated economic growth of 15.3% annually.

Higher oil prices by yearend 1973 substantially increased government revenues beyond anticipated levels. Oil revenues for the Iranian year 1352 (March 1973–March 1974) were estimated at $4,236 million,[2] a 62% increase over revenues for the previous 12 months. This sudden influx of additional revenues prompted early realignment of the Fifth National Development Plan. Revised development allocations were virtually doubled to $65 million, and the anticipated annual growth rate was adjusted to 29.5%. Revenues from the hydrocarbon industry constituted 62.7% of the total government revenues of $6,757 million and 21.3% of the gross national product (GNP) of $19,850 million.

In March, the Government announced the takeover of all oil operations in Iran by the National Iranian Oil Co. (NIOC). Under new legislation covering exploration licenses, commercial companies will not receive equity participation. In the event of a commercial discovery, NIOC will take over all production and development operations; then, for a limited period, it will sell up to 50% of production to the exploration company at about 5% discount off a market price agreed on between the two parties. This arrangement was to compensate the exploration company for the financial risk; an allowance was also to be made for the recovery of exploration and development expenditures.

As part of NIOC's assumption of control, the 1954 consortium contract was revoked. The Iranian Oil Participants, Ltd. (IOP Consortium), was disbanded and reformed as the Oil Services Co. of Iran (OSCO). The new company is under contract to assist NIOC in exploration and drilling. OSCO participants are guaranteed supplies of oil for 20 years, in ratio to their former ownership in IOP. Although NIOC is responsible for capital investment, financing seems assured since OSCO participants have been making advance payments against future oil deliveries by NIOC.

In addition to NIOC control of the Iranian oil industry, major mineral industry developments included the expansion of petroleum production and refinery facilities, the discovery of a large gasfield near the Persian Gulf Coast, and the construction of a liquefied natural gas (LNG) plant. Proposals were also being considered for overland and/or combination overland-and-marine shipment of natural gas in liquid and/or gaseous form to Western Europe. During the year, a domestic primary aluminum industry and crude steel industry were realized, the development of the Sar Cheshmeh Copper Co. deposit was underway, the cement and construction materials industry was under expansion, and mineral exploration activity was accelerated.

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[1] Mineral specialist, Division of Fossils Fuels—Mineral Supply.

[2] Where necessary, values have been converted from Iranian Rials (Rls) to U.S. dollars at the rate of Rls68.17 = US$1.00.

Table. 1—Iran: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]		1971 [2]	1972 [2]	1973 [p 2]
METALS				
Aluminum, primary ingot		--	6,500	33,700
Chromium, chromite, gross weight		175,600	180,000	140,000
Copper:				
Mine output, metal content		1,003	1,200	3,000
Smelter output [3]		2,900	4,000	[e] 4,000
Refinery output [e]		1,000	1,000	1,000
Iron and steel:				
Iron ore, gross weight		150,000	98,000	[e] 100,000
Pig iron		--	[e] 300,000	400,000
Steel, crude		--	--	200,000
Lead:				
Mine output, metal content		38,800	43,550	60,000
Smelter output [e]		180	[r] 190	200
Manganese ore, gross weight		[r] 12,300	20,000	36,000
Zinc, mine output, metal content		39,200	52,250	71,500
NONMETALS				
Barite		60,000	80,000	120,000
Cement, hydraulic	thousand tons	2,850	3,392	[e] 3,800
Clays:				
Bentonite		10,000	18,000	35,000
Fire clay		NA	5,500	NA
Kaolin		48,000	55,000	[e] 80,000
Gem stones, turquoise, crude		40	70	70
Gypsum	thousand tons	2,250	2,400	3,000
Lime [e]	do.	1,000	1,000	1,000
Magnesite		[r] 7,000	10,000	16,000
Pigments, mineral, natural ocher		4,600	12,500	5,000
Salt:				
Rock		NA	350,000	350,000
Evaporated		NA	50,000	[e] 50,000
Total		390,000	400,000	[e] 400,000
Stone and sand and gravel:				
Limestone	thousand tons	4,500	5,200	NA
Marble	do.	15	18	18
Silica	do.	36	50	70
Strontium minerals (celestite)		300	300	300
Sulfates, natural:				
Aluminum potassium sulfate (alum)		7,000	300	NA
Sodium sulfate (mineral not specified)		17,000	18,000	18,000
Sulfur:				
From ores (refined)		2,000	3,000	[e] 3,000
Elemental, byproduct		495,000	665,707	[e] 775,000
MINERAL FUELS AND RELATED MATERIALS				
Coal	thousand tons	660	1,000	1,050
Coke	do.	57	[e] 400	[e] 400
Gas, natural:				
Gross production	million cubic feet	1,305,228	1,469,730	1,698,691
Marketed production	do.	298,962	447,908	701,678
Natural gas liquids:				
Propane	thousand 42-gallon barrels	3,900	4,380	[e] 4,910
Butane	do.	3,400	3,639	[e] 4,170
Natural gasoline and other	do.	3,000	3,983	[e] 4,580
Total	do.	10,300	12,002	[e] 13,660
Petroleum:				
Crude (net) [4]	do.	1,661,901	1,838,825	2,139,269
Refinery products:				
Gasoline:				
Aviation	do.	5,361	5,630	5,217
Motor	do.	20,809	21,344	21,748
Jet fuel	do.	10,776	13,282	13,157
Kerosine	do.	19,683	23,977	20,506
Distillate fuel oil	do.	36,297	36,124	38,986
Residual fuel oil	do.	88,084	83,741	88,224
Lubricants	do.	560	546	1,077
Other:				
Liquefied petroleum gas	do.	913	865	2,299
Naphtha and solvents	do.	2,718	4,105	3,026
Asphalt	do.	2,662	1,684	3,159
Unspecified	do.	14,172	8,390	3,020
Refinery fuel and losses	do.	6,673	4,376	13,840
Total	do.	208,708	204,064	214,259

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

[1] In addition to the commodities listed, other types of crude construction materials (such as common clays, sand, and gravel, and other varieties of stone) are also produced, but output is unreported and available information is inadequate to make reliable estimates of output levels.

[2] Data presented are for Iranian calendar years beginning March 21 of the year stated, except for figures on natural gas, natural gas liquids, and petroleum, which are for regular calendar years.

[3] As reported in Iranian sources; apparently includes secondary copper.

[4] Excludes petroleum produced but reinjected into fields.

PRODUCTION

Crude petroleum production valued at approximately $7 billion continued to dominate the Iranian mineral industry. Major increases in the production of other mineral commodities, particularly aluminum, copper, lead, manganese, steel, and zinc reflected the Government's efforts at mineral industry diversification. Aluminum production is based on reduction of imported alumina; other primary metal production is derived from indigenous ores.

TRADE

The large increase in petroleum receipts produced a record surplus of $915 million in the balance of payments for the Iranian year 1352 (March 1973–March 1974) compared with a surplus of $493 million for the Iranian year 1351 (March 1972–March 1973).

Iran trails Saudi Arabia as the world's second largest crude oil exporter. Crude oil exports in 1973 totaled nearly 5.3 million barrels per day. The posted price of Iranian crude oil ranged from $2.53 in January to $5.25 in December and increased to $11.87 on January 1, 1974.

Iran is the world's third largest exporter of natural gas, following Canada and the Netherlands. During 1973, exports exceeded 306 billion cubic feet, all of which was exported by pipeline to the Soviet Union. The original Iran-U.S.S.R. contract price was 18.7 cents per thousand cubic feet. Contract renegotiations resulted in the adoption of a price level of 30.7 cents per thousand cubic feet in late 1973; higher prices were anticipated for 1974.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum metal, including alloys, all forms	--	2,556	Japan 2,550.
Chromium, chromite, 48% Cr_2O_3	151,828	101,105	Poland 23,050; People's Republic of China 19,800; Japan 18,800.
Copper ore and concentrate	840	660	All to Japan.
Iron and steel:			
Scrap	38	84	Do.
Semimanufactures	1,677	1,966	Kuwait 1,652; Afghanistan 184.
Lead ore and concentrate	99,139	66,766	U.S.S.R. 52,797; Japan 11,204; Netherlands 1,176.
Manganese ore and concentrate	12,320	9,652	All to Japan.
Mercury, 76-pound flasks	2	--	
Zinc ore and concentrate	66,223	95,378	Japan 39,118; Belgium 28,775; U.S.S.R. 14,135.
Other:			
Ore and concentrate	675	501	Japan 480; United States 20.
Ash and residue containing nonferrous metals	20	225	United Kingdom 195; Belgium 30.
NONMETALS			
Abrasives, natural:			
Crude, n.e.s	282	90	All to Japan.
Grinding and polishing wheels and stones	5	4	Kuwait 3; Saudi Arabia 1.
Barite, natural	19,522	9,205	Abu Dhabi 5,543; Pakistan 1,900.
Cement	35,873	24,104	Kuwait 20,500; Somali Republic 1,200; Saudi Arabia 1,000.
Chalk	35	20	Abu Dhabi 15.
Clays and clay products:			
Crude clays, n.e.s.:			
Fuller's earth	87	15	Bahrain 6; Kuwait 3; Abu Dhabi 2; Oman 2.
Kaolin	--	5	All to Netherlands.
Other	5,923	2,011	Abu Dhabi 639; Kuwait 577; Saudi Arabia 125.
Products, nonrefractory	1,586	1,576	U.S.S.R. 887; Kuwait 330; Abu Dhabi 191.

See footnotes at end of table.

Table 2.—Iran: Exports of mineral commodities[1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Fertilizer materials:			
Nitrogenous	31	31	All to Kuwait.
Phosphatic	7,187	17,000	All to Afghanistan.
Potassic	500	--	
Other	4,990	10	Kuwait 10.
Ammonia	80,000	90,000	All to Republic of South Africa.
Gypsum	1,294	2,004	Kuwait 1,625; Abu Dhabi 278.
Lime	21	--	
Mica ---kilograms	295	--	
Pigments, ochre	10,882	10,259	France 6,002; United Kingdom 1,986; India 1,484.
Precious and semiprecious stones:			
Turquoise, raw, cut, uncut --grams	250,894	1,134,472	United States 733,959; India 235,800; West Germany 68,566.
Other ---do	40	110,900	All to Saudi Arabia.
Salt	3,077	2,139	Oman 1,073; Kuwait 374; Abu Dhabi 369.
Stone:			
Dimension:			
Alabaster	--	907	Japan 359; Italy 317; Kuwait 174.
Marble	17,758	28,998	Italy 17,865; Abu Dhabi 3,700; Japan 3,031.
Other	5,518	11,727	Italy 4,164; Kuwait 3,127; Japan 3,111.
Worked:			
Slate	64	18	All to Abu Dhabi.
Other	89	47	Hong Kong 29; Thailand 10; Kuwait 7.
Crushed stone	28,878	42,191	Kuwait 24,123; Oman 17,173; Australia 400.
Limestone	1,600	1,600	Kuwait 800; Oman 800.
Quartz	--	3	All to Netherlands.
Sulfur, refined	464,029	488,898	Republic of South Africa 213,168; India 171,257; Taiwan 33,033.
MINERAL FUELS AND RELATED MATERIALS			
Coal, lignite, coking coal	62	52	Kuwait 46; U.S.S.R. 6.
Gas, natural ---million cubic feet	209,634	200,670	All to U.S.S.R.
Petroleum:[2]			
Crude ---thousand 42-gallon barrels	1,182,294	1,598,046	Asia 732,776; Europe 628,381; United States 157,729.
Refinery products:			
Gasoline:			
Aviation ---do	6,171	5,299	Asia 3,081; Africa 968; Europe 582.
Motor ---do	18,085	17,346	Asia 7,155; Africa 5,212; Australia 2,113.
Kerosine ---do	4,231	2,958	Africa 1,737; Asia 660; Australia 258.
Jet fuel ---do	8,457	6,417	Europe 1,747; Asia 1,382; United States 1,376.
Distillate fuel oil ---do	17,375	15,063	Asia 6,083; Africa 6,032; Europe 1,839.
Residual fuel oil ---do	60,372	73,808	Asia 40,912; Europe 18,264; United States 7,760.
Lubricants ---do	3	1	All to Asia.
Other:			
Liquefied petroleum gas do	7,025	7,690	Japan 7,129; Bahrain 309.
Asphalt ---do	385	132	Asia 72.
Solvents ---do	620	717	Africa 371; Asia 257; Australia 89.
Total ---do	122,724	129,431	

[1] Data are for Iranian calendar years beginning March 21 of the year indicated.
[2] Destinations of shipments reported by continent only in most cases; detail by country not available except as shown.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Oxide and hydroxide	3,182	47,510
Metal, including alloys:		
Scrap	1,042	186
Unwrought	8,129	10,131
Semimanufactures	5,305	6,117
Antimony metal, including alloys, all forms	630	10
Arsenic trioxide, pentoxide, acids	7	5
Cadmium metal, including alloys, all forms ---kilograms--	1,185	1,357
Chromium:		
Oxide and hydroxide	50	8
Metal, including alloys, all forms	3	118
Cobalt metal, including alloys, all forms ---kilograms--	853	1,513
Copper metal, including alloys:		
Scrap	405	677
Unwrought	219	505
Semimanufactures	10,526	14,255
Gold metal, all forms ---troy ounces--	23,502	50,059
Iron and steel, metal:		
Scrap	8,437	12,525
Cast iron	12,564	4,756
Ferroalloys	4,206	5,225
Steel, primary forms	305,910	288,254
Semimanufactures ---thousand tons--	1,260	1,314
Lead:		
Ore and concentrate	10	--
Oxide	818	667
Metal, including alloys:		
Scrap	1	8
Unwrought	8,246	2,098
Semimanufactures	34	84
Magnesium metal, including alloys, all forms	5	94
Manganese:		
Ore and concentrate	4	--
Oxide	584	1,297
Mercury ---76-pound flasks--	444	516
Nickel metal, including alloys:		
Scrap	1	(2)
Unwrought	27	35
Semimanufactures	103	150
Platinum metal, including scrap, waste, ash ---troy ounces--	r 836	482
Silver metal, including scrap, waste, ash ---do---	652,627	398,958
Tin:		
Oxide ---long tons--	59	5
Metal, including alloys:		
Unwrought ---do---	270	321
Semimanufactures ---do---	218	407
Titanium oxide	2,469	3,247
Tungsten metal, including alloys, all forms	4	4
Zinc:		
Oxide	848	917
Metal, including alloys:		
Scrap	7	8
Unwrought	5,191	4,794
Semimanufactures	363	228
Other:		
Ore and concentrate, n.e.s	1,209	1,272
Ash and residue containing nonferrous metals	197	180
NONMETALS		
Abrasives, natural:		
Crude, n.e.s	84	149
Grinding and polishing wheels and stones	1,093	1,027
Asbestos	10,514	12,773
Barite	1,515	1,023
Cement	79,550	57,964
Chalk	253	347
Clays and clay products, including all refractory brick:		
Crude clays, n.e.s:		
Fire clay	4,728	3,641
Kaolin	5,801	9,482
Pozzolana and similar earths for cement manufacture	--	13
Other	27,915	822,776
Products:		
Refractory, including nonclay brick	20,261	14,949
Nonrefractory	103	15
Diatomite	512	755

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972
NONMETALS—Continued		
Fertilizer materials:		
Manufactured:		
Nitrogenous	51,590	85,094
Phosphatic	146,735	68,891
Other, including mixed	7,924	2,067
Ammonia	8,401	294
Graphite	1,576	2,087
Gypsum	768	942
Iodine ---kilograms	900	--
Lime	97	538
Magnesite	10	521
Mica:		
Crude	173	347
Worked	113	319
Pigments, mineral:		
Iron, including processed	628	464
Other	5	31
Precious and semiprecious stones:		
Natural ---grams	593,663	1,939,803
Manufactured ---do	32,500	22,900
Salt	111	39
Stone and sand and gravel:		
Dimension stone:		
Crude and partly worked	30	58
Worked:		
Slate	--	(2)
Other	--	20
Crushed stone	289	429
Limestone	1,173	1,878
Quartz	1,300	797
Sand and gravel	1,363	10,114
Sulfur:		
Elemental	355	347
Sulfuric acid	166	59
Talc, steatite, soapstone, pyrophyllite	118	339
Other nonmetals, n.e.s.:		
Crude, meerschaum, amber, jet	4	--
Oxides and hydroxides:		
Magnesium	73	208
Barium	300	585
Other	2,045	2,337
MINERAL FUELS AND RELATED MATERIALS		
Asphalt, natural	29	14
Coal	3,739	2,401
Rare gases, including neon	82	112
Petroleum refinery products:		
Gasoline:		
Aviation ---42-gallon barrels	2	4
Motor ---do	(2)	8,542
Kerosine ---do	1	--
Distillate fuel oil ---do	361	10
Lubricants ---do	44,960	175,376
Mineral jelly and wax ---do	17,023	38,044
Other:		
Liquefied petroleum gas ---do	450	350
Asphalt and bitumen ---do	15,823	28,082
Solvents ---do	21,579	37,883
Other ---do	3,179	4,805
Total ---do	103,378	293,096
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	1,178	1,051

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.—Initial startup of the Araq aluminum plant was achieved in late 1972. By yearend 1973, it was operating at 90% of its design capacity of 45,000 tons annually. The plant is operated by the Iranian Aluminum Co. (Iralco), a joint venture of the Iranian and Pakistani Governments and the U.S. firm of Reynold's International, Inc. About 25,000 tons of the plant's output is reserved for Iranian and Pakistani consumption; the remainder is available

for export. At least 6,000 tons of Iralco aluminum was purchased by Japan in 1973.

Copper.—The Sar Cheshmeh Copper Co., under technical advisement of The Anaconda Company (United States) launched development work on the 400-million-ton ore deposit containing 1.2% copper at Sar Cheshmeh in south-central Iran. In addition to mine operations which are expected to reach a planned production rate of 42,000 tons per day, the complex will include a concentrator and a 145,000-ton-annual-capacity smelter. Full production is anticipated by 1977. The supporting infrastructure for the Sar Cheshmeh complex is expected to contribute to the economic feasibility of developing other small copper deposits in the Kerman-Yazd area. These deposits were discovered during 1969–73 under exploration licenses awarded to Charter Consolidated, Ltd. (United Kingdom), Metallgesellschaft A.G. (Federal Republic of Germany), Péchiney (France), and an unnamed Yugoslav group. The discoveries included a 25-million-ton ore deposit containing 0.2% copper and a 15-million-ton ore deposit containing 0.9% copper in the Yazd area, and an 80-million-ton deposit containing 0.4% copper in the south Kerman area. The discovery of a 45-million-ton ore deposit at Maiduc was announced in 1973; however, no metal content figure was reported.

A contract was awarded to the U.S. firm of Phelps Dodge International Corp. for constructing cable and wire manufacturing facilities. A $25 million plant is to be located at the Ghazvin Industrial Complex, and will produce 330 varieties of copper and aluminum wires and cables at an annual rate of 75,000 tons. The plant is expected to reduce Iran's dependence upon imported semimanufactured and finished copper products.

Reserves at the Qaleh-Zari copper deposit were estimated at 2 million tons of ore containing 3% to 4% copper. The deposit is being developed by Société Maaden Louto, an Iranian-Japanese joint venture. Underground development work and construction of concentrating facilities was expected to be completed by 1974. Production was expected to reach design capacity of 5,000 tons annually of copper concentrates by 1975.

Gold.—Higher gold prices prompted the reopening of the Miteh gold mine, located southwest of Arak in central Iran. The deposit's reserves were reported at 500,000 to 600,000 tons of ore assaying 8.2 grams of gold per ton. Modernization activities were underway during the year and production was anticipated in early 1974.

Iron Ore.—Iron ore for the Aryamehr iron and steel complex is supplied from mining operations at Bafq. The delayed startup of the steel plant caused an erratic pattern in iron ore production. The Bafq reserves were estimated at 170 million tons. The Ghol-e Gowar deposit south of Kerman contains reserves of 400 million tons of ore suitable for direct reduction. Another possible source is the Kudremukh deposit in Karnataka, India. Iran is considering a $300 million investment to develop the deposit and to construct port facilities for shipping the ore to Iran.

Iron and Steel.—Long-delayed steel production from the Aryamehr iron and steel complex was finally realized in March; however, the plant's products had not been placed on the domestic market by yearend 1973. Plans to expand the basic oxygen-steel production capacity of the complex from 0.7 to 1.9 million tons by 1978, and to 4.0 million tons by 1981 were confirmed; however, the bulk of Iran's future iron and steel output will be based on direct-reduction methods utilizing Iran's abundant natural gas and iron ore reserves.

The National Iranian Steel Industries Corp. (NISIC) was formed by the Government in mid-1973 to establish iron and steel mills that would use the direct-reduction method. By yearend, contracts were signed for the establishment of two plants, and at least three other contracts were under negotiation. Korf Engineering GmbH (West Germany) entered into a design-and-construction contract for three 400,000-ton-annual-capacity direct-reduction units that will produce iron pellets for conversion to steel in electric arc furnaces. The units were expected to begin production by November 1976. The plant, located in Ahwaz, will utilize a process licensed under Midland-Ross Corp., a U.S. firm. Total cost is estimated at $67 million.

A second contract for a direct-reduction plant was signed with the U.S. firm, Swindell-Dressler Co. The 1-million-ton-per-year-capacity plant will use a process developed by Hojalata y Lamina, S.A. (Mexico) in cooperation with M. W. Kellogg Co. (United States). Isfahan is the preliminary

site selection for the estimated $50 million plant, which will include electric arc furnaces for the conversion of sponge iron into steel. Completion was scheduled for 1976. In addition to the above mentioned contracts, NISIC is considering construction of a 1.5-million-ton-capacity plant at Bandar Abbas, a 330,000-ton-capacity plant at Ahwaz, and a plant at Khorasan. By 1983, NISIC anticipates a direct-reduction capacity of 11 million tons annually, thus raising total steel capacity to 15 million tons annually.

Domestic steel consumption, estimated at 2 million tons, is dependent upon crude, semimanufactured, and finished steel imports. Imported crude steels are reworked at the Shahriar Industrial Complex at the Ahwaz rolling and pipe mills, and at the NIOC pipe mill.

NONMETALS

Cement.—About two-thirds of Iran's cement requirements were satisfied by the near-capacity operation of the nation's 11 cement plants. Total production capacity is 10,600 tons per day. The Teheran Cement Co. operates the largest plant, with a capacity of 4,000 tons per day. Located about 5 kilometers east of Teheran, the plant has ready access to limestone, clay, and gypsum deposits in the area. Iran's second largest plant, with a capacity of 2,000 tons per day, is located at Doroud. This plant is operated by the Fars and Khuzestan Cement Co., which also operates a 1,500-ton-daily-capacity plant near Shiraz. The Fars and Khuzestan Cement Co.'s Abyek plant was near completion by yearend. The 4,000-ton-daily-capacity plant was expected to enter full production by 1974. Expansion programs are underway at most existing plants and at least nine additional cement plants are planned. Selected plant sites are Gorgan, Bandar Abbas, Kermanshah (expansion), Behbehan, Chah Bahar, Kashan, Rega'yeh, Hamadan, and Yazd. Daily capacity for the plants at the last two sites will be 1,000 tons each; the other plants will have a daily capacity of 2,000 tons each. By 1976, cement production was expected to be about 45,000 tons per day, in line with estimated cement requirements for that year.

Fertilizers.—The Chemical Fertilizers Distribution Company, affiliated with the Iranian Ministry of Agriculture and Natural Resources, reported the distribution of 480,000 tons of fertilizer. Output from the Shahpur chemical complex, as well as imported chemical fertilizers, were used to meet the demand.

Sulfur.—The bulk of sulfur production is obtained through byproduct recovery operations at the Shahpur and Kharg chemical plants. Sulfur recovery at Shahpur was estimated at 450,000 tons, of which 160,000 tons was used in the manufacture of 462,000 tons of sulfuric acid. Most of the remaining sulfur output was exported. By 1975, sulfuric acid production at Shahpur was expected to increase to more than 1 million tons, consuming 375,000 tons of recovered sulfur. Sulfur recovery at the Kharg chemical plant was reported at 250,000 tons. The National Petrochemical Industries Co. signed an agreement with representatives of the People's Republic of China for 50,000 tons of Kharg sulfur in 1973, thus opening a new export market for Iranian sulfur.

Other sulfur-recovery operations and their estimated annual output were the Abadan complex, 40,000 tons; the Bid Bolan gas-treating plant, 22,000 tons; and the newly inaugurated Shiraz refinery, 12,000 tons.

MINERAL FUELS

Natural Gas.—NIOC reported Iranian gross natural gas production at nearly 1.7 trillion cubic feet. About 93% of the gross production, or 1.6 trillion cubic feet, was produced in the former consortium agreement area in southern Iran. Nearly 1 trillion cubic feet of gas was flared. An estimated 315 billion cubic feet was utilized at the Abadan, Bandar Shahpur, and Kharg chemical complexes, and about 306.5 billion cubic feet was exported to the Soviet Union. The remainder (less than 80 billion cubic feet) was utilized for domestic fuel and field operations. Iran plans full utilization of its natural gas reserves, which are currently estimated at 380 trillion cubic feet. Immediate plans include doubling the capacity of the natural-gas-based chemical industry and increasing exports of natural gas in both gaseous and liquid forms.

By yearend, NIOC announced an agreement in principal for constructing a second 1,600-million-cubic-feet-per-day-capacity pipeline. The pipeline will parallel the existing 782-mile-long, 40/42-inch-diameter pipeline that connects the southern field

with Astara on the Soviet border. The new pipeline will deliver additional quantities of natural gas to the Soviet Union, which in turn will deliver equivalent quantities under an Iranian account to West Germany through its pipeline across Czechoslovakia. The Soviet Union will receive transit fees in the form of currency or gas for participation in the tripartite trade agreement. Another proposal under consideration is construction of a pipeline across Turkey for delivering Iranian natural gas to liquefaction facilities on the Mediterranean coast. LNG would then be transported by sea to European consumers. Construction of a pipeline connecting Iran with Western Europe is also under consideration. The pipeline would connect Turkey, Greece, Yugoslavia, Italy, France and West Germany. The estimated cost of the project is $3 to $4 billion.

Construction of the $700 million Kangan LNG (Kalingas) plant began by mid-year, with completion scheduled for 1976. The plant will provide a total of 75 to 115 million barrels annually of LNG for export to Japan and the United States. The project represents a joint venture between NIOC and a United States-Japanese-Norwegian consortium.

NIOC entered a joint venture with Transco Co., Inc., for a $650 million LNG and methanol export project. About 750,000 million cubic feet per day of gas from the Gachsaran, Bibi Hakimeh, Pazanan, Rag-e-Safid, and Binak Fields is to be processed at six extraction plants. The plants are expected to produce 60,000 barrels per day of LNG, or 20,000 barrels per day each of butane, propane, and pentane plus. The methanol is to be transported to the east coast of the United States for conversion to synthetic gas. The agreement was signed in September before the rapid rise in crude oil prices. The plan to utilize gas to repressurize oilfields may place the agreement under scrutiny.

NIOC has entered into a joint venture with European Group of Oil Cos. (EGOCO), a consortium of French, Spanish, Italian, Belgian, and Austrian companies. Essence et Lubrificiant de France-Entreprise de Recherches et d'Activité Pétrolières (Elf-ERAP), the operator for EGOCO, announced discovery of a major gasfield; preliminary reserve estimates range from 70 to 175 trillion cubic feet. The field lies 19 miles inland from the Persian Gulf, lending itself to the possible export of LNG.

Petroleum.—Exploration activity was accelerated to support planned production goals of 8.6 million barrels per day by 1977, an increase of more than 50% over 1972 production levels. A reported total of 868,265 feet was drilled for 73 well completions in 1973, compared with 576,863 feet for 59 well completions in 1972. Fifteen exploration wells with a total footage of 252,226 were drilled in 1973 and yielded four oil-discovery wells and one gas-discovery well. Petroleum reserves were estimated at 68 billion barrels at yearend.

Production increased by more than 800,000 barrels per day during 1973, reaching a daily average of nearly 5.9 million barrels. Iran remained the second largest producer in the Middle East and fourth largest producer in the world. Nearly 92% of the total production, or 5.4 million barrels per day, was recovered onshore in southern Iran in the former consortium agreement area. Most of the remaining production was recovered from offshore wells operated by four companies, each in partnership with NIOC.

The Lavan Petroleum Co. (LAPCO) averaged more than 184,000 barrels per day from 14 wells in the Sassan Field, a 9.5% increase over 1972 production levels. Desalting and crude oil stabilization facilities installed in late 1972 resulted in higher production levels. A record output of 195,000 barrels per day was reported in May. LAPCO equity is held 50% by NIOC and 12.5% each by the U.S. firms of Atlantic Richfield Co., Murphy Oil Corp., Sun Oil Co., and Union Oil Co. of California.

The Iran Pan American Oil Co. (IPAC) averaged more than 128,000 barrels per day from its Darius and Cyrus Fields in the northern Persian Gulf. Two additional fields, Ardeshir and Fereidoon, are under development by IPAC. The Fereidoon Field was expected to enter production by late 1974. The field straddles the Saudi Arabian boundary, and production from the Iranian portion is anticipated at 150,000 barrels per day of 26° to 30° API crude oil averaging 2.6% sulfur. Development plans include construction of two major production platforms with gathering lines extending to satellite platforms, each servicing from two to eight producing wells. The two major platforms will be connected by a 16-inch crude-oil line. A 20-inch underwater crude-oil line will extend 99 kilo-

meters to the IPAC loading terminal at Kharg Island. Platform construction was underway and other contracts were negotiated. Full development drilling of the Ardeshir Field however was not anticipated before 1975. Production from this field, located 72 kilometers west of Kharg Island, was projected at 200,000 barrels per day by 1976. IPAC equity is held jointly by NIOC and Amoco International, a subsidiary of Standard Oil Company of Indiana.

The Société Irano-Italiènne des Pétroles (SIRIP) with equity held jointly by NIOC and Azienda Generale Italiana Petroli (AGIP S.p.A.), averaged nearly 72,000 barrels per day from its Behregansar, Hendijan, and Nowrouz Fields, a decline of nearly 17% from that of 1972.

The Iran Marine International Oil Co. (IMINOCO) averaged more than 68,000 barrels per day from the Rostam and Rakhsh fields. The Alpha–1 discovery well tested at 1,800 barrels per day. The Alpha–2 exploratory well and the 0–4 exploratory well were abandoned at 7,610 feet and 1,461 feet, respectively. Drilling on 0–3 and R–32 was suspended at 6,730 feet and 9,266 feet, respectively. NIOC holds 50% of the equity in IMINOCO, and Phillips Petroleum Co., AGIP S.p.A., and Hydrocarbon India, Ltd., each hold 16.67%.

Production from the NIOC onshore Nafte Shah Field averaged nearly 17,000 barrels per day and reached a record high of over 20,000 barrels per day in November.

Société Française des Pétroles d'Iran (SOFIRAN), a subsidiary of Elf–ERAP under contract to NIOC, announced discovery wells in the Sirri A, C, and D structures in its offshore concession area west of the Straits of Hormuz. The Sirri D structure was expected to enter production in 1975 with 100,000 barrels per day. The discoveries in the Sirri A and C structures are under evaluation. Mitsubishi Petroleum Development of Japan will purchase 40% equity in SOFIRAN's Sirri Field after payment of 40% of SOFIRAN's exploration investments.

Other companies in partnership with NIOC included Iran Nippon Petroleum Co. (INPECO), Hormuz Petroleum Co. (HOPECO), and Bushire Petroleum Co. (BUSHCO). Although these companies were heavily engaged in exploration activities, no discoveries were reported from their concession areas.

Equity in INPECO is held 50% by NIOC; 33.3% by a Japanese consortium of Mitsui & Co. Ltd., Teijin Oil Co. Ltd., North Sumatra Oil Development, and Mitsubishi Oil Co. Ltd., and 16.7% by Mobil Oil Co. The concession covers 3,100 square miles onshore in the Luristan area. INPECO abandoned exploratory well B–G1 at 8,670 feet, PT–1 at 15,020 feet, and BL–1 at 9,712 feet. By yearend, drilling at PQ–1 was at 4,647 feet.

Equity in HOPECO is held 50% by NIOC and 50% by Mobil Oil Corp. The concession area covers 1,350 square miles in the Straits of Hormuz. At least one exploratory well was spudded. By April, it had reached 7,145 feet.

Equity in BUSHCO is held 50% by NIOC and 50% by Amerada Hess. The concession covers 1,200 square miles offshore near the city of Bushehr. Exploratory well BD–1 was abandoned in May at 10,192 feet. BA–1 was suspended in April at 10,079 feet. Drilling at BB–3 had reached 7,744 feet by yearend.

Iran exported more than 90% of total production, or nearly 5.3 million barrels per day, and is second only to Saudi Arabia as the world's largest crude oil exporter. The remaining crude oil production of over 500,000 barrels per day is refined in Iran. By yearend, most refining operations were producing above design-capacity levels. The 430,000-barrel-per-day-capacity Abadan refinery reported an average daily throughput of 433,767 barrels. The refinery was to be expanded to 550,000 barrels per day in the immediate future. The 85,000-barrel-per-day-capacity Teheran refinery reported a daily average throughput of 95,589 barrels. The 40,000-barrel-per-day Shiraz refinery was inaugurated in mid-November. Throughput at Shiraz totaled over 2.6 million barrels by yearend for a 50-day operating average of 52,000 barrels per day. The 15,000-barrel-per-day Kermanshah refinery reported a daily throughput average of 16,849 barrels in its first full year of operation. The daily throughput average at the Masjid Sulaiman topping plant was reported at 33,644 barrels. Construction of a second Teheran refinery was announced. Planned capacity is 100,000 barrels per day. A refinery with similar capacity is planned at Isfahan, and a larger 130,000-barrel-per-day-capacity refinery is to be constructed at Neka. NIOC expects the Neka refinery to be operational by 1980. Crude feedstock will come from an extension of the existing

Ahwaz-to-Teheran pipeline. The possible construction of several 500,000-barrel-per-day-capacity export-oriented refineries was under consideration. Discussions centered upon joint-venture agreements between NIOC and a Japanese consortium, NIOC and a United States consortium, and NIOC and a West German consortium.

Output of petroleum products averaged nearly 550,000 barrels per day; about 50% of this output was exported. Domestic consumption of petroleum products averaged nearly 259,000 barrels per day, an increase of 18% over the 1972 level. Estimated consumption of the various products were as follows: gas oil, 78,000 barrels per day; fuel oil, 69,000 barrels per day; kerosine, 56,000 barrels per day; gasoline, 33,000 barrels per day; and aviation gasoline, 11,000 barrels per day.

The Mineral Industry of Iraq

By John L. Albright [1]

Petroleum production and sales grew in 1973, and the Iraqi petroleum industry's development projects permitted the country to remain as one of the most significant oil producers and exporters in the Middle East. Oilfields were being developed by Iraqi and foreign companies, long-term crude oil sales contracts were negotiated with numerous foreign buyers, Iraq's fleet of oil tankers grew as Spanish shipyards completed delivery of seven ships ordered in 1970, a contract was issued for the construction of a supertanker port in the Persian Gulf near Fao, and projects were inaugurated to expand domestic and international pipelines to ocean terminals. Nearly 65% of the country's oil production came from state-owned fields. Iraq's oil output, accounting for 9.5% of the 1973 Middle East production, set a record of 740.6 million barrels. The Government made final settlement with the Iraq Petroleum Companies (IPC group) for the 1972 nationalization of the Iraq Petroleum Co., Ltd. (IPC), pipelines and producing oilfields, and the Mosul Petroleum Co. Ltd. (MPC) concession was surrendered to the Government. The IPC group was composed of Basrah Petroleum Co., Ltd. (BPC), IPC, and MPC. The United States, the Netherlands, and Portuguese interests in BPC were nationalized by the Government during the year, leaving the British and French owners of BPC as the only foreign oil producers in the country. BPC's output set a record during 1973 at 266.1 million barrels, up nearly 10% from the previous year, and its payments to the Government totaled $433.8 million,[2] an increase of nearly 32% compared with 1972 figures. Iraq's yearend 1973 crude oil reserves were estimated at 36 billion barrels, accounting for about 11% of the Middle East reserves. Oil reserves were sufficient for 49 years of production at the 1973 rate of output. Natural gas reserves were placed at 27.5 trillion cubic feet, approximately 3.5% of the total Middle East gas reserves.

Posted prices for Basra 35° to 35.09° API oil were nearly doubled from the January price, when the Ministry of Oil and Minerals set the price at $4.97 per barrel effective December 1. A 134.5% increase was set to be effective January 1, 1974, raising the posted price to a record $11.67 per barrel. New posted prices effective October 16, 1973, were set at $7.50 per barrel for 36° API Kirkūk crude oil, up 76.8% from the October 1 price.

Oil revenues from petroleum exports and the financial settlement with the IPC totaled an estimated $1.6 billion in 1973, and the Ministry of Oil and Minerals expected oil revenues to rise to $1.8 billion in 1974 and to $2.5 billion in 1975 as production and export increases are realized.

An Advisory Council for Oil and Minerals was formed in December 1973, headed by the Minister of Oil and Minerals, to study oil and minerals policy and investment plans and operations of the state companies. Advisory Council members included Ministry of Oil and Minerals undersecretaries, the presidents of the Iraq Company for Oil Operations (ICOO), the Iraq National Minerals Co. (INMC), and the General Company for Consulting and Planning of Oil Projects, and the two vice-presidents of the Iraq National Oil Co. (INOC). Government Oil Refineries Administration (GORA) officials will advise the new Council. In 1973, INMC initiated an aerial geophysical survey of large areas of the country to be carried out over a 2-year period by a French firm. INOC employees totaled 3,000 in 1973. The company conducted technical and administrative training courses in Iraq and sent more

[1] Mineral specialist (petroleum), Division of Fossil Fuels—Mineral Supply.

[2] Where necessary, values have been converted from Iraqi dinars (ID) to U.S. dollars at the rate of ID1.00=US$3.39.

than 40 men to 13 foreign countries, including the United States and the Soviet Union, for specialized training in engineering, geophysics, and other industry-related subjects.

A $200 million petrochemical complex will be established at Basra, according to plans approved during 1973 by the General Organization for Planning and Industrial Construction. Natural gas feedstocks will be used to produce ethylene at the rate of 120,000 tons per year, which will be converted into plastic materials.

Exports of Mishraq sulfur from the port of Umm Qasr in Southern Iraq, increased during the year and the Iraqis were enlarging their cement-producing capability. A small petroleum refinery came onstream at Kirkūk in the north, and construction was nearly completed at the Basra petroleum refinery site in Southern Iraq. During the year contracts were awarded to foreign firms to construct ammonia, iron and steel, and urea plants.

PRODUCTION

Iraq maintained its position as the third largest Arab oil producer in the Middle East, after Saudi Arabia and Kuwait. Crude oil production during 1973 totaled a record 740.6 million barrels, at the average daily rate of 2.0 million barrels, up 37.3% from the previous year, and government programs were underway to increase output to 3.5 million barrels per day by 1975 and to nearly 5.1 million barrels per day in 1984. The North Rumaila oilfield finished its first full year of production in 1973. Kirkūk, Rumaila, and Zubair were the most productive oilfields, and the Abu Ghirab, Buzurgan, and Nahr Umr Fields were being prepared for commercial production. BPC crude oil production in 1973 totaled 266.1 million barrels, equivalent to 729.137 barrels per day, of which 87% was from the company's South Rumaila Field and the remainder from the Zubair Field. Crude oil production from BPC's oilfields reported a 111.5% increase during the 4-year period 1969–73 and a growth of 9.7% from 1972 to 1973.[3] Iraq was one of the smallest refiners in the Middle East. In 1973 output of refined petroleum products fell 2,200 barrels per day from the previous year but was expected to increase substantially in 1974 when the newly constructed Basra petroleum refinery comes onstream.

Cement producers operated at the 1971–72 level of output, but several new plants were planned or under construction. Sulfur production recorded a significant increase as the Mishraq mine completed its first full year of commercial operations, and Iraq established itself as the leading sulfur producer in the Middle East.

[3] Basrah Petroleum Co., Ltd. Review and Report for 1973.

Table 1.—Iraq: Production of mineral commodities

Commodity [1]	1971	1972	1973 [p]
Cement, hydraulic ---- thousand metric tons	1,856	[r e] 1,905	[e] 1,814
Gas, natural:			
Gross production ---- million cubic feet	[e] 220,000	262,503	308,253
Marketed production ---- do	30,722	32,995	42,730
Petroleum:			
Crude ---- thousand 42-gallon barrels	[2] 624,312	539,226	740,619
Refinery products:			
Gasoline ---- do	3,636	6,698	3,796
Jet fuel ---- do	972	6,112	4,599
Kerosine ---- do	4,637		
Distillate fuel oil ---- do	5,775	10,468	11,060
Residual fuel oil ---- do	10,749	5,270	5,183
Lubricants ---- do	757	NA	NA
Other ---- do	767	5,197	4,220
Refinery fuel and losses ---- do	1,969	1,318	1,109
Total ---- do	29,262	35,063	29,967
Salt ---- thousand metric tons	54	[e] 55	[e] 63
Sulfur, elemental:			
Frasch process ---- do	--	137	395
Byproduct [e] ---- do	60	110	140

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

[1] In addition to the commodities listed, juss (an impure sandy gypsum), lime, and a variety of crude construction materials (clays, stone, sand, and gravel) are produced, but output is not reported quantitatively, and available information is inadequate to permit formulation of reliable estimates of output levels.

[2] Includes an estimate for production from Government-owned Naft Khaneh Field.

TRADE

Iraq enjoyed a favorable balance of trade with crude oil accounting for an estimated 95% of the total value of the country's mineral exports. The country was the Middle East's fourth largest crude oil exporter, after Saudi Arabia, Iran, and Kuwait. Northern Iraqi oil was piped to tanker-loading facilities at Banias, Syria, at the average rate of 606,288 barrels per day and to Tripoli, Lebanon, at the average rate of 428,333 barrels per day. Petroleum refineries at Homs, Syria, and Tripoli, Lebanon, received Iraqi crude oil for processing through the former IPC pipeline. Plans were finalized in 1973 to expand the capacity of Iraq's oil pipeline across Syria to the Mediterranean tanker-loading ports from 1.2 to 1.4 million barrels per day and to construct a large-diameter crude oil pipeline to a tanker port at Dortyol, Turkey, on the Mediterranean Sea. Exports of state-owned crude oil from Iraq's Persian Gulf ports totaled 67.2 million barrels in 1973, an increase of 294% from 1972, of which 61.7% was loaded at Fao and the remainder at Khor al-Amaya. Liftings at the port of Fao more than doubled during the year, and the Khor al-Amaya oil shipments were Iraq's share of BPC's oil production. BPC loaded 530 tankers during the year, and exports totaled 263.9 million barrels, an increase of 21.9 million barrels compared with 1972 operations.

Important quantities of cement were exported mainly to Persian Gulf countries. In 1973, sulfur became Iraq's most important nonpetroleum export commodity as INMC began shipments of Mishraq sulfur from Umm Qasr port facilities, and Iraq became the largest exporter of sulfur in the Middle East and one of the largest in the world.

Table 2.—Iraq: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, waste and scrap	--	450
Copper metal, waste and scrap	784	120
Iron and steel:		
Scrap	7,836	1,712
Primary metal and semimanufactures	175	15
Lead metal:		
Waste and scrap	130	100
Unwrought and semimanufactures	117	198
Manganese oxides	--	50
Nickel alloys, unwrought	5	4
Tin metal, waste and scrap	--	100
Zinc metal:		
Waste and scrap	--	1,080
Semimanufactures	1	--
NONMETALS		
Asbestos	--	216
Cement	369,756	369,901
Chalk	9	31
Clay products, nonrefractory	83	887
Fertilizer materials:		
Crude	750	100
Manufactured, nitrogenous	--	72,115
Ammonia	--	5
Gypsum and plasters	3,251	1,075
Pigments, mineral, natural	2,500	--
Stone, sand and gravel:		
Dimension stone, unworked	561	251
Gravel and crushed stone	60,942	49,869
Sand, excluding metal bearing ---kilograms--	--	10
Other: Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	30	174
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	--	13,658
Petroleum:		
Crude and partly refined ---thousand 42-gallon barrels--	r 582,431	525,613
Refinery products:		
Gasoline ---do---	r 154	142
Distillate fuel oil ---do---	r 858	255
Residual fuel oil ---do---	--	36
Lubricants ---do---	r 112	44
Other:		
Mineral jelly and wax ---do---	15	8
Bitumen and other residues ---do---	r 127	--
Total ---do---	1,266	485

r Revised.

Table 3.—Iraq: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, semimanufactures	3,424	4,176
Arsenic trioxide	2	--
Chromium oxide and hydroxide	2	2
Copper:		
Matte	6	--
Unwrought and semimanufactures	1,813	3,701
Iron and steel:		
Ore and concentrates, except roasted pyrite	8,932	164
Pig iron, including cast iron	755	348
Sponge iron, powder, shot	371	11,515
Ferroalloys	6,672	(1)
Steel, primary forms:		
Ingots	880	179
Blooms, billets, slabs, sheets, bars	(1)	8
Coils for rerolling	--	2,231
Tube and pipe blanks	29,599	31,289
Semimanufactures thousand tons	344	323
Lead:		
Ore and concentrate	8	--
Oxide	--	3
Metal, including alloys, all forms	410	1,415
Magnesium and beryllium	12	62
Mercury 76-pound flasks	136	3
Nickel metal, including alloys, all forms	4	2
Platinum-group metals and silver troy ounces	257	1,833
Rare-earth metals, including alloys, all forms	7	(1)
Tin:		
Oxide long tons	(1)	--
Metal, including alloys, all forms	269	106
Titanium oxides	541	552
Zinc:		
Oxide and peroxide	341	26
Metal including alloys, all forms	182	533
Other:		
Ores and concentrates of base metals, n.e.s	--	10
Ash and residues containing nonferrous metals	28	15
Oxides, hydroxides, and peroxides of metals, n.e.s.	135	148
Metals, including alloys, all forms:		
Metalloids	8	--
Pyrophoric alloys	(1)	6
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	10	1
Grinding and polishing wheels and stones	127	198
Asbestos	3,730	4,138
Barite and witherite	214	687
Boric oxide and acid	174	6
Cement, hydraulic	20,743	62,281
Chalk	182	190
Clays and clay products:		
Crude clay	12,085	1,883
Manufactured products:		
Refractory (including nonclay brick)	5,082	4,054
Nonrefractory	3,311	2,773
Diamond, gem, not set or strung thousand carats	105	45
Fertilizer materials:		
Crude, natural	8	(1)
Manufactured:		
Nitrogenous	28,343	29,533
Phosphatic	6,030	17,000
Potassic	--	1,700
Ammonia	110	24
Graphite, natural	20	27
Gypsum and plasters	15	--
Lime	241	220
Mica, all forms	24	13
Pigments, mineral:		
Natural, crude	1,222	2,007
Iron oxides, processed	587	648
Pyrite, unroasted (gross weight)	98	--
Salt	71	51
Sodium and potassium compounds, n.e.s.:		
Caustic soda	9,015	10,937
Caustic potash	48	2

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972
NONMETALS—Continued		
Stone, sand and gravel:		
Dimension stone, crude and partly worked	1,439	302
Gravel and crushed stone	725	2
Limestone (except dimension)	840	333
Quartz and quartzite	--	13
Sand, excluding metal bearing	86	108
Sulfur:		
Elemental:		
Other than colloidal	2	14
Colloidal	9	1,845
Sulfuric acid	9	(1)
Talc, steatite, soapstone, pyrophyllite	924	481
Other nonmetals, n.e.s.:		
Oxides and hydroxides of magnesium, strontium, barium	12	1
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s.	65	3,435
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	134	26
Carbon black	177	74
Coal and coke, including briquets	2,732	1,230
Petroleum refinery products:		
Gasoline—thousand 42-gallon barrels	r 3	2
Distillate fuel oil—do	r 401	536
Residual fuel oil—do	(2)	(1)
Lubricants—do	r 8	2
Other:		
Liquefied petroleum gas—do	91	27
Mineral jelly and wax—do	r 2	(1)
Nonlubricating oils, n.e.s—do	(1)	(1)
Pitch—do	(1)	3
Bituminous mixtures, n.e.s—do	(1)	14
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	--	2,454

r Revised.
1 Less than ½ unit.
2 Revised to none.

COMMODITY REVIEW

METALS

Iron and Steel.—Near yearend 1973, the Iraqi Ministry of Industry awarded a $136 million contract to the French firm Creusot-Loire Enterprises for the construction of the first stage of an iron and steel complex at Khor al-Zubair, near Umm Qasr in Southern Iraq. According to the terms of the contract, four 70-ton electric arc furnaces will be built and placed in service during 1977. Two continuous billet casters and two rolling mills will also be placed in service at the 400,000-ton-per-year capacity iron and steel plant.[4] Products will consist of construction steel including reinforcing rods, girders, and tempered steel. Khor al-Zubair iron and steel will serve domestic consumers, with a portion of the production exported. Second-stage plans call for the production of sponge iron from imported ore, utilizing natural gas from nearby fields, and possibly the construction of a steel pipe mill. Creusot-Loire Enterprises will train the Iraqis to operate the plant, and when the second stage construction is completed, approximately 1,350 workers will be employed at the complex.

NONMETALS

Cement.—Polish engineers began construction of a $12.9 million cement plant at Al Fallūjah, approximately 60 kilometers west of Baghdad. When the new facility is completed in 1975, it will provide Central Iraq with up to 200,000 tons of cement annually. Iraq's Ministry of Industry planned the construction of three additional cement plants with an aggregate annual capacity of 3 million tons. A 2-million-ton-per-year plant will be built near Al Kūfah (approximately 150 kilometers south of Baghdad), a cement plant with a 0.5-million-ton-per-year capacity was proposed for the As Samāwah Area (midway between Baghdad and Basra), and a 0.5-million-ton-per-year plant has been proposed for the Hammam al 'Alīl Area (in Northern Iraq

[4] Metal Bulletin. No. 5859, Dec. 14, 1973, p. 29.

approximately 25 kilometers southeast of Mosul).

Fertilizer Materials.—Negotiations between Iraq's Ministry of Industry and the Japanese firm Mitsubishi Heavy Industries, Ltd., resulted in a signed contract valued at $100 million for the construction of two chemical fertilizer plants near Basra. One plant will produce ammonia at the rate of 800 tons per day, and the other plant will produce urea at the rate of 1,300 tons per day. Japanese engineers will complete the plants by the end of 1976 and will use the Haldor Topoe steam reforming system for ammonia production and the SNAM Progetti S.p.A. process to produce urea.

Lime.—An economic and technical study will be carried out during 1974 concerning expanding lime production facilities at Hammam al' Alīl. Ministry of Industry preliminary plans called for a $1 million lime plant with a capacity to produce 30,000 tons annually to be built in the area.

Sulfur.—INMC expanded production capacity at its Mishraq mine from 250,000 to 1 million tons annually during 1973 and commenced exports to India, Lebanon, the People's Republic of China, and Poland. The Polish firm Centrozap developed the mine for Iraq and began production at the Mishraq site during 1972. Costs of the second stage project amounted to $20.3 million, bringing the total cost of the Mishraq project to $54 million. Recovery units at Kirkūk produced an estimated 140,000 tons of sulfur from natural gas feedstocks.

MINERAL FUELS

Natural Gas.—Iraq and Turkey signed a preliminary agreement in May 1973 for the construction of a natural gas trunkline between Kirkūk and Batman, Turkey. The proposed international pipeline will be approximately 365 kilometers long in Iraq and will extend 165 kilometers into Turkey. Tumas Consulting and Contracting Co., Ankara, prepared a feasibility report on the project early in 1973 and presented it to Iraqi and Turkish officials for review. However, the two countries failed to sign a final agreement on the project by the end of the year.

Plans were finalized in 1973 to build two domestic gas pipelines—a 25-centimeter—in diameter 140-kilometer-long line from Rumaila to the port of Fao and a 46-centimeter, 665 kilometer-long line between Al Hadīthah, in Central Iraq, and Rumaila, in the south. Natural gas from southern wells will fuel pumping stations along the north-south route which will serve a parallel large-diameter crude oil pipeline.

During 1973 the BPC utilized 3,296 million cubic feet of natural gas in company operations and supplied the Government with 3,849 million cubic feet from the South Rumaila Field and 1,188 million cubic feet from the Zubair Field.

Petroleum.—In February 1973 Government officials and the owners of the IPC group signed documents which settled Iraq's 1972 nationalization of IPC oil production and transport facilities. The IPC group gave up all claims to its Bai Hassen, Jambur, and Kirkūk oilfields, relinquished the MPC concession without compensation, effective March 31, 1973, and agreed to pay $350 million to satisfy the Government's accumulated claims. Iraq agreed to supply 111.8 million barrels of Kirkūk crude oil to meet IPC claims. The agreement further required the BPC to embark on a development program to raise its annual production to 596 million barrels by 1976, and IPC agreed to sell its pipeline in Lebanon and the Tripoli tanker terminal to the Iraqi Government, with the approval of the Lebanese Government. However, Lebanon did not approve the arrangement and appropriated the property for itself.

During fourth-quarter 1973, the Iraqi Government nationalized the United States, the Netherlands and Portuguese petroleum interests in the BPC. Investment in the BPC had been divided between British Petroleum Exploration Co. (Middle East) Ltd. 23.75%; Compagnie Française des Pétroles (CFP), 23.75%; Near East Development Corp. (jointly shared by the Exxon Corp. and Mobil Oil Corp.), 23.75%; Participations and Explorations Corp. (Partex owned by the Portugese firm Gulbenkian Foundation), 5%; and Shell Petroleum Co., Ltd. (owned by Royal Dutch Petroleum of the Netherlands 60% and Shell Transport and Trading Co., Ltd., of the United Kingdom, 40%), 23.75%. On October 7, Iraq nationalized the Exxon-Mobil interest, the Netherland's share (14.25%) of the Shell interest, on October 21, and finally the Partex investment on December 20, 1973, bringing the Iraqi ownership in

BPC to 43%. British and French shares of BPC were not challenged by the Iraqi Government.

In 1973, Iraq agreed to supply Brazil and Yugoslavia each with 7.5 million barrels of crude oil in 1974, and long-term supply contracts were signed with Austria, Bulgaria, Czechoslovakia, France, India, and Spain. A November 1973 contract with Austria provided for 29.8 million barrels of Iraqi crude oil to be delivered during the period 1973–76. Bulgaria will receive a total of 48.4 million barrels of oil from 1974 through 1980, and Czechoslovakia ordered 16.4 million barrels of crude oil for delivery over a 3-year period. CFP concluded a February 1973 agreement whereby INOC will supply the French company with 23.75% of the annual production of the former IPC northern oilfields, approximately 97 million barrels per year, for a period of 10 years. Iraq agreed to supply India with nearly 835 million barrels of crude oil between 1976 and 1987, and in May the Iraqi Revolutionary Command Council ratified a 5-year agreement concluded with Spain in December 1972, under which the Spanish will purchase 44.7 million barrels of oil during the period 1973–75.

Iraqi state oil technicians were actively engaged in developing the country's oilfields in 1973, completing 10 oil wells, drilling at least 11 others in northern and southern fields, and completing concrete foundations for 8 additional wells in the North Rumaila oilfield. ICOO drilled its first exploratory well in the Jabal Hamrin Area approximately 80 kilometers southwest of Kirkūk, and preliminary reports indicated a flow of about 10,000 barrels per day of 32° API oil from the well. Three Iraqi seismic survey teams worked in the Luhais and Zubair Areas, and INOC's Seismic Interpretation Center analyzed field data on the Kreshan, Qurna, and Raji Areas. BPC drilled 12,400 meters during the year. The company abandoned one well, completed three new wells in the Rumaila Field, and was drilling another at yearend. No new wells had been drilled in the previous year. BPC crews carried out workover operations on five wells in the South Rumaila Field and six in the Zubair Field in 1973.

Foreign petroleum companies were equally active during the year under review. Petrobrás Internacional S.A. (Braspetro), the new foreign exploration subsidiary of Brazil's Petróleo Brasileiro S.A., carried out field and seismic surveys in Ali Gharbi and Basra under a contract signed with INOC in 1972. Technoexportstroy, the Bulgarian state organization, began seismic surveys in five areas of Northern Iraq during 1973, Jabal Kand, Mitaha, Rafan, Sasan, and Sufaya and spudded its first exploratory well in the Sufaya structure northwest of 'Ain Zalah near the Syrian border. INOC signed in May 1973 an agreement with Essence et Lubrifiant de France—Entreprise de Recherches et d'Activités Pétrolières (Elf-ERAP) under which the French will develop the Abu Ghirab and Buzurgan oilfields in Eastern Iraq. Crude oil exports have been scheduled to begin from these fields by the end of 1975 at the rate of 160,000 barrels per day through a 170-kilometer-long pipeline which will be constructed to North Rumaila where it will join the crude oil pipeline from that field to Iraq's new deepwater tanker loading facilities.[5]

Forex of France began drilling the Jebel Fauqi Well No. 1 in December 1973, and the site was prepared to begin drilling Abu-Ghirab Well No. 3 in January 1974. Japan Iraq Petroleum Development Co., Ltd., representing a group of five Japanese companies, acquired 40% interest in the Elf-ERAP concession and the Japanese will obtain from 20% to 30% of the oil produced from the Abu Ghirab and Buzurgan Fields. Drilling operations were carried out at three sites in the Jambur oilfield near Kirkūk by petroleum technicians from Chemocomplex of Hungary under a contract signed with INOC in March 1971, and talks were held and a contract signed by the two parties near the close of 1973 for the drilling of two additional wells in the same oilfield. In August 1973, INOC awarded a service contract to the Indian Oil and National Gas Corp. under which the Indians will explore 4,175 square kilometers of Southern Iraq. The Indians will probably commence seismic surveys in the areas early in 1974. INOC signed an April contract with the Romanian State agency Geomin under which the latter will carry out exploratory and development operations including the drilling of five wells in

[5] Middle East Economic Survey (Beirut, Lebanon). V. 16, No. 30, May 18, 1973, pp. 8–9.

areas east of Baghdad and at Jabal Hamrin during 1973. Near yearend, the Romanians were preparing to carry out seismic surveys in three areas of Central Iraq, totaling 1,050 linear kilometers.[6] Iraq and the Soviet Union concluded an accord to provide the necessary equipment for the development of Nahr Umr oilfield in Southern Iraq. The oilfield will begin production in 18 months at the rate of 30,000 barrels per day and will be connected by pipeline to export facilities at the port of Fao.

INOC invited international bids for production service contracts on six large blocks of land totaling 46,860 square kilometers—five in South-Central Iraq near the southern border and one in the north-central part of the country to the west of Kirkūk. Contracts will be awarded early in 1974. Concessions will not be granted, any oil found will be the property of the Iraqi Government, and the exploring companies will be paid for their services in oil.

Six small petroleum refineries with a combined throughput capacity of 113,500 barrels per day provided fuels and lubricants to Iraqi markets, and the country's consumption of petroleum products was at the rate of 85,200 barrels per day, up 11.8% from 1972. In 1973 the BPC piped crude oil to the Muftīyah petroleum refinery at the average rate of 4,500 barrels per day, and the company supplied 176,438 barrels of crude oil to the Shuaiba petroleum refinery in Kuwait during the year. Two petroleum refineries were under construction during 1973—one at Basra in the south and the other in Kirkūk in the northeast, and GORA planned additional plants at Hammām al 'Alīl near Mosul in north central Iraq and near the port of Fao on the Persian Gulf. Construction of the 70,000-barrel-per-day $84.8 million refinery 27 kilometers south of Basra began in 1971 by Technoexport, a Czechoslovak firm, and was nearly completed by yearend 1973. In November trial runs were conducted for several units. All work should be finished early in 1974, and the new refinery will commence producing gas oil, kerosine, and motor gasoline. Crude oil will be piped to the plant from nearby North Rumaila wells through a 41-centimeter line. Also in November, the Iraqi Planning Council approved GORA plans to double the throughput capacity of the Basra refinery, but no contracts were issued by the end of the year. Howe-Baker Engineers, Inc., of the United States installed twin 10,000-barrel-per-day prefabricated refining units at Kirkūk during the first quarter of 1973, and the new topping plant began producing diesel oil, fuel oil, and kerosine for local consumers. The Howe-Baker project was completed in record time for such a project, as the contract was fulfilled within 1 year of its signing.[7]

Iraq awarded a contract to Neftekhimpromexport of the U.S.S.R. in 1972 for the construction of a 30,000-barrel-per-day petroleum refinery at Ḩammān al 'Alīl, 22 kilometers southeast of Mosul, and Soviet technicians began preliminary work at the plant site during 1973. Crude oil will reach the refinery through a 170-kilometer pipeline. A large 200,000-barrel-per-day export refinery may be built near Fao in Southern Iraq, but no government commitments were made during the year concerning this proposal. Iraqi planners also were considering large-capacity joint-venture refineries abroad.[8]

During the year, plans were revealed for the increased production of asphalt, lubricants, and paraffin wax by constructing a new plant at Basra at a cost of $23.1 million. Iraq hopes to have the new plant in service by the end of 1976, with a daily production capacity of 2,800 barrels of asphalt, 1,200 barrels of lubricants, and 260 barrels of paraffin wax.[9]

Important sales contracts were signed in 1973 with India, Japan, and Turkey for the supply of refined petroleum products. The Indian Oil and Natural Gas Commission will buy 680,000 barrels of naphtha over a 1-year period from the contract date, and nearly 63,000 barrels of paraffin wax were ordered by Turkey to be delivered also over a 1-year period. Mitsubishi LPG Co., Ltd. of Japan reached a basic agreement to buy all of INOC's liquefied petroleum gas (LPG), estimated at 1.2 million tons (13.9 million barrels), over a period of 25 years beginning in 1976.[10]

[6] Middle East Economic Survey (Beirut, Lebanon). V. 17, No. 3, Nov. 9, 1973, p. 3.
[7] Oil and Gas Journal. V. 71, No. 53, Dec. 31, 1973, pp. 146–147.
[8] Middle East Economic Survey (Beirut, Lebanon). V. 16, No. 49, Sept. 28, 1973, p. 6–7.
[9] Pétrole Informations. No. 1290, Oct. 25–Nov. 1, 1973, p. 39.
[10] Middle East Economic Survey (Beirut, Lebanon). V. 16, No. 41, Aug. 3, 1973, p. 4.

Table 4.—Iraq: Refinery crude oil throughput

(Thousand barrels per calendar day)

	1971	1972	1973
Al Hadīthah	6.0	6.0	6.5
Dawrah	88.0	88.0	70.0
Khānaqīn	12.5	12.5	10.5
Kirkūk	2.6	2.6	20.0
Muftīyah	4.3	4.3	4.5
Qayyārah	2.3	2.3	2.0
Total	115.7	115.7	113.5

Iraq negotiated pipeline transit agreements during 1973 with Lebanon, Syria, and Turkey concerning crude oil shipments to Mediterranean ports for export. In 1972, Iraq and Syria nationalized the sections of the IPC pipeline within their borders; the line had transported IPC's Northern Iraqi crude oil to Banias, Syria, and Tripoli, Lebanon. Syria and Iraq disagreed over transit fees but continued operating the pipeline to the port of Banias. However, the Lebanese closed their 40-kilometer section of the pipeline to Iraqi exports from June 1972 to March 1973. Early in 1973, Iraq claimed ownership of the IPC pipeline in Lebanon, as the line was reportedly turned over to them by its former owner by the February 1973 IPC-Iraq settlement, but on March 6, 1973, the Lebanese Government appropriated the property. Simultaneously with the IPC takeover, Lebanon reached a 15-year transit agreement with Iraq under which Iraq will pay the Lebanese $0.11 per barrel for its crude oil exports through the Tripoli oil terminal.[11] Iraq will continue to supply the Tripoli petroleum refinery with crude oil at the rate of 30,000 barrels per day, according to the 1973 agreement signed by Iraqi and Lebanese officials. Syria negotiated a 15-year transit agreement with Iraq in January 1973, which specified that Iraq will pay Syria $0.41 per barrel for Iraqi oil pumped to the Banias, Syria, export terminal and $0.30 per barrel for crude oil transported across Syrian territory to Lebanon. An agreement was also reached with Syria for continued deliveries to the petroleum refinery at Homs, Syria.[12] ICOO installed a new turbine pump at the Avanah pumping station and completed construction of three turbine pumps at the K2 pumping station, increasing the capacity of the Mediterranean oil pipeline to 1.2 million barrels per day. During 1973, Syria and Iraq agreed to enlarge the former IPC pipeline to 1.4 million barrels per day from its current 1.2 million-barrel-per-day operating capacity and the French engineering company, Entrepose, was awarded a $44 million contract for the project.

On August 27, 1973, Iraqi and Turkish negotiators signed an agreement to construct a large-diameter high-capacity crude oil pipeline from the Kirkūk oilfields to a Mediterranean Sea tanker loading terminal to be built at Dortyol, Turkey, approximately 30 kilometers north of Iskenderun. Pipes, 102 centimeters in diameter, will be welded together over the 1,005-kilometer right-of-way, of which 373 kilometers will be in Iraq and the remainder in Southern Turkey. Five pumping stations will be required, two in Iraq and three in Turkey. Operations will be carried out for a period of 20 years, and the agreement can be extended for 5-year time periods by the two parties. SNAM of Italy prepared the feasibility study, and Iraq and Turkey planned to secure construction firms and begin building the line during 1974. Construction should be completed in 1977, when the line will commence transporting crude oil to Dortyol at the rate of 500,000 barrels per day. Throughput will be increased to 600,000 barrels per day in 1980, and finally to 700,000 barrels per day in 1983. According to the terms of the contract, Turkey will buy 40% of the Iraqi crude oil throughput, and the rest will be exported from the Dortyol marine petroleum terminal. Each country will pay for the construction and maintenance of the pipeline section in its territory, with the total installation cost of the project set at nearly $400 million. Iraq will pay Turkey $0.35 per barrel transit fees for its exports through the proposed pipeline.

A major pipeline project was approved in 1973, which includes building oil and gas lines between Al Hadīthah and Rumaila and an oil line to a new deepwater tanker loading terminal at Khor al-Khafji, near the port of Fao. Two 665-kilometer pipelines will be laid from Al Hadīthah to Rumaila, one 197 centimeters in diameter for crude oil and the other 46 centimeters in diameter for natural gas.[13] The crude oil trunkline will have a flow reversal capability, that is, oil may be pumped to the

[11] Oil and Gas Journal. V. 71, No. 12, Mar. 19, 1973, p. 36.
[12] Oil Daily. Jan. 25, 1973, p. 6.
[13] Middle East Economic Survey (Beirut, Lebanon). V. 17, No. 1, Oct. 26, 1973, pp. 13–14.

north at the rate of 880,000 barrels per day or to the south at 960,000 barrels per day. Pumping stations along this strategic line will be supplied by the natural gas pipeline connected to the Rumaila associated gas facilities. The new crude oil pipeline will connect northern and southern producing oilfields and will make Persian Gulf and Mediterranean tanker terminals available to all major Iraqi oilfields. Mannesmann Aktiengesellschaft of West Germany will build the connecting North Rumaila to Fao pipeline and ancillary facilities, and Brown and Root, Inc., of the United States assumed the responsibility for the offshore installation at Khor al-Khafji. In 1973, North Rumaila crude oil reached the Fao tanker loading facility through a 71-centimeter-in diameter, 146-kilometer-long, pipeline.

The Spanish shipbuilding firm, Astilleros Españoles delivered three oil tankers to Iraq during 1973, completing their 1970 contract for seven 35,470 deadweight-ton vessels at a total cost of $70 million. The first three tankers had been delivered in 1972. Iraq Oil Tankers Co. (IOTC) contracted seamen from the U.S.S.R. to work on board the oil tankers as well as several maritime specialists to assist overall operations, and they planned to send students to Egypt, France, and possibly to the U.S.S.R. for maritime studies. In October 1973, IOTC invited international bids for the construction of four 120,000 deadweight-ton tankers, and the company planned to issue contracts for the new ships early in 1974.

International construction and engineering firms submitted bids to Iraq for the construction of a Persian Gulf supertanker terminal for the export of North Rumaila crude oil. Khor al-Khafji was selected as the terminal site 42 kilometers offshore of the port of Fao and 35 kilometers west of the Khor al-Amaya oil loading terminal. Brown and Root, Inc., received the $122 million contract for the offshore project and connecting pipelines, preliminary work commenced before the end of the year, and the facility will be placed in service in May 1975. Twin 122-centimeter sea lines will connect onshore storage tanks to four berths designed to receive 35,000- to 350,000-deadweight-ton crude oil tankers, and the terminal will have an initial daily loading capacity of 0.8 million barrels, which will be expanded to 1.6 million barrels. Iraqi planners designed the Khor al-Khafji marine petroleum terminal to be eventually enlarged to permit loadings at the rate of 2.4 million barrels per day.[14] Port facilities in use at Fao in 1973 were limited to tankers of 35,000 deadweight tons.

BPC added a supertanker berth to the Khor al-Amaya offshore tanker terminal. The new loading facility, designated Berth No. 7, will handle tankers up to 330,000 deadweight tons.[15]

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[14] Middle East Economic Survey (Beirut, Lebanon). V. 16, No. 49, Sep. 28, 1973, p. 6.

[15] Petroleum Times. V. 77, No. 1961, May 18, 1973, p. 13.

The Mineral Industry of Ireland

By J. M. West [1]

Development of one of Europe's richest zinc-lead deposits continued at Navan, despite uncertainties about issuance by the Irish Government of a mining license and controversy over ownership of a portion of the ore deposit. The target date for production remained 1975, although it appeared initial operation could be delayed a year. A description of mining plans for the Navan deposit and details on other Irish mining operations were published.[2]

Prospecting for metals, oil, and natural gas continued at a high pace, although there was a note of discouragement after the Irish Government announced in September that the 20-year tax exemption on mining profits, introduced in 1967, would be withdrawn. The "tax holiday" was to be replaced by a system of tax allowances that would apply to all existing and future mining operations. The new provisions provided that profits from mining of nonbedded materials will be liable to the normal 50% tax rate after deducting allowances for prospecting, exploration, development, and new plant and machinery. Final amending legislation was expected in early 1974.

Fuel costs rose sharply in 1973 because of the higher prices for imported fuels, but there was increased hope that natural gas found offshore from the County Cork coast by Marathon Petroleum (Ireland) Ltd. would supply at least part of Ireland's future fuel needs. Plans were still under consideration for the Electricity Supply Board to build a 500- to 600-megawatt nuclear powerplant, possibly at Carnsore Point in County Wexford on the southeast coast. The proposed $240 million plant could be placed in service by about 1981, if plans were implemented soon.

The Irish economy made significant strides in 1973, and real growth in the gross national product (GNP) was expected to reach 6% to 7%, about double the average for the previous 3 years. Ireland continued to offer good opportunities for business and industrial ventures. A number of international firms had announced plans to establish a variety of new manufacturing plants, drawn by Ireland's entry into the European Communities (EC), its lower wage scales, and grants and tax incentives. Inflation remained a serious problem, and the Government in late June introduced a wide range of new price and profit controls to combat inflation. Industrial export values were up 40% during the first three quarters of 1973; however, import values were up even more owing largely to higher costs for petroleum. The result was an approximate 60% increase in the country's trade deficit during the year. The Industrial Development Authority continued to offer grants to establish new industries, especially those that would lead to increased employment in depressed and less developed areas of western Ireland. Exemptions from taxes on industrial export profits were expected to continue as an important incentive to new investments.

PRODUCTION

Output of zinc, lead, and copper, were all lower but production of silver and mercury were significantly higher than that in 1972. Zinc production was reduced because of lower mill throughput at Mogul

[1] Physical scientist, Division of Nonferrous Metals—Mineral Supply.

[2] Tinsley, C. Richard. Ireland: On the Way to Becoming Top Producer of Base Metals in Northwest Europe. Eng. and Min. J., v. 174, No. 11, November 1973, pp. 144–158.

of Ireland Ltd.'s Silvermines Ltd. property, 5 miles from Nenagh, in County Tipperary. About two-thirds of the Mogul ore was produced from the older section of the mine, and one-third from a newer section where a trackless mining system was used.[3]

Construction materials generally were in greater demand and cement production rose nearly 8% in 1973. Production of refined petroleum products was lower than that in 1972 despite rising consumption.

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

Commodity [1]	1971	1972	1973 [p]
METALS			
Copper, mine output, metal content	11,800	13,209	13,005
Lead, mine output, metal content	51,592	59,541	56,188
Iron and steel, crude steel ---thousand tons	80	77	121
Mercury ---76-pound flasks	2,345	1,233	1,345
Silver, mine output, metal content --thousand troy ounces	1,432	1,553	1,839
Zinc, mine output, metal content	87,500	94,797	68,888
NONMETALS			
Barite	196,100	237,217	270,370
Cement, hydraulic ---thousand tons	1,500	1,534	1,651
Gypsum ---do	338	386	436
Lime ---do	54	[e] 50	76
Sand and gravel [2] ---do	5,954	NA	6,078
Stone, limestone [2] ---do	6,777	NA	8,982
Other [3] ---do	3,095	NA	4,248
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Anthracite ---do	27	[e] 30	63
Bituminous ---do	63	[e] 45	
Peat:			
Agricultural use ---do	57	[e] 60	NA
Fuel use:			
Briquets ---do	327	[e] 330	326
Sod peat [4] ---do	2,183	[e] 2,200	1,986
Milled peat [5] ---do	2,985	[e] 3,000	1,864
Petroleum refinery products:			
Gasoline ---thousand 42-gallon barrels	4,208	4,046	3,904
Jet fuel ---do	602	608	626
Distillate fuel oil ---do	5,185	4,968	5,177
Residual fuel oil ---do	9,485	8,671	8,343
Other ---do	1,172	960	1,013
Refinery fuel and losses ---do	762	777	[e] 769
Total ---do	21,414	20,030	19,832

[e] Estimate. [p] Preliminary. NA Not available.
[1] In addition to the commodities listed, substantial quantities of stone, sand, and gravel are produced by local authorities for purposes such as maintenance of roads, but statistics on such output are not reported and available general information is inadequate to make reliable estimates of output levels.
[2] Excludes output by local authorities.
[3] Figures given as reported in source; includes granite, marble, silica rock, sand, calcspar, fire clay, and shale and clays for cement production, but excludes output of these materials by local authorities.
[4] Includes production by farmers and by Bord Na Mona.
[5] Includes milled peat used in the production of peat briquets listed previously in this table.

TRADE

The value of mineral imports rose sharply in 1973 owing chiefly to the sharply higher prices of imported crude petroleum and petroleum products. Although total quantities of mineral exports declined, the overall value rose owing to higher world prices, especially for the metal products. Most exported products went to other European countries. Tariff reductions were expected between Ireland and West European destinations as a result of agreements negotiated with the EC.

[3] Atkinson, Paul H. Mogul of Ireland Ltd. Deco Trefoil Bull. M4–B146, 1974, pp. 7–14.

Table 2.—Ireland: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Metal, including alloys:			
Scrap	478	--	NA.
Unwrought and semimanufactures	2,585	4,593	United Kingdom 3,961.
Copper:			
Ore and concentrate, gross weight	39,241	55,887	Spain 40,844; Sweden 8,306.
Metal, including alloys:			
Scrap	6,274	4,755	United Kingdom 2,206; Netherlands 891.
Unwrought	810	601	Italy 425; Netherlands 155.
Semimanufactures	802	1,144	United Kingdom 749; United States 315.
Iron and steel:			
Metal:			
Scrap	9,845	11,694	Spain 8,255.
Semimanufactures	14,108	44,246	United Kingdom 41,100.
Lead:			
Ore and concentrate, gross weight	116,820	123,634	France 38,683; Netherlands 30,506; Belgium-Luxembourg 26,046.
Metal, including alloys:			
Scrap	5,000	2,670	Belgium-Luxembourg 2,413.
Unwrought and semimanufactures	1,560	1,928	United Kingdom 1,835.
Zinc ore and concentrate	129,297	164,436	France 40,868; Netherlands 25,108; West Germany 22,909; United Kingdom 22,610.
NONMETALS			
Barite and witherite	192,290	241,066	United States 174,851; Singapore 13,920; United Kingdom 10,094.
Cement	99,012	117,976	All to United Kingdom.
Clay products, refractory (including nonclay brick)	43,749	28,800	United Kingdom 26,895.
Fertilizer materials:			
Crude	6,314	22,059	United Kingdom 21,302.
Manufactured	32,099	64,148	United Kingdom 50,635; U.S.S.R. 13,513.
Gypsum and plaster	114,741	103,111	All to United Kingdom.
Stone, sand and gravel:			
Dimension stone, worked	285	336	United Kingdom 287.
Gravel and crushed stone	255,171	290,826	West Germany 203,672; United Kingdom 65,637.
Limestone (except dimension)	17,628	23,828	United Kingdom 21,065.
Other nonmetals, n.e.s.:			
Crude, other	192,290	241,066	United States 174,851.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	10,187	15,421	United Kingdom 9,743; Hong Kong 4,322.
MINERAL FUELS AND RELATED MATERIALS			
Coal and briquets:			
Anthracite and bituminous coal	684	--	
Briquets of anthracite and bituminous coal	25,715	77,318	Netherlands 42,668; United Kingdom 33,719.
Coke and semicoke	18,823	19,096	Netherlands 6,215; Sweden 7,008; Norway 5,873.
Peat, including briquets and litter	91,120	106,042	United Kingdom 104,305.
Petroleum refinery products:			
Gasoline ----thousand 42-gallon barrels	22	--	
Distillate fuel oil ----------do----	216	380	All to United Kingdom.
Residual fuel oil ----------do----	4,618	3,111	United Kingdom 2,912.
Lubricants ----------do----	8	5	United Kingdom 4.
Other:			
Liquified petroleum gas ------do----	73	--	
Unspecified ----------do----	43	158	All to United Kingdom.
Total ----------do----	4,980	3,654	

NA Not available.

Table 3.—Ireland: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum metal, including alloys:			
Unwrought	3,117	3,939	Canada 1,953; United Kingdom 961.
Semimanufactures	6,276	6,727	United Kingdom 4,692; West Germany 1,007.
Copper metal, including alloys:			
Unwrought	265	225	United Kingdom 211.
Semimanufactures	8,527	11,091	United Kingdom 9,951.
Iron and steel metal:			
Pig iron, including cast iron	19,079	21,924	U.S.S.R. 18,043.
Sponge iron, powder and shot	165	58	United Kingdom 48.
Ferromanganese	1,057	1,158	Czechoslovakia 528; Spain 508.
Steel, primary forms	13,506	5,290	West Germany 2,904; United Kingdom 1,270.
Semimanufactures:			
Bars, rods, angles, shapes, sections	82,993	97,903	United Kingdom 54,166; West Germany 23,909.
Universals, plates, sheets	96,771	121,439	United Kingdom 61,291; Poland 15,451.
Hoop and strip	7,591	6,797	United Kingdom 5,786.
Rails and accessories	7,173	4,988	United Kingdom 4,192.
Wire	9,199	14,878	United Kingdom 6,166; Netherlands 3,676.
Tubes, pipes, fittings	52,600	53,395	United Kingdom 41,128.
Castings and forgings, rough	893	1,865	Japan 1,088; United Kingdom 749.
Total semimanufactures	257,220	301,265	
Lead:			
Oxides	2,485	2,991	United Kingdom 2,926.
Metal, including alloys, all forms	824	2,270	United Kingdom 1,767.
Manganese oxides	--	455	United Kingdom 356.
Nickel metal, including alloys, unwrought and semimanufactures	367	303	United Kingdom 203; Switzerland. 53.
Platinum-group metals and silver, including alloys:			
Platinum group ——value, thousands	$326	$230	All from United Kingdom.
Silver ——do	$290	$268	United Kingdom $253.
Tin metal, including alloys, unwrought and semimanufactures ——long tons	57	68	United Kingdom 58.
Titanium oxide	3,207	3,404	Japan 159; Belgium-Luxembourg 145.
Zinc:			
Oxides	944	721	United Kingdom 603.
Metal, including alloys:			
Unwrought	3,104	3,944	United Kingdom 3,579.
Semimanufactures	1,033	1,070	United Kingdom 969.
Other:			
Nonferrous ore and concentrate, n.e.s	10,766	4,899	NA.
Metals, nonferrous base metals, including alloys, all forms, n.e.s. value, thousands	$434	$650	United States $500; United Kingdom $100.
NONMETALS			
Abrasives, natural:			
Crude, n.e.s ——do	$164	$303	NA.
Grinding and polishing wheels and stones	435	408	United Kingdom 247; West Germany 63.
Asbestos	5,182	4,191	Republic of South Africa 1,196; Cyprus 853; Canada 648.
Cement, hydraulic	129,933	268,013	United Kingdom 196,583.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	17,706	18,437	United Kingdom 16,923.
Products:			
Refractory (including nonclay brick)	16,383	15,701	United Kingdom 13,955.
Nonrefractory	7,327	9,818	United Kingdom 7,950.
Fertilizer materials:			
Crude:			
Phosphatic	400,855	297,170	Morocco 297,148.
Other	1,416	--	
Manufactured:			
Nitrogenous	31,093	86,671	United Kingdom 37,672; Netherlands 15,003; Kuwait 10,960.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Fertilizer materials—Continued			
Manufactured—Continued			
Phosphatic:			
Thomas slag	179,194	174,799	Belgium-Luxembourg 173,275.
Other	13,090	23,198	United Kingdom 19,622.
Potassic	252,740	237,351	West Germany 65,032; East Germany 44,282; Spain 43,503.
Other, including mixed	80,094	89,662	United Kingdom 63,651; Belgium-Luxembourg 9,928.
Ammonia	51,520	50,810	France 27,266; Netherlands 11,816.
Lime	7,982	7,275	All from United States.
Magnesite	19,547	4,378	United Kingdom 1,545; Greece 1,427.
Pigments, mineral, iron oxides, processed	2,351	1,224	West Germany 741.
Salt	56,814	55,484	United Kingdom 38,707; West Germany 13,234.
Sodium and potassium compounds, n.e.s	7,772	10,752	United Kingdom 10,116.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	3,622	4,077	Italy 1,612; United Kingdom 1,149.
Worked	252	232	Italy 113.
Dolomite, chiefly refractory grade	1,541	1,251	United Kingdom 792.
Gravel and crushed rock	68,019	92,478	United Kingdom 90,242.
Limestone (except dimension) including gypsum	4,355	--	
Sand, excluding metal bearing	54,447	59,768	Belgium-Luxembourg 37,663; United Kingdom 27,791.
Sulfur:			
Elemental, other than colloidal	121,380	39,207	United States 38,268.
Sulfuric acid, including oleum	6,644	80,372	Sweden 25,479; Netherlands 19,189; United Kingdom 18,257.
Other:			
Crude nonmetals, n.e.s	18,964	18,006	United Kingdom 9,909.
Slag, dross, and similar waste, not metal bearing	8,377	6,248	NA.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	6,117	7,431	United Kingdom 7,018.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	7,730	4,922	United Kingdom 2,630.
Coal and briquets, anthracite and bituminous coal ---thousand tons	1,038	892	Poland 690; United Kingdom 125.
Coke and semicoke ---do---	14	17	United Kingdom 12; France 3.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	22,849	17,955	Kuwait 9,911; Iran 3,565; Saudi Arabia 3,290.
Refinery products:			
Gasoline ---do---	1,581	2,301	United Kingdom 2,295.
Kerosine ---do---	2,817	2,676	All from United Kingdom.
Distillate fuel oil ---do---	2,026	2,733	Do.
Residual fuel oil ---do---	11,382	10,603	United Kingdom 7,959; U.S.S.R. 1,331.
Lubricants ---do---	263	307	United Kingdom 297.
Mineral jelly and wax ---do---	23	27	West Germany 13; United Kingdom 11.
Other:			
Liquefied petroleum gas ---do---	479	534	United Kingdom 509.
Nonlubricating oils, n.e.s ---do---	647	606	United Kingdom 603.
Bitumen and other residues and bituminous mixtures, n.e.s ---do---	694	711	United Kingdom 407; Netherlands Antilles 213.
Total ---do---	19,912	20,498	

NA Not available.

COMMODITY REVIEW

METALS

Alumina.—Plans were disclosed by Alcan Aluminium Ltd. to build a $230 million 880,000-ton-per-year alumina plant on Aughinish Island in the Shannon estuary, about 18 miles from Limerick. Construction was scheduled to start in 1974 and be completed in 1978. The plant was to be designed, primarily, to treat bauxite from West Africa and the product was to be exported mostly to West European countries.

Copper, Lead, Zinc, Mercury, and Silver.—Outputs of base metals in Ireland were lower than those in 1972. Silver production, however, increased 18%, mainly as a result of increased output at the Tynagh mine of Irish Base Metals Ltd., subsidiary of Northgate Exploration Ltd. A new underground section of the mine was brought into production during the year. The Tynagh mine was the source of about 75% of the lead and 33% of the zinc, that was produced and exported in concentrate or oxide forms. Over half of the country's copper continued to come from the Avoca Mines Canada Ltd. deposit in County Wicklow. Avoca was also the source of about 75,000 tons of pyrite concentrate. Most of the balance of the copper produced came from the Gortdrum mine of Northgate Exploration in County Tipperary. Byproduct mercury was also produced at the Gortdrum operation. Gortdrum accounted for about 20% of total silver production. Silvermines Ltd., processing lower grade ores in 1973, supplied a major part of the zinc and most of the remaining lead output.

Tara Exploration and Development Co. Ltd. continued development of the exceptionally large zinc-lead deposit discovered in 1970 at Navan, in County Meath. The mine was scheduled to begin operation in 1975, but delays were experienced because of negotiations with the Irish Government over the granting of a mining lease. The negotiations covered Tara's application for a lease on the section south of the Blackwater River which contains 85% of the ore reserves. Total reserves have been estimated in excess of 77 million tons averaging 10.9% zinc and 2.63% lead. A dispute remained over claims of a rival firm to title covering possibly 12 million tons of ore in the northern portion of the ore body. Meanwhile, work continued on an access shaft and decline tunnel for haulage on the Tara portion of the deposit.

New exploration by Munster Base Metals, Ltd., a subsidiary of Anglo United Development Corp. Ltd., disclosed a potentially large copper-silver deposit near Tullacondra, in County Mallow. Reserves in 1973 were estimated at 4 million tons averaging 0.69% copper and 0.86 ounce of silver per ton.

Smelter Corp. of Ireland Ltd., 70% owned by Northgate Exploration Ltd. and 30% by Tara Exploration and Development, continued feasibility studies for an electrolytic zinc refinery, probably to be located near County Cork. The proposed $100 million plant would require 2½ years to build and would produce 120,000 tons of zinc per year, recovering byproduct cadmium and silver. The project remained controversial because of potential pollution aspects.

Manganese Dioxide.—A contract was let to E. Lummus, a subsidiary of Combustion Engineering Inc., to design and build a $15 million 12,000-ton-per-year electrolytic manganese dioxide plant on Little Island, in County Cork. The plant, Japanese financed, was scheduled to start operation in mid-1975, utilizing imported manganese ores.

NONMETALS

Barite.—Production from the large Magcobar (Ireland) Ltd. barite deposit in County Tipperary exceeded that of 1972 owing to the large increase in world demand for barite for use in oil well drilling.

Cement.—Cement Roadstone Ltd. was expected to complete construction of Ireland's third and largest cement plant at Platin, west of Drogheda. Construction of the new plant followed the addition of a new 400,000-ton kiln at the plant of Cement Ltd., also at Platin.

Fertilizer Materials.—A $21 million fertilizer plant was scheduled for construction at Whitegate, in County Cork, by Co-Operative Agricultural Purchasers (Ireland) and N-Ren, Inc. (United States). The new firm was named Eir-N Chemicals Ltd. Production capacities were to be 60,000 tons of ammonia, 20,000 tons of nitric acid, 72,000 tons of urea, and 70,000 tons of intermediate products in the first year. In addition,

Nitrigin Eireann Teoranta, the Government-sponsored fertilizer company, announced plans to build a $48 million chemical plant at County Cork harbor to process ammonia from natural gas or naphtha, depending on supply developments. The plant was scheduled to begin production in 1977 and was to have capacity of 350,000 tons of ammonia annually. About one-third of the output was to go to the company plant at Arklow, County Wicklow, and one-third, to exports. The balance would go into a new urea plant at the site, producing about 175,000 tons annually.

Gypsum.—Gypsum was mined from the Drumgoosat and Drungill deposits, both near Kingscourt, and used mostly in the manufacture of plasterboard.

Magnesia.—*Dolomite.*.—Dolomite was mined at Bennettsbridge and hauled by rail to Dungarvan, on the southern coast, where it was used by Quigley Magnesite Div. of Pfizer Inc. (United States) in magnesia manufacture. The product, about 75,000 tons per year, was shipped mainly to Europe for furnace refractory coatings.

MINERAL FUELS

Fuel imports, on which Ireland largely depends for its energy requirements, were restricted by export limitations in producing countries during 1973. Government restrictions were placed on the distribution of petroleum products owing to supply shortfalls. Ireland's only oil refinery, at Whitegate, supplied about half of the estimated consumption of 38.1 million barrels of petroleum products including bunker fuels in 1973. At yearend, product stocks on hand were estimated at about a 55-day supply, 10 days less than at the start of the year.

The state-sponsored Electricity Supply Board announced sharply increased prices for electricity to cover higher fuel costs. About yearend, the price of imported Polish coal was raised 40% to the equivalent of $60 per short ton. The Dublin Gas Co. at yearend introduced a rationing system for piped gas, produced mainly from naphtha, announcing that prices would be raised 10% and calling for consumption to be lowered by 33%. A number of other energy-saving measures were introduced as fuel supplies dropped throughout Ireland.

Coal, Coke, and Peat.—Coal output declined in 1973 despite rising demand for fuels. Sod and milled peat, produced mainly by Bord Na Mona and used largely in electrical generation, were produced in lesser quantities during the year, but output of agricultural peat was higher. Peat briquets were manufactured and exported in part, as usual.

Petroleum.—During the first 9 months of 1973, 1.84 million metric tons of crude petroleum was imported into Ireland for refining from the following countries: Iran, 42%; Kuwait, 30%; Saudi Arabia, 26%; and other, 2%. Residual fuel oils amounting to 1.19 million tons were imported during the same period from the United Kingdom (81%), the U.S.S.R. (9%), and other countries (10%). All crude oil was refined at the Whitegate refinery in County Cork. Plans were reported for Shaheen Natural Resources Co., Inc. (United States), to build a $255 million refinery and petrochemical complex on Bantry Bay, County Cork. Product capacity was expected to be 10 million tons per year, about triple the capacity of the existing Whitegate plant. Another refinery was under consideration by Irish Oil Co. Ltd. near Drimoleague, about 6 miles from Bantry. This plant was expected to cost $180 million and would receive imported crude oil from Bantry Bay docks via pipeline.

In August, Marathon Petroleum (Ireland) Ltd. announced the discovery of significant amounts of natural gas 29 miles southeast of the Old Head of Kinsale, off the County Cork coast. The discovery was the eighth well drilled by the firm off the Counties Cork and Waterford coasts and was the third gas strike in the same area. The new well flowed at a rate of 52.4 million cubic feet of gas per day through a 2-inch surface choke from a depth of 2,806 to 2,895 feet. A lower zone from 3,066 to 3,091 feet was less productive. After the tests, Marathon's drill ship, *Glomar North Sea*, was reported to have moved to a location 64 miles off the County Cork coast and 35 miles southeast of the new discovery. It was believed that gas reserves would prove substantial and could be a significant factor in future Irish energy supplies and as a chemical industry feedstock.

The Mineral Industry of Israel

By William F. Keyes [1]

The defense-inflated economy of Israel continued to grow during 1973, although a setback was suffered in October when a fourth war with the Arab countries took place. After 5 years of economic boom, the gross national product (GNP), in current prices, increased 26% during 1973, reaching $8.7 billion at the official exchange rate of 4.2 Israeli pounds (I£) per U.S. dollar; it was forecast to rise 6.9% in 1974.[2] But in terms of constant 1972 prices the GNP increase in 1973 was only 7%, and the real increase, discounting defense spending, was estimated at only 3.6%, less than half of what it would have been without the war.

Domestic demand for raw materials, especially by the chemical industry, as well as strong export demand, induced growth in fertilizer materials, petroleum products, and other products of Israel's relatively limited resource base.

PRODUCTION

Production in most Israeli mining and minerals processing industries dropped during 1973 as a result of the October war and the induction of key personnel into the armed services. Declines were reported in output of the major minerals, potash, phosphate, copper, bromine, and cement; only the still relatively minor production of phosphoric acid, which has been plagued by process failures, showed some increase. The year also brought the initial production of magnesium oxide. The Government-owned Israeli Chemicals Ltd., which supervises minerals activities, planned to invest $333 million in the coming 5 years to expand producton.[3]

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[1] Physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

[2] U.S. Embassy, Tel Aviv, Israel. State Department Airgram A-65, Apr. 4, 1974, p. 4.

[3] U.S. Embassy, Tel Aviv, Israel. State Department Airgram A-173, July 12, 1974, p.1.

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

Commodity	1971	1972	1973 p
METALS			
Copper, cement, 70% to 80% Cu:			
Gross weight	13,500	14,900	13,252
Metal content	10,125	11,175	10,162
Iron and steel: e			
Pig iron	40,000	40,000	40,000
Crude steel	120,000	120,000	120,000
NONMETALS			
Bromine:			
Elemental	e 8,800	14,100	13,040
Compounds	e 4,400	10,000	9,500
Cement, hydraulic ---thousand tons	r 1,392	1,545	1,258
Clays:			
Flint clay	27,000	61,000	15,000
Metabentonite	NA	2,000	4,000
Kaolin	20,000	29,000	e 29,000
Other	NA	10,450	2,000
Fertilizer materials:			
Crude:			
Phosphatic:			
Unprocessed ---thousand tons	e 1,440	1,643	1,537
Beneficiated ---do	764	937	781
Potassic:			
Gross weight ---do	e 1,000	920	878
K_2O equivalent ---do	e 610	561	535
Manufactured:			
Nitrogenous	e 105,000	108,101	138,101
Phosphatic (superphosphate)	r 195,600	196,000	198,900
Potassic	r 3,708	3,704	3,045
Gypsum	80,000	120,000	e 100,000
Lime	180,000	180,000	e 180,000
Salt, marketed (mainly marine)	79,464	61,803	61,469
Sand and gravel:			
Sand:			
Glass sand	NA	73,000	69,500
Other (for building industry) ---thousand cubic meters	NA	5,000	NA
Gravel ---do	NA	1,000	NA
Stone:			
Dimension, marble	NA	16,000	NA
Crushed ---thousand cubic meters	NA	10,000	NA
Sulfur, elemental e	10,000	10,000	10,000
MINERAL FUELS AND RELATED MATERIALS			
Gas, natural, marketed ---million cubic feet	r 4,365	4,386	1,907
Peat e ---thousand tons	20	20	20
Petroleum:			
Crude:			
From Israel proper ---thousand 42-gallon barrels	r 445	342	275
From occupied Sinai e ---do	44,173	43,578	31,918
Refinery products: e			
Gasoline ---do	6,067	6,307	8,246
Jet fuel ---do	4,767	2,703	3,608
Kerosine ---do		2,253	2,577
Distillate fuel oil ---do	8,667	9,011	9,277
Residual fuel oil ---do	19,068	19,823	21,646
Lubricants ---do	3,033	3,153	155
Other ---do			4,483
Refinery fuel and losses ---do	1,734	1,803	1,546
Total ---do	43,336	45,053	51,538

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

TRADE

Israel's balance of trade is heavily unfavorable. In 1973 the deficit amounted to $1.6 billion, an increase of 83% over the 1972 deficit. The deficit in goods and services was $790 million in 1973 and was expected to approximate $3 billion in 1974; these deficits are largely covered by capital inflow.

The contribution of exports of fertilizer materials and copper to the trade balance is not inconsiderable. In 1973 exports from these industries amounted to over $57 million.[4] This was about 7% of total industrial exports (excluding polished dia-

[4] Work cited in footnote 3.

mond), and an increase of 16% over the 1972 value of $49 million. Israeli exports of mineral commodities were destined mainly to East and West Europe, with only small shipments to the United States.

Exports and imports of mineral commodities for the years 1971 and 1972 are shown in tables 2 and 3. Detailed trade data for 1973 were not available. Exports of cement-copper declined 6% from 1971 to 1972, and nitrogenous fertilizer exports virtually ceased. Exports of other fertilizer materials (phosphate rock and potash) rose considerably. Other increases were noted in exports of gem diamond and crude and partly refined petroleum. A strong increase in imports of cement was reported, as well as in nitrogenous fertilizers and petroleum.

Table 2.—Israel: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1971
METALS			
Aluminum metal, including alloys, all forms	r 2,866	3,069	West Germany 530; Nigeria 333; Belgium 258.
Copper:			
Copper cement	17,419	16,384	United Kingdom 5,602; Spain 5,232; Netherlands 1,255.
Matte	386	929	West Germany 359.
Copper sulfate	15	12	All to Africa(not further identified).
Metal, including alloys:			
Scrap	1,634	1,533	Spain 629; Belgium 413; Italy 202.
Unwrought and semimanufactures	460	2,306	NA.
Gold metal, unworked or partly worked value	$2,000	$1,000	All to West Germany.
Iron and steel:			
Scrap	1,649	481	Greece 1,271; Belgium 102; Netherlands 96.
Steel, primary forms	13	--	All to United States.
Semimanufactures:			
Tubes, pipes, fittings	r 10,808	12,602	Bulgaria 2,400; Romania 1,880; United States 1,510.
Other	r 112	25	United States 52; Uganda 22; Netherlands 12.
Lead metal, including alloys, all forms	239	777	United Kingdom 233.
Nickel metal, including alloys, all forms	r 8	98	West Germany 6; United States 2.
Platinum metal, unwrought or partly worked value	--	$17,000	
Silver metal, unwrought or partly worked troy ounces	1,125	--	NA.
Tin metal, including alloys, all forms value	$5,000	$4,000	United Kingdom $3,000.
Zinc:			
Oxide	--	30	
Metal, including alloys, all forms	r 158	157	Netherlands 141; Spain 17.
Other:			
Ash and residue containing nonferrous metals	64	606	Belgium 53; Netherlands 11.
Metals, including alloys, all forms: Alkali, alkaline earth, rare-earth metals	85	--	All to Austria.
NONMETALS			
Abrasives, natural, n.e.s., grinding and polishing wheels and stones value	$9,000	$26,000	Turkey $4,000; United States $2,000.
Barite and witherite	250	304	All to Republic of South Africa.
Bromine [1]	r 1,144	917	United States 478; Republic of South Africa 153; Netherlands 133.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	r 3,968	7,550	West Germany 2,782; Switzerland 1,001.
Products, refractory (including nonclay brick)	r 4,072	1,185	Iran 1,584; West Germany 1,314; Greece 941.
Diamond, gem, not set or strung thousand carats	2,116	2,532	United States 705; Hong Kong 300; Belgium 218; Netherlands 217.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1971
NONMETALS—Continued			
Fertilizer materials:			
Crude, phosphatic	r 357,704	503,162	Italy 104,265; Romania 77,363; Austria 50,331.
Manufactured:			
Nitrogenous	435	5	Malta 300; Ethiopia 135.
Phosphatic	r 195,879	177,985	Yugoslavia 72,346; Austria 27,644; Romania 24,876.
Potassic ——value, thousands	$84	$164	Cyprus $71; Kenya $13.
Other, including mixed	r 786,444	799,536	France 172,322; Japan 100,362; United Kingdom 85,521.
Ammonia	26	33	Iran 15; Cyprus 3.
Gypsum and plasters	79	47	Ivory Coast 35.
Magnesite	--	66	
Pigments, mineral, natural, crude	588	4	All to Uganda.
Precious and semiprecious stones, except diamond ——value, thousands	r $2,730	$3,354	United States $1,440; Switzerland $598; United Kingdom $275.
Salt and brine	111	436	Malaysia 105.
Stone, dimension:			
Crude and partly worked	13	--	All to United States.
Worked	18	55	All to Republic of South Africa.
Sulfur:			
Elemental, all forms	r 65	24	Iran 40; Thailand 25.
Sulfuric acid	91	89	Ethiopia 63; Mauritius 15.
Other nonmetals, n.e.s.:			
Slag and ash, n.e.s	--	103	
Bromine, chlorine, fluorine, iodine	5,386	6,324	United Kingdom 3,012; Hungary 470; Italy 419.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	--	15	
Carbon black	4,077	6,868	Turkey 1,991; United States 1,148.
Hydrogen, helium and rare gases	6	13	Iran 4; Turkey 2.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	23,725	38,441	NA.
Refinery products: e			
Gasoline ——do	1,443	994	NA.
Kerosine ——do	100	272	NA.
Jet fuel ——do		380	NA.
Distillate fuel oil ——do	2,499	1,559	NA.
Residual fuel oil ——do	713	2,134	NA.
Other ——do	87	639	NA.
Total ——do	4,842	5,978	

e Estimate. r Revised. NA Not available.

1 Elemental bromine is included (inseparable) with chlorine, fluorine, and iodine and is reported in this grouping under other nonmetals in this table.

Table 3.—Israel: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Bauxite and concentrate	403	102
Oxide and hydroxide	1,033	750
Metal, including alloys, all forms	r 18,344	15,963
Arsenic:		
Natural sulfides	--	4
Trioxide, pentoxide and acids	61	11
Chromium oxide, hydroxide and trioxide	67	55
Cobalt oxide and hydroxide	(1)	19
Copper:		
Matte	6	7
Metal, including alloys, all forms	r 11,550	6,667
Gold metal, unworked or partly worked ---value, thousands	r $6,858	$6,688
Iron and steel metal:		
Scrap	r 760	550
Pig iron, ferroalloys, and similar materials	r 12,271	16,425
Steel, primary forms	r 63,774	89,436
Semimanufactures: [2]		
Bars, rods, angles, shapes, sections	201,041	206,672
Universals, plates and sheets	281,275	215,384
Hoop and strip	6,562	5,222
Rails and accessories	1,064	2,564
Wire	11,754	8,327
Tubes, pipes, fittings	8,329	6,373
High carbon and alloy steel shapes, not further described	4,484	2,735
Lead:		
Oxides	1,001	995
Metal, including alloys, all forms	r 2,662	4,298
Magnesium metal, including alloys, all forms	45	83
Manganese oxides	363	397
Mercury ---76-pound flasks	464	319
Nickel metal, including alloys, all forms	r 160	40
Platinum-group metals, including alloys, all forms ---troy ounces	r 113,653	101,596
Silver metal, including alloys, all forms ---value, thousands	r $1,581	$1,750
Tin:		
Oxides ---long tons	4	5
Metal, including alloys, all forms ---do	r 126	23
Titanium oxides	r 2,687	2,952
Zinc:		
Oxide and peroxide	668	514
Metal, including alloys, all forms	r 4,518	4,980
Other:		
Ore and concentrate, n.e.s	r 336	285
Oxides, hydroxides and peroxides of metals, n.e.s	244	254
Metals, including alloys, all forms: Alkali and rare-earth metals value, thousands	$60	$10
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	r 349	202
Corundum, artificial	r 111	270
Grinding and polishing wheels and stones ---value, thousands	$370	$400
Asbestos	9,435	9,402
Barite and witherite	2,528	2
Boron materials, oxide and acid	417	220
Cement	r 278,200	509,860
Chalk	291	354
Clays and clay products (including all refractory brick):		
Crude clays, andalusite, kyanite, etc	29,884	25,807
Products:		
Refractory (including nonclay bricks)	r 3,863	4,020
Nonrefractory ---thousand square meters	r 3,699	r 1,694
Cryolite and chiolite	55	15
Diamond:		
Gem, not set or strung ---thousand carats	r 4,336	4,938
Worked:		
Industrial ---do	346	320
Other ---do	646	616
Diatomite and other infusorial earth	r 377	518
Feldspar and fluorspar	2,751	3,836
Fertilizer materials:		
Crude, phosphatic	8	37
Manufactured:		
Nitrogenous	r 44,813	56,144
Potassic	17	--
Other, including mixed	96	82
Ammonia	15,372	2,140
Graphite, natural	r 94	83

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972
NONMETALS—Continued		
Gypsum and plasters	251	106
Lime	r 9,805	5,108
Magnesite	586	(4)
Mica, crude, including splittings and waste	91	48
Pigments, mineral:		
Natural, crude	182	38
Iron oxides, processed	r 462	465
Precious and semiprecious stones, except diamond, natural and manufactured including synthetic ——value, thousands	r $1,886	$2,027
Salt	206	60
Sodium and potassium compounds, n.e.s	r 1,197	887
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked, calcareous	r 837	952
Worked	30	306
Dolomite, chiefly refractory grade	206	201
Gravel and crushed rock	r 5,198	7,141
Limestone	12	--
Quartz and quartzite	891	1,070
Sand, excluding metal bearing	62	86
Sulfur:		
Elemental, all forms	70,660	64,427
Sulfuric acid	7,967	25,253
Talc, steatite, soapstone, pyrophyllite	1,965	2,086
Other nonmetals, n.e.s.:		
Crude:		
Meerschaum, amber, jet	320	--
Mineral substances, n.e.s	518	584
Slag and ash, n.e.s	771	892
Oxides and hydroxides of magnesium, strontium, barium	109	90
Bromine, iodine, fluorine	39	2
Building materials, of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	r 30	39
Other nonmetals, n.e.s	144	91
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	274	3 23
Carbon black	2,289	2,403
Coal, all grades, including briquets	1,105	4,657
Coke and semicoke	7,525	1,991
Peat, including peat briquets and litter	198	1,140
Rare gases (argon)	12	29
Petroleum:		
Crude and partly refined ——thousand 42-gallon barrels	27,375	40,535
Refinery products: e		
Gasoline (including natural) ——do	95	528
Kerosine and jet fuel ——do	770	1,420
Distillate fuel oil ——do	919	328
Residual fuel oil ——do	--	54
Lubricants ——do	76	294
Other ——do	328	470
Total ——do	2,188	3,094
Mineral tar and other coal–, petroleum–, or gas–derived crude chemicals	r 3,080	1,045

e Estimate. r Revised.
1 Less than ½ unit.
2 Data for 1971 have been regrouped so as to include under each of the various shapes most of the material previously reported under "ingots and semimanufactures of high carbon and alloy steel."
3 Partial figure.
4 Quantity not available. Reported value for 1972, $223,000.

COMMODITY REVIEW

METALS

Copper.—The development of the Timna II underground mine continued during 1973. The mine, about 1 mile down the dip of the ore body, reportedly will make available, through a vertical shaft, about 10 million tons of ore reserves, enough to last 10 years at the planned rate of production. Timna Copper Mines Ltd. was also authorized by the Government to develop a new surface mine to continue production once the existing surface mines at Timna are exhausted. This project is expected to be completed by 1976.

Magnesium.—The new magnesium-oxide plant of Dead Sea Periclase Ltd. (a joint

venture of the Israeli Government and a group of foreign investors) started production at a rate scheduled to reach 50,000 tons per year. The plant used Dead Sea brines as raw material. It was closed temporarily shortly after starting as a result of the fourth Arab-Israeli war, in October, Key personnel and other workers had been drafted into the army.[5]

Uranium.—The Government of Israel reportedly decided to construct one 600-megawatt nuclear powered electric generating station by 1981. A duplicate would be constructed if further studies were favorable. In view of the limited resources of fossil fuels in Israel, the Government is moving to reduce its reliance on oil.[6]

NONMETALS

Bromine.—Bromine production by Dead Sea Bromine Co., a subsidiary of Dead Sea Works Ltd., was 14,200 tons in the fiscal year ending March 31, 1973. Most of the production was exported, particularly that in the form of ethylene dibromide. During 1973, Dead Sea Bromine was engaged in expansion projects designed to increase production capacity to 16,000 tons per year. Part of the bromine output was used by Bromine Compounds Co. located in Be'er Sheva to manufacture bromine derivatives for agricultural and industrial use. Eighty percent of the output of this company was exported.

Cement.—A third cement plant, the Shimshon plant at Bet Shamesh, was expected to start production early in 1974 to reach an eventual annual rate of 600,000 tons; all three present plants are operated by the Nesher Cement Co. Ltd.[7] A fourth plant, to be built by the Israel Corp. investment company and Solel Boneh, was planned for Mizpe Ramon in the central Negev to produce 800,000 to 1 million tons.[8] Total Israeli annual cement production would then exceed 3 million tons by 1978.

Clays and Sand.—Israel's entire requirements for industrial sands and clays are supplied by Negev Ceramics Ltd., which increased its production by about 50% to a total of 160,000 tons of quartz sand and various clays during the fiscal year ending March 31, 1973. Quartz sands and various clays are mined from the Great Crater near Yeruhan. Flint clays are mined and processed in the Ramon Crater. Both areas are in the Negev.[9]

Diamond.—Net exports of polished diamond, all from imported uncut stones, rose by 44% in 1973 to a record value of $556.8 million. After the October war, however, exports slowed down because of the general mobilization, disruptions in air shipments, signs of recession in some export countries, and stiffer competition from the Belgian diamond industry. An official forecast estimated that diamond exports in 1974 might fall 10% to $500 million.

The diamond-cutting industry in Israel provided an export surplus of $108.8 million in 1973 compared with a surplus of $69.7 million in 1972, and diamonds almost displaced citrus fruit as Israel's top net commodity export earner. The United States was Israel's leading buyer of polished diamonds, taking 28% of total sales. Hong Kong, Japan, and the Netherlands each took about 10% of total sales.[10]

Fertilizer Materials.—Production of beneficiated phosphate rock in calendar year 1973 was 781,000 tons; the decline compared with that of 1972, was attributed in part to the failure of a new phosphoric acid plant to operate as planned and in part to disruption caused by the October war. About 80% of the output of the fiscal year to March 31, 1974, valued at $12 million, was exported.

The sole phosphate rock producer was Negev Phosphate Co. Ltd. at its Oron and Little Crater mines in the Negev. For the first time in its history, Negev Phosphate showed a small profit, which was attributed to smooth operaton of the calciner, an efficiency campaign, and a general rise in world prices. A new phosphate field, said to contain 137 million tons of phosphate reserves of relatively high grade, was to be developed at Nahal Zin, near Oron, by Negev Phosphate.

Arad Chemical Industries Ltd., which was established in 1966 to manufacture annually 160,000 tons of phosphoric acid, has been able to function only at a maxi-

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[5] Chemical Week. V. 14, No. 1, Jan. 2, 1974, p. 22.
[6] U.S. Embassy, Tel Aviv, Israel. Telegram 10458, Dec. 27, 1973.
[7] Israel Industry & Commerce and Export News. V. 25, No. 1, February–March 1974, p. 2.
[8] Israel Economist. V. 29, No. 9, September 1973, p. 255.
[9] Ministry of Commerce and Industry, A Survey of the Chemical Industry in Israel. Jerusalem, Israel. 1973, 152 pp.
[10] U.S. Embassy, Tel Aviv, Israel. State Department Airgram A–66, Apr. 5, 1974, 2 pp.

mum capacity of 50%, because of breakdowns resulting in temporary paralysis of operations.[11]

In 1973 potash production rose to 535,000 tons of K_2O, of which 90% valued at about $26 million was exported.[12] The producer, Dead Sea Works Ltd., reportedly invested $19 million in expansion projects aimed at raising potash output to 1.2 million tons by 1975.

Producton of potassium nitrate by Haifa Chemicals Ltd., a subsidiary of the Israeli Government-owned Haifa Refineries, in the new 110,000-ton-per-year plant at Haifa was to be doubled under an expansion program to be completed by 1977. As with other industrial activity, some interruption was suffered as a result of the October war.[13] Production in 1973 was 87,000 tons.

MINERAL FUELS

Petroleum.—As a result of the world energy crisis, exploration activities for oil were to be stepped up in Israel. A committee of geologists submitted a report to the Israeli cabinet in September 1973 to the effect that reasonable prospects exist for the discovery of oil in Israel. The ministerial Committee for Economic Affairs then approved a 3-year investment plan to cost $33 million to speed up exploration activities. The search will be concentrated in two areas: Offshore up to 3 or 4 kilometers from Nahariya to Al-'Arish and also in the Dead Sea-Jericho area. Oil prospecting was the responsibility of the Lapidoth Oil Co., an agent of the Israeli Government.

To the end of 1973, nearly 250 oil drillings had been carried out in Israel at a total investment of approximately $60 million. These drillings resulted in the discovery of oil and gas with a combined value of about $43 million. The only production of oil in Israel proper was from the Helez-Brur-Kokhav Area, where reserves are nearly exhausted. Some 21 billion cubic feet of natural gas also remained available for exploitation at the Zohar-Kidod-Qanna'in Fields in the Negev, representing one-third of the original total. Oil exploration in Israel has been at a low ebb in recent years because of the unexpected access, after the Six-Day war, to the relatively rich oilfields at Abu Rodeis in the Sinai.[14]

The Ministry of Development of Israel issued a report on the current state of petroleum in Israel.[15] The report discussed the legal background, institutions and procedures, exploration efforts, and production and described pipelines, terminals, and refineries, as well as reporting on services available from the Lapidoth Co. It also listed companies that have been active in petroleum exploration in Israel.

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[11] U.S. Embassy, Tel Aviv, Israel. State Department Airgram A-231, Aug. 7, 1973, 5 pp.

[12] Foreign Agricultural Service (Tel Aviv, Israel). IS 4010, Apr. 8, 1974.

[13] Industrial Minerals. No. 73, September 1973, p. 43.

[14] U.S. Embassy, Tel Aviv, Israel. State Department Airgram A-056, Mar. 26, 1974, 3 pp.

[15] Cohen, Amnon. Petroleum in Israel: Exploration and Production. Geol. Survey of Israel, Jerusalem, May 1973, 16 pp.

The Mineral Industry of Italy

By Andrew Kuklis [1]

The upward trend in economic growth of past years continued through 1973 and resulted in a rise in Italy's gross national product (GNP) of nearly 6% compared with 3% and 2% in 1972 and 1971, respectively. The main stimulus for growth stemmed from an increase in disposable income and in social transfer payments. This generated a significant increase in public consumption and in fixed investment. At the same time, inflationary expectations, combined with fear of future scarcities, stimulated stock building for basic commodities and finished goods.

The continued floating of the lira independently of other Common Market currencies resulted in an effective weighted devaluation of the lira of about 20% in 1973.

Italy has insufficient indigenous sources of energy and raw materials and is an inadequate producer of basic agriculture products. The country's imports in these commodity sectors was expected to remain high. Because of an adverse shift in value of trade, Italy's balance-of-payments position deteriorated notably in 1973. This deterioration was entirely due to an expansion in imports that exceeded the increase in exports.

Value of exports totaled $22 billion, or 19% over that of 1972. Exports of goods and services increased at a lower rate than in previous years because labor problems early in 1973 had a pronounced impact on such large exporters as the automotive and home appliance industries.

Value of imports recorded a 44% increase compared with 1972. Higher imports were primarily due to the unprecedented rise in international market prices for raw materials, basic foods, and industrial equipment.

Employment in 1973 rose by 412,000 workers, hence reflecting a continued strong gain in the industry and service sectors of the economy. As a consequence, the unemployment rate in 1973 declined to 3.5% of the work force compared with 3.7% in 1972.

PRODUCTION

Italy's mineral industry is the third most important in the European Communities (EC). Although the nation is relatively deficient in most basic industrial raw materials such as the common metals and mineral fuels, it has become increasingly more important to the world's mineral economy as a market for raw materials produced by other countries. For example, the Italian iron and steel and petroleum industries have grown significantly during the post-war period. Currently the nation ranks seventh in world steel production and has the largest petroleum refining capacity in Western Europe.

The overall volume of production by the mining industry decreased 2% compared with that of 1972. Output of solid fuels increased 11%, metallic minerals decreased 19%, nonmetallic minerals increased 6%, and petroleum declined 10%. Despite the overall decreases, higher outputs were reported for antimony, asbestos, bentonite, feldspar, and rock salt. In the metal processing industry, output of pig iron, crude steel, and aluminum increased while production of zinc and lead decreased. Cement production increased by 9% and the output of petroleum products increased 6%.

[1] Physical Scientist, Division of Ferrous Metals—Mineral Supply.

Table 1.—Italy: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Aluminum:			
Bauxite	190,847	96,528	49,551
Alumina	262,608	206,328	158,333
Metal:			
Primary	136,413	149,459	184,200
Secondary	150,000	164,000	192,200
Antimony:			
Mine output, metal content	1,175	1,201	1,372
Regulus	1,053	1,120	1,277
Cadmium, smelter output	r 350	416	397
Copper:			
Mine output, metal content	1,540	1,049	864
Metal, secondary only	9,500	8,000	12,200
Germanium	17	31	52
Iron and steel:			
Iron ore and concentrate [1] thousand tons	683	616	522
Roasted pyrite do	NA	NA	NA
Pig iron do	8,536	9,415	10,032
Ferroalloys:			
Blast furnace do	18	48	65
Electric furnace do	174	171	173
Crude steel do	17,452	19,815	20,995
Steel, semimanufactures:			
Hot-rolled:			
Wire rod do	933	1,030	1,168
Sections do	5,075	5,596	6,457
Plates and sheets do	6,007	6,613	7,521
Hoop and strip do	854	1,041	1,051
Railway track material do	190	185	173
Ingots, semimanfacturing and solid for tubes do	1,082	1,129	1,075
Other do	724	861	911
Total hot-rolled do	14,865	16,455	18,356
Castings and forgings do	328	281	293
Cold-rolled sheet do	3,171	3,724	3,888
Seamless tubes do	882	881	836
Lead:			
Mine output, metal content	31,600	33,700	24,993
Metal:			
Primary	r 48,486	50,138	46,700
Secondary	27,400	19,100	e 19,000
Magnesium metal, primary	r 8,390	9,054	7,247
Manganese:			
Mine output, gross weight	30,604	25,637	25,559
Mine output, metal content	7,600	7,100	e 7,100
Mercury metal 76-pound flasks	42,613	41,800	32,692
Silicon, elemental	r 21,700	21,250	e 20,200
Silver metal thousand troy ounces	1,236	2,166	1,349
Zinc:			
Mine output, metal content	105,900	102,600	77,996
Metal, primary	r 139,919	155,861	155,771
NONMETALS			
Asbestos	119,568	131,272	149,255
Barite	201,526	181,768	166,197
Cement, hydraulic thousand tons	r 31,799	33,461	36,312
Clays, crude:			
Bentonite do	r 297	275	299
Fire do	294	269	2 315
For cement do	4,472	NA	NA
For brick and terra cotta do	24,762	NA	NA
Fuller's earth do	75	75	114
Kaolin do	96	69	72
Kaolinitic earth do	15	16	(3)
Diatomite	49,577	r e 50,000	e 50,000
Feldspar	r 205,924	182,817	190,198
Fertilizer materials:			
Crude potassium salts, natural thousand tons	1,785	1,801	1,791
Manufactured, gross weight:			
Nitrogenous do	r 2,933	2,947	3,182
Phosphatic do	1,269	1,219	1,132
Potassic do	280	281	258
Mixed and unspecified do	1,582	1,633	1,672
Fluorspar, all grades	r 295,591	276,913	235,533
Graphite, all grades	r 639	773	4,161
Gypsum (except dimension stone use) thousand tons	3,404	e 3,500	e 3,500
Lime (quicklime and hydrated) do	4,200	e 4,000	e 4,000
Pigments, natural, crude	1,190	e 1,200	e 1,200

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
NONMETALS—Continued			
Pumice and related materials:			
Pumice and pumaceous lapilli ---thousand tons--	840	r e 800	e 800
Pozollan ---do----	3,560	r e 3,500	e 3,500
Pyrite, all kinds:			
Gross weight ---do----	1,504	1,382	1,169
Sulfur content ---do----	646	594	515
Salt:			
Marine, crude ---do----	1,170	719	1,165
Other, including brine ---do----	3,391	3,360	3,707
Sand and gravel:			
Calcareous sand ---do----	2,266		
Silica sand ---do----	4,849	NA	NA
Volcanic sand ---do----	157		
Other sand and gravel ---do----	76,793		
Stone:			
Dimension stone:			
Calcareous:			
Alabaster and onyx ---do----	9		
Gypsum for cutting ---do----	20	NA	NA
Limestone ---do----	202		
Marble in blocks:			
White ---do----	809	1,167	1,299
Colored ---do----	1,035		
Schist ---do----	19		
Travertine ---do----	377	NA	NA
Tufa ---do----	1,897		
Other:			
Diorite ---do----	10		
Gneiss ---do----	176		
Granite ---do----	39		
Lava, basalt and trachyte ---do----	99		
Porphyry ---do----	208		
Quartz and quartzite ---do----	14	NA	NA
Sandstone ---do----	190		
Serpentine ---do----	589		
Slate ---do----	71		
Syenite ---do----	5,005		
Tuff, volcanic ---do----	290		
Crushed and broken:			
Calcareous tufa ---do----	3,079		
Diabase ---do----	170		
Diorite ---do----	5		
Dolomite ---do----	1,101	NA	NA
Granite ---do----	306		
Lava ---do----	7,432		
Limestone ---do----	72,438		
Marble, white and colored ---do----	1,570		
Marl for cement ---do----	7,982	7,261	7,982
Porphyry ---do----	208		
Quartz and quartzite ---do----	481		
Sandstone ---do----	898		
Schist ---do----	50	NA	NA
Serpentine ---do----	1,551		
Travertine ---do----	368		
Tuff volcanic ---do----	3,501		
Strontium minerals	835	735	735
Sulfur, native:			
Ore	r 573,823	833,797	777,846
Concentrate and filtrate (85% to 90% sulfur)	r 73,621	77,235	69,911
Fused in briquets	15,669	33,919	31,157
Talc and related materials	r 137,868	147,046	146,546
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bituminous rock, natural:			
For distillation	58,648	80,386	173,747
For paving	109,126	126,962	
Carbon black	r 126,306	130,785	146,796
Coal:			
Subbituminous (sulcis coal) ---thousand tons--	256	151	5
Lignite ---do----	1,326	839	1,301
Coke:			
Metallurgical ---do----	r 6,956	7,024	7,671
Gashouse ---do----	113	43	(4)
Gas, natural, marketed production ---million cubic feet--	472,845	501,009	541,267
Natural gas liquids, natural gasoline thousand 42-gallon barrels--	590	547	544
Petroleum:			
Crude ---do----	r 8,788	7,852	7,082

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity		1971	1972	1973 p
MINERAL FUELS AND RELATED MATERIALS—Continued				
Petroleum—Continued				
Refinery products:				
Gasoline	thousand 42-gallon barrels	r 112,114	118,837	129,012
Jet fuel	do	r 14,799	16,583	16,711
Kerosine	do	r 32,090	32,096	34,763
Distillate fuel oil	do	r 190,737	201,963	227,265
Residual fuel oil	do	r 359,307	365,660	376,225
Lubricants	do	3,818	3,480	3,455
Other:				
Refinery gas	do	5,247	3,877	3,996
Liquefied petroleum gas	do	24,251	25,234	26,435
Naphtha	do	74,479	75,236	80,036
Parafin	do	108	98	98
Bitumen	do	12,693	13,521	13,720
Unspecified	do	2,094	1,206	1,043
Partly refined oil	do	34,982	31,255	35,027
Refinery fuel and losses	do	r 52,177	55,950	56,908
Total	do	r 918,896	944,996	1,004,694

e Estimate. p Preliminary. r Revised. NA Not available.
1 Excluding pelletized iron oxide derived from pyrite.
2 Includes kaolinitic earth.
3 Included with fire clay.
4 Less than ½ unit.

TRADE

Italy is self-sufficient in asbestos, feldspar, fluorspar, magnesium, marble, mercury, pumice, and talc and also exports some of these products. For other minerals and ores, the nation is a net importer and was expected to be increasingly so to meet its rising consumption.

Mineral and metal exports in 1973 were valued at $1.1 billion or 5% of the value of all exports. Metals, principally refined products, accounted for most of the exports.

Imports of minerals and metals were valued at $6.2 billion, or 23% of the value of all imports. Metals were valued at $2.1 billion, or 8% of all imports, followed by mineral fuels $3.6 billion, or 13%, and nonmetals $269.6 million, or 2%.

Table 2.—Italy: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Bauxite	2,607	3,448	Switzerland 3,359; West Germany 89.
Ash and residue containing aluminum	1,656	2,046	France 1,931; West Germany 99; Belgium-Luxembourg 13.
Oxide and hydroxide	5,574	567	Mexico 257; West Germany 50; Spain 32.
Metal, including alloys:			
Scrap	67	286	West Germany 195; France 60; Netherlands 24.
Unwrought	12,938	12,479	Argentina 3,356; West Germany 3,330; France 2,557.
Semimanufactures	44,953	56,420	France 14,106; West Germany 8,785; United States 3,299.
Antimony metal, all forms, including waste and scrap	607	287	France 142; West Germany 67; Chile 25.
Arsenic:			
Natural sulfides	--	20	All to Switzerland.
Trioxide, pentoxide and acids	20	23	Mainly to France.
Beryllium oxide and hydroxide	--	30	Belgium-Luxembourg 20; Canada 10.
Bismuth metal	16	25	Netherlands 10; West Germany 8; France 6.
Cadmium metal, including alloys, all forms	85	95	West Germany 50; Netherlands 33; Belgium-Luxembourg 10.
Cesium and rubidium	--	6	Mainly to Belgium-Luxembourg.

See footnotes at end of table.

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

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Chrome:			
Chromite	685	893	Yugoslavia 643; Austria 219.
Oxide and hydroxide	1,197	3,008	United States 2,247; Sweden 320.
Metal, including alloys, all forms	2	37	Mainly to United States.
Cobalt:			
Oxide and hydroxide	(1)	3	West Germany 2; Netherlands 1.
Metal, including alloys, all forms	2	4	France 3; Spain 1.
Columbium and tantalum:			
Ore and concentrate	6	40	United Kingdom 20; West Germany 19.
Metal, all forms, including waste and scrap	(1)	21	Greece 18; France 2; United States 1.
Copper:			
Ore and concentrate	5,802	3,760	All to Spain.
Matte	143	--	
Ash and residue containing copper	13,590	5,944	West Germany 5,403; Spain 193; Belgium-Luxembourg 161.
Copper sulfate	101	1,727	Austria 1,012; Tunisia 309; Yugoslavia 248.
Metal, including alloys:			
Scrap	1,217	1,520	West Germany 1,400; France 65; United Kingdom 14.
Unwrought	4,375	3,898	West Germany 3,670; Switzerland 41; France 39.
Semimanufactures	30,936	37,803	West Germany 10,457; France 6,049; Poland 2,762.
Gallium, indium, and thallium—kilograms	926	988	All to Switzerland.
Germanium	3	(1)	Mainly to Belgium-Luxembourg.
Iron and steel:			
Ore and concentrate	64	141	Yugoslavia 48; Switzerland 48; India 40.
Roasted pyrite—thousand tons	287	255	Austria 144; United Kingdom 49; France 32.
Metal:			
Scrap—do	9	15	France 5; West Germany 5; Netherlands 4.
Pig iron, including cast iron, spiegeleisen, powder and shot—do	7	8	West Germany 1; France 1; Netherlands 1.
Ferroalloys—do	16	29	West Germany 10; Austria 4; United States 4.
Steel, primary forms—do	353	385	West Germany 114; Belgium-Luxembourg 66; United States 49.
Semimanufactures:			
Bars, rods, angles, shapes and sections—do	1,115	1,508	West Germany 587; France 290; Libya 118.
Universals, plates, and sheets—do	948	1,046	United States 162; West Germany 147; France 145.
Hoop and strip—do	79	95	France 15; Greece 13; United States 12.
Rails and accessories—do	7	15	Switzerland 6; Turkey 6; Pakistan 2.
Wire—do	27	33	West Germany 5; Poland 3; People's Republic of China 3.
Tubes, pipes, and fittings—do	592	692	West Germany 100; U.S.S.R. 84; United States 74.
Castings and forgings—do	63	78	Libya 15; France 14; West Germany 10.
Total—do	2,831	3,467	
Lead:			
Ore and concentrate	14,813	23,362	Austria 8,312; Greece 6,694; Yugoslavia 5,371.
Ash and residue containing lead	1,888	272	West Germany 188; United Kingdom 64; France 20.
Oxide	28	10	Belgium-Luxembourg 2; Somali Republic 2; Yugoslavia 2.
Metal, including alloys:			
Scrap	r 14	32	Australia 30; Switzerland 2.
Unwrought	746	446	Greece 128; Libya 101; Yugoslavia 100.
Semimanufactures	167	442	Libya 295; Algeria 59; France 31.
Lithium	(1)	7	Angola 5; ships stores 1.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Magnesium metal, including alloys:			
Scrap	13	261	United Kingdom 99; France 75; Mexico 35.
Unwrought	4,399	7,420	West Germany 6,205; Brazil 480; Belgium-Luxembourg 297.
Semimanufactures	65	91	France 30; Austria 16; West Germany 13.
Manganese:			
Ore and concentrate	458	--	
Oxide and hydroxide	60	12	Yugoslavia 6; Nicaragua 2; Republic of South Africa 2.
Metal, all forms	6	(1)	All to Nigeria.
Mercury ---76-pound flasks	15,206	10,936	United Kingdom 3,004; West Germany 2,001; Belgium-Luxembourg 1,100.
Molybdenum:			
Ore and concentrate	49	936	Austria 831; France 85; Switzerland 20.
Metal, including alloys, all forms ---kilograms	1,516	1,535	Ships stores 753; West Germany 400; Netherlands 236.
Nickel:			
Matte, speiss and similar materials	--	21	United States 20; Spain 1.
Metal, including alloys:			
Unwrought	307	214	Mainly to Netherlands.
Semimanufactures	961	1,024	Spain 348; Morocco 311; France 123.
Platinum-group metals and silver, including alloys:			
Platinum group ---thousand troy ounces	r 27	77	West Germany 44; Belgium-Luxembourg 8; United Kingdom 6.
Silver ---do	r 8,811	4,420	West Germany 2,840; Switzerland 530; France 307.
Rare-earth metals:			
Oxides and other compounds---value	$112,670	$7,650	Austria $4,992; Switzerland $1,475; Malta $823.
Metals, cerium	1	--	
Selenium, elemental ---kilograms	214	1	Mainly to West Germany.
Silicon, elemental	7,926	9,242	West Germany 3,833; United Kingdom 2,586; United States 1,275.
Tellurium and arsenic	--	(1)	All to ships stores.
Thorium:			
Ore and concentrate ---kilograms	36,400	103,535	All to West Germany.
Thoria ---value	$252	$187	All to Romania.
Tin:			
Oxide ---long tons	14	96	Israel 55; France 29; Yugoslavia 50.
Metal, all forms ---do	281	410	West Germany 138; France 53; United Kingdom 40.
Titanium:			
Ore and concentrate	10	20	All to Lebanon.
Oxides	19,301	24,050	Poland 6,023; West Germany 3,935; France 2,883.
Metal, including alloys, all forms	35	58	West Germany 35; France 20; Switzerland 3.
Tungsten:			
Ore and concentrate	3	--	
Metal, including alloys, all forms	23	11	Belgium-Luxembourg 5; West Germany 3; Sweden 2.
Vanadium oxide and hydroxide---kilograms	55	2,256	Mainly to Yugoslavia.
Zinc:			
Ore and concentrate	7,132	84	Yugoslavia 55; France 23; Portugal 5.
Ash and residue containing zinc	2,914	5,006	West Germany 3,600; Belgium-Luxembourg 567; France 457.
Oxide	921	1,998	France 1,617; Belgium-Luxembourg 80; Malaysia 50.
Metal, including alloys:			
Scrap	66	38	All to France.
Blue powder	r 488	164	Switzerland 100; West Germany 53; United Kingdom 4.
Unwrought	216	242	Yugoslavia 116; West Germany 31; Tunisia 21.
Semimanufactures	304	610	Ships stores 133; Netherlands 58; Canada 50.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Zirconium:			
Ore and concentrate	47	18	Zaire 12; Yugoslavia 5.
Metal, including alloys, all forms	(1)	6	Poland 5; France 1.
Other:			
Ores and concentrates	13	8	United States 6; West Germany 1.
Ash and residue containing nonferrous metals, n.e.s	r 856	1,427	West Germany 852; United Kingdom 244; France 213.
Oxides and hydroxides	419	294	West Germany 97; Zaire 53; France 51.
Metals, including alloys, all forms:			
Metalloids, n.e.s	125	25	Brazil 10; France 9; Switzerland 5.
Alkali, alkaline earth and rare-earth metals, n.e.s	41	1	Mainly to Yugoslavia.
Pyrophoric alloys	(1)	(1)	Mainly to France.
Base metals, including alloys, all forms, n.e.s	--	1	All to West Germany.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, corundum, etc	383,973	531,862	United States 224,485; United Kingdom 148,988; Netherlands 39,706.
Dust and powder of precious and semiprecious stones, value	$2,327	$1,700	United States $996; Switzerland $568.
Grinding and polishing wheels and stones	7,326	7,980	France 1,523; West Germany 1,115; Belgium-Luxembourg 397.
Asbestos	48,971	54,668	West Germany 21,961; France 13,577; Spain 5,776.
Barite and witherite	35,046	6,539	Romania 2,151; West Germany 1,717; Libya 1,600.
Boron materials:			
Crude natural borates	2	745	Switzerland 525; Greece 200; France 20.
Oxide and acid	1,918	2,401	West Germany 765; France 674; Switzerland 312.
Cement	304,528	1,085,512	Switzerland 301,146; Yugoslavia 269,508; Algeria 155,652.
Chalk	1,328	962	Switzerland 905; France 32; Yugoslavia 25.
Clays and clay products (including all refractory brick):			
Crude n.e.s.:			
Bentonite	9,543	12,947	Libya 5,230; Spain 3,791; Belgium-Luxembourg 1,046.
Kaolin	1,196	1,650	Greece 1,294; Spain 74; Switzerland 61.
Other	31,470	37,746	France 33,226; Switzerland 1,410.
Products:			
Refractory (including nonclay bricks)	r 55,417	57,224	West Germany 7,516; Switzerland 6,617; Yugoslavia 4,880.
Nonrefractory, thousand tons	r 1,209	1,122	Switzerland 278; France 233; West Germany 219.
Cryolite and chiolite	9	--	
Diamond:			
Gem, not set or strung, value, thousands	r $35	$35	Belgium-Luxembourg $34; France $1.
Industrial, do	r $67	$83	United Kingdom $47; Israel $14; Belgium-Luxembourg $7.
Diatomite and other infusorial earth	1,410	1,760	Austria 363; Yugoslavia 336; Switzerland 314.
Feldspar	r 26,882	30,935	West Germany 12,681; Switzerland 3,102; Netherlands 3,006.
Fertilizer materials:			
Crude	r 2,479	3,169	France 2,773.
Manufactured:			
Nitrogenous, thousand tons	r 872	1,196	Turkey 395; People's Republic of China 316; Arab Republic of Egypt 141.
Phosphatic, do	4	3	Mainly to Libya.
Potassic, do	6	13	Belgium-Luxembourg 4; France 4; Greece 2.
Other, do	r 337	245	Turkey 67; France 39; Zambia 21.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Fertilizer materials—Continued			
Ammonia	8,011	11,633	Mainly to Greece.
Fluorspar	r 161,133	67,060	United States 41,320; West Germany 9,238; Norway 6,700.
Graphite, natural	1,579	1,497	France 1,233; United Kingdom 40; United States 35.
Gypsum and plasters	42,845	18,365	Switzerland 12,829; France 1,344; Austria 1,163.
Lime	70,937	90,800	Libya 50,290; Switzerland 33,064; Yugoslavia 6,246.
Magnesite	7	10	West Germany 4; United Kingdom 2; France 2.
Mica:			
Crude, including splittings and waste	249	305	Arab Republic of Egypt 125; Libya 55; Angola 45.
Worked, including agglomerated splittings	18	53	Malta 28; Portugal 9; Netherlands 5.
Pigments, mineral, including processed iron oxides	1,039	1,219	United States 691; Somali Republic 69; France 52.
Precious and semiprecious stones, except diamond:			
Natural—value, thousands	r $72	$222	West Germany $79; Switzerland $42; United States $33.
Manufactured—kilograms	r 392	347	Peru 120; Switzerland 113; France 40.
Pyrite (gross weight)	26,896	11,438	Switzerland 9,673; West Germany 982; Austria 427.
Salt, all forms	160,100	261,301	Spain 71,535; Norway 44,348; Iceland 32,430.
Sodium compounds, n.e.s	275,374	179,095	Yugoslavia 74,500; U.S.S.R. 69,747; Greece 39,364.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	r 277,705	281,010	West Germany 50,066; France 47,244; Lebanon 23,080.
Slate	3,183	2,902	Switzerland 1,629; West Germany 758; France 157.
Other	52,829	61,989	West Germany 17,296; Switzerland 15,569; Austria 10,762.
Worked, all forms	r 608,324	745,812	West Germany 415,124; France 125,339; United States 85,889.
Dolomite, all grades	21,417	23,955	Switzerland 7,309; Argentina 3,294; Austria 2,952.
Gravel and crushed rock	492,556	507,531	West Germany 134,856; Switzerland 81,216; Libya 75,888.
Limestone (except dimension)	819	256	All to Switzerland.
Quartz and quartzite:			
Piezoelectric crystal—kilograms	7	11	United States 7; West Germany 4.
Other	32,537	34,371	Switzerland 14,569; France 8,829; Yugoslavia 7,439.
Sand, excluding metal bearing	523,467	694,608	Mainly to Switzerland.
Sulfur:			
Elemental, all forms	r 4,323	4,557	Yugoslavia 3,097; Israel 382; France 342.
Sulfur dioxide	37	30	Switzerland 23; France 5.
Sulfuric acid	10,352	307	Austria 110; France 95; Libya 15.
Talc, steatite, and soapstone	48,296	59,635	West Germany 18,148; United States 15,170; United Kingdom 7,660.
Other:			
Slag, dross, and similar waste, not metal bearing	171,678	213,042	Yugoslavia 174,896; France 19,963.
Oxides, hydroxides and peroxides of magnesium, strontium and barium	3,237	1,936	U.S.S.R. 1,000; West Germany 262; United States 134.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s	76,702	60,247	France 26,354; West Germany 6,354; Hungary 4,914.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	903	927	Malta 457; Libya 269; Yugoslavia 75.
Carbon black and gas carbon	r 28,203	37,797	Turkey 9,706; Austria 8,342; Iran 3,960.
Coal, all grades, including briquets	13,644	2,030	Yugoslavia 1,252; Austria 371; Greece 191.
Coke and semicoke	408,664	514,367	Romania 141,466; Spain 94,495; Yugoslavia 59,306.
Peat	25	83	France 51; Switzerland 28; Iran 3.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	56,602	49,300	United Kingdom 7,996; France 6,574; Belgium-Luxembourg 6,320.
Kerosine do	21,995	22,567	Greece 2,929; Netherlands 2,876; United States 2,587.
Distillate fuel oil do	70,706	63,574	France 18,470; West Germany 8,840; Netherlands 8,669.
Residual fuel oil do	85,434	102,677	United States 24,615; Greece 7,359; Netherlands 7,112.
Lubricants do	2,042	1,758	Algeria 390; Switzerland 311; Belgium-Luxembourg 144.
Other:			
Liquefied petroleum gas do	3,620	3,689	Algeria 792; Arab Republic of Egypt 748; Greece 431.
Mineral jelly and wax do	18	9	Poland 2; Spain 2; West Germany 1.
Bitumen and other residues do	r 1,219	1,051	Austria 659; Switzerland 206; Tunisia 88.
Petroleum coke and pitch coke do	357	329	Switzerland 115; France 100; Greece 39.
Bituminous mixtures, n.e.s. do	64	139	Algeria 50; Libya 27; Tunisia 21.
Total do	242,057	245,093	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	r 27,913	46,885	Netherlands 18,976; Yugoslavia 5,571; West Germany 5,112.

r Revised.
1 Less than ½ unit.

Table 3.—Italy: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite	548,127	676,158	Yugoslavia 266,844; Australia 176,941; Sierra Leone 76,489.
Ash and residue containing aluminum	29,669	35,636	Austria 17,687; Yugoslavia 3,433; Hungary 3,318.
Oxide and hydroxide	69,765	189,205	France 128,168; Guyana 20,650; Surinam 15,666.
Metals, including alloys:			
Scrap	31,220	59,605	France 16,496; Austria 13,419; West Germany 6,688.
Unwrought	155,809	173,277	France 36,830; Greece 35,614; Norway 17,881.
Semimanufactures	29,285	34,647	West Germany 16,160; France 7,890; United States 3,487.
Antimony:			
Ore and concentrate	855	1,464	Canada 533; Republic of South Africa 507; Thailand 234.
Metal, including alloys, all forms	140	200	People's Republic of China 123; Belgium-Luxembourg 41; Netherlands 20.
Arsenic trioxide, pentoxide and acids	1,386	1,925	France 1,089; People's Republic of China 647; Switzerland 80.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Beryllium metal, including alloys, all forms ---kilograms--	r 474	3,936	West Germany 3,377; United States 559.
Bismuth metal, including alloys, all forms	186	195	France 144; United Kingdom 18; West Germany 13.
Cadmium	29	33	Belgium-Luxembourg 11; Yugoslavia 6; West Germany 3.
Chromium:			
Chromite	201,772	193,611	U.S.S.R. 54,470; Albania 53,943; Turkey 50,722.
Oxide and hydroxide	1,532	1,900	West Germany 942; Hungary 372; Poland 296.
Metal, including alloys, all forms	73	209	West Germany 110; France 49; United Kingdom 48.
Cobalt:			
Oxide and hydroxide	306	230	Belgium-Luxembourg 197; France 33.
Metal, including alloys, all forms	73	209	Belgium-Luxembourg 276; France 24.
Columbium and tantalum:			
Ore and concentrate	179	110	Netherlands 63; Canada 42; Brazil 5.
Metal, all forms, including waste and scrap	9	9	United States 5; West Germany 1; Austria 1.
Copper:			
Matte	1,646	728	France 160; United States 125; Zaire 115.
Ash and residue containing copper	382	424	Switzerland 384; West Germany 40.
Copper sulfate	5,810	5,233	Yugoslavia 3,315; France 1,252.
Metal, including alloys:			
Scrap	46,228	48,819	France 15,023; West Germany 13,493; United States 8,399.
Unwrought	288,179	315,759	Zambia 76,535; Chile 63,148; Zaire 45,478.
Semimanufactures	11,869	17,510	West Germany 6,370; France 3,447; Belgium-Luxembourg 2,845.
Gallium, indium, and thallium ---kilograms--	408	355	United Kingdom 209; United States 106.
Germanium ---do---	2,777	7,332	France 4,730; Belgium-Luxembourg 2,554.
Iron and steel:			
Ore and concentrate --thousand tons--	11,246	13,308	Liberia 4,130; Brazil 2,077; Venezuela 1,493.
Roasted pyrites ---do---	(1)	--	
Metal:			
Scrap ---do---	5,481	5,679	France 2,250; West Germany 1,661; United States 639.
Pig iron, including cast iron and spiegeleisen ---do---	749	1,382	U.S.S.R. 253; West Germany 231; Yugoslavia 184.
Sponge iron, powder and shot ---do---	14	16	France 7; Sweden 6; West Germany 1.
Ferroalloys:			
Ferromanganese ---do---	117	88	France 58; U.S.S.R. 7; Belgium-Luxembourg 6.
Other ---do---	83	101	France 24; Yugoslavia 16; Norway 13.
Steel, primary forms ---do---	1,975	2,572	West Germany 420; Japan 260; Belgium-Luxembourg 241.
Semimanufactures:			
Bars, rods, angles, shapes, and sections ---do---	504	501	Belgium-Luxembourg 139; France 132; West Germany 94.
Universals, plates, and sheets ---do---	1,179	1,247	France 307; Belgium-Luxembourg 251; West Germany 225.
Hoop and strip ---do---	133	160	France 51; West Germany 30; Belgium-Luxembourg 26.
Rails and accessories --do---	108	109	France 73; West Germany 22; Belgium-Luxembourg 10.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Semimanufactures—Continued			
Wire ——thousand tons	53	45	Belgium-Luxembourg 21; France 9; West Germany 5.
Tubes, pipes and fittings ——do	173	163	West Germany 56; France 43; Sweden 6.
Castings and forgings ——do	26	27	West Germany 9; France 6; United States 5.
Total ——do	2,176	2,252	
Lead:			
Ore and concentrate	28,165	24,699	Greece 12,457; Canada 6,187; Sweden 1,588.
Ash and residue containing lead	10,300	17,932	Tunisia 6,130; Norway 4,948; Sweden 2,834.
Oxide	8,852	6,108	France 2,109; Mexico 955; Bulgaria 928.
Metal, including alloys:			
Scrap	19,884	20,874	France 9,437; Switzerland 5,234; West Germany 3,688.
Unwrought	127,119	150,832	West Germany 35,402; Mexico 24,288; North Korea 13,302.
Semimanufactures	378	795	Yugoslavia 362; France 217; West Germany 166.
Lithium	4	3	West Germany 1; U.S.S.R. 1; United States 1.
Magnesium metal, including alloys:			
Scrap	457	943	West Germany 742; Austria 58; France 55.
Unwrought	1,042	851	United States 362; United Kingdom 237; France 120.
Semimanufactures	90	58	United States 20; United Kingdom 14; West Germany 10.
Manganese:			
Ore and concentrate	290,561	283,343	Republic of South Africa 149,865; Gabon 75,094; Brazil 25,528.
Oxides	2,425	1,441	Japan 892; Belgium-Luxembourg 422; West Germany 63.
Metal, all forms	1,503	2,033	France 1,310; Republic of South Africa 379; Japan 232.
Mercury ——76-pound flasks	3,875	5,300	Yugoslavia 3,451; Algeria 701; Turkey 530.
Molybdenum:			
Ore and concentrate	3,769	5,705	Netherlands 2,579; United States 1,451; Canada 679.
Metal, including alloys, all forms	43	54	Austria 26; France 14; Netherlands 6.
Nickel:			
Matte, speiss and similar materials	2,611	4,349	Canada 3,318; Cuba 652; West Germany 251.
Metal, including alloys:			
Scrap	739	1,220	United States 564; Canada 306; West Germany 71.
Unwrought	14,169	14,229	Canada 4,297; Norway 2,126; Cuba 1,936.
Semimanufactures	2,488	2,531	West Germany 830; United States 507; France 494.
Platinum-group metals and silver, including alloys:			
Platinum group thousand troy ounces	372	406	West Germany 190; United Kingdom 96; France 65.
Silver ——do	r 37,700	48,627	West Germany 13,983; United States 12,981; United Kingdom 12,152.
Rare-earth metals:			
Oxides and other compounds ——value	$497	$577	France $449; United Kingdom $56; United States $17.
Metals:			
Cerium	28	71	West Germany 40; Brazil 26; United States 2; France 2.
Other	1	154	United States 79; West Germany 46; Austria 21.
Selenium, elemental	21	37	Japan 12; West Germany 10; United Kingdom 6.
Silicon, elemental	498	320	Yugoslavia 242; France 72; West Germany 4.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Tellurium and arsenic	96	92	West Germany 46; Sweden 33; Canada 7.
Thoria ——value	$21,661	$85,833	France $61,256; West Germany $24,128; United Kingdom $449.
Tin:			
Oxide ——long tons	20	9	Belgium-Luxembourg 5; West Germany 3; France 1.
Metal, including alloys:			
Scrap ——do	39	25	Spain 20; Panamá 3; United Kingdom 2.
Unwrought ——do	7,151	8,147	Malaysia 6,065; Indonesia 604; People's Republic of China 396.
Semimanufactures ——do	99	170	West Germany 80; Belgium-Luxembourg 15.
Titanium:			
Ore and concentrate	107,785	133,477	Norway 127,693; Australia 5,520; Belgium-Luxembourg 148.
Oxides	35,397	45,261	West Germany 22,172; France 9,157; Netherlands 5,410.
Metal, including alloys, all forms	822	1,289	United States 891; West Germany 183; France 27.
Tungsten:			
Ore and concentrate	115	100	Zaire 21; Australia 20; Portugal 12.
Metal, including alloys, all forms	62	53	France 18; United States 9; West Germany 9.
Uranium metal ——kilograms	19,435	24,381	United States 22,760; West Germany 1,000; Netherlands 621.
Vanadium oxide and hydroxide	316	881	Netherlands 597; West Germany 201.
Zinc:			
Ore and concentrate	107,324	147,948	Peru 27,507; Algeria 17,274; Tunisia 16,499.
Ash and residue containing zinc	r 2,344	4,354	Switzerland 1,825; Belgium-Luxembourg 1,055; West Germany 652.
Oxide and hydroxide	6,452	4,329	Czechoslovakia 942; Yugoslavia 702; West Germany 645.
Metal, including alloys:			
Scrap	3,585	4,228	West Germany 1,728; France 1,166; Switzerland 888.
Blue powder	r 3,803	2,253	Belgium-Luxembourg 1,962; Norway 108; France 74.
Unwrought	40,044	47,463	Belgium-Luxembourg 12,753; West Germany 11,232; Zaire 4,048.
Semimanufactures	3,364	5,271	Belgium-Luxembourg 3,904; West Germany 680; Spain 432.
Zirconium:			
Ore and concentrate	17,380	33,280	Australia 32,998; West Germany 158; United States 57.
Metal, including alloys, all forms ——kilograms	6,843	7,683	United States 4,203; United Kingdom 1,887; France 1,381.
Other:			
Ore and concentrate	r 286	4,335	Ireland 3,976; Australia 307.
Ash and residue containing nonferrous metals, n.e.s	30,274	8,074	Austria 3,293; Yugoslavia 2,050; France 1,539.
Oxides and hydroxides	2,563	1,888	West Germany 654; Cuba 370; Belgium-Luxembourg 242.
Metals including alloys, all forms:			
Metalloids	3,585	2,091	West Germany 1,125; Netherlands 818; France 148.
Alkali, alkaline earth and rare-earth metals, n.e.s	8,290	8,515	West Germany 7,191; U.S.S.R. 783; Switzerland 162.
Pyrophoric alloys	2	21	United Kingdom 8; West Germany 6; Austria 4.
Base metals including alloys, all forms, n.e.s	r 1	3	All from West Germany.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, etc	2,755	2,058	Greece 1,285; West Germany 455; United States 175.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Abrasives, natural, n.e.s—Continued			
Dust and powder of precious and semiprecious stones value, thousands	$3,606	$4,504	Switzerland $1,163; United States $881; Zaire $780.
Grinding and polishing wheels and stones ---thousand tons	4,264	3,862	West Germany 896; Austria 825; United Kingdom 734.
Asbestos	64,257	47,753	Republic of South Africa 22,905; Canada 13,986; U.S.S.R. 7,547.
Barite and witherite	19,745	53,296	Spain 38,345; People's Republic of China 4,750; Turkey 3,825.
Boron materials:			
Crude natural borates	103,332	112,419	Turkey 85,779; United States 20,989; West Germany 3,865.
Oxide and acid	687	421	Yugoslavia 105; United States 104; France 92.
Cement	58,195	56,242	France 44,628; Spain 5,124; Yugoslavia 3,110.
Chalk	r 8,326	7,702	France 6,674; Austria 774; West Germany 246.
Clays and clay products:			
Clay:			
Bentonite	25,595	20,220	Greece 13,345; West Germany 2,788; United States 1,306.
Kaolin	463,789	515,919	United Kingdom 291,753; United States 130,641; West Germany 29,882.
Other	r 731,249	689,982	France 269,598; West Germany 209,112; United Kingdom 95,024.
Products:			
Refractory	129,560	127,245	West Germany 50,094; Austria 23,837; France 13,977.
Nonrefractory	22,462	33,396	West Germany 27,789; Belgium-Luxembourg 2,130; Switzerland 1,906.
Cryolite and chiolite	627	605	Denmark 585; West Germany 20.
Diamond:			
Gem, not set or strung value, thousands	$2,994	$3,171	Belgium-Luxembourg $1,873; West Germany $925; Israel $154.
Industrial ---do	$1,159	$1,041	Belgium-Luxembourg $617; Netherlands $173; United Kingdom $144.
Diatomite and other infusorial earth	3,865	4,831	West Germany 1,547; France 733; United States 700.
Feldspar	r 20,597	24,052	Norway 7,930; West Germany 3,678; Portugal 3,360.
Fertilizer materials:			
Crude ---thousand tons	r 1,928	2,227	Morocco 1,177; United States 766; Israel 126.
Manufactured:			
Nitrogenous	109,894	148,031	United States 31,743; France 28,970; Romania 14,517.
Phosphatic	264,234	208,540	France 56,493; Belgium-Luxembourg 51,880; Tunisia 49,809.
Potassic	r 292,492	210,090	France 60,003; West Germany 43,609; Israel 40,031.
Other	r 293,841	310,600	United States 211,585; Yugoslavia 38,654; Greece 22,519.
Ammonia	7,582	19,703	United States 6,533; Trinidad and Tobago 4,727; Algeria 4,131.
Fluorspar	98,368	71,671	Tunisia 21,184; France 16,607; Mexico 10,172.
Graphite, natural	10,052	6,930	Austria 3,983; West Germany 1,980.
Gypsum and plasters	1,825	2,644	United States 1,170; Spain 719; West Germany 509.
Lime	177	100	United Kingdom 58; France 28; West Germany 10.
Magnesite	52,907	49,017	Greece 17,507; Austria 10,081; Yugoslavia 8,235.
Mica:			
Crude, including splittings and waste	1,504	1,685	Republic of South Africa 453; Romania 256; India 234.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Mica—Continued			
Worked, including agglomerated splittings	200	200	France 62; Belgium-Luxembourg 58; United States 20.
Pigments, mineral, iron oxides	16,025	22,617	West Germany 12,976; France 1,733.
Precious and semiprecious stones, except diamond:			
Natural ——value, thousands	$780	$1,236	Thailand $233; West Germany $222; Brazil $174.
Manufactured ——kilograms	14,213	12,495	Switzerland 7,538; France 3,328; West Germany 875.
Pyrite, gross weight ——thousand tons	549	453	U.S.S.R. 318; Cyprus 118; Yugoslavia 10.
Salt	5,667	3,811	West Germany 2,411; Netherlands 600; France 377.
Sodium and potassium compounds	12,651	47,611	France 35,495; Netherlands 10,035; West Germany 1,146.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous, including marble	172,273	161,431	Yugoslavia 51,194; Portugal 39,710; Iran 17,098.
Slate	3,770	3,203	West Germany 1,759; France 1,025; Norway 391.
Other	115,739	129,067	Republic of South Africa 39,840; Norway 18,912; Argentina 12,946.
Worked, all forms	2,426	3,735	West Germany 1,176; Yugoslavia 523; Norway 394.
Dolomite	2,445	2,107	Switzerland 890; France 551; Norway 316.
Gravel and crushed rock	12,266	7,824	France 4,417; Austria 1,109; West Germany 567.
Limestone (except dimension)	756	576	All from Switzerland.
Quartz and quartzite:			
Piezoelectric crystal ——kilograms	254	225	United Kingdom 89; U.S.S.R. 65; West Germany 39.
Other	86,779	94,005	Portugal 36,881; Switzerland 29,157; West Germany 16,746.
Sand, excluding metal bearing thousand tons	1,042	1,180	Belgium-Luxembourg 538; France 462.
Sulfur:			
Elemental, all forms	284,551	341,949	Canada 155,487; Poland 85,723; France 57,151.
Sulfur dioxide	481	463	All from West Germany.
Sulfuric acid	42,693	91,488	Poland 27,789; Greece 25,771; West Germany 19,945.
Talc, steatite, soapstone and pyrophyllite	18,484	19,606	Austria 10,637; France 4,128; People's Republic of China 1,408.
Other:			
Slag, dross, and similar waste, not metal bearing	13,553	14,228	France 7,020; Yugoslavia 1,984; Tunisia 1,666.
Oxides and hydroxides of strontium, barium and magnesium	1,658	2,165	United States 833; West Germany 683; France 303.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s	23,217	18,944	France 5,905; Yugoslavia 5,511; Belgium-Luxembourg 3,262.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen	2,498	2,042	United States 1,674; France 353.
Carbon black and gas carbon	27,891	27,339	France 9,398; West Germany 4,923; Netherlands 4,543.
Coal and briquets:			
Anthracite and bituminous thousand tons	r 11,409	10,756	United States 3,170; West Germany 2,720; Poland 2,558.
Briquets of bituminous coal and anthracite ——do	62	27	France 16; Algeria 6; West Germany 4.
Lignite and lignite briquets ——do	172	140	West Germany 72; Yugoslavia 48; East Germany 16.
Coke and semicoke ——do	154	139	France 71; Hungary 13; West Germany 12.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Gas, natural, liquefied --thousand tons--	64	1,014	All from Libya.
Peat ----------do----	20	29	West Germany 14; Poland 5; Yugoslavia 3.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels--	r 854,628	886,719	Saudi Arabia 209,062; Libya 160,505; Iran 130,230.
Refinery products:			
Gasoline ----------do----	4,917	7,473	U.S.S.R. 2,928; France 1,018; Spain 854.
Kerosine ----------do----	904	1,010	Trinidad and Tobago 346; U.S.S.R. 178; United States 121.
Distillate fuel oil ----------do----	4,041	7,497	U.S.S.R. 3,059; Spain 1,360; Yugoslavia 1,323.
Residual fuel oil ----------do----	12,168	18,667	U.S.S.R. 4,736; Greece 3,413; Romania 2,689.
Lubricants ----------do----	959	1,351	United States 412; France 263; West Germany 174.
Other:			
Liquefied petroleum gas do----	r 1,863	1,276	Yugoslavia 406; Spain 336; West Germany 128.
Mineral jelly and wax do----	336	365	West Germany 116; Hungary 37; People's Republic of China 33.
Petroleum coke and pitch coke ----------do----	r 2,493	1,699	United States 989; West Germany 314; U.S.S.R. 236.
Bitumen and other residues do----	r 1,698	2,030	United States 1,359; Albania 608; France 33.
Bituminous mixtures, n.e.s do----	r 34	20	France 10; United Kingdom 4; West Germany 2.
Total ----------do----	29,413	41,388	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ----------	r 32,241	52,501	U.S.S.R. 12,943; France 11,885; West Germany 8,367.

r Revised.
1 Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—Italian production of primary aluminum increased 23% compared with that of 1972. Most was produced at plants operated by Montecatini-Edison S.p.A. (Montedison) near Bolzano, Mori, and Venice. Società Alluminio Veneto per Azioni (S.A.V.A.) ranked second in output of primary aluminum and operated plants near Fusina and Porto Marghera.

Mine production of bauxite dropped for the third consecutive year because of declining reserves and high operating costs at the San Giovanni Rotondo mine, Italy's principal producer. Imports are expected to continue to increase to meet higher demand which is estimated to reach 1 million tons annually by 1975.

Ente Partecipazioni e Finanziamento Industria Manifatturiera (EFIM) acquired control of Montedison's aluminum production facilities during the year. Included in the acquisition were plants that produce alumina, primary aluminum, and the manufacturing of finished aluminum products. EFIM currently controls an estimated 85% of Italy's production of primary aluminum metal. The agency was conducting metallurgical research on extensive leucite deposits in Calabria and Sardinia as a possible substitute for bauxite.

Antimony.—Output of antimony increased 172 tons in 1973 and was 14% higher than in 1972. Most of the increase in production came from the Tafone mine operated by Azienda Minerali Metallici Italiane S.p.A. (AMMI). Lower grade deposits also were mined near Villasalto, in the Cagliari province of Sardenia.

Copper.—Domestic output of copper concentrate declined for the fourth consecutive year. Some chalcopyrite concentrate was produced as a byproduct of lead-zinc ores at the Accesa Serrabotino mine near Massa Marittima and cupriferous-pyrite ores near Farini d'olmo.

Italy's declining production of copper concentrate was balanced by increasing imports from Canada and Australia.

Iron and Steel.—Steel output reached a record level of 21.0 million tons, a 6% increase compared with that of 1972. Improvement in instrumentation at existing facilities and startup of new electric furnaces at medium-size steel plants contributed to the higher steel production for 1973. However, labor problems during the early part of the year prevented the industry from obtaining even a higher production level for 1973. A new labor contract was signed in March which resulted in a wage increase of nearly 25%. Also, higher output resulted from increased demand for steel by the transportation and manufacturing industries.

Electric furnaces accounted for about 41% of all steel produced in 1973, Linz-Donawitz (LD) converters supplied 42%, and the remaining 17% was by open-hearth furnaces. Salient statistics on Italian steel production are shown in table 4.

Italy's steel output in 1973 represented 3.0% of world production compared with 3.2% in 1972.

At yearend, steel production capacity was reported at 27.6 million tons, 12% over 1972 figures. and the industry operated at about 80% of theoretical capacity.

Domestic consumption of steel continued upward and rose to 23 million tons in 1973, partially because of improvement in the general economy of the nation. Prices of most steel products rose during the year; however, higher steel prices reportedly did not compensate for increased overhead and other higher costs associated with steel manufacture. Some major steel producers reported losses for 1973.

Per capita steel consumption in Italy was 385 kilograms in 1973 compared with 369 kilograms in 1972 and an average of 510 kilograms for EC countries.

The nation was both an exporter and importer of steel. In 1973 steel imports were 6.1 million tons, while exports totaled 4.7 million tons. Imports increased over 6% but exports declined 4% compared with those of 1972. The limited devaluation of the lira with respect to the dollar was not sufficient to increase imports of steel products from the United States. As in past years, importation of steel came principally from EC countries.

Italian steel exports, however, tend to be primarily finished products such as steel pipe with a far higher added value than the semifinished products which form the bulk of the imports.

Expansion of the Taranto steel complex operated by Italsider S.p.A. continued during 1973. The startup of the fourth blast furnace was initiated early in the year. The fifth blast furnace, associated rolling mills, and pipemaking facility were under construction. A second LD plant was completed at midyear and placed in operation. Two 350-ton-capacity converters were the principal steel producing units in the plant. The No. 2 plant at the Taranto works completed its first full year of production in manufacturing large-diameter longitudinal and spiral welded pipe. The U.S.S.R. reportedly received a shipment of large-diameter pipe totaling 430,000 tons from the plant for use in transmission of natural gas. Exports of line pipe to the U.S.S.R. were expected to increase to 500,000 tons in 1974 and to 1 million tons by 1980.

Improvement in port facilities was underway at the Taranto works. An unloading dock for receiving raw material from boats of 250,000 dead-weight tons was completed late in 1973. A second port facility for outgoing shipments was scheduled for completion in 1975. Construction was continuing on an extensive road and rail network between the steel center and the port facilities.

Technocogne S.p.A. negotiated a $86 million turn-key contract with Latrobe Steel Co., (United States) to design and build a high-temperature alloy steel plant in the Naples area. The special steel would be used in manufacturing space hardware, nuclear reactors, jet turbine blades, and machinery products. Completion of the project was scheduled for 1976 and the facility was expected to provide employment for 1,000 workers.

In April 1973, the International Committee for Economic Planning (CIPE) formally approved the much debated project for the creation of a fifth iron and steel complex near Gioia Tauro (Calabria). The project will be implemented in two stages:

1. Installation of a cold rolling mill hav-

Table 4.—Salient statistics on iron and steel production

(Metric tons)

Year	Pig Iron			Ferro-alloys	Crude Steel					Hot rolled steel [1]	Iron rolled from rerolled scrap	Other finished products [2]
	Blast furnace	Electric furnace	Total		Open hearth furnace	Electric furnace	Converter	Other	Total			
1955	1,371,423	253,489	1,624,912	105,884	3,051,609	2,140,632	355,398	--	5,547,639	3,999,681	25,543	179,595
1956	1,643,351	230,075	1,873,426	120,146	3,371,761	2,370,255	333,614	--	6,075,630	4,415,927	20,722	184,661
1957	1,841,953	229,957	2,071,910	134,511	3,895,782	2,704,078	379,573	--	6,979,433	5,013,827	106,907	201,059
1958	1,837,950	221,810	2,059,760	107,332	3,611,693	2,501,457	335,901	--	6,449,051	4,635,247	119,467	172,426
1959	1,885,815	211,885	2,097,700	94,227	3,751,447	2,802,994	399,358	--	6,953,799	5,083,858	118,508	163,555
1960	2,373,251	309,590	2,682,841	141,421	4,601,144	3,411,849	449,075	--	8,462,068	6,483,664	146,905	209,019
1961	2,771,248	285,102	3,056,350	145,093	4,985,905	3,765,203	632,178	--	9,383,286	7,043,353	154,721	242,424
1962	3,306,928	249,055	3,555,983	121,610	5,159,850	3,960,039	636,932	628	9,757,449	7,386,014	161,167	242,304
1963	3,508,420	232,245	3,740,665	127,181	5,266,088	4,234,627	655,075	742	10,156,532	7,835,109	144,937	227,429
1964	3,249,071	248,714	3,497,785	126,902	4,885,534	4,226,252	680,055	1,443	9,793,284	7,617,248	124,427	200,545
1965	5,252,462	237,469	5,489,931	141,303	5,145,530	4,745,011	2,789,020	1,842	12,681,403	9,780,014	88,922	208,056
1966	6,081,965	176,955	6,258,920	157,874	4,954,566	4,970,084	3,711,433	2,528	13,638,611	10,329,333	73,768	229,674
1967	7,052,285	242,087	7,294,372	169,891	5,618,133	5,997,357	4,271,639	2,733	15,889,862	12,155,748	78,396	298,662
1968	7,619,043	206,674	7,825,717	167,605	5,664,615	6,427,013	4,868,857	3,043	16,963,528	13,247,957	74,660	319,550
1969	7,542,297	238,224	7,780,521	166,965	5,204,306	6,554,149	4,665,995	3,685	16,428,135	13,352,843	65,658	333,428
1970	8,109,164	222,397	8,331,561	196,959	4,840,615	6,994,117	5,437,700	4,832	17,277,264	13,928,820	67,782	360,899
1971	8,411,182	125,154	8,536,336	191,076	3,998,760	7,072,606	6,375,386	5,174	17,451,926	13,968,892	64,603	327,592
1972	9,347,366	67,732	9,415,098	219,000	3,988,286	8,075,239	7,745,012	6,068	19,814,605	15,341,514	65,629	280,693
1973	9,975,900	56,600	10,032,500	238,472	3,627,900	8,633,000	8,727,600	6,500	20,995,000	17,287,900	68,723	293,000

[1] Rolled steel structurals; plates, sheets, tin plates, wire rods, rails, etc.
[2] Including forged steel castings and other finished products, excluding welded tubes.

Source: Associaziono Nazionale Industrie Siderurgiche (ASSIDER).

ing an annual production capacity of 1 million tons of steel and employing 2,500 workers.

2. Installation of a hot rolling mill with an annual production capacity of 3.6 million tons of steel. Also, building of an electric steel producing section having an annual production capacity of 0.5 million tons of steel.

Work on the project was expected to commence in about 2 to 3 years. Completion of the project will take from 8 to 10 years and cost $1.7 billion. A total of 7,500 workers will be employed at the steel complex.

Italsider announced plans to build a new steel plant utilizing electric furnaces and expand existing foundry, forging, heat-treating, and mechanical-processing operations at its steel complex in Lovere near Milan.

Terni S.p.A. controlled by Società Finanziaria Siderurgica S.p.A. (Finsider), began operating a 55-ton capacity Argon-Oxygen-Decarburization (AOD) converter for producing stainless steel. The process was developed by Union Carbide Co. of the United States.

Italsider was authorized $60 million by Finsider to expand steel capacity at the Bagnoli works, and to install the most up-to-date pollution control equipment.

Iron Ore.—The nation's output of iron ore declined for the fourth straight year because of high costs and low-grade ore. The grade of the iron ore was 44% in 1973, the same as in 1972. The progressively lower production at the Cogne and Finsider mines in Bergamo was responsible for the declining output. The Elba mines are the only domestic sources of iron ore in Italy.

Italy imports most of its iron ore requirements. In 1973, 14.2 million tons were received from Liberia, Brazil, Australia, and three other countries. Liberia supplied over 30% of the nation's requirements compared with 31% in 1972.

To provide a continuous supply of raw materials for Italy's steel plants, Finsider authorized expenditures of $5 million for construction of a 3-million-ton pelletizing plant in Brazil. The project is a joint venture with Companhia Vale do Rio Doce, a Brazilian firm. Finsider agreed to supply about 80% of the equipment, mostly produced by Italian manufacturing firms.

Pig Iron.—Domestic production of pig iron rose from 9.4 to 10.0 million tons in 1973, an increase of 7% compared with that of 1972. Most of the increase in pig iron output came from the new blast furnace placed onstream at Taranto during 1973. Blast furnaces were the principal sources of pig iron. The pig iron industry operated at 76% capacity compared with 75% in 1972, and the ratio of pig iron to raw steel production was 47.8% compared with 47.5% in 1972. Italsider remained the largest producer of pig iron, accounting for over 90% of output. Imports of pig iron in 1973 totaled 1.0 million tons compared with 1.2 million tons in 1972. U.S.S.R. and West Germany supplied more than 40% of total imports.

Iron and Steel Scrap.—Total scrap resources amounted to 14.7 million tons or 17% more than in 1972. Domestic sources accounted for the increase as iron and steel scrap imports approximated those received in 1972. Steel scrap consumption and distribution by source for the last 2 years was as follows:

Source	Quantity (thousand metric tons)	
	1972	1973
Domestic supply:		
Own arising	5,148	5,800
Home supplies	1,743	3,400
Imports:		
From ECSC countries [1]	3,919	3,756
From other countries	1,760	1,716
Total	12,570	14,672
Yearend stocks	r 1,239	1,351

r Revised.
[1] European Coal and Steel Community.

The Italian steel industry was making a concerted effort to increase domestic supplies of scrap steel. Ten shredding plants were in operation and 5 new plants were under construction. These were expected to be onstream in 1974.

Special Steels.—Production of carbon and alloy steel in 1973 increased 4% and was approximately 16% of total steel production. Stainless and structural steel output were the only special steels to record significant increases in 1973. Italy's output of special steels, by type, in the last 2 years was as follows:

	Quantity (thousand metric tons)	
	1972	1973
High-carbon steel:		
Structural	1,325	1,393
Tool	2	1
Total	1,327	1,394
Alloy steel:		
Structural	1,070	1,064
Tool	28	18
Bearing	107	90
Stainless	220	291
High speed	1	2
Other	2	2
Total	1,428	1,467
Grand total	2,755	2,861

Galvanized Steel.—Two companies operated galvanized sheet and steel products facilities in 1973, namely Cantieri Metallurgici, Italiani S.p.A. and La Magona d'Italia S.p.A. Italy's galvanized sheet capacity rose from 528,000 to 640,000 tons, an increase of over 20% compared with that of 1972. The demand for galvanized products was stimulated by the introduction of cut-sheet galvanizing production equipment.

Lead and Zinc.—Mine production of lead and zinc concentrate declined 26% and 24%, respectively, compared with 1972. Low-grade material averaging 7.8% metallic zinc was reportedly produced from oxide ores mined at the Salafossa, Guienni, and Val Brembana mines; output rose nearly 30% compared with that in 1972. Production declines in lead and zinc concentrate were apparently due to increased labor costs, decreasing grade of ore mined, and removal of protective tariffs. Virtually all lead and zinc ore was mined in the province of Cagliari, Sardinia. Historical data on production indicate a declining trend in mine output of lead ore and high-grade zinc ore in Italy. Prior to 1963, the nation was the leading producer of zinc ore and ranked second in lead ore output in the EC.

Società Pertusola S.p.A.'s new zinc smelting and refining plant near Crotone produced 73,000 tons of zinc, 170,000 tons of sulfuric acid, and 27,000 pounds of germanium during the year. In view of the expected growth of zinc consumption, the company was expanding production capacity of electrolytic zinc from the current 90,000 tons to 130,000 tons at a cost of $320 million.

Manganese.—Production of manganese ore in 1973 approximated that produced in 1972. Italsider's Gambatesa mine near Varese Ligure accounted for most of the nation's output. A small deposit of pyrolusite ore was intermittantly mined near Carloforte, Sardinia.

Italy is the only producer of manganese ore containing over 20% manganese in the EC. Production had remained fairly constant since 1955 except for the past 3 years. Operating costs have been rising in recent years, hence production is less competitive with foreign imports.

In 1973, the nation imported manganese from the Republic of South Africa, Gabon, Brazil, and Ghana.

Mercury.—Italy, closely followed by Spain, continued to rank high among the world's producers of mercury. Output in 1973 dropped for the second consecutive year because of decreasing use by the chemical industry. The average mercury content of the ore appeared to have declined to 0.47% from 0.48% reportedly mined in 1972.

The 22% drop in mine production in 1973 reflected curtailment of operations by Stabilimento Minerario del Siele and Società Monte Amiata S.p.A., Italy's two major mercury producers. The Provinces of Siena and Grosseto contain the only known minable deposits of mercury in Italy.

Monte Amiata, Italy's largest mercury producer, reportedly transferred mining and processing operations to a state-owned corporation. Lower prices and higher operating costs affected the company's profitability for the past 2 years and necessitated the change. Stocks of mercury, estimated at 50,000 flasks, were included in the transfer. To curtail increasing unemployment in the area, the Italian Government was expected to continue operation of the mines and processing facilities. Production at Monte Amiata operations declined about 1,400 flasks in 1973 compared with that of 1972.

Titanium.—The sulfate-process titanium pigment plant of Montedison at Scarlino was the target of much criticism because of its practice of disposing of waste by dumping at sea. Quantities dumped ranged from 2,500 to 3,000 tons per day. Montedison sought temporary solutions by converting a portion of its effluent to ferrous oxide and reclaiming sulfuric acid, and also by disposing of its waste at depths below the normal habitat of most marine life. However, in September, a local magistrate ordered seizure of two ships used to move waste to the dumping grounds. As a long-

range solution, Montedison was committed to install technology developed by New Jersey Zinc Co. to separate the ferrous sulfate and to concentrate the remaining acid sufficiently for reuse. However, the recovery plant probably will not be operative until mid-1976; meanwhile resumption of operations depends on further court action.

Uranium.—Comitato Nazionale per l'Energia Nucleare (CNEN), a government agency, announced discovery of a 10,000-ton uranium deposit near Viterbo, about 65 kilometers north of Rome. Preliminary studies indicated that the deposit was commercially minable, and hence competitive with imported uranium. Production of uranium from the Viterbo deposit was expected to cost about $10 per pound.

NONMETALS

Asbestos.—Output of asbestos rose 14% compared with that of 1972. The increase was the eleventh consecutive year of higher output. Italy continued to be the principal West European producer of asbestos. The rising output was apparently due to increased domestic consumption and increased exports of fibre and asbestos cement.

The highly mechanized San Vittore open pit mine in the Province of Turin, was the principal source of the nation's output.

Barite.—Production of barite declined 15,571 tons in 1973 and was 9% lower than in 1972. The decrease was apparently due to lower domestic demand and reduced exports. Barite was mined principally in Sardinia. The Mont'Ega mine near Narcao operated by Società Bariosarda S.p.A. accounted for over 50% of the nation's output in 1973.

Barite output in Italy reached a peak in 1969 and declined during the next 4 years.

Cement.—Output of cement increased 2.9 million tons in 1973 and was 9% higher than in 1972. The increase in production was apparently due to higher prices and greater demand by the construction industry. Italy's 1973 output was the highest on record.

The industry ranked second to West Germany among West European countries. The nation's cement industry is comprised of 120 plants; one-half of these are located in Northern Italy.

Cementerie Siciliano completed expansion of its cement plant near Porto Empedocle, Sicily. The plant capacity was increased to 1 million tons of cement at a cost of nearly $15 million.

Cement production increased in output for all years except 1965, 1966, and 1971. The industry produced cement at an average annual growth rate of over 6% for the 19-year period (1955–73).

Clays.—*Bentonite.*—Società Mineraria Isole Pontine (SAMIP) discovered a large bentonite deposit near Isili, Sardinia. Evaluation work continued and SAMIP engineers expect the size of the deposit to exceed 10 million tons. The company was mining a high-grade bentonite deposit on the island of Ponza, an operation in production since 1935. Bentonite mined on Ponza was used principally for foundry clays and drilling mud.

Feldspar.—Output of feldspar increased 7,381 tons in 1973 and was 4% more than in 1972. The material was consumed in making decorative aggregate. The Giustino mine of Società Maffei Feld Spato S.p.A. accounted for most of the nation's feldspar production.

Feldspar production in Italy rose steadily for most years from 1955 through 1969. Output peaked at 212,645 tons in 1969; subsequently demand weakened and since 1969 the mines have operated slightly below capacity levels.

Fluorspar.—Italian fluorspar production in 1973 declined 15% and was the lowest since 1969. The decrease in output was apparently due to higher labor and transportation costs and declining grade of the nation's deposits. This situation may have weakened the competitive position of Italian fluorspar, particularly with regard to Spanish and Mexican fluorspar.

Italy's fluorspar mining industry is dependent on foreign markets for disposal of about 50% of its output. In recent years, the United States was the leading consumer. In 1973, exports to the United States totaled 55,387 tons compared with 114,954 tons in 1971. The overall decline in fluorspar exports has had a disquieting effect on the Italian industry.

As in past years, the industry was dominated by two companies: Montedison and Mineraria Silus S.p.A. The latter company is the world's largest producer of acid-grade fluorspar.

Fluosarda, a subsidiary of the Sardinian Mining Agency, initiated a 3-year fluorspar exploration program on a large concession in the Sarrabus-Serrei and Sarcidano Area.

The agency was expected to spend $2 million on the project.

Phosphates.—Fosifitalia S.p.A. completed construction of a $5 million phosphate processing plant near Trieste. The facility was expected to produce phosphoric acid and a wide range of phosphatic compounds. The nation depends heavily on imports of phosphates for its requirements. Imports declined about 20% compared with those of 1972. Three countries, Morocco, Israel, and the United States, supplied over 90% of the imports.

Potassium Salts.—Production of potassium salts approximated that produced in 1972. Most was produced at the San Cataldo and San Caterina mines in the Province of Caltanissetta, Sicily. Virtually all the potassium ore was processed into chemical fertilizer.

Pyrite.—Production of pyrite declined for the fourth consecutive year. The 1.2 million tons produced in 1973 was 15% lower than in 1972 and reportedly the lowest tonnage mined in many years. The declining output in recent years was apparently due to an oversupply of elemental sulfur, excessive mining costs, and low-grade deposits.

Italy pyrite production was utilized in manufacturing sulfuric acid and iron sinter. Although pyrite output was substantial and exceeded 1 million tons, the nation imported one-third million tons for consumption. Imports of pyrite came principally from U.S.S.R.

Montedison, from mines in the Province of Grosseto, continued to account for most of Italy's pyrite production. At midyear, Montedison reportedly sold its pyrite mines in the Province of Grosseto to the state-controlled agency, AMMI. The purchased price was reported at $30 million. The acquisition provided AMMI with control of nearly 90% of the nation's pyrite output.

Despite reduced output, the nation continued to rank second to Spain among West European countries in pyrite output.

The processing of pyrite to iron pellets and sulfuric acid at the Scarlino plant was reduced because of environmental pollution problems. Disposing of a silt byproduct off the coast of Corsica was disallowed.

Salt.—Rock salt production increased 346,427 tons in 1973 and was 10% more than in 1972. Most of the increase came from two mines operated by Società Solvay S.p.A. in the Province of Pisa and six mines operated by Ente Mineraria Sarda (EMS) in the Province of Agrigento. The salt was consumed to manufacture pure sodium chloride.

Sand and Gravel.—*Silica Sand.*—Società Italiana Vetro S.p.A.'s (SIV) float glass facility was near completion at yearend and was expected to commence production early in 1974. Pilkington Brothers, Great Britain, inventor of the float glass process, was providing engineering service and technical assistance in the initial stages of operations. The facility, near San Salvo, was expected to be the largest of its kind in Italy. Sand will be purchased from the Italsie S.p.A. processing plant near Melfi, Potenza.

Stone.—*Marble.*—Production of block marble (white and colored) increased 132,765 tons in 1973 and was 11% above that in 1972. Higher output was apparently due to greater demand by the domestic building industry and increased exports.

More than 80 types or grades of marble were produced, mostly from Tuscany. The island of Sicily and Sardinia also quarried commercial marble for the building industry.

Output of marble peaked in 1970 when over 1.9 million tons were produced. The following year production declined because of a worldwide economic recession. Output in 1973 represented the second consecutive year in which marble production increased.

Sulfur.—Output of sulfur ore dropped to 777,846 tons, or 7% lower than in 1972. The decline was apparently caused by high operating costs. Sicilian mines accounted for most of the output.

Output of sulfur ores, including ground sulfur, have been on the decline since 1957. This trend was expected to continue because sulfur can be imported at a lower cost than when produced in Italy.

MINERAL FUELS

Consumption of energy was estimated at 119.2 million tons of crude oil equivalent,[2] of which petroleum supplied 72%, solid fuels 7%, natural gas, 12%, hydro-electric power 7%, and other sources the remaining 2%. Domestic resources provided an estimated 19% of the energy consumed while imported fuels supplied the remainder. The tabulation in table 5 shows the share of different sources of energy in tons of standard crude oil equivalent.

[2] At 10,000 calories per kilogram.

Coal.—Production of sulcis coal dropped to less than 5,000 tons in 1973. High production costs and increased imports of higher grade coal accounted for the drop. Sulcis coal was produced in Sardinian mines operated by Ente National Energia Electrica (ENEL).

Imports of coal remained high because of increasing demand. Coking coal accounted for 87% of the imports, steam coal 8%, and the remainder was gas coal. Total value was $312.5 million compared with $254.2 million in 1972. Increased imports of coal from European sources continued to reduce the share imported from the United States which amounted to 26% of total Italian coal imports in 1973 compared with 28% in 1972.

Most of the domestically produced coal and lignite was consumed for electric power generation. Coking facilities were the largest users of imported coal.

Lignite.—Lignite mining was related to the operation of minemouth thermoelectric plants situated at the lignite deposits at Valdarno, Mecure, and Pietrafita. After output declined for 3 consecutive years. it rose 56% in 1973 compared with 1972. The increase was apparently due to higher costs of imported liquid fuels used in thermoelectric plants.

Coke.—Output of coke increased to 7.7 million tons from the 7.1 million tons produced in 1972. Almost all was metallurgical coke, a small quantity was for gas works. Italy's entire output was produced from imported coal, mainly from the United States, Poland, West Germany, and the Soviet Union.

Electric Energy.—Output of electricity continued to increase with thermal plants supplying nearly 69% of total production in 1973. Although output from all sources increased, the share of the total provided by hydroelectric plants declined slightly. Production by type of plant is shown in table 6.

Natural Gas.—Output of natural gas rose from 14.2 to 15.3 billion cubic meters, an increase of 8% compared with 1972. Most of the increase came from the Po Valley and Offshore Adriatic and Ionian Sea gasfields. Some natural gas was produced in Central Italy and Sicily. A total of 70 wells produced natural gas in 1973; however, nine of these wells were offshore and produced about one-half of Italy's output. Natural gas reserves rose to over 213 billion cubic meters because of discovery of new reserves in offshore areas.

Although production of natural gas exceeded 15 billion cubic meters. it was insufficient to meet the nation's demand. To keep supply and demand in balance, a total of 3 billion cubic meters of natural gas in liquefied form was imported from Libya. Liquefied natural gas was regassified at the Società Nationale Metanodotti Progetti (SNAM) plant near La Spezia and thence entered the pipeline network for distribution.

Table 5.—Consumption of solid and liquid fuels, natural gas and electric power

(Quantity in thousands of metric tons of crude oil equivalent, at 10,000 calories per kilo)
(Bunkers not included)

Year	Coal and lignite		Crude oil		Natural gas		Electric power		Total		From domestic sources	
	Quantity	Index	Quantity	Index	Quantity	Index	Quantity	Index	Quantity	Index	Quantity	Index
1955	8,344	91	9,824	21	2,974	43	7,617	63	28,759	38	11,506	57
1956	8,827	96	11,587	25	3,661	53	7,762	64	31,837	42	12,581	62
1957	9,078	99	12,415	26	4,090	59	7,954	66	33,537	45	13,658	68
1958	7,943	87	13,823	29	4,244	61	8,862	74	34,872	46	15,000	74
1959	7,402	81	15,713	33	5,016	73	9,479	79	37,610	50	16,300	81
1960	8,028	87	19,324	41	5,286	76	11,208	93	43,846	58	18,279	90
1961	8,557	93	23,010	49	5,627	81	10,360	86	47,554	63	18,063	89
1962	9,062	99	28,572	61	5,862	85	9,995	83	53,491	71	17,667	87
1963	9,032	98	33,273	71	5,959	86	11,692	97	59,956	80	18,888	93
1964	8,318	91	38,635	82	6,301	91	10,550	88	63,804	85	19,013	94
1965	8,606	94	42,166	90	6,397	93	11,521	96	68,690	91	19,770	98
1966	9,180	100	46,943	100	6,915	100	12,041	100	75,079	100	20,198	100
1967	9,624	105	52,135	111	7,562	109	11,800	98	81,121	108	20,672	102
1968	9,473	103	58,321	124	8,819	128	11,856	98	88,469	118	21,782	108
1969	9,601	105	64,368	137	9,800	142	11,497	95	95,266	127	22,582	112
1970	9,446	103	73,687	157	10,694	155	12,024	100	105,851	141	22,973	114
1971	9,094	99	77,508	165	10,892	158	11,212	93	108,661	145	22,672	112
1972	9,600	104	93,500	199	12,500	181	10,800	90	126,400	168	22,812	113
1973	8,800	95	85,500	182	14,200	206	10,700	89	119,200	158	23,115	115

Source: Italian Ministry of Industry and Commerce.

Consumption of natural gas in 1973 was principally for industrial purposes (71%). Other major consumers were residential and commercial establishments, 24%; electric power generation, 4%; and 1% for other uses shown in table 7.

Petroleum.—The reduced output of crude oil continued in 1973 and resulted from the lower production rate at both the Gela and Ragusa oilfields in Sicily. The downward trend was expected to continue because of progressive depletion of reserves and water infiltration in both oilfields. The Sicilian oilfields continued to account for over 95% of domestic crude oil output. Yearend reserves were estimated at 215 million barrels, or 2% below yearend 1972 figures.

Italy was dependent heavily on imports of crude oil. In 1973 imports totaled 128.3 million tons, or 8% above 1972 figures. The Middle East strengthened its position as the principal supplier of crude oil to Italy. The African share of the market increased to 24%, mainly because of higher shipments from Libya. Venezuelan and U.S.S.R. oil shipments to Italy both continued to drop; the former supplied 1% and the latter 6% of the market.

Table 6.—Production of electric power

(Millions of kilowatt hours)

Year	Hydropower	Thermal, geothermal	Nuclear	Total
1955	30,800	7,324	--	38,124
1956	31,318	9,274	--	40,592
1957	31,848	10,878	--	42,726
1958	35,931	9,231	--	45,162
1959	38,472	10,384	--	48,856
1960	46,243	9,706	--	55,949
1961	41,934	18,313	--	60,247
1962	39,114	25,369	--	64,483
1963	45,907	23,832	323	70,062
1964	39,156	33,697	2,395	75,248
1965	42,910	35,150	3,510	81,570
1966	44,067	40,156	3,863	88,086
1967	42,801	48,800	3,152	94,753
1968	42,311	56,032	2,576	100,919
1969	42,069	64,571	1,679	108,319
1970	41,343	70,922	3,176	115,441
1971	39,904	79,310	3,366	122,580
1972	42,354	87,009	3,626	132,989
1973	39,391	102,497	3,142	145,030

Source: Italian Ministry of Public Works.

Table 7.—Natural gas production and consumption

(Thousands of cubic meters)

Year	Production	Consumption					
		Industrial	Domestic and heating	Electric power generation	Transportation [1]	Mining	Total
1955	3,615,824	2,591,706	310,221	503,053	199,875	13,027	3,617,882
1956	4,465,429	3,119,189	433,699	671,618	219,510	19,004	4,463,020
1957	4,987,074	3,549,561	515,704	644,462	231,142	20,201	4,961,070
1958	5,175,670	3,973,693	624,983	304,011	234,151	23,973	5,160,811
1959	6,117,549	4,812,009	695,346	327,961	228,687	28,711	6,092,714
1960	6,447,224	5,170,598	819,090	204,704	214,617	25,510	6,434,519
1961	6,862,710	5,379,266	909,617	350,718	180,979	21,794	6,842,374
1962	7,150,580	5,299,763	1,163,212	495,088	152,374	17,899	7,128,336
1963	7,267,598	5,338,620	1,336,089	424,372	130,645	15,402	7,245,128
1964	7,684,300	5,420,195	1,536,805	514,612	117,218	15,506	7,604,336
1965	7,802,445	5,423,447	1,741,115	434,980	111,680	16,762	7,727,984
1966	8,795,066	5,760,096	1,846,548	667,399	105,013	19,769	8,398,825
1967	9,366,902	6,245,215	2,022,670	771,511	101,909	24,138	9,165,443
1968	10,412,272	7,019,834	2,242,748	1,272,369	98,756	30,589	10,664,296
1969	11,959,241	7,842,208	2,609,651	1,234,241	98,497	34,596	11,819,193
1970	13,137,742	8,584,259	2,971,766	1,110,100	93,834	61,351	12,821,310
1971	13,389,548	9,231,655	3,431,121	266,260	109,973	71,794	13,110,803
1972	14,187,057	10,518,562	3,952,036	530,902	131,617	71,357	15,204,474
1973	15,327,057	11,575,669	3,961,635	609,482	137,215	70,575	16,354,576

[1] Italian State Railways and motor vehicles.

Source: Italian Ministry of Industry and Commerce.

Azienda Generale Italiani Petroli S.p.A. (AGIP) signed a joint venture agreement with Libya on a production concession at a major oilfield. AGIP will have responsibility for overall operations of the concession and act as a marketing agent for the production. Output was expected to total 10 million tons of crude oil annually.

Pipelines.—At yearend, Italy's pipeline network totaled 6,758 miles, an increase of over 1% compared with that of 1972. During 1973, more than 200 miles of pipeline was in various stages of construction.

Work was progressing satisfactorily on construction of a 240-mile pipeline through Austria by Trans-Austria Gasleiung (TAG). Completion of the project was scheduled for mid-1974. The pipeline will deliver 6 billion cubic meters of natural gas annually from Bratislava, Czechoslovakia, to Tarvisio where it enters the Italian distribution network. The natural gas, totaling 100 billion cubic meters, will come from the U.S.S.R. under a long-term contract negotiated in 1969. The connecting pipeline from the Tyumen gasfield in Siberia, was completed to Bratislava in 1972.

Work on the 506-mile pipeline from the Netherland's Groningen gasfield through West Germany and Switzerland, and joining Italy's gas distribution system near Milan, was near completion at yearend 1973. SNAM contracted to build the pipeline having a capacity to transmit 6 billion cubic meters of natural gas annually. At midyear, a total of about 390 miles of line pipe was layed. Construction of the pipeline crossing of the Alp Mountains was a major engineering undertaking. Several tunnels were excavated, the longest was the 19-mile-long Gries tunnel at an elevation of 7,840 feet. Tunneling was accomplished by special rotary drills utilizing 10-foot cutting heads. Aerial cableways and helicopters were employed to deliver supplies and employees to the worksite. In 1971, ENI contracted to purchase 6 billion cubic meters of natural gas annually for a period of 20 years from N.V. Nederlandse Aardolie Maatschappij, the Netherlands natural gas producer.

At yearend, ENI negotiated an agreement with Société Nationale pour la Recherche, la Production, le Transport, la Transformation, et la Commercialisation des Hydrocarbures (Sonatrach), an Algerian State Agency, to construct a 1,400-mile pipeline from the Hassi R'mel gasfield to Calabria and purchase nearly 12 billion cubic meters of natural gas annually for a period of 25 years. Sonatrach will be responsible for building the pipeline from the gasfield to Cape Bon, Tunisia. ENI was expected to spend $1.2 billion for construction of the 900-mile section of the pipeline from Tunisia across the Sicilian channel in the Mediterranean, and the Island of Sicily, and thence across the Strait of Messina to Calabria.

Refining.—The quantity of crude petroleum processed by the nation's refineries and petrochemical plants in 1973 was about 131.7 million tons, or 6% higher than in 1972. Petroleum refinery output is shown in table 8. Domestic markets consumed about 70% of the processed crude. Consumption of petroleum products increased 6% compared with 1972 figures. Fuel oil accounted for over 43% of total consumption, followed by gas oil 19%, gasoline 12%, and the remaining 26% was for miscellaneous products (table 8).

At yearend 1973, there were 36 refineries in operation with a total annual capacity of 200 million tons. Expansion projects underway and/or authorized were expected to increase capacity by more than 20 million tons by 1980. Italy ranked first among nations in the EC and third in the world in crude oil refining capacity.

British Petroleum Ltd. (BP) sold its refining, distribution, and marketing operations to a consortium of Italian corporations for $200 million. The major holdings disposed of included full and/or part ownership of the Porto Marghera and Volpiano refineries and 3,200 service stations. The 1973 throughput at the two refineries reportedly totaled 6.4 million tons; 3.9 million tons at the Porto Marghera and 2.5 million tons at the Volpiano.

ENI acquired three petroleum refineries having an estimated capacity of 10 million tons annually and 4,500 service stations from Shell Italiana S.p.A. The purchase price was reported at $200 million payable over a period of 4 years. With the acquisition of Shell's properties in Italy, ENI controls more than 20% of the nation's crude oil refinery capacity and about 30% of service station outlets. Shell Italiana's refineries located in La Spezia, Rho (Milano), and Toranto throughput was 3.0, 3.2, and 2.7 million tons, respectively.

Shell Oil Corp. agreed to supply 30 million tons of crude oil annually to ENI over a 5-year period starting in 1974. Industria

Table 8.—Petroleum refinery production

(Metric tons)

Year	Crude oil and residues processed	Main products obtained					
		Gasoline	Jet fuel	Kerosine	Gas oil	Fuel oil	Lubricating oil
1955	17,533,300	2,718,270	589,682	524,591	3,586,282	7,774,035	147,934
1956	19,286,300	3,098,225	569,781	565,301	3,944,376	8,508,101	167,547
1957	20,718,100	3,080,952	505,249	530,036	4,354,594	9,621,411	149,544
1958	24,105,808	3,453,000	716,218	477,572	4,670,163	11,899,545	154,057
1959	26,409,374	3,969,881	580,748	446,667	5,189,457	13,133,734	153,378
1960	30,866,574	5,026,855	529,283	531,191	5,944,253	15,346,428	165,792
1961	35,057,868	5,517,756	688,730	689,872	6,376,872	17,787,951	155,415
1962	41,825,062	6,582,370	649,924	722,495	7,607,587	21,609,423	172,567
1963	48,350,127	7,212,794	710,923	817,462	8,952,718	25,178,408	169,129
1964	57,851,398	8,511,734	794,441	828,723	10,334,375	30,587,238	259,170
1965	69,368,370	10,304,062	1,005,600	1,333,648	12,303,365	36,684,295	347,563
1966	80,615,660	12,213,671	1,435,311	1,490,478	14,248,262	42,298,809	442,627
1967	87,110,826	15,054,405	1,249,018	2,226,010	15,960,871	43,253,351	444,529
1968	94,892,875	17,872,617	1,704,304	2,559,159	17,657,424	45,086,791	495,499
1969	105,557,200	19,490,980	1,556,337	3,299,460	19,886,397	49,571,410	524,771
1970	117,235,907	21,440,553	1,486,326	4,348,155	23,015,860	54,203,860	534,571
1971	120,280,771	21,785,373	1,849,895	4,140,643	23,739,296	53,949,947	545,447
1972	124,359,764	22,709,148	2,072,148	4,141,447	25,189,539	55,401,000	497,190
1973	131,700,000	15,135,000	2,168,400	4,331,600	28,955,000	56,370,000	495,000

Source: Italian Central Institute of Statistics (ISTAT).

Italiana Petroli was designated as the new corporate name of the organization.

Exploration.—Offshore exploration permits issued at yearend 1973 covered an area of 5.9 million hectares, 7% more than at yearend 1972. The corresponding area for onshore exploration permits was down to 2.1 million hectares. Applications for mainland concessions were 200,041 hectares while those for offshore totaled 52,876 hectares (table 10). These data confirm a shift from offshore to onshore exploration where prospects for natural gas discoveries are believed to be good.

In 1967 ENI was assigned prospecting rights to all offshore concessions to a depth of 200 meters along the Continental Shelf. Technological advances in offshore exploration have made drilling at greater depth possible; hence the Government has introduced legislation in Parliament to revise the provision of the 1967 law that limits prospecting to a depth of 200 meters.

Licensing requirements for hydrocarbon exploration and production in Continental Shelf Areas of Italy and Malta are summarized in table 11.

Table 9.—Petroleum refineries and integrated chemical plants

(Thousand metric tons)

Refinery	Location	Throughput
Amoco	Cremona	3,468
ANIC	Sannazzaro (PV)	4,427
API	Falconara (Ancona)	3,072
Aquila	Trieste	2,038
BP	Volpiano (Turin)	2,504
Garrone	Genoa	7,281
Gaeta Industrie Petroli	Gaeta	2,847
Gulf	Bartonico (Milan)	2,833
Icip	Mantova	2,383
Ilsea	Valmadrera (Como)	326
Irom	Porto Marghera (Venice)	3,943
Lombarda Petroli	Villasanta (MI)	1,239
Mediterranea	Milazzo (Messina)	8,625
Mobil Oil	Napoli (Naples)	5,572
Raffineria di Roma	Pantano (Roma)	3,190
Rasion	Augusta (Siracusa)	8,702
Sanquirico	Genoa	789
Saras	Cagliari	14,469
Sardoil	Porto Torres (Cagliari)	3,947
Sarom	Ravenna	4,078
Sarpom	Trecate	8,469
Shell	La Spezia	2,967
Do	Rho (Milano)	3,152
Do	Toranto	2,691
S.P.I.	Arcola (La Spezia)	539
Stanic	Bari	2,813
Do	Livorno	4,055
Other refineries		2,085
Total refineries		112,504
Integrated chemical plants:		
Anic	Gela (Caltanissetta)	3,243
Montedison	Brindisi	1,163
Do	Priolo Melilli	12,480
Total plants		16,886
Unfinished		2,310
Grand total		131,700

Table 10.—Concessions and exploration permits for oil and natural gas

(Hectares)

Area	Year	
	1972	1973
Mainland:		
Exploration permits	2,785,423	2,095,155
Concessions	223,529	200,041
Total	3,008,952	2,295,196
Offshore:		
Exploration permits	5,548,535	5,912,207
Concessions	50,489	52,876
Total	5,599,024	5,965,083
Grand total	8,607,976	8,260,279

Source: Italian Ministry of Industry and Commerce.

Table 11.—Offshore hydrocarbon license requirements

Types of license	Duration	Relinquishments	Royalties
	ITALY		
Production	21 years	None	Gas, 5% for flow rates above 200 million cubic meters per year; oil, 8% for flow rates above 50,000 tons per year.
Prospecting:			
Nonexclusive	1 year; renewable for 1 year	None	None.
Exploration:			
Exclusive	6 years; twice renewable for two additional 3 year periods	25% of initial area at each renewal	None.
Exploitation:	30 years; renewable for 10 years	None	None.
	MALTA		
Exploration:			
Nonexclusive	3 years	None	None.
Production:			
Noncommercial	10 years	50% after 6 years	12.5% of posted price.
Production:			
Commercial discovery	30 years; renewable for 10 years	None	12.5% of posted price.

Source: Petroleum Times, Feb. 8, 1974.

The Mineral Industry of Japan

By K. P. Wang[1]

No sooner had Japan weathered the recession that ended early in 1972 after a second upward evaluation of the Japanese yen,[2] there occurred another setback in the economy as a result of the Mideast crisis and the ensuing petroleum shortage and price increases. Up until the fall of 1973, Japan's annual growth rate ranged mainly between 10% to 15%. The remaining part of the year was an economic emergency. Numerous industrial expansion plans were curtailed or delayed, and output from existing facilities was cut back in many cases. At yearend 1973, the general appraisal was that overall industrial production would be reduced drastically, at least during the early months of 1974. It was also felt that while foreign petroleum supply may return to near former levels, oil imports would no longer expand indefinitely and prices would settle down at much higher levels. Japan's future annual oil import costs probably will soon top $15 billion, as compared with less than $4 billion in 1972. All of Japan's industries, including mineral, metal, fuel, and chemical industries, will have to adjust to the new economic parameters and, therefore, new concepts of utilization and technology.

Japan's 1973 gross national product (GNP) was estimated at about Y115 trillion, as compared with Y91 trillion in 1972. At current yen prices, the growth rate of 26% was much higher than the 13% registered 1 year earlier and better than even the 1966–71 average level. However, inflation became rampant towards yearend. In terms of constant 1965 prices, the annual GNP increase in yen value was closer to 9% for 1972 and 11% for 1973. Since the Mideast crisis did not start until the last quarter of 1973, its influence on the Japanese economy did not show up in a pronounced manner for 1973 as a whole. On the other hand, it was evident that Japan's economic growth in the immediate future would be at low levels. There was a run on the yen at yearend, and Japan was hard put to maintain the exchange rate at Y300 to the $1.00. Meanwhile, the country's foreign exchange reserves were being reduced at an alarming rate.

Mineral production in 1973 was erratic, with performance varying within individual industries according to how directly the oil crisis influenced their operations near yearend. Generally, nonferrous metal industries were affected more than the steel and construction industries. Aluminum, zinc, and lead output hovered at just above the 1972 levels all year. Copper registered a significant increase until the very end of the year. Many new facilities placed in operation by the steel and cement industries during 1973 caused output to rise sharply in these sectors. Compared with the rapid and across-the-board growth in Japan's mineral and metal output between 1966 and 1971, and moderate gains in 1972, performance in 1973 varied from hardly any growth to remarkable increases of as much as one-fourth over the previous year. Economic indicators at yearend showed that sharp downturns may be expected for the first half of 1974, followed by a good general recovery in the second half.

Mineral processing in Japan, led by iron and steel manufacturing, nonferrous metal production, and fuel treatment, continued to gain ground on mining of raw material which it already outweighs by possibly 7

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[2] The exchange rate from January to October 1973 of Japan Yen (Y) was about Y265=US$1.00; whereas at yearend, it was closer to Y300=US$1.00.

to 1 in value. Although some important mineral discoveries have been made in Japan during recent years, dependence upon foreign raw materials has clearly increased. Using the index of 1970=100, the output trend for the major mineral-oriented sectors was as follows, in terms of value added:

Sector	Average 1971	Average 1972	September 1972	September 1973	December 1973
Mining	94.5	90.0	86.6	77.8	76.6
Iron and steel	96.8	104.7	106.0	131.8	132.9
Nonferrous metals	102.0	115.5	118.4	144.1	142.4
Ceramics	101.6	108.5	110.9	124.8	123.8
Chemicals	105.6	112.0	113.2	132.8	130.9
Petroleum-and coal products	109.6	114.6	108.9	141.2	134.3
Construction materials	100.9	119.5	125.3	131.5	133.5

In November, the Ministry of International Trade and Industry (MITI) was drafting legislation to establish an "overseas" public corporation for the purpose of stockpiling imported primary commodities and promoting investment in countries possessing resources needed in Japan. MITI also made a budget request of Y20.7 billion ($69 million when converted at Y300= US$1.00) for Japanese fiscal year (JFY) 1974.[3] Emphasis would be placed on helping small and medium firms. Commodities considered in the draft legislation includes logs and lumber, aluminum, copper, nickel, other nonferrous metals, uranium, soybeans, beef, wool, and cotton. Specific projects to be promoted included a copper mine in Peru, an aluminum plant in Indonesia, and uranium resources in Niger.

The long-standing program to encourage exploration abroad and stabilize mineral imports was being pushed until the oil crisis slowed down activities near yearend. MITI was authorized to loan Japanese nonferrous companies foreign currencies amounting to about one-third of exploration costs. MITI also established a fund to provide low-cost loans for uranium and oil exploration in foreign countries, stipulating that repayment is contingent upon successful discovery. Other government agencies like the Japan Export-Import Bank and the Overseas Economic Cooperation Fund continued to help finance many kinds of Japanese mineral projects. During recent years, Japan's activities in the mineral-related fields broadened to much beyond the acquisition of foreign crude raw materials. An increasing number of beneficiation, smelting, and refining plants were being built abroad by the Japanese to minimize pollution problems at home and assist foreign countries to industrialize. Again until the oil crisis struck, Japan was trying to make best use of its large foreign exchange holdings.

However, circumstances drastically changed at yearend 1973. Weakening of the yen and deterioration of Japan's balance-of-payments position temporarily stymied many mineral and industrial projects at home and abroad. Funds were cut, mineral contracts had to be renegotiated, shipping terms became radically different, and priorities had to be reexamined. With high fuel costs, Japan not only had to think in terms of making adjustments in technology and business, but also in terms of shipping distances and freight charges when considering the source of raw materials.

MITI underwent a basic reorganization soon after mid-year to "meet the demands of the 1970's." The Industrial Policy Bureau and the International Trade Policy Bureau were established to focus on policy considerations. The Industrial Location and Environment Protection Bureau was formed. Agencies related to surveillance of specific industries were regrouped. A totally new Resources and Energy Agency was established, along with the abolishment of the old Mineral, Oil and Coal Mining Bureau. Atomic energy still remained in the Science and Technology Agency, an arm of the Prime Minister's Office. The Agency of Industrial Science and Technology under MITI remained intact, along with its subdivisions including the Geological Survey of Japan and the Resources Research Institute. Thus, Japan was focusing on energy and resource problems before the Mideast crisis.

Japan's first-stage energy saving program went into effect November 16, 1973 and called for a 10% across-the-board cut in consumption of oil and electricity through the end of December, 1973. On an administrative guidance basis, this slash primarily applied to 12 major industries—steel, automobile, petrochemical, electric machinery, auto tire, synthetic fiber, aluminum refining, nonferrous metal refining, cement

[3] Japanese fiscal year (JFY) is from April of the year stated to March of the following year.

sheet glass, and paper and pulp. A pro-Arab policy was subsequently adopted, and Deputy Prime Minister Miki was dispatched to the Middle East on a special mission on December 10. The Petroleum Supply Adjustment Law and the National Livelihood Stabilization Law were promulgated on December 22.[4]

At yearend, MITI recommended that a technical program be instituted for the development of four new energy sources by the year 2000.[5] In solar energy, the goal is to develop high performance, large capacity generating systems. In geothermal energy, the approach would be to develop larger general systems, extra-deep geothermal heat, and volcanically powered generating systems. In synthetic natural gas (gasifying and liquefying coal), the objective would be to develop large gas plants, generating systems, and workable liquefying plants. The fourth area is hydrogen energy where the plan would be to investigate manufacturing methods and total systems for hydrogen economy.

PRODUCTION

Japan's mineral and metal production showed mostly uneven gains for 1973 as a whole, with steel and cement up sharply, copper and petroleum (refining) up significantly, aluminum up only moderately, and zinc and lead up slightly. Coal output declined more than 5 million tons. Although the oil crisis had a severe impact on all mineral industries, it failed to show up statistically in a striking manner until December for most items. Compared with November, copper, aluminum, and zinc were all down about 4%, and lead showed little change; generally, iron and steel production did not have time to drop yet, and in fact, most other products showed slight increases.

In 1973 Japan experienced another record year. The gain in steel output was 23%, with the absolute tonnage only 11% lower than that of the United States and 10% lower than that of the U.S.S.R. Cement production growth was somewhat lower than steel, with Japan catching up on its competitors. Copper increased more than 17%, aluminum 9%, and zinc 4%, with fertilizers somewhere in between.

Japan's world ranking in output of certain major mineral and metal products during 1973 was as follows: Pyrite and slab zinc, first; chemical fertilizers, second; cement, refined copper, steel, aluminum, and refined oil products, third; coke, fourth; and refined lead, fifth.

[4] Japan Petroleum Weekly (Tokyo). Japan Petroleum Consultants, Ltd. V. 9, No. 1, Jan. 7, 1974, pp. 1–4.

[5] American Metal Market (New York). Dec. 28, 1973, p. 6.

Table 1.—Japan: Production of mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity		1971	1972	1973 p
METALS				
Aluminum:				
Alumina, gross weight		1,603	1,644	1,987
Metal:				
Primary:				
Regular grades		887	1,009	1,097
High purity		6	6	6
Total		893	1,015	1,103
Secondary		349	412	536
Antimony:				
Mine output, metal content	tons	3	e 5	e 5
Oxide	do	2,449	3,639	4,492
Metal	do	4,789	3,206	2,783
Arsenic, white (equivalent of arsenic acid)	do	955	427	e 450
Bismuth	do	812	895	862
Cadmium	do	2,675	3,029	3,159
Chromium:				
Chromite, gross weight	do	31,642	24,819	23,174
Metal	do	2,082	2,320	2,001
Columbium and tantalum, tantalum metal	do	15	19	43

See footnotes at end of table.

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

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS—Continued			
Copper:			
Mine output, metal content	121	112	91
Metal:			
Blister	r 661	778	1,001
Refined:			
Primary	610	810	951
Secondary	103		
Germanium:			
Oxide ---tons	16	12	15
Metal ---do	19	22	28
Gold:			
Mine output, metal content ---thousand troy ounces	255	243	188
Metal ---do	r 773	846	1,053
Indium metal ---do	529	498	e 550
Iron and steel:			
Iron ore and ore sand concentrate	r 1,420	1,347	1,007
Roasted pyrite concentrate (50% or more Fe)	1,510	1,075	891
Pig iron and blast furnace ferroalloys	72,745	74,055	90,007
Electric furnace ferroalloys:			
Ferrochrome	403	303	443
Ferromanganese	534	553	617
Ferronickel	286	189	200
Ferrosilicon	322	309	354
Silicomanganese	325	343	376
Other [1]	95	33	25
Steel:			
Crude	88,557	96,900	119,327
Semimanufactures, hot rolled:			
Ordinary steel	65,171	74,924	92,583
Special steels	6,906	7,175	9,142
Lead:			
Mine output, metal content	r 71	63	53
Metal, refined:			
Primary	215	223	228
Secondary	43	31	36
Magnesium metal:			
Primary ---tons	9,693	10,890	11,203
Secondary ---do	r 7,075	4,844	NA
Manganese:			
Ore and concentrate, gross weight	285	261	189
Oxide	42	39	38
Metal ---tons	r 9,865	7,671	10,080
Mercury:			
Mine output, metal content ---76-pound flasks	5,564	5,018	3,742
Metal ---do	6,620	5,163	3,742
Molybdenum:			
Concentrate output, metal content ---tons	278	224	157
Metal ---do	188	272	458
Nickel metal, primary ---do	15,492	16,501	21,726
Platinum-group metals:			
Palladium metal ---troy ounces	5,375	5,659	10,014
Platinum metal ---do	3,451	4,240	6,827
Rare-earth metals:			
Lanthanum oxide ---tons	95	107	161
Cerium metal ---do	114	166	NA
Selenium, elemental ---do	238	335	358
Silicon metal ---do	r 160	190	247
Silver:			
Mine output, metal content ---thousand troy ounces	11,293	10,021	8,552
Metal, primary ---do	31,056	30,841	31,612
Tellurium, elemental ---tons	36	35	e 43
Tin:			
Mine output, metal content ---long tons	777	859	796
Metal:			
Primary ---do	r 1,263	1,329	1,329
Secondary ---do	163	164	120
Titanium:			
Concentrate, gross weight ---tons	2,376	2,115	e 2,200
Slag ---do	5,531	3,328	4,255
Metal ---do	6,777	4,658	6,507
Tungsten:			
Mine output, metal content ---do	r 730	897	940
Metal ---do	1,176	1,411	2,018
Uranium metal ---kilograms	86	NA	NA

See footnotes at end of table.

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

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS—Continued			
Zinc:			
Mine output, metal content	r 294	281	264
Oxide	r 60	62	64
Metal:			
Primary	716	805	843
Secondary	r 22	23	e 23
Zirconium metal ---kilograms---	24,378	65,296	149,154
NONMETALS			
Asbestos	18	14	e 15
Barite	57	60	63
Bromine, elemental	9	11	11
Cement, hydraulic	r 59,434	66,333	78,024
Clays:			
Fire clay	2,136	2,023	1,353
Kaolin	381	323	390
Feldspar [2]	501	514	548
Fertilizer materials:			
Crude potassic (potassium carbonate), gross weight	19	23	29
Manufactured:			
Nitrogenous [3]	2,105	2,121	NA
Superphosphates	712	716	700
Fluorspar, all grades	r 13	8	e 8
Graphite (crystalline) ---tons---	1,054	853	e 850
Gypsum	529	465	378
Iodine, elemental ---tons---	6,748	7,493	7,292
Lime (quicklime)	9,919	10,130	11,815
Pyrite and pyrrhotite (including cupreous):			
Gross weight	2,343	1,579	1,275
Sulfur content	1,109	767	569
Salt, all types	946	687	1,015
Stone, sand and gravel, n.e.s.:			
Crushed and broken stone:			
Dolomite	2,706	2,722	2,850
Limestone	124,701	134,258	163,213
Sulfur, elemental:			
Native, other than Frasch [4]	65	17	NA
Byproduct (recovered from petroleum refinery)	344	482	NA
Total	409	499	681
Sulfuric acid	6,659	6,692	7,116
Talc and related materials:			
Pyrophyllite	1,434	1,377	1,418
Talc	137	130	146
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	308	341	404
Coal:			
Anthracite	r 498	457	217
Bituminous [5]	r 32,935	27,641	22,197
Lignite	r 134	102	86
Total	r 33,567	28,200	22,500
Coke, including breeze:			
Metallurgical coke	36,881	36,146	44,316
Metallurgical coke breeze	1,834	1,863	1,826
Gashouse coke, including breeze	4,793	4,421	4,715
Fuel briquets, all grades	1,423	920	946
Gas, natural:			
Gross production ---million cubic feet---	r 85,936	87,405	91,642
Marketed ---do---	r 85,156	86,319	85,108
Natural gas liquids:			
Natural gasoline ---thousand 42-gallon barrels---	27	31	44
Liquefied petroleum gas from natural gas (from field plants only) ---do---	123	137	151
Peat e	70	70	70
Petroleum:			
Crude oil ---thousand 42-gallon barrels---	r 5,529	5,241	5,141
Refinery products:			
Gasoline:			
Aviation ---do---	442	401	342
Other ---do---	r 142,185	152,359	169,154
Jet fuel ---do---	16,907	21,328	26,048
Kerosine ---do---	r 156,911	106,792	144,570
Distillate fuel oil ---do---	r 158,701	180,184	226,234
Residual fuel oil ---do---	r 645,688	657,568	764,062
Lubricants ---do---	15,651	15,817	17,762

See footnotes at end of table.

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

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Other:			
Asphalt and bitumen _____thousand 42-gallon barrels__	25,302	27,744	31,661
Liquefied petroleum gas _____do____	43,012	45,581	51,607
Naphtha _____do____	r 110,491	169,315	196,586
Paraffin _____do____	1,148	1,195	1,322
Petroleum coke _____do____	1,191	1,100	1,185
Unfinished oils _____do____	42,870	52,124	38,361
Refinery fuel and losses _____do____	r 52,646	66,178	73,039
Total _____do____	r 1,413,145	1,497,686	1,741,933

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

[1] Includes (but is not limited to) ferromolybdenum, ferrotungsten, ferrovanadium, and silicochromium.

[2] Includes aplite as follows in thousand tons: 1971—443; 1972—455; 1973—497; and saba as follows, in thousand tons: 1971—5; 1972—1; 1973—NA.

[3] Year ended June 30 of that stated.

[4] Includes a small quantity of byproduct sulfur recovered from sulfide ores as well as sulfur content of sulfur ores.

[5] Includes a small amount of natural coke.

TRADE

Japan's overall trade in 1973 totaled about Y20,364.5 billion (rough conversion may be Y285=US$1.00); exports totaled Y10,026.5 billion and imports, Y10,338.0 billion. Mineral and related products were an important part of the total. Mineral exports during the year comprised about 18% of all exports, and mineral imports about 40% of all imports. The leading mineral export was iron and steel, accounting for nearly 80% of the value of all mineral exports and 14% of total commodity exports. Iron and steel exports in 1973 approximated Y1,441.5 billion, about $5 billion.

The most important minerals imported in 1973 were as follows, with rounded value in billions of yen: crude oil, 1,633; iron ore, 450; coal, 369; nonferrous metal ores, 511 (320 for copper); nonferrous metals, 453 (185 for copper); refined petroleum, 198; natural gas, 67; and nonmetallics, 306.

Details on mineral exports and imports are given in the following tabulations in billion yen:

Exports [1]	1972 r	1973
METALS		
Iron and steel	1,111.9	1,441.5
Iron and steel scrap	3.7	5.5
Nonferrous metals:		
Copper	37.3	41.2
Aluminum	12.3	11.8
Zinc	13.2	10.3
Other	12.0	20.6
NONMETALS		
Inorganic chemicals	55.4	33.9
Cement	7.1	4.8
Chemical fertilizers	61.9	65.5
Nonmetallic manufactures	141.0	150.0
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products	15.4	19.0
Other	3.3	6.1
Total:		
Mineral commodities	1,474.5	1,810.2
All commodities	7,423.0	10,026.5

r Revised.

[1] The value of the yen was Y308=US$1.00 for 1972. This rate held for the beginning of 1973, then changed to about Y265=US$1.00 for most of 1973; at yearend, it was about Y300=US$1.00. To convert 1973 yen to dollars, a general exchange figure of about Y285=US$1.00 might be used.

Imports [1]	1972 [r]	1973
METALS		
Iron and steel:		
Iron ore	392.7	450.3
Scrap	33.6	104.7
Metal	32.0	65.1
Nonferrous metals:		
Ores and concentrates:		
Copper	159.9	320.3
Lead	10.8	15.0
Zinc	36.3	47.5
Nickel	38.5	46.1
Bauxite	16.0	17.1
Manganese	20.6	25.3
Other	29.3	40.0
Scrap	26.8	29.9
Metal:		
Copper	104.7	184.9
Silver and platinum group	67.5	98.8
Aluminum	51.4	75.6
Tin	36.5	45.2
Nickel	13.6	17.0
Other	10.2	31.1
NONMETALS		
Inorganic chemicals	30.5	31.4
Salt	18.2	17.7
Phosphate rock	17.9	20.0
Manufactured fertilizers (mainly potassic)	18.2	21.5
Other crude fertilizers and minerals	15.8	54.9
Nonmetallic manufactures	104.7	160.2
MINERAL FUELS AND RELATED MATERIALS		
Coal and coke	332.6	368.6
Petroleum:		
Crude	1,209.8	1,633.0
Refinery products	166.0	197.6
Natural gas	52.1	66.6
Total:		
Mineral commodities	[r] 3,046.2	4,185.4
All commodities	7,228.8	10,338.0

[r] Revised.
[1] The value of the yen was Y308=US$1.00 for 1972. This rate held for the beginning of 1973, then changed to about Y265=US$1.00 for most of 1973; at yearend, it was about Y300=US$1.00. To convert 1973 yen to dollars, a general exchange figure of about Y285=US$1.00 might be used.

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

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973	Principal destinations, 1972
METALS				
Aluminum:				
Bauxite and concentrate ____tons__	319	7,905	316	Australia 6,700; Thailand 1,050.
Oxide (alumina) and hydroxide __	250	220	183	United States 141; Republic of Korea 23; Taiwan 16.
Fused alumina _____tons__	3,695	5,223	6,431	Taiwan 2,500; Republic of Korea 1,676; Australia 312.
Metal, including alloys, all forms _	107	45	34	United States 8; People's Republic of China 6; Indonesia 6.
Arsenic trioxide, pentoxide, and acids tons__	210	[r] 128	47	Republic of Korea 110; India 10.
Beryllium metal, including alloys, all forms _____kilograms__	51	228	28	Italy 196; Singapore 30.
Bismuth metal, including alloys, all forms _____tons__	460	613	531	Netherlands 475; United States 71; United Kingdom 44.

See footnotes at end of table.

Table 2.—Japan: Exports of mineral commodities[1]—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973	Principal destinations, 1972
METALS—Continued				
Cadmium metal, including alloys, all forms ---------- tons	1,190	1,018	1,513	Netherlands 737; Belgium 121; United Kingdom 52.
Chromium:				
Chromite ---------- do	30	--	71	
Oxide and hydroxide ---------- do	4,693	2,405	1,661	United States 1,423; Republic of Korea 421; Taiwan 371.
Cobalt oxide and hydroxide ---- do	6	5	16	Republic of Korea 3; Thailand 1.
Columbium and tantalum: Tantalum metal, including alloys, all forms kilograms	r 896	r 2,321	545	People's Republic of China 1,303; West Germany 761.
Copper:				
Ore and concentrate ---------- tons	--	4,550	--	North Korea 3,050; Republic of Korea 1,500.
Copper sulfate ---------- do	1,045	1,754	268	People's Republic of China 1,500.
Metal, including alloys, all forms	67	r 86	80	United States 24; Taiwan 18; India 10.
Iron and steel:				
Ore and concentrate ---------- tons	3	210	2	Portugal 100; Australia 75.
Metal:				
Scrap ---------- do	373,133	221,588	208,381	Republic of Korea 84,530; Taiwan 50,451; People's Republic of China 40,501.
Pig iron, including cast iron do	432,747	381,744	108,183	People's Republic of China 272,403; Philippines 26,743; Italy 20,532.
Sponge iron, powder, and shot do	6,501	8,038	7,009	United States 2,044; Australia 1,442; Taiwan 854.
Ferroalloys:				
Ferromanganese ----------	19	50	26	United States 39; People's Republic of China 3; Australia 2.
Other ----------	49	56	24	United States 24; Netherlands 19; Singapore 4.
Steel, primary forms ----------	3,053	1,789	5,233	Republic of Korea 649; Argentina 356; United States 261.
Semimanufactures:				
Bars, rods, angles, shapes, sections ----------	3,448	3,132	3,636	United States 1,127; People's Republic of China 272; Canada 156.
Universals, plates, sheets: Plates and sheets, uncoated ----------	10,055	9,665	9,274	United States 2,106; People's Republic of China 741; Taiwan 575.
Tinned plates and sheets ----------	786	832	888	United States 244; U.S.S.R. 84; Taiwan 84.
Other coated plates and sheets ----------	1,375	1,476	1,548	United States 659; Venezuela 46; Iran 46; West Germany 45.
Hoop and strip ----------	518	557	670	United States 85; Thailand 39; Malaysia 35; Canada 34.
Rails and accessories ----	98	37	73	Australia 8; Indonesia 7; Turkey 6.
Wire ----------	550	463	419	United States 254; Indonesia 31; People's Republic of China 20.
Tubes, pipes, fittings ----	3,211	2,911	2980	United States 914; People's Republic of China 289; Saudi Arabia 210.
Castings and forgings, rough ----------	15	16	12	United States 13; People's Republic of China 1.
Lead:				
Ore and concentrate ---------- tons	1,053	1,466	--	All from North Korea.
Oxides ---------- do	84	65	195	Taiwan 48; Thailand 9.
Metal, including alloys, all forms	6	6	5	Republic of Korea 3; Taiwan 2.

See footnotes at end of table.

Table 2.—Japan: Exports of mineral commodities[1]—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973	Principal destinations, 1972
METALS—Continued				
Magnesium metal, including alloys, all forms ---tons--	49	89	117	Indonesia 52; Taiwan 15; Republic of Korea 19.
Manganese:				
Ore and concentrate ---do---	3,142	3,350	1,812	Taiwan 830; Arab Republic of Egypt 830; Thailand 470.
Oxides ---do---	34	41	39	United Kingdom 4; United States 4; Taiwan 3.
Mercury ---76-pound flasks--	968	370	1,955	Republic of Korea 264; Thailand 60; Philippines 12.
Molybdenum metal, including alloys, all forms ---tons--	23	22	35	People's Republic of China 4; Taiwan 4; Republic of Korea 3; West Germany 3.
Nickel metal, including alloys, all forms ---do---	843	744	934	India 131; Thailand 123; Republic of South Africa 103.
Phosphorus, elemental (red) ---do---	616	314	47	India 220; Thailand 35; United States 23.
Platinum-group metals and silver:				
Ore and concentrate ---do---	--	--	25	
Waste and sweepings ---do---	2	--	5	
Metals, including alloys:				
Platinum-group thousand troy ounces--	19	175	214	United States 122; People's Republic of China 16; West Germany 12.
Silver ---do---	685	522	645	Taiwan 372; Republic of Korea 44; Singapore 31.
Selenium, elemental ---tons--	65	213	168	Netherlands 99; United Kingdom 24; Poland 17.
Tin:				
Ore and concentrate --long tons--	--	16	--	All to Hong Kong.
Oxides ---do---	6	r 38	188	Netherlands 23; North Korea 7; Republic of Korea 2.
Metal, including alloys, all forms do---	955	581	1,570	Taiwan 181; Republic of Korea 128; Philippines 98.
Titanium:				
Oxide	14	15	29	United States 9; Taiwan 2; West Germany 1.
Metal, including alloys, all forms tons--	3,191	3,600	2,771	United States 2,990; Italy 155; Netherlands 133.
Tungsten:				
Ore and concentrate ---do---	--	--	31	
Metal, including alloys, all forms do---	92	81	64	U.S.S.R. 31; People's Republic of China 14; United States 10.
Uranium and thorium:				
Oxides, including rare-earth oxides ---do---	116	65	86	United Kingdom 33; Taiwan 19; West Germany 6.
Metal, including alloys, all forms kilograms--	--	160	--	All to Taiwan.
Zinc:				
Ore and concentrate ---tons--	--	880	24,550	All to Republic of Korea.
Oxide ---do---	1,384	r 1,605	889	United States 500; Taiwan 318; Thailand 268.
Metal, including alloys, all forms	70	r 111	69	United States 41; India 16; Taiwan 14.
Other:				
Ore and concentrate:				
Of titanium, molybdenum, tantalum, vanadium, zirconium ---tons--	709	295	321	Taiwan 190; Republic of Korea 100.
Of base metals, n.e.s ---do---	--	46	10	Taiwan 36.
Ash and residues, containing nonferrous metals ---do---	4,318	1,092	9,872	Republic of Korea 544; Taiwan 361; United Kingdom 127.
Oxides, hydroxides and peroxides of metals, n.e.s ---do---	3,155	3,974	3,461	United States 1,353; Taiwan 302; Canada 293.

See footnotes at end of table.

Table 2.—Japan: Exports of mineral commodities[1]—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973	Principal destinations, 1972
METALS—Continued				
Other—Continued				
Metals, including alloys, all forms:				
Phosphorus and other metalloids ----------tons--	50	113	368	Taiwan 51; United States 16; Republic of Korea 15.
Alkali, alkaline-earth and rare-earth metals ----do----	130	47	120	Taiwan 32; United Kingdom 4; Australia 3.
Pyrophoric alloys ------do----	137	106	110	Singapore 26; Hong Kong 19; United States 17.
Base metals, including alloys, all forms, n.e.s ------do----	8,202	8,800	8,000	United States 2,908; West Germany 1,750; United Kingdom 1,041.
NONMETALS				
Abrasives, natural, n.e.s.:				
Emery ----------do----	924	1,180	1,491	Taiwan 749; Hong Kong 182; Republic of Korea 171.
Natural abrasives, n.e.s ----do----	279	366	703	Taiwan 99; Ryukyu Islands 80; U.S.S.R. 75.
Dust and powder of precious and semiprecious stones thousand carats--	6,922	8,871	1,112	Republic of Korea 7,524; United States 1,227.
Grinding and polishing wheels and stones ----------tons--	2,999	2,962	3,554	United States 448; Thailand 319; Singapore 290.
Asbestos ----------do----	493	758	257	Republic of Korea 468; Malaysia 185.
Barite and witherite ----------do----	210	390	100	Philippines 350; Indonesia 40.
Boron materials:				
Crude natural borates ------do----	--	--	150	
Oxide and acid ----------do----	85	107	121	Taiwan 70; Republic of Korea 20; India 13.
Cement ----------	2,322	1,544	857	Singapore 381; Indonesia 333; Kuwait 152.
Chalk ----------tons--	2,621	3,675	949	Hong Kong 2,030; Indonesia 600.
Clays and clay products (including all refractory brick):				
Crude clays, n.e.s ---------do----	44,376	54,027	62,451	Philippines 17,339; Taiwan 12,835; Belgium 2,882.
Products:				
Refractory (including nonclay brick) ----------do----	77,361	113,818	92,244	Republic of Korea 39,926; Brazil 9,732; Republic of South Africa 7,363.
Nonrefractory[2] -------do----	85,122	71,976	54,592	United States 32,098; Australia 7,160; Hong Kong 6,955.
Cryolite and chiolite ----------do----	341	2	18	All to Republic of Korea.
Diamond:				
Gem, not set or strung ---carats--	4,415	5,590	8,785	Hong Kong 4,525; United Kingdom 565.
Industrial -------thousand carats--	148	103	93	United States 51; Taiwan 24; United Kingdom 23.
Diatomite and other infusorial earth tons--	1,414	1,414	1,294	Australia 310; Taiwan 284; Republic of South Africa 270.
Feldspar and fluorspar:				
Feldspar ----------do----	3,701	3,191	5,438	Taiwan 1,454; Thailand 883; Malaysia 320.
Fluorspar, leucite, nepheline, nepheline syenite -------do----	6,384	19	18,043	All to Ryukyu Islands.
Fertilizer materials:				
Crude ----------do----	9	36	2,930	Ryukyu Islands 33; Iraq 3.
Manufactured:				
Nitrogenous[3] ----------	r 3,136	r 4,048	3,454	People's Republic of China 2,406; Indonesia 378; India 328.
Phosphatic ----------	32	87	37	People's Republic of China 33; Indonesia 10; U.S.S.R. 9.
Potassic ----------	9	6	2	Ryukyu Islands 4; Thailand 1.
Other and mixed ----------	171	228	166	Thailand 144; Sri Lanka 26; Indonesia 19.
Ammonia ----------tons--	104,486	99,438	119,919	Philippines 81,988; Republic of Korea 10,040; Malaysia 8,513.

See footnotes at end of table.

Table 2.—Japan: Exports of mineral commodities[1]—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973	Principal destinations, 1972
NONMETALS—Continued				
Graphite, natural ——tons	801	420	440	Indonesia 133; Taiwan 70; Pakistan 66.
Gypsum and plasters ——do	6,501	2,537	2,546	Taiwan 859; Thailand 488; Republic of Korea 481.
Iodine ——do	5,637	6,551	6,265	United States 2,936; West Germany 954; France 698.
Kyanite and related materials ——do	3,995	5,204	10,676	Taiwan 4,216; Republic of Korea 586; Malaysia 201.
Lime ——do	8,780	7,164	23,317	Papua New Guinea 4,949; Indonesia 1,407; Hong Kong 500.
Magnesite ——do	408	68	100	Ryukyu Islands 33; Taiwan 20.
Mica ——do	199	390	171	Taiwan 248; Republic of Korea 47.
Pigments, mineral, iron oxides, processed ——do	1,165	2,088	5,248	Taiwan 1,048; Bulgaria 319; Republic of Korea 220.
Precious and semiprecious stones, except diamond:				
Natural ——thousand carats	202,138	230,511	222,873	Republic of Korea 177,258; United States 15,439; Hong Kong 11,569.
Manufactured ——do	22,993	44,550	72,742	United States 15,708; West Germany 14,216; Netherlands 8,000.
Pyrite (gross weight) ——tons	--	--	3,209	
Salt and brine ——do	1,018	311	533	Republic of Korea 82; Mariana, Marshall, and Caroline Islands 74; Indonesia 52.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	289	186	185	Australia 149; Indonesia 12; Republic of Korea 6.
Caustic potash, sodic, potassic peroxides	4	5	3	People's Republic of China 3; United States 1.
Stone, sand and gravel:				
Dimension stone ——tons	1,715	826	1,714	Australia 197; Ryukyu Islands 170; United States 139.
Dolomite, chiefly refractory grade ——do	3,286	3,772	3,193	Philippines 3,285; Ryukyu Islands 245.
Gravel and crushed rock ——do	3,990	r 4,357	1,922	Ryukyu Islands 2,409; Hong Kong 781; Puerto Rico 318.
Limestone (except dimension)	674	881	1,442	Australia 847; Indonesia 29; Hong Kong 2.
Quartz and quartzite ——tons	370	160	256	Thailand 91; Taiwan 56; Republic of Korea 10.
Sand, excluding metal bearing ——do	13,790	3,499	3,452	Philippines 1,410; Taiwan 723; Hong Kong 645.
Sulfur:				
Elemental:				
Other than colloidal ——do	12,589	47,318	45,051	Republic of Korea 35,820; Taiwan 10,070.
Colloidal ——do	590	571	2,421	Republic of Korea 301; South Vietnam 103; Indonesia 44.
Sulfur dioxide ——do	219	387	180	Philippines 235; Australia 141.
Sulfuric acid ——do	886	462	176	Republic of Korea 222; Hong Kong 47; Indonesia 43.
Talc and steatite ——do	1,854	765	829	Singapore 365; Malaysia 136; Thailand 101.
Other nonmetals, n.e.s.:				
Crude	8	5	5	Taiwan 1; Thailand 1; Republic of Korea 1.
Slag, dross and similar waste, not metal bearing	32	20	25	Republic of Korea 19.
Oxides, hydroxides and peroxides of magnesium, strontium, and barium (including magnesia clinker)	84	87	94	Netherlands 15; United States 14; Republic of South Africa 9.

See footnotes at end of table.

Table 2.—Japan: Exports of mineral commodities[1]—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973	Principal destinations, 1972
NONMETALS—Continued				
Other nonmetals, n.e.s.—Continued				
Fluorine and bromine _kilograms__	1,350	2,500	1,175	Taiwan 1,300; Republic of Korea 1,100; Republic of South Africa 100.
Building materials of asphalt, asbestos, fiber cement, and unfired nonmetals, n.e.s	27	19	5	United States 6; Canada 3; Indonesia 3.
Asphalt and bitumtn, natural __tons__	3	6	--	All to Indonesia.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black and gas carbon:				
Carbon black	26	28	16	Taiwan 8; Thailand 5; India 3.
Gas carbon _____kilograms__	--	3	--	All to North Korea.
Coal, all grades, including briquets	18	9	24	Mainly to Republic of Korea.
Coke and semicoke	259	394	564	Venezuela 164; Peru 118; Chile 41.
Gas, manufactured only _____tons__	3	301	1	Indonesia 297.
Hydrogen and rare gases (helium, neon, argon, krypton, xenon) _do____	275	278	563	Singapore 79; Republic of Korea 48; Philippines 23.
Peat, including peat briquets and litter _____do____	90	20	--	All to Taiwan.
Petroleum:				
Crude and partly refined thousand 42-gallon barrels__	684	7,610	258	Republic of Korea 4,647; Philippines 2,907; United States 56.
Refinery products:				
Nonbunker:				
Gasoline _____do____	483	349	576	Australia 137; Guam 82; Ryukyu Islands 62.
Naphtha _____do____	31	479	647	United States 458; Ryukyu Islands 18.
Kerosine and jet fuel oil do____	3,016	3,107	2,398	United States 2,163; Indonesia 544; Hong Kong 313.
Distillate fuel oil __do____	884	519	945	Hong Kong 262; United States 153; Mexico 77.
Residual fuel oil __do____	531	189	1,496	Taiwan 184.
Lubricants _____do____	2,472	3,188	2,229	Malaysia 652; Republic of Korea 638; Taiwan 513.
Mineral jelly and wax do____	301	329	410	United States 51; Republic of South Africa 46; Republic of Korea 37.
Bitumen _____do____	482	211	128	Burma 52; Indonesia 31; Ryukyu Islands 29.
Liquefied petroleum gas do____	696	527	336	Taiwan 272; Ryukyu Islands 134; Hong Kong 104.
Other _____do____	136	129	229	Taiwan 35; Republic of Korea 34; Ryukyu Islands 25.
Bunker:[4]				
Kerosine and jet fuel do____	9,813	10,217	NA	NA.
Distillate fuel oil __do____	8,639	9,525	NA	NA.
Residual fuel oil ___do____	98,966	94,458	NA	NA.
Other _____do____	255	314	NA	NA.

r Revised. NA Not available.

[1] Excludes exports under Japanese–United States Mutual Defense Agreement or for account of U.S. military forces.

[2] Excludes mosaic tile valued at (thousand yen): 1971, 15,119,569; 1972, 20,666,571; 1973, 26,471,496.

[3] Includes exports of following amounts of urea containing more than 45% nitrogen: 1971, 1,797,950 tons; 1972, 2,511,128 tons; and 1973, 2,454,739 tons.

Source: Ministry of International Trade and Industry. Yearbook of Petroleum Statistics for 1971 and 1972.

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

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973	Principal sources, 1972
METALS				
Aluminum:				
Bauxite and concentrate	4,669	4,997	5,615	Australia 3,009; Indonesia 1,074; Malaysia 822.
Oxide and hydroxide	506	548	452	Australia 542; Netherlands 5.
Fused alumina (artificial corundum)—tons	2,213	201	565	United States 117; West Germany 64.
Metal, including alloys:				
Scrap	12	37	48	United States 24; Canada 3; Hong Kong 2.
Unwrought	226	325	476	Canada 78; U.S.S.R. 60; New Zealand 52.
Semimanufactures	4	8	28	United States 5; New Zealand 1.
Antimony:				
Ore and concentrate—tons	10,197	13,312	13,959	Bolivia 6,504; People's Republic of China 2,182; Republic of South Africa 1,485.
Metal, including alloys, all forms—do	(2)	262	1,248	People's Republic of China 100; Thailand 95; Netherlands 45.
Arsenic:				
Natural sulfides—do	10	2	5	All from People's Republic of China.
Trioxide, pentoxide, acids—do	605	1,442	1,971	People's Republic of China 901; France 540.
Beryllium metal, including alloys, all forms—kilograms	3,276	9,084	8,696	All from United States.
Bismuth metal, including alloys, all forms—tons	1	1	2	Mainly from United Kingdom.
Cadmium metal, including alloys, all forms—kilograms	52	4	3,984	All from Canada.
Chromium:				
Ore and concentrate	1,162	875	1,164	Republic of South Africa 445; India 154; U.S.S.R. 104.
Oxide and hydroxide—tons	739	r 955	2,016	West Germany 737; United States 217.
Cobalt:				
Oxide and hydroxides—do	580	684	944	Belgium 668; Canada 12.
Metal, including alloys, all forms—do	1,470	2,952	4,657	Zaire 1,847; Belgium 366; United States 299.
Columbium and tantalum:				
Columbium (niobium) ore and concentrate—do	1,230	1,479	2,207	Brazil 660; Nigeria 650.
Tantalum:				
Ore and concentrate—do	105	59	84	Thailand 28; Australia 13.
Metal, including alloys, all forms—do	23	23	49	United States 22.
Copper:				
Ore and concentrate	1,926	2,170	2,973	Canada 813; Philippines 715; Australia 164.
Matte, cement copper, native copper	9	8	17	Taiwan 7.
Copper sulfate—tons	1	101	152	France 99; United States 2.
Metal, including alloys:				
Scrap	54	70	68	United States 43; Hong Kong 7; Singapore 5.
Unwrought	282	303	410	Zambia 151; Chile 44; United States 29.
Semimanufactures—tons	1,547	1,864	12,355	United States 884; West Germany 534.
Germanium:				
Dioxide—do	15	20	15	Belgium 11; West Germany 6.
Metal, including alloys, all forms—kilograms	1,301	269	918	Czechoslovakia 254; U.S.S.R. 9; Belgium 6.
Indium metal, including alloys, all forms—do	--	50	1,424	United States 45; West Germany 5.
Iron and steel:				
Ore and concentrate	114,914	111,501	134,724	Australia 48,295; India 17,901; Brazil 9,335.
Roasted pyrite—tons	37,243	18,120	--	Philippines 18,020.

See footnotes at end of table.

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

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973	Principal sources, 1972
METALS—Continued				
Iron and steel—Continued				
Metal:				
Scrap	2,552	2,499	5,409	United States 1,868; U.S.S.R. 287; Australia 242.
Pig iron, including cast iron	1,183	1,004	1,547	Republic of South Africa 448; Australia 227; India 128.
Sponge iron, powder, shot	15	13	15	Sweden 11; United States 1.
Ferroalloys	48	60	143	Republic of South Africa 34; Taiwan 5; Republic of Korea 4.
Steel, primary forms	29	64	142	Australia 29; Argentina 19; Taiwan 8.
Semimanufactures	23	39	85	United States 16; Republic of Korea 10; Taiwan 6.
Lead:				
Ore and concentrate	225	199	243	Canada 142; Peru 26; Republic of Korea 17.
Oxides ——tons	176	350	1,241	United States 165; People's Republic of China 105; Mexico 50.
Metal, including alloys:				
Scrap ——do	1,759	4,133	7,928	South Vietnam 2,219; United States 988; Hong Kong 746.
Unwrought ——do	3,638	5,241	64,483	Peru 1,487; South-West Africa 891; Mexico 617.
Semimanufactures ——do	42	8	12	United States 5; West Germany 2.
Magnesium metal, including alloys, all forms ——do	1,005	3,221	6,593	U.S.S.R. 1,369; United States 1,117; Norway 598.
Manganese:				
Ore and concentrate[3]	3,243	2,921	3,364	Republic of South Africa 1,076; India 724; Australia 506.
Oxides ——kilograms	316	235	119	United States 226; West Germany 9.
Mercury ——76-pound flasks	15,045	13,005	15,794	Spain 3,990; Mexico 3,156; Philippines 3,000.
Molybdenum:				
Ore and concentrate ——tons	12,814	10,235	16,613	United States 5,691; Canada 2,868; Chile 1,468.
Trioxide ——do	20	123	447	United States 100; Republic of Korea 22.
Metal, including alloys, all forms ——do	44	143	289	West Germany 60; U.S.S.R. 30; United States 29.
Nickel:				
Ore and concentrate	4,903	3,152	3,539	New Caledonia 2,246; Indonesia 784; Australia 81.
Matte, speiss, and similar materials	16	13	30	Canada 10; New Caledonia 3.
Metal, including alloys:				
Scrap ——tons	912	1,828	1,225	Taiwan 646; United States 351; United Kingdom 279.
Unwrought ——do	9,356	12,310	15,238	U.S.S.R. 4,423; Canada 3,381; Norway 2,536.
Semimanufactures ——do	1,337	1,629	2,369	United Kingdom 932; United States 241; Taiwan 147.
Platinum-group metals, including alloys, all forms:				
Platinum ——thousand troy ounces	646	1,121	1,337	U.S.S.R. 371; United Kingdom 297; Republic of South Africa 275.
Palladium ——troy ounces	699,000	929,153	869,846	U.S.S.R. 840,063; Republic of South Africa 39,193; United States 23,483.
Rhodium ——do	8,765	10,070	17,619	U.S.S.R. 7,308; United Kingdom 1,803; United States 843.
Iridium, osmium, ruthenium ——do	7,804	4,221	21,516	United States 2,135; United Kingdom 1,571.
Alloys ——do	11,059	12,465	30,447	West Germany 5,119; United States 4,099; United Kingdom 2,964.

See footnotes at end of table.

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

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973	Principal sources, 1972
METALS—Continued				
Rare-earth metals:				
Oxides and crude chlorides --tons--	2,471	2,235	2,375	India 1,536; United States 104; France 57.
Metals (yttrium, scandium, intermixtures) ------kilograms--	148	204	10,190	United States 134; France 50; West Germany 20.
Selenium, elemental ----------do----	1,915	190	4,384	All from Republic of Korea.
Silicon ----------tons--	809	7,792	11,327	Yugoslavia 4,420; France 1,142.
Silver:				
Ore and concentrate -------do----	6,376	5,485	3,770	Republic of Korea 2,619; Peru 1,694; Canada 922.
Metal, including alloys, all forms thousand troy ounces--	9,950	18,582	34,273	Peru 7,384; Mexico 3,593; Australia 2,438; North Korea 1,998.
Tellurium ----------kilograms--	1,280	1,099	4,188	U.S.S.R. 1,000; United States 90.
Tin:				
Ore and concentrate ---long tons--	18	26	10	All from Australia.
Oxide ----------do----	5	14	10	Australia 10; United States 2.
Metal, including alloys, all forms do----	27,274	30,585	35,831	Malaysia 22,886; Indonesia 3,571; Thailand 3,085.
Titanium:				
Ore and concentrate ----------	554	446	494	Malaysia 147; Australia 107; India 97.
Slag ----------	15	52	78	All from Canada.
Oxide ----------tons--	6,167	3,359	13,420	United States 943; United Kingdom 776; People's Republic of China 701.
Tungsten:				
Ore and concentrate ------do----	2,756	2,436	4,563	Republic of Korea 1,220; Peru 397; Thailand 283.
Metal, including alloys, all forms do----	59	60	246	West Germany 26; France 19.
Uranium and thorium:				
Ore and concentrate -------do----	180	65	32	All from Zaire.
Oxides (compounds of thorium or uranium depleted in U-235) kilograms--	37,461	50,924	61,593	France 28,730; United States 14,379; Australia 7,793.
Metal, including alloys, all forms do----	1	202	315	West Germany 200; United States 2.
Vanadium pentoxide ----------tons--	2,317	2,039	2,632	Republic of South Africa 1,334; West Germany 552; United States 153.
Zinc:				
Ore and concentrate ----------	1,076	1,116	1,205	Peru 400; Canada 344; Australia 121.
Oxide ----------tons--	264	1,084	994	U.S.S.R. 892; United States 72; West Germany 66.
Metal, including alloys, all forms --	14	8	28	North Korea 7.
Zirconium ore and concentrate (including zircon sand) ------tons--	76,588	117,175	138,013	Australia 113,463; Malaysia 1,901.
Other:				
Ore and concentrate of base metals, n.e.s ----------do----	r 1,920	r 1,316	1,586	Australia 684; United States 404; Brazil 228.
Ash and residue containing nonferrous metals -------do----	14,911	14,229	9,499	Australia 3,566; United States 2,595; Philippines 1,444.
Oxides, hydroxides, peroxides of metals, n.e.s. [4] ----------do----	1,201	1,427	2,878	United States 854; U.S.S.R. 453.
Metalloids [5] ----------do----	4,954	10,171	12,166	U.S.S.R. 5,343; Canada 2,419; United States 2,365.
Alkali and alkaline-earth metals [6] ----------do----	29	23	52	United States 13; Canada 5.
Pyrophoric alloys (ferrocerium) do----	7	7	10	Australia 5; France 1.
Base metals, including alloys, all forms, n.e.s -----do----	1,209	606	609	United States 273; U.S.S.R. 214; United Kingdom 88.

See footnotes at end of table.

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

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973	Principal sources, 1972
NONMETALS				
Abrasives, natural, except diamond, n.e.s.:				
Crude ——tons——	2,755	2,702	2,991	United States 1,360; People's Republic of China 611; Italy 478.
Dust and powder of precious and semiprecious stones ——kilograms——	18	131	19,175	Denmark 80; France 50.
Grinding and polishing wheels and stones ——tons——	308	302	456	Taiwan 103; United States 95; Italy 25.
Asbestos	274	279	342	Canada 118; Republic of South Africa 100; U.S.S.R. 41.
Barite and witherite	9	20	42	People's Republic of China 13; India 6.
Boron materials:				
Crude natural borates	24	42	43	Turkey 33; United States 5; U.S.S.R. 4.
Oxide and acid	14	15	17	United States 12.
Cement	5	5	348	United States 2; West Germany 1; Taiwan 1.
Clays and clay products:				
Crude clays, n.e.s.:				
Kaolin	249	276	342	United States 157; Republic of Korea 73; U.S.S.R. 37.
Kyanite, andalusite, sillimanite	26	19	25	Republic of South Africa 9; India 8.
Other	498	259	344	United States 89; Republic of South Africa 65; Republic of Korea 31.
Products:				
Refractory (including nonclay brick) ——tons——	7,032	8,107	7,447	United States 5,374; West Germany 1,335; Taiwan 940.
Nonrefractory ——do——	1,578	6,291	15,537	Italy 3,067; Republic of Korea 2,109; United States 295.
Cryolite and chiolite ——do——	7,914	875	2,038	Denmark 576; Greenland 299.
Diamond:				
Gem, not set or strung thousand carats——	384	534	689	Israel 216; Belgium 127; India 61.
Industrial stones ——do——	672	814	1,157	United States 240; Belgium 186; United Kingdom 125.
Powder and dust ——do——	5,118	6,525	9,936	United States 3,558; Zaire 1,014; Ireland 889.
Diatomite and other infusorial earth tons——	2,104	3,249	4,422	United States 3,109; Republic of Korea 80; Mexico 60.
Feldspar, leucite, nepheline, nepheline syenite ——do——	2,468	2,508	9,881	Republic of Korea 1,600; India 490; People's Republic of China 310.
Fertilizer materials:				
Crude:				
Nitrogenous (natural sodium nitrate) ——do——	500	1,689	209	Chile 1,500; People's Republic of China 189.
Phosphatic	2,985	3,040	3,190	United States 2,054; Morocco 464; Jordan 150.
Manufactured:				
Nitrogenous	7	20	37	Chile 16; Norway 2.
Phosphatic	10	16	20	United States 14; Mexico 2.
Potassic	1,271	1,176	1,322	Canada 553; U.S.S.R. 204; United States 152.
Mixed	67	49	97	United States 26; Republic of Korea 22.
Ammonia ——tons——	1	3	2	All from United States.
Fluorspar	678	490	573	Thailand 229; People's Republic of China 107; Republic of South Africa 105.
Graphite, natural	56	40	66	Republic of Korea 25; North Korea 9; U.S.S.R. 3.
Gypsum and plasters	89	138	207	Mexico 91; Morocco 46.
Lime ——tons——	2,500	--	--	
Magnesite and magnesia clinker	37	27	52	North Korea 19; U.S.S.R. 6.

See footnotes at end of table.

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

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973	Principal sources, 1972
NONMETALS—Continued				
Mica, all forms	7	7	10	India 6.
Pigments, mineral, including processed iron oxides ——tons	2,398	3,148	3,950	West Germany 2,211; Austria 467; People's Republic of China 223.
Precious and semiprecious stones, except diamond:				
Natural ——do	883	1,049	1,506	Brazil 675; Republic of South Africa 133; Madagascar 62.
Manufactured ——do	11	12	19	United States 10.
Pyrite (gross weight) ——do	110	3,471	25,867	All from Philippines.
Salt	7,254	r 6,873	7,275	Mexico 3,181; Australia 2,429.
Sodium carbonate, natural ——tons	--	--	5	
Sodium and potassium compounds, n.e.s.:				
Caustic soda ——do	186	108	75,037	West Germany 89; United States 19.
Caustic potash, sodium peroxide do	10	10	2,231	All from West Germany.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	154	191	462	Republic of South Africa 56; India 27; Republic of Korea 21.
Worked	4	12	27	Taiwan 4; People's Republic of China 3; Italy 2.
Dolomite, including agglomerated dolomite	24	20	19	Mainly from Republic of Korea.
Gravel and crushed rock	21	40	68	Republic of Korea 26; People's Republic of China 4; Taiwan 4.
Limestone ——tons	--	110	282	France 95; Philippines 9; United States 6.
Quartz and quartzite	155	110	170	Republic of Korea 96; People's Republic of China 6; Sweden 4.
Sand, excluding metal bearing	185	262	535	Australia 255; Republic of Korea 3.
Sulfur:				
Elemental:				
Other than colloidal ——tons	--	12,113	46,409	All from Mexico.
Colloidal ——do	276	153	323	United States 145; West Germany 8.
Sulfuric acid ——do	--	161	60,086	All from Taiwan.
Talc, steatite, soapstone, pyrophyllite	173	220	277	People's Republic of China 132; North Korea 44; Republic of Korea 24.
Other nonmetals, n.e.s.:				
Crude:				
Meerschaum, amber, jet kilograms	10	--	--	
Other	157	201	283	Republic of Korea 84; Philippines 49; Australia 31.
Slag, dross, and similar waste and ash, including kelp, not metal bearing	146	122	164	India 63; Republic of Korea 42; People's Republic of China 12.
Oxides, hydroxides, and peroxides of magnesium, strontium, barium tons	120	178	221	United States 121; West Germany 25; France 22.
Bromine and iodine ——do	273	1,324	1,187	Chile 900; Israel 424.
Fluorine ——kilograms	228	28	60	All from United States.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s ——tons	5,366	5,790	19,189	Canada 4,064; Belgium 522; Australia 430.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2	2	3	Mainly from United States.
Carbon black	4	4	8	United States 3.
Coal and briquets:				
Anthracite	1,584	756	1,031	People's Republic of China 251; Republic of Korea 159; Canada 122.

See footnotes at end of table.

Table 3.—Japan: Imports of mineral commodities[1]—Continued
(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973	Principal sources, 1972
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coal and briquets—Continued				
Bituminous:				
Heavy coking coal, less than 8% ash	20,174	20,459	22,001	United States 12,837; Australia 3,962; Canada 1,620.
Heavy coking coal, more than 8% ash	15,969	17,136	22,224	Australia 9,908; Canada 4,955; U.S.S.R. 1,253.
Other coking coal	9,197	10,927	11,598	Australia 6,690; United States 2,702; Canada 1,099.
Lignite and lignite briquets	13	9	11	All from Australia.
Coke and semicoke	41	15	41	Mainly from Australia.
Gas, hydrocarbon (liquefied natural gas)—thousand 42-gallon barrels	11,390	11,040	22,583	United States 10,662; Brunei 378.
Hydrogen, helium, rare gases—kilograms	92,476	82,085	89,271	United States 69,573; Canada 12,375.
Peat, including peat briquets and litter—tons	1,455	4,277	8,145	U.S.S.R. 2,810; Poland 632; Denmark 309.
Petroleum:				
Crude and partly refined:				
Crude—thousand 42-gallon barrels	1,332,516	1,447,835	1,700,531	Iran 605,301; Saudi Arabia 258,011; Indonesia 199,368.
Partly refined—do	66,918	119,541	121,616	Saudi Arabia 95,244; Kuwait 16,810; Indonesia 3,424.
Refinery products:				
Naphtha—do	37,436	37,684	38,661	Kuwait 10,294; Singapore 8,995; Saudi Arabia 4,124.
Kerosine and jet fuel—do	2,063	1,835	2,683	Singapore 1,310; Ryukyu Islands 177; Saudi Arabia 161.
Distillate fuel oil—do	15,787	15,813	21,623	Singapore 4,132; Kuwait 3,108; Bahrain 2,081.
Residual fuel oil—do	129,146	98,626	76,708	Singapore 16,538; Saudi Arabia 14,020; Indonesia 13,971.
Lubricants—do	2,782	1,363	1,153	United States 934; Taiwan 206; Netherlands Antilles 100.
Liquefied petroleum gas—do	38,394	49,472	59,028	Kuwait 14,454; Saudi Arabia 11,626; Australia 8,190.
Petroleum coke—do	9,016	9,781	10,521	United States 8,851; People's Republic of China 335; U.S.S.R. 163.
Other—do	369	807	1,362	United States 326.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	24	25	54	United States 10; Republic of Korea 6; U.S.S.R. 4.

r Revised.
[1] Excludes imports under Japanese–United States Mutual Defense agreement or for account of U.S. military forces.
[2] Less than ½ unit.
[3] Includes ferruginous manganese and manganese dioxide.
[4] Includes lithium hydroxide, beryllium oxide, mercury oxide, antimony trioxide, cuprous oxide and nickel oxide, inorganc bases and metallic oxides, hydroxides and peroxides, n.e.s., and silicon dioxides.
[5] Includes phosphorus boron, and arsenic.
[6] Includes lithium, sodium, alkali metals, n.e.s., and alkaline-earth metals.

COMMODITY REVIEW

METALS

Aluminum.—Japan's primary aluminum production increased 8.7% in 1973, reaching 1,096,765 tons, according to the Japan Light Metal Association. In addition, 536,489 tons of secondary aluminum and alloy ingots were produced. Although still far below U.S. production, Japan was pressing the U.S.S.R. and had left Canada behind. Nonetheless, output near yearend declined and most aluminum producers in Japan were reevaluating their plans to cope with the high cost of energy.

Japan's aluminum capacity at yearend 1973 was roughly 1.28 million tons with percentage breakdown by company as follows: Nippon Light Metal Co., Ltd. (NLM), 28.1; Sumitomo Chemical Co., Ltd., 22.8; Showa Denko Co., Ltd., 21.5; Mitsubishi Chemical Co., Ltd., 21.1; and Mitsui Aluminum Co., Ltd., 6.5.

The growth rate of Japan's aluminum industry slowed in 1973 as compared with 1972 for the following principal reasons: startup of operations for already expanded facilities was in many cases delayed, on account of an oversupply of aluminum early in 1973; Mitsubishi Chemical did not produce as much as anticipated because of a major accident at its Sakaide Works; and the whole industry was compelled to reduce production as a result of the oil crisis towards yearend 1973.

In primary aluminum production, NLM made a gain of 17.9%, to 320,909 tons in 1973; Showa Denko showed a drop of 6.4%, to 198,755 tons; Sumitomo Chemical increased production by 13.7% attaining 274,145 tons; Mitsubishi Chemical registered a gain of 6.2%, to 244,915 tons, despite the forementioned accident; and Mitsui Aluminum raised output by 9.6%, to 78,041 tons.

Japan's aluminum industry, being international in nature, has many commercial and investment ties with major companies abroad. Because of these relationships, large quantities of alumina are both imported and exported, and sizable tonnages of aluminum are imported. During 1973 imports of alumina exceeded 400,000 tons and exports, about 183,000 tons. In the same year, imports of aluminum ingot were 373,101 tons (primarily from New Zealand, Bahrain, and Canada) and alloyed aluminum ingot, 102,553 tons (from the U.S.S.R. and the United States). Japan has no bauxite, hence all needs must be met by imports. During 1973, approximately 5.6 million tons of bauxite were imported, compared with 4.5 million tons in 1972. In 1973, Australia supplied about 60%, Indonesia 20%, and Malaysia, just under 20% of the imports.

Australia has become the principal raw material base for Japan's aluminum industry and its position is improving. During 1973, Japan imported about 3.3 million tons of bauxite from Australia. About two-thirds of this came from the Weipa Area, produced and sold by a consortium headed by Comalco Industry Pty., Ltd. (Australia), and shipped mainly to Sumitomo Chemical, and Showa Denko who are shareholders in Comalco. Bauxite from the Darling Range deposit, owned by Alcoa (Australia) Ltd., was shipped mainly to NLM. Bauxite from deposits at Gove, owned by Napalco Pty., Ltd., formerly went only to Mitsui Aluminum, under a 20-year, 10-million-ton (total) contract. Early in 1974 another contract (15-year, 7,500,000 ton total) was being negotiated to supply NLM, Showa Denko, and Sumitomo Chemical with additional bauxite from the Gove Area. Alumina from Pinjarra (also owned by Alcoa), amounting to 443,000 tons in 1973, went entirely to Mitsubishi Chemical.

Japan has acquired about 2 million tons of bauxite yearly from Bintan, Indonesia, and Johore, Malaysia, in recent years, with NLM, Sumitomo Chemical, and Showa Denko importing the bulk. Whereas reserves of high-grade bauxite from Malaysia may run out in 5 to 10 years, a new deposit has been found on Enam Island, Indonesia. Discussions were underway to build a 400,000-ton alumina plant in Indonesia based upon Enam ores. This probably will be part of the Asahan Project (integrated power—aluminum complex) to be built under a joint venture shared by the five Japanese aluminum companies and Aluminum Co. of America (Alcoa) (15%) and Kaiser Aluminum and Chemical Corp. (15%). A new estimate of construction costs was being made early in 1974. Late in 1973, an agreement was reached between Aluminum Resources Development Co. (ARDECO) of Japan and Cia. Vale do Rio Doce (CVRD) of Brazil to jointly develop the extensive bauxite deposits in the Trombetas District with a view towards producing primary aluminum in Brazil along with exporting bauxite to Japan. Previously, ARDECO had made surveys for bauxite in Ghana, and on Samar Island, the Philippines.

Japan's alumina production increased 20.8%, to 1,987,144 tons in 1973. NLM raised output 22.3%, to 768,859 tons; and Sumitomo Chemical raised output 8.2%, to 567,582 tons. Showa Denko showed only a nominal gain of 0.4%, registering 469,794 tons. As a result of placing its alumina plant in Kyushu in full-scale operation, Mitsui Aluminum upped produc-

tion 671.2%, to 180,909 tons of alumina in 1973.

NLM, half-owned by Alcan Aluminium Ltd., upped primary aluminum production sharply because its two relatively new reduction works—Tomakomai and Niigata—were both in full-scale operation during 1973 whereas Niigata was one-half down the year before. NLM is the principal Japanese company shipping alumina abroad. At yearend, NLM was investigating the possibility of building a reduction plant in Canada jointly with Alcan to cope with the energy problem.

Sumitomo Chemical raised output considerably mainly because of full-scale operations of the expanded Toyama Works. The small and old Kikumoto reduction plant was scheduled to be scrapped early in 1975. Sumitomo was hoping to build Japan's first integrated aluminum plant near Sakata in Yamaguchi Prefecture, but work had not yet started. Sumitomo and Showa Denko are minority partners with Comalco in not only the Weipa project in Australia, but also the Bluff project in New Zealand.

Showa Denko continued to have financial difficulties, and hesitancy on implementation of plans probably caused the drop in primary aluminum production. The final phase 50,000-ton-per-year expansion of the Chiba reduction plant was postponed indefinitely at yearend, in favor of expansion of the project in New Zealand and construction of joint-venture plants in Venezuela and Indonesia.

Mitsubishi Chemical, Japan's newest aluminum producer, is now fully established with two new plants. Naoetsu is completed, but Sakaide is not quite finished; both were originally designed for 155,000 to 160,000 tons of aluminum per year. Roughly 20,000 tons of production was lost at the Sakaide Works on account of the accident in 1973. Mitsubishi Chemical buys all its alumina from Australia. The company was considering a joint-venture project in Venezuela.

Mitsui Aluminum finally got into full-scale operations with regard to its 200,000-ton alumina works at Wakamatsu and 82,500-ton aluminum works at Miike. Construction was started at yearend to raise Miike's annual capacity to 166,000 tons by the end of 1975; a coal-fired 175,000-kilowatt powerplant will be built, along with a new reduction plant. This company's raw material source is Australia. On January 30, 1974, Mitsui & Co. (affiliated with Mitsui Aluminum) formed a 50-50 joint venture with American Metal Climax., Inc. (AMAX), by the new name of AMAX Aluminum Co., Inc., to take over all the worldwide aluminum interests of AMAX.

The joint venture Bluff Works of New Zealand decided to expand aluminum capacity from 112,000 to 150,000 tons per year to be completed by mid-1976. Showa Denko and Sumitomo Chemical will take 75,000 tons according to their combined shares.

Copper.—After a very profitable half year covering March through September, a most difficult quarter closed out 1973, as a result of repercussions of the Middle East War. Overall, production of electrolytic copper increased to 950,908 tons, a gain of 17.4% over 1972 and despite a 4.1% output decline in December as compared with November. The refined metal was extracted from approximately 2,973,000 tons of imported copper concentrate (less stocks), plus one-half million tons of domestic concentrate. In 1973 Japan also imported roughly 80,000 tons of blister copper (principally from Zambia, Peru, and Chile), 314,000 tons of refined copper (half from Zambia and just under 15% each from U.S.S.R. and the United States), and nearly 90,000 tons of copper and alloy scrap (more than half from the United States). Although based mainly upon foreign raw materials, Japan's annual copper refining capacity at yearend 1973 was probably close to 1.1 million tons. Japan retires inefficient facilities as new ones are built so reported capacities automatically exclude obsolescent facilities.

Nippon Mining Co. was the leading refined copper producer during April–September 1973, barely ahead of Mitsubishi Metal Corp. In this period, production by company was as follows: Nippon Mining, 120,357; Mitsubishi Metal, 115,000; Mitsui Mining and Smelting Co., Ltd., 62,846; Sumitomo Metal Mining Co., Ltd., 67,581; Dowa Mining Co., 56,114; Furukawa Mining Co., Ltd., 34,491; and Toho Zinc Co., Ltd., 7,203.

Japan's copper mining industry, although operated by the same companies that own the large and modern smelters, has been in a rather stationary position during the last few years in terms of overall output tonnage. However, some of the old copper mines were shutdown, such as the Besshi

mine (Ehine Prefecture) of Sumitomo Metal Mining in 1972, the Ashio mine of Furukawa Mining in early 1973, the Myoho mine of Mitsubishi Metal, and the Yoshire mine of Nippon Mining, both also in 1973. Meanwhile, development of complex metal ("black ore") deposits and mines progressed. Nippon Mining's Shakanai and Hitachi mines were reorganized into affiliated companies and exploration and development continued at the Namariyama mine and Ginzan property. Mitsubishi Metal started to develop a new ore body at the Shimokawa mine which already provided about 9,000 tons of mine copper annually from 2% plus copper ores. Mitsubishi Metal also started to produce nonferrous metals from its Matsuki mine in Akita Prefecture. Matsuki's reserves were 3 million tons of ore containing 3.7% Cu, 2% Zn, and 0.8% Pb. Developed at a cost of Y2.8 million Matsuki was expected to eventually yield 12,000 tons of ore per month. Dowa Mining's black ore reserves in Akita Prefecture have been raised to more than 50 million tons, including 2 million tons of proved reserves (1% Cu, 3% Pb, and 13.5% Zn) at the relatively new Fukazawa mine developed at a cost of Y2.3 billion. Dowa Mining continued to be optimistic about future discoveries of additional "black ore."

For some time to come, Japan's main source of copper will continue to be foreign concentrates. Considering materials already contracted for, imports of copper-in-concentrates will probably rise from about 830,000 tons in 1973 to more than 1 million tons yearly by the mid-1970's. Thereafter, growth in concentrate imports may slow down, since Japanese copper producers already have an open mind about building copper smelters abroad, so as not to aggrevate the environmental pollution problem at home, and obtaining copper in ingot form. For example, in August 1973, Japanese copper producers signed an agreement with Southern Peru Copper Corp. to acquire 27,000 tons of blister copper annually for 15 years beginning 1977. This followed a previously signed long-term contract with Zambia for 50,000 tons of blister copper per year.

Japan's imports of copper concentrates showed a 37% increase over the 2.17 million tons imported 1 year earlier. During 1973, Canada strengthened its position as the principal supplier of mine copper, with imports by Japan increasing 45%, from 813,427 tons in 1972 to 1,181,505 tons in 1973. The second largest supplier, the Philippines, furnished 762,879 tons of copper concentrates as compared with 715,146 tons in 1972. The amount provided by Bouganville in 1973 was 380,834 tons. Other suppliers included: Chile, 185,459 tons; Australia, 159,037 tons; Peru, 84,960 tons; Zaire, 75,993 tons; United States, 60,504 tons; Indonesia, 59,034 tons; Bolivia, 11,216 tons; and miscellaneous, 11,328 tons.

Japan has become increasingly reliant on copper concentrates from Canada, particularly British Columbia, with supplies doubling since 1970. Initial purchases were from established operations. However, many mines were subsequently developed for the Japanese market, many with the help of Japanese capital and knowhow, with Sumitomo Metal Mining being the most involved. Fox Lake and Grandue were in full operations a few years back, but four new large projects—Ingerbelle, Lornex, Port Hardy, and Valley Copper—played a basic role in raising copper concentrate imports from Canada.

The Philippine supply of mine copper to Japan increased about 7% in 1973, mainly on account of increased production by Atlas Consolidated Mining and Development Corp. in Cebu. During the year exploratory drilling uncovered another large reserve which could be the basis for a third large pit and mill. Several new copper properties were also being developed in part for the Japanese market. The possibility of building copper smelting facilities in the Philippines increased, which could mean less concentrates and more blister shipped to Japan.

The Bougainville project in the Australian administered Territory of Papua New Guinea went through its first year of full-scale operations. The original output target was exceeded, and shipments to Japan topped 100,000 tons of mine copper in 1973. The Musoshi project in Zaire, owned 85% by the Japanese and the remainder by the Zaire Government, was not yet in full-scale production. However, shipments to Japan already topped 20,000 tons of mine copper in 1973. At Nippon Mining Debarwa copper project in Ethiopia preparations were made to build a concentrator.

Freeport Mineral Co.'s Ertzberg project

in West Irian, Indonesia, was moving ahead according to schedule, although annual shipments to Japan will not reach the contracted level of 40,000 tons of copper-in-concentrates until 1974 or 1975. The Mamut project in Sabah, Malaysia, half-owned by the Japanese but wholly committed to supplying Japanese smelters, was still also 1 or 2 years away from supplying 30,000 tons of copper-in-concentrates yearly to Japan; construction of a slurry pipeline was getting underway. Japanese copper smelters have been receiving about 44,000 tons of copper-in-concentrates annually from the Rio Blanco region of Chile.

Japanese copper producers have set up the Michiquillay Mining Co. to work jointly with the Banco Minero of Peru to develop new copper production (over 100,000 tons per year) in Peru by 1980. The Coroccohuayco, Colowai, and Pashpap Districts in Peru, each with 50 to 200 million tons of 0.8% copper ore (preliminary estimates), were being investigated by the Japanese. A Japanese delegation was sent to evaluate the Cerro Pantanos District in Colombia in mid-1973. Cobre Panama, a Japanese consortium, signed a 4-year exploration contract with the Panamanian Government in July to examine the Petaquilla District for copper and other minerals.

At yearend 1973, Nippon Mining's copper smelting capacity was rated at about 224,000 tons per year and refining capacity at about 290,000 tons, split between two large smelters—Hitachi north of Tokyo and Saganoseki in Kyushu. Hitachi has one 7,000-ton-per-month autogenous furnace and a 16,000-ton-per-month refining capacity (three refineries). Saganoseki has two 10,000-ton autogenous furnaces and 11,000-tons of refining capacity. The company's long range thinking was to increase Saganoseki's refining capacity to 20,000 tons and Hitachi's smelting capacity to 14,000 tons (another 7,000-ton autogenous furnace). Nippon Mining's goal was to maintain its first position in copper production in Japan.

Mitsubishi Metal Corp.'s "pollution-free" continuous copper smelter of 4,000 tons monthly (could be easily increased to 5,000 tons, according to company spokesman), built at a cost of Y9 billion at Naoshima in Kagawa Prefecture, was being tested for full-scale production at yearend.[6] A new 6,000-ton-per-month electrolytic copper refinery at Naoshima was also nearing completion. When this refinery becomes fully operable, Mitsubishi Metal's older 6,500-ton-per-month refinery in Osaka will be shutdown. In addition to the new integrated continuous copper smelter and refinery, Naoshima has an older complex capable of producing 7,000 to 8,000 tons of blister and refined copper per month. Copper production at the Onahama smelter, Mitsubishi Metal's subsidiary, was being hard hit by the energy crisis. Originally, the hope was to raise Onahama's monthly output near yearend to about 16,000 tons of electrolytic copper or 90% of capacity. However, cuts in heavy oil supplies reduced monthly production in December to only 12,000 tons.

Sumitomo Metal Mining was moving ahead to further expand copper smelting and refining facilities. As of yearend 1973, Sumitomo's copper refining capacity was split between the Niihama Works rated at 12,000 tons per month and the newly built Toyo Works, both in Ehime Prefecture, rated at 4,000 tons. The company's crude copper smelting capacity comprised the autogenous smelting furnaces at the Toyo Works rated at 10,000 tons per month plus a 1,000-ton-per-month capacity of the old Kunitomi Works in Hokkaido, and a 2,000-ton capacity at the even older Shisakajima Works. Sumitomo obtained large tonnages of copper concentrates from Canada and elsewhere, together with 1,500 tons per month of blister copper on long-term contracts from Zambia and Australia. At yearend, Sumitomo was considering doubling the capacity of the Toyo smelter to 20,000 tons per month by 1976 at a cost of Y10 billion and also enlarging existing refining capacity 25%, to 20,000 tons.

Iron and Steel.—Despite the energy crisis and sharp inflational pressures late in the year, Japan established a steel production record of 119.3 million tons in 1973, up 23% over the previous year. However, the last quarter showed little gain and the first 2 months in 1974 showed a slight decline. With the oil embargo lifted, steel production was expected to more than recover,

[6] Japan Metal Bulletin (Tokyo). Jan. 23, 1974, pp. 3–14.

although further expansion will be somewhat delayed.

Japan strengthened its position as the world's third largest steel producer following the United States with 136.0 million tons and the Soviet Union with 131.5 million tons. Japan continued to be the world's foremost steel exporter, exporting a record 24.7 million tons during 1973. Raw material imports, specifically 135 million tons of iron ore, 52.5 million tons of coking coals (by the steel industry only), 5.4 million tons of steel scrap, and 1.6 million tons of pig iron, were also very important by world standards. Steel exports greatly exceeded imports of steelmaking raw materials in value, with the favorable trade balance amounting to approximately $2 billion in 1973 excluding the value of imported liquid fuels.

Four Japanese steel companies, headed by Nippon Steel Corp. with output of about 41.1 million tons, were among the world's top 10 companies in 1973. Nippon Steel's output was roughly 9.3 million tons ahead of the 31.8 million produced by the United States Steel Corp. and 17.1 million ahead of the 24.0 million tons produced by the British Steel Corp., the next two ranking steel firms, and about twice as much as the 21.5 million produced by fourth ranking Bethlehem Steel Corp. Japan's Nippon Kokan Co. was fifth with 16.1 million, followed by Sumitomo Metal Industries Ltd. with 14.5 million tons, and Kawasaki Steel Corp. with 14.4 million tons. West Germany's August Thyssen Huette AG(ATH) with 13.9 million, the Netherlands–West German joint venture Ester with 11.6 million, and Italy's Finsider Enterprises with 11.5 million tons rounded out the first 10 companies.[7]

Japan had 7 of the 10 largest blast furnaces of the world early in 1974 and 14 of the first 20; France, the Netherlands, and West Germany had the other 3 furnaces among the top 10. The present Japanese and world leader is Nippon Kokan's Fukuyama No. 5 furnaces, capable of producing more than 11,000 tons of pig iron per day. In comparison, the largest Soviet furnace is rated at 3,200 cubic meters (ranking 13th worldwide) and the largest U.S. furnace, less than 2,500 cubic meters. At yearend 1973, Japan's 10 largest blast furnaces were as follows:

Company and blast furnace	*Cubic meters*
Nippon Kokan's Fukuyama Works No. 5	4,617
Kawasaki Steel's Mizushima Works No. 4	4,323
Nippon Kokan's Fukuyama Works No. 4	4,197
Nippon Steel's Oita Works No. 1	4,158
Sumitomo's Kashima Works No. 2	4,080
Nippon Steel's Kimitsu Works No. 3	4,063
Kobe Steel's Kagogawa Works No. 2	3,850
Nippon Steel Yawata Works Tobata No. 4	3,799
Kawasaki Steel's Mizushima Works No. 3	3,367
Sumitomo's Kashima Works No. 1	3,159

About 57 blast furnaces were in operation at the end of 1973. Four new furnaces were blown in during the year: Nippon Kokan's Fukuyama No. 5 (4,617 cubic meters) in November; Nippon Steel's Kimitsu No. 3 (4,063 cubic meters) in September; Kawasaki Steel's Mizushima No. 4 (4,323 cubic meters) in April; and Sumitomo's Kashima No. 2 (4,080 cubic meters) in March. Most new furnaces were started at the expense of idling older furnaces. Nippon Steel began construction of a second blast furnace of about 5,000 cubic meters at its Oita Works to be completed by late 1975.

In conjunction with producing a reported 119.3 million tons of crude steel in calendar year 1973, Japan also produced 90.0 million tons of pig iron and 92.6 million tons of hot-rolled ordinary steel. The high ratio of pig to steel shows the importance of iron ore and large blast furnaces to the industry. Breakdown of Japan's crude steel output in 1973 was as follows, in million tons: Basic oxygen furnaces, 96.1; electric furnaces, 21.4; and open-hearth furnaces, 1.8.

At yearend 1973, Japan had three steel complexes with an annual steel capacity of more than 10 million tons, headed by Nippon Kokan's Fukuyama Works at close to 15 million and Nippon Steel's Yawata Works at 13 million tons. The Soviet Magnitogorsk Works is the only non-Japanese steel complex in the world with more than 10-million-ton-per-year capacity. Kawasaki Steel's Mizushima Works also belongs to the 10-million-ton group, and Nippon Steel's Kitmitsu Works will soon reach this tonnage. Included among large steel complexes of the 81 to 10-million-ton range are Sumitomo's Wakayama Works, ATH's

[7] Japan Metal Bulletin (Tokyo). Mar. 30, 1974, pp. 1–2.

Duisberg-Hamborn Works, and Bethlehem Steel Corp.'s Sparrows Point plant.

As an indication of Japan's continuing efforts to stay in the forefront of steel technology,[8] and in view of the energy crisis, Nippon Steel and other major Japanese steelmakers made a basic decision to step-up investigations of direct iron-reducing technologies using atomic energy.[9] The "6-year Program for Atomic Energy Steel Production" initially to be concluded in fiscal year 1978 at a cost of Y6.7 billion was due to be accelerated. Programs for making coke from soft coal through pelletizing and caking processes were also being pushed to counteract the sharp price increases in heavy oil. Nippon Steel and Sumitomo Metal Industries, which previously had conducted separate research on soft coal, have decided to join their efforts. Steelworks being built or expanded were emulating Nippon Steel's program at its Oita Works which has been described as "nearly a manless operation."

The importance of exports to Japan's steel industry is such that nearly one-third of steel products output in recent years has been exported. Asian countries were first on the list of destinations in 1973, but the United States was still by far the most important single recipient country, with exports totaling 5.29 million tons. Next came the People's Republic of China (PRC), with Japanese steel exports at 2.66 million tons, up 0.90 million as compared with 1972 exports. Regionally, Asia accounted for 11.46 million tons—up 3.09 million from 1972; North America, 6.24 million tons—down 1.02 million; Europe, 3.38 million tons—up 0.28 million; and South America, 2.47 million—up 0.67 million.

Japan's ultramodern blast furnaces depend upon a steady, long-term supply of high-grade foreign raw materials and this has made the country the world's number one iron ore importer and a leading iron shipper. During 1973, Japan imported 135 million tons of iron ore, as compared with 111 million tons for 1972. The pattern of imports by country show that nearly half came from Australia, one-seventh from India, nearly one-tenth from Brazil, and just one-tenth from Peru and Chile combined. Iron ore requirements by major steel producers during 1973 shows Nippon Steel at more than 60 million tons; Nippon Kokan, Kawasaki Steel, and Sumitomo Metal at 18 to 21 million tons each; and Kobe Steel Ltd. at just over 10 million tons.

Despite concern over top-heavy dependence for ironmaking raw materials on any single country, the Japanese view Australia as being, economically, the most advantageous supplier. The fuel crisis has made Australia even more attractive, on account of the shorter hauls compared with other areas. However, survey teams have been sent to many other countries to obtain supplies. For example, Japanese steelmakers hope to obtain more than 10 million tons of iron ore annually during the second half of the 1970's from the Sishen mine in the Republic of South Africa, owned by the South African Iron and Steel Industrial Corp. (ISCOR). Contract negotiations were underway to increase imports (recently, 2.5 million tons per annum) from the Lamco iron mine in Liberia, owned by the Granges International Mining Co. Imports of pellets is expected to gain ground. A new contract has been negotiated with Chile to obtain 32.6 million tons of high-grade pellets from the Algarrobo mine (which now supplies medium-grade iron ore) during 1976–85. A 6-million-ton-per-year pellet plant is scheduled to be built jointly with CVRD in Brazil to supply pellets to both Brazil and Japan by 1977. The Japanese will also help build a 5-million-ton-per-year iron pellet plant in Mindanao, the Philippines.

Even with the preponderance of integrated blast furnace—convertor operations, Japanese steelmakers and foundries still consume very sizable tonnages of iron and steel scrap. The Japanese Iron and Steel Federation reported that 48.6 million tons were consumed in 1973 as compared with 39.7 million tons in 1972. Much of this undoubtedly was recirculated plant scrap from domestic operations. However, imports have been important. During 1973 steel scrap imports totaled 5.4 million tons as compared with only 2.5 million in 1972. Price and availability of supply greatly affect the use of foreign scrap. At yearend 1973, nine Japanese scrap cartels worked out a plan with MITI to form the Steel Scrap Stockpiling Co. for the purpose of

[8] U.S. Bureau of Mines. Minerals Yearbook 1972. Chapter on The Mineral Industry of Japan.
[9] Japan Metal Bulletin (Tokyo). Dec. 27, 1973, p. 1.

purchasing domestic and foreign scrap at reasonable prices. The company will be capitalized initially at about $13 million, with authorization to hold about $54 million in stock.

During 1973, Japanese steelmakers consumed about 53.7 million tons of imported coking coal and 10.2 million tons domestic weakly coking coal. The steel industry imported about 52.5 million tons of coking coal in 1973 and 45.6 million tons in 1972 (see section on Coal). The price aspects of coal, iron ore, and other raw materials has been uncertain, but the trend is sharply up, due to the energy crisis and inflation. Almost all coal and iron contracts have to be renegotiated, so that price quotations near the turn of 1973–74 were somewhat meaningless and stability is not expected in the immediate future. The United States and Australia continued to be the principal suppliers of coal to Japan, with U.S. coal commanding higher prices because of superior quality. Early in 1974 most U.S. coals were raised $10 to $14 per ton to roughly $40 f.o.b., excluding freight charges, which also increased sharply.

Lead and Zinc.—Japan's zinc position has been much more important than that of lead, both in terms of domestic mine production and refined metal output, the latter being based primarily on imported raw materials. Local zinc-lead ores contain substantially more zinc than lead. Imports of zinc concentrates have also been much larger than imports of lead concentrates. Nonetheless, the country's indigenous mine output of both metals constituted on the order of one-third of the total supply of primary raw materials during 1972–73. In slab zinc output, Japan ranked first in the world in 1972 and 1973, surpassing the United States and the U.S.S.R. by sizable tonnages. Within a few years, the country's zinc metal production should top the 1-million-ton plateau.

Development of the "black ores" in northern Honshu (mostly in Akita Prefecture) continued to make significant progress. Activities related to Nippon Mining's Shakanai and Namariyama mines and Mitsubishi Metal's Shimokawa and Matsuki mines have already been mentioned (see section on Copper). On October 16, Dowa Mining, Japan's leading producer of "black ores", formally opened its new Fukazawa mine near Odate which was developed at a cost of $6 million.[10] Fukazawa's 3-million-ton ore reserve analyzes about 1% copper, 3% lead, and 15% zinc. The mine has a trackless system underground and an incline conveyor belt to haul ore out. Dowa Mining has another important deposit at Sankei in Hokkaido, and Nippon Mining owns two additional discoveries of complex metal ores—Toyoha in Hokkaido and Nakanogawa. Mitsui Mining and Smelting Co. was making plans to mine the 16 million tons of additional high-grade ores (combined lead-zinc about 15%) uncovered at Kamioka, Japan's premium zinc mine.

Imports of zinc concentrates rose from 1,115,675 tons in 1972 to 1,205,405 tons in 1973. Converting at about 53% zinc in concentrates, Japan's imports in each of these 2 years was just over 600,000 tons of contained zinc. In 1973, Canada supplied 35% of Japan's zinc concentrate imports followed by Peru with 27% and Australia with 18%; Mexico, South Korea, Iran, and Honduras furnished a large part of the remainder. Unlike iron ore and copper, most of the zinc concentrates obtained abroad were from established producers rather than new mines developed for the Japanese market.

However, Japan was moving into the area of participating in foreign zinc projects. For example, Mitsubishi Metal was expecting to receive the first shipment of zinc concentrates from the Lutan Lake mine in Manitoba, owned by the Sherritt Gordon Mines, Ltd., of Canada; a long-term contract calls for 100,000 tons of zinc concentrates annually for 10 years.[11] Dowa Mining and Marubeni Corp. were engaged in exploration and plant construction evaluation in Mexico with a view towards shipping zinc to the United States and Japan. Examination of zinc oxide ores in Australia and Iran continued. Mitsui Mining and Smelting, the world's largest zinc producer, was interested in a joint venture with any foreign company to build zinc smelting facilities outside of Japan.

Although most of the zinc produced in Japan has gone into domestic markets, exports have reached significant levels during the last few years. Exports totaled 106,637 tons in 1972 and 64,005 tons in

[10] World Mining (San Francisco). November 1973, p. 69.
[11] Japan Metal Bulletin (Tokyo). Nov. 6, 1973, p. 5.

1973, with about two-fifths going to the United States where some smelters were having pollution-control difficulties.

Japan's mine output of lead has declined, in line with reduced mine output of zinc and despite the development of the "black ores." Mine lead production has averaged 63,000 tons annually during the last 3 years. This compares with imports of lead concentrates (grade of about 60% to 70% lead) of 225,427 tons in 1971, 198,948 tons in 1972, and 242,753 tons in 1973. Two-thirds of the imported lead concentrates came from Canada, and the rest mainly from Peru, Australia, and South Korea.

Near yearend, many zinc smelters were affected by the shortage of power, particularly those in the northeast. As an extreme case, the 10,000-ton-per-month Mikkaichi smelter-refinery of Nippon Mining may be forced to severely restrict production. The power shortage also influenced expansion of new capacity. For example, Mitsui Mining and Smelting, which hoped to double the capacity of its Hikoshima smelter to 14,000 tons of zinc per year by 1976, was not given the go-ahead sign by its power supplier, Chugoku Electric Power Co. The Mitsui-controlled Imperial Smelting Process (ISP) plant at Hachinoe (or Hachinohe) rated at 30,000 tons of lead and 72,000 tons of zinc per year, also encountered problems in its program to expand facilities. Japan's second ISP plant Harima, owned primarily by Sumiko Co. a subsidiary of Sumitomo Metal Mining, fared better; plans are to raise lead production from 1,450 to 1,800 tons per month while keeping the zinc capacity at about 4,500 tons.

Japan's largest zinc smelter, Annaka of Toho Zinc Co., was still recovering from the financial blow brought about by "cadmium-pollution." Rated at 204,000 tons per year, MITI would not permit Annaka to operate at full-scale until strict pollution standards are met.

Dowa Mining, part owner in various nonferrous smelters, including the large Onahama copper smelter and the Hachinoe ISP plant, improved its long-range smelting capacity. The Iijima zinc smelter under Akita Zinc Co., which is in turn more than half owned by Dowa Mining, had a zinc capacity of 78,000 tons per year; this capacity was about to be doubled in the not-too-distant future, so as to handle ores from the Dowa's new Fukazawa mine and other sources. Dowa Mining was hoping to join with Mitsubishi Metal and Nippon Mining to build a new lead smelter-refinery with a 2,000 to 2,500-ton-per-month capacity within the confines of its Kosaka nonferrous complex, where there is already a lead refining capacity of 1,000 tons per month.

Mitsui Mining and Smelting had no known plans to add more capacity to its 140,000-ton-per-year vertical retort zinc plant at Miike, Kyushu, or its 60,000-ton electrolytic zinc plant at Kamioka. Although expansion of the very modern "nearly-pollution free" Hikoshima plant may be delayed, work commenced at the Kamioka plant to increase electrolytic lead production capacity to 2,200 tons per month. Kamioka was shipping 500 tons of base bullion per month to Mitsui's Takehara refinery for final processing. When enlargement of electrolytic lead cells are completed late in 1975, all the lead bullion will be refined locally.

Mitsubishi Metal had no known plans to expand or modify its 90,000-ton-per-year zinc plant at Akita. However, changes were being made at its Naoshima copper and lead complex, which is in part owned and operated by Mitsubishi Cominco, a subsidiary. In addition to preparing for startup of the continuous copper smelter, Mitsubishi was in the process of expanding lead capacity from 2,800 tons per month to 3,300 tons.

Magnesium.—Although Japan's primary magnesium production at 11,203 tons showed little change from the 10,890 tons produced in 1972, secondary magnesium production rose to 8,146 tons compared with only 4,844 tons in 1972. Demand for the metal increased 30%, reaching nearly 24,000 tons in 1973. The most important 1973 gains in usage were titanium and zirconium smelting, to 8,360 tons (44%); light metal rolling, to 5,890 tons (22%); aluminum alloys, to 4,690 tons (32%); and nodular cast iron, to 2,110 tons (21%).[12] Reflecting this buoyant demand, Japan's magnesium imports reached 5,972 tons of unwrought metal and 428 tons of semimanufactures in 1973, with the Soviet Union and the United States as the principal suppliers. Imports of unwrought magnesium were only 2,860 tons in 1972.

[12] Japan Metal Journal (Tokyo). Apr. 1, 1974, p. 10.

Manganese.—Although Japan produces several hundred thousand tons of low-grade manganese annually, virtually all requirements for high-grade manganese ores have been met by imports. In 1973, imports of these ores amounted to 1.8 million tons (1.6 million tons in 1972), with Australia and the Republic of South Africa each supplying about 35% and Gabon 12%. Groot Eylandt Mining Co., Pty., Ltd. and Longreach Manganese Pity., Ltd., in Australia, South African Manganese Ltd. in Cape Province, and Compagnie Minière de l'Ogooue of Gabon were the main suppliers. About 1.6 million tons of ferrugenous manganese ore, used for direct charging to blast furnaces, were also imported in 1973; the supply came mainly from the Republic of South Africa (54%) and India (42%).

Japan produced 470,000 to 610,000 tons of ferromanganese, mainly of the high-carbon type, and 280,000 to 320,000 tons of silicomanganese annually during 1970–72. Export markets are no longer important (26,000 tons of ferromanganese exported and 22,000 tons imported during 1973), and production is geared to the expanding needs of the Japanese steel industry.

Japan ranked second to the United States as a producer of electrolytic manganese and manganese dioxide. Respective annual capacities total just over 14,000 and 40,000 tons. Production in both cases was affected by the energy shortage since there was intensive electricity consumption. Tekkosha Co. has been prominent in both products. Virtually all the manganese oxide has been exported (38,689 tons in 1973), and this explains why Tekkosha and Mitsui Mining and Smelting were looking for plant sites abroad. Tekkosha was going ahead with a 12,000-ton-per-year manganese dioxide project, jointly with Mitsubishi Corp. which has a 35% minority interest in Saronikos (Greece) for startup in the spring of 1975. Mitsui Mining and Smelting was building a similar-size manganese dioxide plant in Cork, Ireland, for completion by the summer of 1975.

Molybdenum.—Japan imported 16,613 tons of mostly roasted molybdenum concentrates in 1973, one-half from the United States, nearly one-third from Canada, and about one-eighth from Chile. In 1972, total imports were only 10,235 tons, indicating a surge in demand. Indigenous production has always been nominal. Japan also imports much ferromolybdenum—516 tons in 1972 and 2,292 tons in 1973—to supplement the 2,000 to 3,000 tons of ferromolybdenum produced annually in recent years. During 1973, Japan produced 486 tons of molybdenum powder as well.

AMAX, by far the principal individual supplier, formed a joint venture (34% AMAX) with 10 Japanese ferroalloy producers, under the name of Japan Molybdenum Co., to build a 9,000-ton-per-year molybdenum trioxide plant. The original plan was to build a roasting plant at Ishinomaki in Miyagi Prefecture. However, for financial and foreign exchange reasons, the revised plan is to build a plant at Sumitomo Metal Mining's Shisakajima facility. A final decision had not yet made at yearend, and the switch may affect the identity of Japan Molybdenum Co., which might in fact be dissolved. The original thought was to produce more than half of Japan's needs for molybdenum trioxide. AMAX has a subsidiary (AMAX Japan) to handle all of Japan's import business originating from AMAX enterprises including U.S. molybdenum materials, copper from AMAX enterprises including U.S. molybdenum materials, copper from various sources, Australian iron ore, potash, and large quantities of nonferrous ores.

Nickel.—For lack of indigenous resources, Japan imports all of its nickel requirements. During 1973, 14,299 tons of nickel metal (4,670 tons from Canada, 4,548 tons from the U.S.S.R., 2,140 tons from Norway, and 1,470 tons from the Republic of South Africa); 3,539 million tons of 1.8 to 2.5% nickel ore (2,723 million from New Caledonia and 0.730 million from Indonesia); and 30,391 tons of nickel matte and speiss (19,129 tons from Canada, 6,728 tons from Australia, and 4,534 tons from New Caledonia) were imported. From these raw materials, Japan produced 21,726 tons of nickel and 57,456 tons of nickel contained in ferronickel in 1973. Japan also imported 1,152 tons of semifabricated nickel and alloy products and 938 tons of nickel alloy ingot. Production of nickel metal and ferronickel went up 32% and 6%, respectively. This explained the need to import 12% more ore and concentrate and 130% more matte and speiss in 1973.

Although ferronickel production did not increase significantly, consumption showed a sharp increase in line with a 23% rise in

steel production. Pacific Metals Co. Ltd., Nippon Yakin Kogyo Co., Nippon Mining, Sumitomo Metal Mining Co., and Shimura Kako Co. were the five companies (with six plants) producing ferronickel in Japan during 1973 and their combined annual capacity totaled about 100,000 tons of nickel in ferronickel.

Measured in nickel content, ferronickel was nearly 3 times as important as nickel metal. However, nickel as metal is used in much more diversified areas, headed by steel manufacture, plating, electric machines, brass products, coinage, and catalysts. As of 1973, Japan had two nickel plants (Sumitomo Metal Mining's Niihama plant and Shimura Kako's Tokyo plant) and two nickel oxide plants (Tokyo Nickel Co.'s Matzusaka plant and Nippon Nickel Co.'s Tsuruga plant). Near yearend, Nippon Nickel announced that it plans to complete a nickel plant of 3,000- to 5,000-ton-per-year capacity at its Tsuruga site by the end of 1974 or early in 1975. Nippon Mining considered producing 3,000 tons of nickel and 1,000 tons of cobalt annually at its Hitachi copper smelter by 1975 by processing Australian sulfides. Prior to yearend when Mideast oil supplies were temporarily cut, Shimura Kako was contemplating raising capacity of its Tokyo plant from 600 to 1,000 tons monthly. Also, Sumitomo Metal Mining was hoping to scale up its Niihama plant from 1,500 to 2,000 tons of nickel per month by adopting the fire-refining process, although these plans became rather indefinite.

In mid-1973, Sumitomo Metal Mining, Shimura Kako, Tokyo Nickel, Mitsui & Co., Nissho Iwai, and Sumitomo Metal Industries, Co., paid their first investment to P.T. International Nickel Indonesia (subsidiary of Inco of Canada) for development of nickel resources in the Soroako District, Sulawesi (Celebes) of Indonesia. The deposit of 180 million tons of 1.7% nickel ore will be developed and a smelter will be built for the production of 14,000 tons of nickel (contained in matte) annually over 15 years beginning in 3 to 5 years. In September 1973, Pacific Metals obtained a 40% interest in the Rio Tuba Nickel Mining Co. to help develop a 60-million-ton nickel ore deposit in the Philippines.[13] Scheduled to commence in 1975, shipments to Japan will be raised to 1 million tons annually by 1979. Pacific Metals already has the world's largest electric furnace (40,000 kilowatts) at its Hachinoe (or Hanchinohe) Works, along with other smaller furnaces. It now plans to install a 60,000-kilowatt furnace by 1975 to smelt Philippine ore; when this is completed, Hachinoe's annual capacity to produce ferronickel will be raised from 32,000 to 50,000 tons. New Caledonia and specifically Société Le Nickel, Japan's main supplier of nickel ore so far, reportedly was having financial and operational difficulties.[14]

Tin.—Japan's 1973 tin consumption was second only to that of the United States and ahead of the U.S.S.R. As in the United States, by far the most important areas of use have been in tinplating and soldering. Japan's own production of mine tin was disappearing, with imminent closure of the only two mines—Akenobe and Ikuno—both belonging to Mitsubishi Metal Corp. which also owns the country's small and only tin smelter at Ikuno. Over 95% of the tin is imported as refined tin. Malaysia furnished 25,671 metric tons out of a total of 35,816 tons of refined tin imported by Japan in 1973. Thailand provided 3,642 tons; Indonesia, 4,981 tons; and potentially important, the PRC, 709 tons.

Titanium.—Demand for Japanese sponge titanium has taken a sharp upturn since midyear, mainly because of remodeling of petrochemical and caustic soda plants for pollution control purposes. This explains why production went up 40% to 6,507 tons, which was close to the 1971 level. With consumption controls on oil and power removed, the Japanese titanium industry was hopeful that the peak output level of 9,230 tons attained in 1970 might be surpassed in the coming year. Exports (mainly to the United States) declined from 3,256 tons in 1972 to 2,264 tons in 1973, but overseas demand became brisk at yearend. With production of 2,100 tons and exports of 500 tons in 1973, the titanium fabrication business also improved. Japanese titanium producers had a price problem near the turn of the year, as costs have gone up sharply, but major consumers were still reluctant to permit price rises accordingly.

Japan's well-established titanium and titania industries have no operational diffi-

[13] Japan Metal Bulletin (Tokyo). Sept. 27, 1973, p. 4.

[14] Mining Magazine (London). Difficult Days for New Caledonia. V. 129, No. 3, September 1973, pp. 179–180.

culties except rising costs to meet anticipated greater demand. In sponge titanium, Osaka Titanium Co. Ltd. and Toho Titanium Co. each has a monthly capacity of 450 tons, and New Metals Industries Co. (subsidiary of Nippon Soda Co.) has another 180 tons.[15] The fabricators have been building up, with Kobe Steel accounting for 110 tons of products capacity per month. Nippon Mining and Nippon Stainless Steel Co. 55 tons each, and Furukawa Metal Co., 5 tons.

Japan has also been prominent as a world producer and exporter of titania and synthetic rutile. There were six titania producers together capable of producing about 180,000 tons of titania yearly and headed by Ishihara Sangyo Kaisha, Ltd., and Sakai Chemical Industry Co. Ishihara was the only company among the six with plans to expand capacity—addition of 3,000 tons monthly (chlorine process) with proposed startup by 1975. Ishihara has a 40,000-ton-per-year synthetic rutile plant at Yokkaichi, using ilmenite as raw material, and has contracts to ship 30,000 tons and 50,000 tons to the U.S. firms Glidden-Durkee Co. (subsidiary of SCM Corp.) and New Jersey Zinc Co., respectively, during 1973–76. Ishihara together with C. Itoh & Co. have signed contracts to participate in a joint venture in Brazil[16] to produce titania and intermediate material from ilmenite and anatase. Tohoku Chemical Co. was scheduled to become a "full-fledged titanium dioxide manufacturer." Mitsubishi Metal recently succeeded in upgrading ilmenite to synthetic rutile, which it plans to sell to titanium and titania manufacturers.

Tungsten.—Japan produced only 1,506 tons (1,553 tons in 1972) of tungsten concentrate in 1973 and imported 4,563 tons (only 2,436 tons in 1972). Various mines shutdown, but Awamura Metal Industry Co. continued to be the principal producer. The Republic of Korea furnished 1,473 tons of the 1973 tungsten concentrate imports; Thailand, 842 tons; Canada, 790 tons; Australia, 519 tons; Peru, 301 tons; and the PRC, 263 tons. Hoping for stabilized imports of Chinese tungsten, a mission was sent there at yearend to negotiate possibly 800 tons annually from the PRC on a long-term basis.

Awamura was the sole Japanese ferrotungsten producer. Producer in 1972 was only 609 tons, just over half the 1970 level. Imports in 1972 were only 77 tons, but the figure for 1973 was 598 tons. The three producers of powdered tungsten were Japan New Metals Co. Ltd., Nakahara Construction, and Japan Heavy Metals Co. Their combined output was 2,020 tons, up nearly 40% from 1972. In addition, 204 tons of tungsten powder were imported in 1973 from the United States, West Germany, and France. Overall demand for tungsten was strong. Roughly 40% of the 1973 tungsten supply went to steelmaking, 30% to electronics (wire rod and sheet), and 30% to tungsten carbide tools.

Uranium.[17]—As a result of the Mideast crisis, Japanese officials were considering programs to expedite the development of nuclear energy. At the turn of the year, Japan had only five nuclear powerplants with a combined capacity of 1,820,000 kilowatts and supplying 3% of the country's power. About 16 plants totaling possibly 12 to 14 million kilowatts were scheduled to come onstream by 1977–78. The latest thinking was to expand the share of nuclear energy to more than the original target of 25% by 1985. The hope is to introduce fast breeder reactors. Japan's Power Reactor and Fuel Development Corp. was operating experimental facilities and testing an advanced thermal converter using a "slow-speed boiling light water cooling reactor." Heavy water reactors burning natural uranium (rather than enriched uranium used by light water reactors) were also being investigated. Meanwhile, Japan's Electric Power Development Co. was introducing U.S. technology related to high-temperature gas-cooled reactors.

The Japanese were greatly concerned with the lack of facilities to produce enriched uranium. An almost $2 billion agreement was signed with the United States in March to obtain most of the uranium fuel needed by about 60 Japanese nuclear powerplants during the next 3 decades. Negotiations were underway by yearend for Japan to buy 1.0 to 1.5 million separative work units (SWU's) of enriched uranium annually from France during 1980–90. The Soviets

[15] Plant sites are as follows: Osaka Titanium—Amagasaki in Kyogo; Toho Titanium—Chigasaki in Kanagawa; and New Metals—Nihongi in Niigata.

[16] Japan Chemical Week (Tokyo). Nov. 29, 1973, p. 5.

[17] Journal of Commerce (New York). New Energy Sources Badly Needed by Japan. Apr. 9, 1974, pp. 1 and 3.

offered the Japanese 300,000 to 400,000 SWU's annually between 1976 and 2000 at good prices. The Japanese were also discussing the possibility with the Australian Government to build an enrichment plant in Australia with Japanese technology and money to supply Japan under a long-term contract. Meanwhile, MITI was formulating plans to make it possible for the nation to produce at least one-third of its enriched uranium requirements by 1985.

The Japanese were investing heavily in a gas centrifuge method developed by a British-Netherlands-West German enrichment constortium known as the "Troika" in which Japan is a study group member on centrifuge plant usage.[18] Japan has done experimental work on this subject at the Tokyo Institute of Technology since 1959, and test work at the Tokai nuclear center (100 kilometers north of Tokyo) since 1972. The target date for a production scale plant was 1985. The still unproven gas centrifuge process known as "second generation" enrichment or fast breeder technology is supposedly a relatively cheap device with modest electricity requirements to increase the percent of fissionable uranium-235 in a given quantity of uranium containing mostly uranium-238.

Another planned major step is active participation by the Japanese in the construction of a multinational gas diffusion plant. Separation of uranium by gas diffusion, the existing standard method, involves vast expenditures of energy and capital, with specific technology being proprietary information of their various owners. Since at least one more diffusion plant will probably have to be built somewhere in the world, economic-technological cooperation with one of the owner countries could be highly attractive for Japan. Talks with Americans to build a jointly owned gas diffusion plant in the United States have been going on for some time. Japan also has close ties with France, being France's main client for nuclear material. There is already an agreement in force for France to deliver 5,000 tons of uranium hexafluoride (the gaseous feedstock for the enrichment process) to Japan during 1974–86. Japan was attracted by French terms for a joint diffusion plant. Japan has a comprehensive treaty for atomic cooperation with Australia which has extensive and varied energy resources. The possibility of building a joint diffusion plant in Australia has been mentioned. Late in 1973, the alternative of investing in an enrichment plant in Canada was also a remote possibility.

Japan continued to strengthen its nuclear raw material supply position. Annual requirements for enriched uranium may be on the order of 3,000 tons by 1975 and 3 times this a decade later. Fairly firm commitments to acquire adequate quantities of enriched uranium have already been made. Japan also has long-term contracts for more than 30,000 tons of uranium oxide annually by 1985, although this is still far short of anticipated requirements. Major contracts signed have been with Canada's Denison Mines, Ltd., Rio Tinto Zinc Corp. of Australia, and the U.S. firm, Kerr-McGee Corp. In August 1973, Denison Mines successfully negotiated on behalf of the Japanese for Canadian Government permission to sell 1,000 tons of Denison Mines generated uranium oxide from the Government stockpile for delivery in 1977–81. At yearend 1973 the Overseas Uranium Resources Development Co. (OURD) of Japan signed a basic agreement with the Niger Government and the French Atomic Energy Commission to develop jointly a 0.5% grade 72,000-ton (U_3O_8) deposit in the Akuta Area of Niger.[19] With 25% of the investment (total of Y20 billion with Japan's share at Y5 billion), OURD will take 43.3% of the output, which is planned to be 2,000 tons of uranium-oxide yearly beginning in 1979 and a 3,500-ton production eventually.

The Japanese Government, through the Metal Mining Agency, has given special loans to two overseas Japanese uranium ventures with stipulation that half the loans do not have to be repaid in case of exploration failure.[20] One venture is headed by C. Itoh (70% of Japanese share) and Sumitomo Metal Mining (20%) jointly with the Italian firm Ente Nazionale Idrocarbure (ENI) for exploration in the Kimberley District of Western Australia. The second venture is under Mitsubishi Metal Corp. (60%) jointly with Westinghouse Co's subsidiary and Péchiney Co's subsidiary to explore in the Northern Territory, Australia.

[18] Far Eastern Economic Review (Hong Kong). Japan Turns to Uranium. Sept. 4, 1973, pp. 48–49.

[19] Japan Chemical Week (Tokyo). Feb. 14, 1974, p. 5.

[20] Japan Metal Journal (Tokyo). July 30, 1973, p. 10.

Other Metals.—During 1973 Japan produced 1.05 million troy ounces of gold and 31.6 million troy ounces of silver. Output of gold derived mainly from the smelting of imported nonferrous ores, was nearly 25% higher than in 1972. Imports of gold in 1973 was nearly 4 times the production, and imports of silver, about as much as production. Japan's platinum needs were totally met by imports.

Japan was pushing the United States as the leading world producer of cadmium, a byproduct of zinc smelting. Japan's cadmium output averaged about 250 tons monthly during the last quarter when the economy was down. Domestic consumption, primarily by the cosmetics industry and battery makers, declined somewhat as compared with 1972. Exports in 1973 totaled 1,513 tons, mainly to Western Europe and particularly to or via the Netherlands (1,091 tons), compared with 1,018 tons in 1972.

Japan was involved in all phases of chrome operations. Domestic output of low-grade chromite continued to be only a fraction of imports. Ferrochrome production remained at high levels, registering about 125,000 during the April–June 1973 quarter. Japan's exports of ferrochrome were only about 17,000 tons, mainly to the United States. However, all Japanese ferrochrome producers were interested in smelting overseas. Meanwhile, high-grade ores are imported, specifically 1,163,616 tons in 1973, with 619,338 tons from the Republic of South Africa; 221,224 tons from India; 115,480 tons from the Philippines; and 95,333 tons from the U.S.S.S.R. Japan's five ferrochrome producers (Showa Denko, Japan Metals & Chemicals Co., Nippon Denko, Nippon Kokan, and Awamura Metal Industry Co.) have taken 49% ownership of a joint project with the Brazilian firm Cia. de Ferro Ligas da Bahia S.A. to mine a 100-million-ton ore reserve in Bahia, Brazil. The plan is to produce 100,000 to 200,000 tons of chromite annually beginning in 1974 and 35,000 to 70,000 tons of ferrochrome beginning in 1976. The project was well underway.

Japan produces little antimony ore, but rather relies on imports of the metal in various forms. However, it does produce antimony metal and antimony oxide: 3,206 and 3,639 tons, respectively, in 1972, and 2,783 and 4,492 tons, respectively, in 1973. During 1973, Japan imported 13,959 tons of antimony ore and concentrate (about 50% to 60% grade), including 7,345 tons from Bolivia, 3,014 tons from the PRC, and 1,526 tons from Thailand. Hibino Metals, the main Japanese importer, was negotiating with the PRC late in 1973 for a steady supply of antimony.

Japan also produces many other metals, often as byproducts, usually of high purity, and generally in quantities prominent by world standards. Output of these is shown in table 1.

NONMETALS

Cement.—Japan's cement output set another record in 1973, attaining 78.0 million tons, an 18% increase over the 1972 tonnage.[21] Thus, Japan was pushing the United States as the foremost cement producer in the non-Communist world. All except 1% to 2% of the cement has been consumed internally in recent years, the export trade having steadily declined. Japan's 1973 cement exports were valued at only Y4.8 billion.

Ube Industries, Ltd.'s cement kiln at Isa, Yamaguchi Prefecture reportedly the "worlds largest"—20 feet in diameter, 410 feet in length, and rated at over 2-million-ton capacity per year—went through the first full year of operation. Onoda Cement Co. Ltd. was planning to install a 3,000-ton-a-day kiln at its Ofunato plant, equipped with a new reinforced suspension preheater (RSP) system; another RSP system kiln of 5,500 tons daily was previously completed. Among other new facilities installed were Sumitomo Cement Co.'s 1.2-million-ton plant at Ako Nakamizu (Hyogo Prefecture) and 720,000-ton kiln at Tochigi; Nihon Cement Co. Ltd.'s 1.2 million-ton kiln at Kamiiso (Hokkaido); and Denki Kagaku Kogyo 900,000-ton kiln at Omi (Niigata Prefecture). Chichibu Cement Co. Ltd. was pushing a new process for making cement that can sharply increase unit capacity while cutting down on fuel requirements. Chichibu was also adding a 2 million-ton wet process unit at its Kumagaya plant in Saitama Prefecture. Thus, Japan has some of the world's largest and newest cement facilities.

Fertilizer Materials.—Japan's chemical fertilizer industry, second largest in the

[21] Japan Chemical Week (Tokyo). Feb. 7, 1974, p. 1.

world, had a difficult time in the last quarter after a very profitable first three quarters. Japanese producers were severely hit by soaring oil prices accompanied also by the several-fold increase in phosphate rock prices. Fertilizer production levels did not change greatly late in the year, but cost of raw materials and energy became so unstable that Japanese were hesitant about sales and exports before existing contracts are renegotiated.

Japan's fertilizer industry has long been export-oriented. During 1973, production and exports (in parentheses) of various chemical fertilizers were as follows, in thousand tons: Ammonium sulfate, 2,109 (959); urea, 3,522 (2,454); ammonium chloride, 956 (675); calcium superphosphate, 670 (11); fused magnesium phosphate, 420 (small); and complex fertilizers, 3,512 (157). Total value of all fertilizer exports in 1973 was Y65.5 billion (about $230 million). Approximately two-thirds of the export value was represented by urea, and the PRC took about 80% of the exports. Aside from conventional fertilizers, Japan also exported small quantities of anhydrous ammonia to Malaysia, the Republic of Korea and other countries and aqueous ammonia to the Philippines.

The PRC took 55% of Japan's urea exports, 88% of the ammonium chloride, and 55% of the ammonium sulfate during 1973. At yearend, the PRC was advised that there would be shipping delays which then led to temporary suspension of contract negotiations. The PRC on its part was also weighing the relative advantages of increasing domestic production versus sustaining current levels of fertilizer imports from Japan. The PRC had also purchased fertilizer equipment from Japan, including a 1,000-ton-per-day ammonia plant and a 1,600-ton-per-day urea plant in the fall, to complement two more of exactly the same capacities earlier in the spring. Late in 1973, Japan also sent fertilizer missions to India, Sri Lanka, Indonesia, and other countries to renegotiate contracts.

In contrast to adequate supplies of nitrogen (from the air) and sulfur, Japan continued to be totally dependent upon foreign sources for phosphate rock and potash. During 1973, Japan imported 3,189,935 tons of phosphate rock, including 1,931,257 tons from the United States and 618,484 tons from Morocco. Annual potash needs have been about 1.2 million tons in recent years, nearly half from Canada, 15% to 20% from the U.S.S.R., 10% to 15% from the United States, and 10% each from Israel and West Germany.

Fluorspar.—Japan's output of fluorspar, as in the past, provided only a few percent of the overall supply. Consumption surpassed one-half of a million tons for the fifth year in a row, although growth has not been commensurate with the gains in basic industrial production. About two-thirds of the fluorspar went into steel smelting, and most of the rest into aluminum reduction and manufacture of chemicals. Fluorspar has been particularly essential in oxygen converter or basic-oxygen furnace (BOF) steel smelting as a fluxing material to remove impurities. However, Japanese steelmakers have been successful in reducing fluorspar consumption per unit of steel produced by substituting red mud derived from alumina plants, mixtures of fluorspar with red mud, and other synthetic fluxes, and improving smelting efficiency in general.

Japan's 1973 imports of fluorspar totaled 572,631 tons, including 241,085 tons from Thailand, 158,324 tons from the PRC, 113,542 tons from the Republic of South Africa, 24,138 tons from Kenya, and 17,521 tons from the Republic of Korea. The 1973 total was more than 100,000 tons lower than the 1971 figure but roughly 84,000 tons higher than the 1972 figure. At yearend 1973, large tonnages of fluorspar bought in Thailand were temporarily stockpiled there, partly on account of very high shipping costs. Only a small part of Thai shipments to Japan was acid-grade flotation concentrates. Chinese fluorspar was predominantly metallurgical grade. Mexico was expected to become a significant supplier of aluminum fluoride to Japan as soon as such a plant is completed at Torreon.

Salt.—Japan's salt production of just over 1 million tons in 1973 compared with imports of approximately 7.27 million tons. Domestic output has been fluctuating, whereas imports have been increasing slightly. Breakdown of 1973 imports from the three major suppliers shows 43.7% from Australia, 42.3% from Mexico, and 12.7% from the PRC.

Mexico's largest salt-producing firm, Exportadora de Sal. S.A., which operates the

Guerrero Negro salt complex in Baja California, was sold on April 17, 1973, by the U.S. firm Sea Tankers, Inc.. to Mitsubishi Corp. and the Mexican Government, holding 75% and 25% ownership, respectively. Producing about 5 million tons annually, Guerrero Negro furnished Japan with only about 1 million tons in the past. Under the new management, annual shipments to Japan had already reached a yearly level of 2.8 million tons.

Australia's salt industry has been developed primarily for the Japanese market. Three large producers supplied most of the salt to Japan, namely Dampier Salt Ltd. (annual capacity about 2 million tons), Shark Bay Gypsum Pty. Ltd., and Leslie Salt Co. Recent contracts with the PRC show that yearly shipments to Japan will remain at 1 million tons per year or slightly higher.

Salt is needed in Japan by the steadily expanding chlor-alkali industry, headed by firms like Nippon Soda Co. Ltd., Sumitomo Chemical Co. Ltd., Toyo Soda Manufacturing Co. Ltd., Tokuyama Soda Co., Central Glass Co. Ltd., Kanto Denka Kogyo Co. Ltd., Okayama Chemical Co., Tekkosha Co. Ltd., Ryo-Nichi Co. Ltd., and Nippon Carbide Co. In 1973, Japan produced 3.23 million tons of caustic soda, 1.36 million tons of soda ash, and 2.84 million tons of chlorine. Growth in demand for these products has been estimated at 5% to 8% annually. Difficulty in finding plantsites prompted four Japanese firms to join with Comalco Ltd. to start building a 500,000-ton-per-year caustic soda plant in Pilbara, Australia. Whereas new soda plants in Japan are mostly diaphragm type, the older mercury plants were being modernized with a closed reuse waste water system. Asahi's new caustic process using an ion exchange membrane was being tested against the conventional mercury and diaphragm processes.

Sulfur.—Japan's production of elemental sulfur from indigenous ores has declined to less than 10% of the overall supply and soon may be under 5%. However, sulfur recovered from petroleum refining has been increasing sharply. Output of byproduct sulfur reportedly totaled 680,643 tons, up 154,393 tons, excluding the 47,198 tons by Okinawa Sekiyu Seisei Co. which was newly listed in the statistics.[22]

The Hokkaido refinery of Indemitsu Kosan Co. Ltd., Muroran refinery (Hokkaido) of Nippon Petroleum Refining Co. Ltd., Sendai refinery (Miyagi) of Tohoku Oil Co., and the Nagoya refinery of Toa-Kyoseki were among those starting desulfurization operations during 1973.

Output by Idemitsu Kosan with four refineries and Toa Nenryo Kogyo K. K. with three plants accounted for some 20% of the total. Eleven refineries recovered more than 30,000 tons of sulfur each in 1973, headed by the Chiba refinery of Idemitsu Kosan as the largest (see footnote 22 for detailed list of producers and sulfur output).

Actual production of elemental sulfur was much lower than capacity, which reportedly was 4,364 tons per day in mid-1973. Anticipating additional desulfurization facilities to be installed at the petroleum refineries, it is likely that Japan will have surpluses of sulfur in the future. For the moment, however, there was a slight shortage. The most important areas of sulfur demand were synthetic fibers, carbon disulfide, and Japanese rinsan which together account for 75% of the 1973 total; paper and pulp ranked next with 10% to 15%, respectively.

Japan does not have a resource problem with regard to the sulfur needed for making sulfuric acid, as it has long been one of the worlds' leading producers of pyrite. Dowa Mining's Yanahara mine, Japan's largest pyrite mine, however, has embarked upon a program of retrenchment. Japan also has many cupriferous, zinc, and complex metal mines with sulfide ores. In addition, Japan imports large tonnages of sulfur contained in nonferrous sulfides plus sulfur contained in crude oil. Japan has built up an annual capacity of more than 8 million tons of 100% sulfuric acid.[23] Total Japanese production in October, the last somewhat normal month in 1973, was about 619,000 tons of 100% sulfuric acid. Japan's large nonferrous metal mining companies and smelters were also very prominent in sulfuric acid production, along with chemical and petroleum refining firms.

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[22] Japan Chemical Week (Tokyo). Mar. 28, 1974, p. 5.

[23] Japan Chemical Week (Tokyo). Aug. 23, 1973, p. 5. (This source has detailed listing of all Japanese companies, plants, and their sulfuric acid capacities.)

MINERAL FUELS

Coal.—Japan's domestic coal production continued to dwindle. The approximately 22.5 million tons of coal produced in 1973 was only about two-fifths the output of a decade ago. Compared with 1972 production, the decline was 5 to 6 million tons. The downward trend was expectel to continue and could eventually approach the 15-million-ton annual level. Efforts were being made by the Japanese Government to prevent coal production from dropping below the 20-million-ton level, according to MITI's Coal Mining Council in a report entitled "On Long-term Coal Policy" dated June 29, 1972. The recent energy crunch accentuated the need for preserving internal capability in the production of energy raw materials. and this may mean that some marginal coal mines will be kept open under the present adverse circumstances of high-priced imports.

Among the many kinds of measures considered, the Japanese Government plans to take over long-term debts of coal enterprises. Non-interest loans or outright grants will be given to high-efficiency mines. Higher coal prices will be permitted, and subsidies will be given for mine modernization and safety. The Government will help mining companies to raise part of their operating funds. Large-scale users are urged to purchase definite tonnages of domestic coal. Large-scale coal consumers may be given subsidies to counteract high prices. Help will be given with regard to mine shut-downs, welfare of discharged workers, and establishment of new industries in coal districts.

As in past years. virtually all of the coal produced in Japan during 1973 was bituminous coal. About half the coal was "ordinary" or steam-raising coal, and the other half "raw material" or coking coal plus a little gas coal. Japan's coking coal is mostly weakly caking and generally must be blended with high-grade imports for smelting use. Hokkaido and Kyushu, the two big islands to the north and south of Japan's main island, Honshu, provided the bulk of the coal output with Hokkaido slightly more important than Kyushu. Almost all of the coal comes from big mines, with Miike mine in Kyushu heading the list.

Japan's 1973 energy balance showed that approximately 70% of the energy consumed was derived from imported crude oil; 5% from imported refined petroleum; 2% from imported liquefied petroleum gas and liquefied natural gas; 12% from imported coal; 4% from domestic coal; 5% from indigenous hydropower; and 2% from other sources. Coal consumed in electric power generation was only about 9 million tons in 1973.

The role of coal in steelmaking was much more important then energy. Approximately 64 million tons of coal—nearly 54 million tons of foreign coal and over 10 million tons of domestic coal—were consumed by the steel industry in 1973. Most of the Australian and Canadian coals, which were generally of medium quality, were used as such. In contrast, U.S. coking coals of exceptionally high quality were blended with weakly coking indigenous coals for quality-improvement. During 1973, Japan's total coal imports were just under 57 million tons and Australia, the United States, and Canada furnished nearly 52 million. Specifically, Australia's share was 24.9 million, the United States share 16.5 million, and Canada's share 10.4 million. Japan's coal import costs for the year were Y369 billion, the exchange rate being about Y265 to the $1.00 during the first 9 months and closer to Y300 to the $1.00 at yearend. Since the country's steel production is expected to remain at last year's level, with lesser domestic consumption compensated by anticipated larger exports, coal requirements should also approximate the 1973 tonnage. However, early in 1974, coal deliveries to Japan from the United States and Australia were below anticipated levels.

Although coal deliveries to Japan were fairly stable during most of 1973, the yearend situation was rather confusing, with suppliers generally demanding much higher prices. This could have been expected, in view of the spiraling rise in petroleum prices compounded by widely fluctuating, but generally sharply increasing freight rates. Thus, the cost of imported coal to Japan was readjusting to much higher levels.

During December, the average f.o.b prices (originating country) per ton of foreign coals were as follows, according to Japan's official trade returns: heavy U.S. coking coal of less than 8% ash, about

Y8,400 ($27 at Y300 to US$1.00); heavy Australian coking coal of more than 8% ash, Y5,700 ($19); heavy Canadian coking coal of more than 8% ash, Y5,900 ($20 minus); and Australian "bituminous coal for coking" of more than 8% ash, Y5,300 ($18 minus).

Examples of long-term coal prices being negotiated by the Japanese early in 1974 were as follows, tons f.o.b. originating country: South Bulli coal from New South Wales in Australia, $29; Bellambi coal from Australia, $29; Itman coking coal from the U.S. firm Consolidated Coal Co.; $39; Keystone coking coal from the U.S. firm Castner, Curran & Bullitt, Inc., $39; and Beatrice coal from the U.S. firm Island Creek Coal Co., $41. Canadian prices were comparable. Spot or short-term prices were about $10 per ton higher.

Two key developments near the tum of the year caused concern among Japanese coal importers. Soaring American spot-contract coal prices sparked a movement among leading steel companies in Japan for a campaign to hold down high-priced imports from the United States over a 6-month period. Japanese steelmakers were shocked by a policy decision of the Australian Joint Coal Board to drastically cut back exports of coal from New South Wales, on account of a sharp decline in coal production due to heavy rainfalls and coal mine stokes.

Meanwhile, Japan continued to make long-term coal purchase and development contracts. For example, a 15-year (1976–91) contract was signed with Gregg River Resources Corp. of Canada for the delivery of about 21 million tons of low-sulfur, less than 9% ash coking coal, with the prices to be negotiated later. The Japanese were looking into the development of the Babcock coal mine in British Columbia with the hope that 2 million tons of coal might be produced annually by 1979, all for export to Japan. A 12-year contract was signed with Kembla Coal and Coke Pty., Ltd., of Australia (1974–86) for about 27 million tons of "Coal Cliff Coal"; again, prices were subject to renegotiation. A tentative agreement was reached with the Soviet Mining and Industrial Products Export-Import Corp. for the importation of 88 million tons of Nelinugra coal from the South Yakutsk coalfield during 1983–99. Also, the annual tonnage of Soviet coal from Kuznetsk would be upped from 1 million to 3 million tons during 1979–98. For the Soviet deals, the Japanese would furnish more than $400 million in loans and credits to purchase equipment from Japan and elsewhere.

Petroleum.—As in 1972, Japan again broke the record in almost every category of the petroleum enterprise. Although the Middle East crisis was keenly felt towards yearend, most of 1973 was not greatly affected and hence overall growth in consumption was fairly normal. Crude oil (including "raw petroleum oil" or "partly refined oil") imports during 1973 reached 1.82 billion barrels (or 290 million kiloliters), up 16% over the revised figure for 1972. Imports or refined petroleum remained small, corresponding to about 12% of the crude oil. In 1973, value of crude oil imports increased 35% to Y1,633 billion (about $5.7 billion). Refinery output also registered a significant gain. Near yearend, Japanese refineries were instructed by MITI to release some stocks so as to hold the oil slash to basic industries at about 10% of normal supply. From October 1972 to October 1973, reportedly 721,000 barrels per day of refinery capacity was added; capacity was not increased further the last quarter of 1973. Continued emphasis was placed on building oil storage facilities capable of holding 60 days of stocks by March 1975.

Two laws related to the oil crisis—Petroleum Supply Adjustment Law and National Livelihood Stabilization Law—went into effect on December 22, 1973.[24] These two laws plus the updated Price Control Ordinance and the Strengthened Anti-Speculation Law authorized the Government to control the national economy which was suffering from violent inflationary pressures stemming from the oil crisis. Earlier on November 16, 1973, the first-stage energy-saving program calling for a 10% across-the-board (including basic industries) cut in oil and electricity consumption had gone into effect to cover the period through the end of December. A second-stage program calling for slashing power and oil consumption by 20% beginning in January 1974 was held back at the last minute when the Organization of Arab Petroleum Exporting Countries decided to list Japan as

[24] Work cited in footnote 4.

a "friendly nation" and relax its oil supply cutback to Japan. The country's efforts in "resources diplomacy" might have contributed to this result.[25] Prime Minister Tanaka, Deputy Prime Minister Miki, and MITI, Minister Nakasone visited many important oil producing countries late in December 1973 and early in January 1974.

Reflecting some improvement in the oil supply position early in 1974, attention in Japan switched to the problem of prices. On February 19, MITI announced that anticipated oil arrivals in March should reach 150 to 160 million barrels, substantially more than forecast earlier and that therefore restraints on the use of fuel oil and electricity by industry would be eased. Sharp cost and price increases in oil were compounded by a general price inflation of more than 30% in 1973. According to government figures, crude oil prices paid by Japan had doubled in 1973, while wholesale prices of most petroleum products were raised by around 60% to 90%. Kerosine was the only product featuring a moderate increase because of frozen prices. By January 1974, with crude oil costs f.o.b. Middle East up to $8 or $9 per barrel, a further 50% price rise for products was being freely forecast for Japan. Oil products were further threatened by a January 1 boost in crude oil prices—up 125% in the Middle East.

However, MITI was trying to postpone or hold back price increases. Meanwhile, Japan's Fair Trade Commission started legal action against 12 refinery companies for price fixing and illegal allocation of crude oil deliveries.

The momentous and rapid-fire developments in petroleum matters prompted the Japanese to consider changes in policy.[26] First the Overall Energy Council was approached by MITI for recommendations regarding revision of the July 1962 Petroleum Industry Law now in force, with the thought that the Japanese oil industry should be reorganized. The feeling was that the Japanese Government's effort to develop mainly foreign resources with Japanese capital in order to tie-up the oil did little to help the nation out of the crisis. Secondly, the Japanese refining and marketing industry has long been suffering from low profitability and weak corporation strength and therefore triggered off price increases. Thirdly, the Japanese oil industry's downstream operations are split into those affiliated with international companies and those wholly owned by Japanese capital. The "internationals" were doing well, whereas the Japanese independents may report large financial deficits in the future.

MITI believes that consolidating the marketing divisions of various independent oil companies into the Kyodo Oil Co. Ltd. (combined refining capacity of 954,350 barrels daily or 17.6% Japan's national total) and assisting these companies with long-term, low-interest loans (over $375 million combined worth of loans through the Japan Development Bank) to expand refining and marketing facilities has achieved excellent results. New versions of Kyodo Oil were being considered to embrace other companies. MITI was even looking into the consolidation of Arabian Oil Co. (Japanese firm in Kuwait-Neutral Zone) with Kyodo Oil to form Japan's first integrated oil company.

Regarding the financial assistance by the Japanese Government for exploration and development, the Japan Petroleum Development Corp. (JPDC) has spent about Y92.2 billion (or about $320 million) from its inception in 1967 to yearend 1973 in the way of loans and investment. JPDC was also able to guarantee private companies liabilities related to development projects to the amount of Y82.5 billion.

Crude oils developed by Japanese capital represented 5.6% of Japan's total 1973 imports. The countries "direct deal" crude oil imports accounted for 2%, and "Japanese suppliers", another 12%. Thus, the Japanese say that only about one-fifth of the supply was controlled internally, whereas four-fifths was supplied by major international oil companies. With regard to refining and distribution, the "international" share was about 50%. It was felt that because the Japanese oil industry was under strong influence of foreign interests, it follows that the "oil crisis" was able to deal such a "fatal blow" to the Japanese economy. Thus, new concepts of petroleum policy were in the process of formation.

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[25] Japan Petroleum Weekly (Tokyo). Japan Petroleum Consultants, Ltd. V. 9, No. 4, Jan. 28, 1974, pp. 1-3.

[26] Japan Petroleum Weekly (Tokyo). Japan Petroleum Consultants, Ltd. V. 9, No. 10, Mar. 11, 1974, pp. 1-3.

As of December 31, 1973, Japan had 48 refineries owned by 31 companies, with a total atmospheric distillation capacity of 5,410,360 barrels per day (bpd). Corresponding downstream capacities were as follows: Vacuum distillation, 1,540,200 bpd; catalytic cracking, 320,100 bpd; catalytic reforming, 541,800 bpd; middle distillates hydrodesulfurization, 1,100,800 bpd; fuel oil desulfurization, 861,500 bpd; hydrocracking, 12,500 bpd; lube oil solvent extraction, 69,160 bpd; lube oil solven deasphalting, 49,100 bpd; lube oil solvent dewaxing, 58,070 bpd; sulfur recovery, 4,543 tons per day; and liquefied petroleum gas (LPG) recovery, 22,350 tons per day.[27] There were 35 vacuum distillation units, 39 catalytic reforming units, and 19 catalytic cracking unit. As of yearend, Japan also had 1,983,000 bpd of additional refining capacity under construction or being planned. Japanese refineries and their capacities are listed in the following tabulation:

[27] Pages 6–8 of work cited in footnote 25.

Company and refinery	Capacity (barrels per day)	
	December 1973	October 1974
Asia-Kyoseki: Sakaide	60,000	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
Onahama	--	30,000
Fuji Sekiyu: Sodegaura	140,000	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
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	100,000	150,000
Kyushu Sekiyu: Oita	170,000	170,000
Maruzen Sekiyu:		
Chiba	195,000	195,000
Matsuyama	50,000	50,000
Shimotsu	37,500	37,500
Mitsubishi Sekiyu:		
Kawasaki	105,000	105,000
Mitsushima	220,000	270,000
Nansei Sekiyu: Nishihara (Okinawa)	80,000	80,000
Nichimo Sekiyu: Kawasaki	100,000	100,000
Nihonkai Sekiyu: Toyama	60,000	60,000
Nihon Kogyo:		
Funakawa	14,150	14,150
Mizushima	235,200	235,200
Nihon Sekiyu: Niigata	26,000	26,000
Nihon Sekiyu Seisei:		
Kudamatsu	42,000	42,000
Muroran	110,000	110,000
Negishi	330,000	330,000
Yokohama	70,000	70,000
Okinawa Sekiyu: Henza (Okinawa)	100,000	100,000
Seibu Sekiyu: Yamaguchi	110,000	190,000
Showa Sekiyu:		
Kawasaki	149,000	149,000
Niigata	43,000	43,000
Showa Yokkaichi: Yokkaichi	310,000	310,000
Taiyo Sekiyu: Nikuma	59,000	69,000
Teiseki Topping: Kubiki	4,410	4,410
Toa Nenryo Kokyo:		
Kawasaki	200,000	200,000
Shimizu	43,500	43,500
Wakayama	187,000	257,000
Toa Sekiyu:		
Kawasaki	100,000	100,000
Nagoya	100,000	100,000
Toho Sekiyu: Owase	40,000	40,000
Tohoku Sekiyu: Sendai	70,000	100,000
Toyo Sekiyu: Nakagsk (Okinawa)	28,000	28,000
Total	5,410,360	6,040,360

Japan's meager oil and natural gas output remained at low levels. However, the Japanese were hopeful about the offshore potential. East Japan Oil Development Co., Teikoku Oil Co. Ltd., and Esso Abukuma, Inc., jointly completed their first gas well successfully in the Joban District on offshore Fukushima Prefecture during the second half of 1973, developing a daily output capacity of 320,000 cubic meters; a second well was dry. Idemitsu Exploration Co. (Japan Sea) Ltd. and Japan Offshore, Ltd., have been jointly involved in offshore exploration off Niigata and Akita Prefectures; 10 wells have been drilled and 2 of 6 successful wells were brought in early in 1973 in the Aga Field.

Near yearend, Japan successfully negotiated two treaties with the Republic of Korea for delimitation of the northern part of the Continental Shelf and for joint exploration and exploitation of seabed oil and natural gas resources in the southern part of the Shelf. The PRC considered this act as an infringement of China's sovereignty, arguing that the Continental Shelf of the East China Sea is an extension of the Chinese Continent. Meanwhile, the PRC continued to be interested in Japanese offshore drilling rigs for use in their own offshort areas. Japanese-made offshore rigs were gaining popularity elsewhere in the world also.

During 1973, Japan obtained 34% of its crude oil from Iran, 23% from Saudi Arabia, 9% from Kuwait, 9% from the United Arab Emirates, 14% from Indonesia, 3% from Brunei, 2% from Nigeria and 6% from all others. Comparing December 1973 with April–September 1973 figures, the supply from the Middle East declined from 78.2% to 72.3%; that from Southeast Asia increased from 17.9% to 21.1%; and that from "others" (including the Republic of South Africa, the PRC, the U.S.S.R., Venezuela, and Australia) increased from 3.9% to 6.6%. Except for Iran and Kuwait, all supplying countries made significant gains over 1972, with Saudi Arabia, Indonesia, and the United Arab Emirates gaining in the 60-million-barrel range, and Brunei increasing from 35 million to 63 million and Nigeria from 27 million to 38 million barrels. Japan's actual imports in December 1973 were nearly 160 million barrels indicating that the Arab boycott had little effect on the tonnage imported although prices soared.

Because of the increasing importance of governmental companies in the oil-producing countries, MITI and Japanese oil firms have embarked on a policy of direct purchasing of "participation crude" from these companies. Early in the year, Abu Dhabi signed an 8-year direct sales participation agreement with the shipping company Japan Line. A direct crude oil purchase contract was subsequently concluded between the Saudi Arabian Government and seven Japanese oil refinery companies for 70,000 bpd for the latter part of 1973. This may portend more broad-ranging economic cooperation with Saudi Arabia, such as the $1 billion petrochemical plant being constructed by the Japanese firm Overseas Petroleum Corp. for Petromin of Saudi Arabia. A long-negotiated project in Iran for Japanese financial and technical help in the construction of a 500,000-bpd refinery and delivery of refinery products to Japan did not materialize.

Japan's Abu Dhabi Oil Co. brought the Mubarras Field into production in May, with initial rate of 40,000 bpd to be upped to 100,000 bpd by 1976. The recent agreement between the Overseas Petroleum Corp. representing a Japanese consortium and British Petroleum Co., Ltd. (BP), called for the purchase of 45% of BP's equity interest in Abu Dhabi Marine Areas Ltd. for about $780 million and acquisitions by the Japanese of 4 billion barrels of crude over 30 years. Japanese firms were also considering the construction of a large refining, chemical, fertilizer, and aluminum complex in Abu Dhabi to utilize the abundant local oil and gas.

Japan takes about 75% of Indonesia's oil exports and more than 50% of that country's production. It is involved in many different kinds of oil and gas activities in Indonesia. A 10-year contract between Japanese firms and Pertamina, involving 50 million tons per year of low-sulfur crude from Indonesia, was initiated only 1 year ago; Japan would provide untied 3% soft loans of $200 million plus $100 million from private circles at 6.25% interest. Japan was committed to help build a $130 million, 100,000-bpd refinery in Japan. Late in 1973, the Japanese Government decided to offer $200 million in credits for the de-

velopment of natural gas deposits in Indonesia as part of a two-part $900 million natural gas liquefication (LNG) project in which the United States would also be involved. LNG plants would be built in North Sumatra and East Kalimantan. Japan would receive 7.5 million tons of LNG annually (large shipments would also go to the United States) for 20 years starting in 1977. A new company, Japan Indonesia LNG Company, Ltd., was established to handle affairs on the Japanese side.

The Japanese and Soviets were hopeful on a "Siberian Accord." The Soviets were asking for more than $7 billion in credits to buy Japanese and some American equipment for five major projects—Tyumen oil in Western Siberia, gas from northern Yakutsk, coking coal from southern Yakutsk, and lumber and offshore oil exploration near Sakhalin Island. The Soviets wanted the Japanese to make a decision so that they can work it into Moscow's next 5-year plan beginning 1976. Japan's joint venture project with the Nigerian Government has already yielded concrete results; in fact, the goal of obtaining 6 million kiloliters of oil per year from Nigeria was already achieved in 1973. A group of Japanese industrial firms was planning to participate in an Australian $6 billion industrial complex in Pilbara, Western Australia, to utilize extensive natural gas reserves, 20 billion tons of high-quality iron ore. and aluminum raw materials.

The Mineral Industry of Kenya, Tanzania, and Uganda

By Avery H. Reed [1] and Robert G. Clarke [2]

KENYA [3]

The mineral industry of Kenya operated at record levels in 1973. Output increased 10% and was 1% above the 1971 record. New annual records were set for the production of barite, carbon dioxide, fluorspar, gem stones, iron ore, and soda.

Petroleum refinery output increased. New records were set for the output of motor gasoline.

The principal exports from Kenya were cement, residual fuel oil, soda, and scrap iron. Leading imports were crude petroleum, iron and steel products, coal, and fertilizers.

Kenya will construct a new 440-mile highway, with the help of a $29 million World Bank loan.

COMMODITY REVIEW

Metals.—*Iron Ore.*—Output of magnetite for use by the cement industry, expanded to a record 12,345 tons.

Lead.—Development work at the Kinagoni lead, silver, and zinc mine continued. Operation of the mine is to be by Industrial and Commercial Development Corp. (51%) and Geomin, a Romanian Government entity (49%). Reserves are 3 million tons of 7.5% lead, 4.2 ounces of silver, and 0.6% zinc ore.

Nonmetals.—*Barite.*—Output of barite was a record 903 tons, 22% above the 1971 record. Reserves of high-grade barite at Vitengeni were estimated at 100,000 tons.

Cement.—Cement production increased 8% to 791,190 tons but was 2% below the 1971 record.

Clays.—Kaolin production increased 32% to 947 tons.

Diatomite.—African Diatomite Industries Ltd. mined 124 tons of diatomite at the Kariandusi mine near Gilgil.

Fluorspar.—Fluorspar Co. of Kenya Ltd. owned by the Kenya Government (51%), Bamburi Cement Co., and Continental Ore Corp., mined a record 26,733 tons of fluorspar at its Kerio Valley mine in the Rift Valley. Reserves are estimated at 6 million tons proven, 4 million tons probable, and 6 million tons inferred of 50% ore. The company has obtained loans from United States banks totaling $2 million to build a flotation mill. All the ore mined to date has been metallurgical grade.

Gem Stones.—The record output of gem stones was valued at $99,010. Minerals collected included amethyst, aquamarine, garnet, ruby, sapphire, tourmaline, and topaz.

Salt.—Output of salt from Lake Magadi increased 11% but was 51% below the 1968 record.

Soda Ash and Trona.—Output of soda from Lake Magadi increased 32% to a new annual record, 18% above the 1970 record. Production was 201,009 tons valued at $6,623,000. Reserves are more than 100 million tons.

Vermiculite.—Output of vermiculite decreased 7% to 871 tons valued at $15,180.

Wollastonite.—Production of wollastonite

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[1] Supervisory physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

[2] Physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

[3] Prepared by Avery H. Reed.

Table 1.—Kenya: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Beryllium, beryl concentrate, gross weight	--	(1)	--
Copper, mine output, metal content	73	72	e 70
Gold, mine output content—troy ounces	--	31	5
Iron ore, gross weight	1,205	8,382	12,345
Lead, mine output, metal content	--	2	--
Silver, mine output, metal content—troy ounces	--	--	6
NONMETALS			
Barite	743	628	903
Cement, hydraulic	803,823	734,354	791,190
Clays, kaolin	NA	718	947
Diatomite	1,400	1,812	124
Feldspar	2,650	1,962	1,461
Fertilizer materials, crude, phosphatic, guano	350	147	NA
Fluorspar	6,561	10,457	2 26,733
Gem stones, precious and semiprecious:			
Aquamarine—kilograms	--	18	18
Garnet [3]—do	12	24	18
Ruby—do	r 3	6	--
Sapphire—do	NA	47	450
Tourmaline—do	NA	1	NA
Gypsum and anhydrite:			
For cement production	4 91,872	NA	e 90,000
Other	NA	NA	e 10,000
Total	91,872	e 100,000	e 100,000
Lime	28,127	22,854	32,546
Magnesite, crude	221	628	1,517
Salt:			
Marine	43,406	22,756	30,946
Rock	4,430	5,010	NA
Total	47,836	27,766	30,946
Soda, raw crushed (trona)	1,923	3,665	4,121
Soda ash	161,260	148,617	196,888
Stone, sand and gravel:			
Calcareous:			
Coral (for cement manufacture)—thousand tons	918	NA	NA
Kunkur for cement manufacture	51,499	61,757	54,712
Limestone for cement manufacture—thousand tons	1,015	NA	121
Sand	8,728	12,900	12,511
Shale	187,050	e 185,000	e 180,000
Volcanic ash for cement manufacture	1,866	2,633	--
Vermiculite	1,359	932	871
Wollastonite	--	--	55
MINERAL FUELS AND RELATED MATERIALS			
Carbon dioxide, natural	1,051	1,124	1,666
Petroleum refinery products:			
Gasoline, motor—thousand 42-gallon barrels	2,776	2,756	2,842
Jet fuel—do	e 2,010	e 2,056	--
Kerosine—do	e 861	e 761	2,912
Distillate fuel oil—do	3,585	3,690	3,882
Residual fuel oil—do	8,136	7,967	5,655
Other—do	495	435	3,439
Refinery fuel and losses—do	496	720	571
Total—do	18,359	18,385	19,301

e Estimate. p Preliminary. r Revised. NA Not available.
[1] Less than ½ unit.
[2] Sales only.
[3] Quality (gem or industrial) not specified.
[4] Figure probably includes gypsum for other than cement production.

Table 2.—Kenya: Exports of major mineral commodities to countries outside the East African Economic Community[1]

(Metric tons unless otherwise specified)

Commodity		1971	1972
METALS			
Aluminum metal, including alloys, all forms	value	$1,186	$12,566
Iron and steel metal:			
Scrap		1,791	2,729
Semimanufactures:			
Bars, rods, angles, shapes, sections:			
Wire rods		94	--
Other rods and bars		820	45
Angles, shapes, sections		2	111
Universals, plates, sheets		63	198
Wire		33	13
Tubes, pipes, fittings		12	9
Other:			
Ore and concentrate of base metals, n.e.s		--	2
Nonferrous metals, scrap, n.e.s		2,460	3,163
NONMETALS			
Abrasives, natural, n.e.s		743	592
Cement		331,688	372,208
Clays and clay products, including all refractory brick		2	--
Fertilizer materials, manufactured:			
Phosphatic		--	50
Other, including mixed		1,829	--
Gypsum and plasters		--	1
Lime		--	10
Magnesite		--	265
Precious and semiprecious stones, except diamond, natural	value	$2,123	$59,222
Salt and brine		681	383
Sodium compounds, soda ash, sodium carbonate		149,907	144,718
Stone, sand and gravel: Sand, excluding metal bearing		19	53
Sulfur, sulfuric acid		(2)	2
Other nonmetals, n.e.s	value	$47,422	$19,456
MINERAL FUELS AND RELATED MATERIALS			
Oxygen, nitrogen, hydrogen, rare gases	do	$18,517	$31,630
Petroleum refinery products:			
Gasoline, including natural	thousand 42-gallon barrels	158	187
Kerosine	do	50	74
Jet fuel	do	1,338	1,502
Distillate fuel oil	do	778	765
Residual fuel oil	do	4,876	4,572
Lubricants	do	176	214
Other:			
Nonlubricating oils, n.e.s	42-gallon barrels	39	45
Liquefied petroleum gas	do	36	44
Bitumen and other residues	do	22,713	21,561
Bituminous mixtures, n.e.s	do	2,412	1,212

[1] Excludes reexports.
[2] Less than ½ unit.

Table 3.—Kenya: Imports of major mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, including alloys:		
Unwrought ——value——	$2,399	$612
Semimanufactures	1,098	979
Copper metal, including alloys, all forms	1,233	536
Gold, metal ——troy ounces——	14,631	20,990
Iron and steel:		
Ore and concentrate	100	10
Metal:		
Scrap	73	--
Pig iron ferroalloys, similar materials	1,270	1,729
Steel, primary forms	18,461	22,152
Semimanufactures:		
Bars, rods, angles, shapes, sections:		
Wire rod	8,309	9,662
Other bars and rods	26,582	2,082
Angles, shapes, sections	16,586	10,072
Universals, plates, sheets	r 73,171	60,463
Hoop and strip	1,763	2,291
Rails and accessories	4,927	2,073
Wire	9,464	7,677
Tubes, pipes, fittings:		
Cast iron tubes and pipes	825	652
Seamless tubes and pipes, except cast iron	4,341	9,491
Welded and clinched tubes and pipes	7,585	10,639
High pressure steel hydroelectric conduits	2	--
Tubes and pipe fittings	1,673	1,654
Castings and forgings, rough	3	4
Lead metal, including alloys:		
Unwrought	599	537
Semimanufactures	50	31
Manganese ore and concentrates	330	305
Nickel metal, including alloys, all forms	8	2
Platinum-group metals, including alloys, all forms ——troy ounces——	124	109
Silver metal, including alloys, all forms ——do——	7,543	11,759
Tin metal, including alloys, all forms ——long tons——	178	180
Zinc metal, including alloys:		
Unwrought	2,107	2,621
Semimanufactures	528	1,061
Other:		
Nonferrous metals, scrap	45	129
Metals, including alloys, all forms ——value——	$55,889	$1,826
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	191	170
Grinding and polishing wheels and stones	68	99
Asbestos	--	11
Cement	42,064	63,978
Clays and clay products, including all refractory brick:		
Crude clays, n.e.s	842	723
Products:		
Refractory, including nonclay brick	2,435	1,587
Nonrefractory	2,103	1,747
Diamond, gem, not set or strung ——carats——	1,095	215
Fertilizer materials:		
Crude:		
Nitrogenous	--	200
Phosphatic	--	200
Potassic	919	--
Manufactured:		
Nitrogenous	r 41,025	54,668
Phosphatic, including basic slag	22,687	15,421
Potassic	3,080	7,380
Other, including mixed	44,530	52,290
Ammonia	81	49
Graphite, natural	--	62
Lime	91	43
Magnesite	1	2
Mica:		
Crude, including splittings and waste	74	12
Worked, including agglomerated splittings ——value——	$2,003	$4,746
Pigments, mineral, including processed iron oxides	1,695	1,164
Precious and semiprecious stones, except diamond:		
Natural ——value——	$86,460	$37,504
Manufactured ——do——	$38,363	$21,787
Salt and brine	6,785	6,777
Sodium and potassium compounds, n.e.s	5,170	3,410

See footnotes at end of table.

Table 3.—Kenya: Imports of major mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1971	1972
NONMETALS—Continued			
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked		24	--
Worked		38	56
Dolomite, chiefly refractory grade		74	211
Gravel and crushed rock		974	705
Limestone [1]		9,356	339
Quartz and quartzite		1	3
Sand, excluding metal bearing		44	96
Sulfur:			
Elemental		1,154	506
Sulfuric acid		176	80
Other nonmetals, n.e.s.:			
Crude	value	$88,438	$99,492
Oxides and hydroxides, n.e.s	do	$100,724	$87,808
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s		4,633	2,651
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural		734	646
Coal and briquets:			
Anthracite and bituminous coal		81,271	39,142
Briquets of anthracite and bituminous coal		--	46
Coke and semicoke		1,440	1,269
Hydrogen, helium, rare gases	value	$15,192	$56,607
Peat, including peat briquets and litter		--	2
Petroleum:			
Crude and partly refined	thousand 42-gallon barrels	r 18,692	18,401
Refinery products:			
Gasoline	do	351	665
Kerosine and jet fuel	do	248	495
Distillate fuel oil	do	319	472
Residual fuel oil	do	1	--
Lubricants	do	335	498
Mineral jelly and wax	do	17	45
Other	do	22	29

r Revised.

[1] Includes gypsum, plasters, limestone flux, and similar stone used for the manufacture of lime or cement.

began at Turoka and output totaled 55 tons valued at $3,080. Reserves are more than 1 million tons.

Mineral Fuels.—*Petroleum.*—Crude petroleum has not been discovered in Kenya and the oil refinery at Mombasa operated solely on imported crude oil.

However, several companies were active in oil exploration. All the potential oil producing areas in Kenya are now covered by oil exploration licenses. Licenses were issued to: Adobe Oil Co., Burmah Oil Development, Inc., and Cities Service Co. covering 20,000 square kilometers in the northeast corner of Kenya; Chevron Oil Co. of Kenya covering 50,000 square kilometers south of the Adobe concession; Canadian Superior Oil Ltd. covering 27,000 square kilometers and Louisiana Land and Exploration Co. covering 32,000 square kilometers south of Chevron; and three other companies covering 38,700 square kilometers in the southeast corner, including offshore areas. The total area under license is 167,700 square kilometers.

The capacity of the Mombasa refinery will be expanded from 48,000 to 80,000 barrels per day. Output of refined products increased 14% over 1972 to a record 19.3 million barrels, an average of 53,000 barrels per day.

Asphalt.—Output of asphalt increased 5% to 297,000 barrels but was 51% below the 1970 record.

Carbon Dioxide.—Production of carbon dioxide from two wells was a record 1,666 tons.

Gasoline.—Production of motor gasoline was a record 2.8 million barrels.

Liquefied Petroleum Gas (LPG).—LPG production increased 12% to 173,000 barrels but was 8% below the 1971 record.

TANZANIA [4]

Diamond continued to be the most important mineral mined and accounted for about 91% of the total value of mineral exports.[5] Diamond production in 1973 in carats decreased about 23% compared with that of 1972. However, 1973 diamond exports in carats decreased only 11% as some sales were made from inventory. The export value of diamond in 1973 increased 20% over that of 1972 due to higher world prices.

The State Mining Corp. was established in August 1972 under the Public Corporations Act of 1969 and became operational at the beginning of 1973. Williamson Diamonds Ltd., Tanzania Diamond Cutting Co. Ltd., Tanzania Gemstones Industries Ltd., Tanzania Portland Cement Co. Ltd., Nyanza Salt Mines Ltd., and Mkomazi Gypsum Ltd. were transferred to the State Mining Corp. from the National Development Corp. (NDC). The State Mining Corp. established an Exploration Department at Dodoma for assessing past geological survey reports on the exploitation of mineral deposits. During 1973, the State Mining Corp. Exploration Department prospected for gypsum at Mkomazi, gold in the Geita District, cement raw materials at Tanga and at Mbeya, and assessed coastal beach sands between Dar Es Salaam and Bagamoyo for heavy minerals such as ilmenite, rutile, and zircon.

Williamson Diamonds Ltd. prospected within its mining lease at Mwadui and in the Selous Game Reserves where two kimberlite occurrences were located but proved to be uneconomical.

The process of mapping geologically the whole of Tanzania continued. With completion of quarter degree sheets 66, 67, 256, and 277, 64% of Tanzania has been geologically mapped to the scale of 1:125,000.

The demand for building materials continued in and around the larger towns and in those areas where dams, large scale road works, and railroad construction were in progress. Production and sales of both cement and lime increased so that pressure to search for building raw materials was intensified.

The ever-increasing oil demands in Tanzania and neighboring Zambia motivated the installation of a single-buoy mooring facility convenient to the harbor of Dar Es Salaam for tankers up to 100,000-deadweight-tons capacity.

PRODUCTION AND TRADE

Available data on mineral production and trade are shown in tables 4, 5, and 6.

COMMODITY REVIEW

Metals.—*Gold and Silver.*—Production of gold and byproduct silver decreased 74% and 92%, respectively. A team from the U.S.S.R. under contract to the State Mining Corp. prospected for gold in the Chunya and Mpanda Areas. The State Mining Corp. Exploration Department carried out a gold prospecting program in the Sekenke Area northwest of Dodoma and in the Geita District. The exploration programs were intended to revive mining in the goldfields.

Tin.—The production of tin concentrate decreased 55% in quantity of which less than half was exported. The value of tin concentrate exported decreased 71%. Tin produced in Tanzania by small-scale tin miners was sold across the border at Kikagati, Uganda to the Uganda National Trading Corp. for prices higher than could be obtained in Tanzania.

Nonmetals.—*Cement.*—Cement production by the Tanzania Portland Cement Co. Ltd. at its Wazo Hill plant increased 33% in 1973 over that of 1972.

Tanzania Portland purchased 13,892 tons of gypsum from local producers to be used in cement manufacture. In addition to cement usage, 4,218 tons of gypsum was exported to Uganda and Kenya.

Clays and Quartz (Glass Sand).—Beneficiation of kaolin-rich sandstone in the Pugu Hills by Tanzania Refractories and Bricks Limited yielded 870 tons of kaolin and 15,233 tons of glass sand, all for local consumption.

Diamond.—The management of the Mwadui mine of Williamson Diamonds Ltd., which had hitherto been by De Beers Consolidated Limited, was transferred to Tanzanian personnel and the chairman ap-

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[4] Prepared by Robert G. Clarke.

[5] Ministry of Commerce and Industries, Geology and Mines Division (Dodoma, Tanzania). Review of the Mineral Industry in Tanzania for the Year 1973. 1974, 7 pp. (This review provided much information for other parts of this subchapter.)

Table 4.—Tanzania: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Gold, refined ——troy ounces	167	213	56
Silver, refined ——do	36	45	4
Tin, mine output, metal content ——long tons	136	51	23
Tungsten, mine output, metal content	7	4	1
NONMETALS			
Cement, hydraulic	179,300	236,956	314,002
Clays, kaolin	830	1,460	870
Diamond:			
Gem e 1 ——carats	418,595	r 326,023	250,730
Industrial e 1 ——do	418,595	r 326,022	250,729
Total ——do	837,190	652,045	501,459
Gem stones, precious and semiprecious, except diamond:			
Amethyst ——kilograms	69	80	NA
Aquamarine ——do	2	3	NA
Beryl (gem only) ——do	35	100	NA
Chrysoprase and opal ——do	5	31	NA
Corundum (gem only) ——do	33	(2)	NA
Garnet ——do	33	104	NA
Ruby and sapphire ——do	11	20	NA
Tourmaline ——do	2	9	NA
Zircon ——do	(2)	3	NA
Zoisite (tanzanite) ——do	16	60	NA
Gypsum and anhydrite, crude	17,691	14,121	12,872
Lime (quicklime and hydrated lime)	5,203	1,862	5,988
Magnesite, crude	982	58	109
Meerschaum	8	30	14
Mica:			
Sheet	37	18	32
Scrap e	13	13	13
Salt, all types	37,278	32,467	38,392
Stone, sand and gravel:			
Ornamental stones:			
Art stone	(3)	5	2
Amethystine quartz	r (2)	30	186
Glass sand	r 2,244	1,489	15,233
Vermiculite	29	--	--
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous	2,798	3,464	1,994
Petroleum refinery products:			
Gasoline, motor ——thousand 42-gallon barrels	1,041	1,128	974
Jet fuel ——do	444	459	445
Kerosine ——do	121	148	148
Distillate fuel oil ——do	875	1,299	1,289
Residual fuel oil ——do	2,379	2,501	2,394
Other ——do	54	58	76
Refinery fuel and losses ——do	609	369	337
Total ——do	5,523	5,962	5,663

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

1 Estimates based on reported total diamond output and best available information on ratio of gem to industrial stones in total output.

2 Less than ½ unit.

3 Revised to none.

Table 5.—Tanzania: Exports of commodities to countries outside the East African Economic Community [1]

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, including alloys, all forms	239	277
Gold metal, unworked or partly worked ——troy ounces	155	100
Iron and steel:		
Scrap	r 967	1,198
Semimanufactures	r 107	98
Silver metal, including alloys ——troy ounces	35	14
Tin ore and concentrate ——long tons	139	76
Tungsten ore and concentrate	5	27
Other, nonferrous metal scrap	1,368	879
NONMETALS		
Cement	5,084	9,970
Clays and clay products, including all refractory brick	--	2
Diamond, gem, not set or strung ——carats	807,810	385,330
Lime	5	--
Magnesite	476	484
Mica, crude, including splittings and waste	40	21
Precious and semiprecious stones, except diamond, natural ——value	$31,119	$84,737
Salt and brine	16,280	13,772
Other nonmetals, crude, n.e.s ——value	$3,354	$16,800
MINERAL FUELS AND RELATED MATERIALS		
Hydrogen, helium, rare gases [2] ——do	$125	$898
Petroleum refinery products:		
Gasoline, including natural ——thousand 42-gallon barrels	1,222	1,629
Kerosine ——do	193	178
Jet fuel ——do	211	297
Distillate fuel oil ——do	[2] 2,077	2,392
Residual fuel oil ——do	1,327	1,447
Other, liquefied petroleum gas ——do	13	12

r Revised.
[1] Excludes reexports.
[2] Includes oxygen, nitrogen, hydrogen, and rare gases.

Table 6.—Tanzania: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, including alloys:		
Unwrought	4,015	4,002
Semimanufactures	r 363	528
Copper metal, including alloys, all forms	814	224
Gold metal, unworked or partly worked ——troy ounces	r 2,847	1,444
Iron and steel:		
Ore and concentrate	644	874
Pig iron, ferroalloys, similar materials	1,242	1,086
Steel, primary forms	7,551	4,838
Semimanufactures:		
Rails and accessories	58,692	56,652
Other	95,058	111,358
Lead metal, including alloys, all forms	374	287
Manganese ore and concentrate	5	270
Nickel metal, including alloys:		
Unwrought	11	--
Worked ——value	$1,767	$1,904
Platinum-group metals, including alloys, all forms ——troy ounces	6	1
Tin metal, including alloys, all forms ——long tons	73	21
Zinc metal, including alloys, all forms	2,355	2,409
Other:		
Nonferrous metal scrap	64	21
Oxides, hydroxides and peroxides of metal, n.e.s ——value	$23,188	$24,191
Base metals, including alloys, all forms, n.e.s	41	22
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	43	59
Grinding and polishing wheels and stones	94	68
Asbestos	(1)	42
Cement	115,260	173,577

See footnotes at end of table.

Table 6.—Tanzania: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972
NONMETALS—Continued		
Clays and clay products, including all refractory brick:		
Crude clays, n.e.s	769	767
Products:		
Refractory, including nonclay brick	1,827	1,241
Nonrefractory	1,622	877
Diamond:		
Gem, not set or strung ---thousand carats	42	51
Industrial ---carats	2,500	346,000
Feldspar and fluorspar	45	5
Fertilizer materials:		
Crude	--	26,800
Manufactured:		
Nitrogenous	r 24,699	30,872
Phosphatic	6,550	--
Potassic	3,166	5,431
Other, including mixed	19,907	7,497
Ammonia	30	4,595
Graphite, natural	(2)	2
Gypsum and plasters [3]	220	44
Lime	39	43
Magnesite	16	7
Mica:		
Crude, including splittings and waste	2	8
Worked, including agglomerated splittings ---value	(2)	(2)
Pigments, mineral, including processed iron oxides	972	1,377
Precious and semiprecious stones, except diamond, including natural and manufactured ---value	$38,326	$11,433
Salt and brine	4,412	5,287
Sodium and potassium compounds, n.e.s	2,927	3,948
Stone, sand and gravel:		
Dimension stone, crude and worked	179	18
Gravel and crushed rock, n.e.s	284	34
Quartz and quartzite	--	1
Sand, excluding metal bearing	354	29
Sulfur:		
Elemental	1,231	9,701
Sulfuric acid	133	250
Other nonmetals, n.e.s.:		
Crude ---value	$93,479	$84,767
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	3,647	5,472
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	8	71
Coal, anthracite and bituminous	86	64
Coke and semicoke	2,072	4,099
Hydrogen, helium, rare gases [4] ---value	$27,229	$11,227
Petroleum:		
Crude and partly refined ---thousand 42-gallon barrels	r 6,949	6,021
Refinery products:		
Gasoline, including natural ---do	788	1,086
Kerosine ---do	123	158
Jet fuel ---do	4	29
Distillate fuel oil ---do	1,873	2,454
Residual fuel oil ---do	12	--
Lubricants ---do	84	41
Other:		
Mineral jelly and wax ---do	r 6	6
Nonlubricating oils, n.e.s ---do	5	7
Bitumen and other residues ---do	67	115
Bituminous mixtures, n.e.s ---do	1	2
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	672	1,444

r Revised.
1 Revised to none.
2 Less than ½ unit.
3 Includes gypsum, plasters, limestone flux, and similar stone used for the manufacture of lime or cement.
4 Includes oxygen, nitrogen, hydrogen, and rare gases.

pointed was Tanzanian. In 1973 at the Mwadui mine, 3,600,000 tons of ore was mined yielding 463,864 carats of diamond, which represents a yield of 12.88 carats per ton compared with 16.51 carats per ton in 1972. The grade was deliberately lowered to take advantage of worldwide high diamond prices and to mine out areas which had low-grade reserves. At the adjoining New Alamasi Ltd. mine no changes were made in mining methods or treatment practices.

Gem Stones.—Gem stones, excluding diamond, ranked second in value of mineral exports in 1973. Gemstone Industries Ltd. realized an increase of over 70% in export value, due to improvements in security at its operations and to improved mining methods at the main mines—Merelani, Umba River, Lalatema, and Longido. In terms of export value, tanzanite accounted for 42% of the total gem stones, excluding diamond, value; emerald and chrysoberyl from Lake Manyara, 16%; and sapphires, 7%. Miscellaneous gem minerals, which accounted for the remainder of exports, included amethyst, aquamarine, chrysoprase, opal, gem corundum, garnet and rhodolite, rough ruby, tourmaline, and zircon.

Meerschaum.—Production of meerschaum from the Sinya mine of Tanganyika Meerschaum Corp. Ltd. decreased from 30 tons in 1972 to 14 tons in 1973. A total of 47,456 tons of ore was mined in 1972; and 39,260 tons in 1973. The yield in 1972 was 0.57 kilogram of meerschaum per ton of ore compared with 0.34 kilogram in 1973.

Mica.—The New Africa Mica Co., which was the sole buyer of mica in Tanzania, closed its offices listing as causes severe competition from Brazil and India, and substitution for mica by other materials in the electronics industry. However, Mangal Singh & Co. reopened its mica mine in the Bundali Hills in the Runqwe District to export mica to Japan.

Salt.—Salt exports decreased mainly due to the occurrence of civil strife in Burundi and Uganda that caused reductions in deliveries to those countries. All exports of salt were from the inland Uvinza salt works of Nyanza Salt Mines Ltd. whose salt is obtained by the evaporation of brine from springs and boreholes. Exports from Uvinza were also made to Rwanda, Zaire, and Zambia.

The inland salt pan works at Ivuna in the Mbeya Region ceased operations in May 1973 when the mining lease expired. Salt production by coastal producers near Tanga in the north and near Mtwara in the south was curtailed due to heavy rains. All salt production at Ivuna and by coastal producers was for local consumption.

Mineral Fuels.—*Coal.*—Coal production decreased 42% mainly because of a switch from coal to wood fuel by some tea estates in the drying of tea.

Petroleum.—Tanzania Petroleum Development Corp. was established in 1969 by law and became operative in 1973. It was made responsible for oil exploration, oil refining, and oil marketing. Azienda Generale Italian Petroli (AGIP) S.p.A., a subsidiary of Italy's Ente Nazionale Idrocarburi (ENI), conducted deep sea and shallow sea seismic surveys. Agreement was reached with Tanzania Petroleum Development to drill two offshore wells and two on land wells. One well was started in December 1973 north of Bagamayo.

The single buoy mooring facility at Mjimwema Bay, the first of its kind in East Africa, approximately 4 miles south of the entrance to the Dar Es Salaam harbor, began service on April 16, 1973. The facility cost $5.2 million and will deliver oil destined for refineries in Tanzania and Zambia. The size of the tankers which used the harbor prior to the installation of the mooring facility was limited to 20,000-deadweight-ton capacity. The safe mooring capacity for the new buoy system is 100,000-deadweight-ton tankers and a maximum discharging rate of 9,000 cubic meters per hour. The largest tanker moored in 1973 had a capacity of 93,000-deadweight-tons and discharged 85,000 tons of crude oil.

UGANDA [6]

Once again, the production of copper dominated the mineral industry of Uganda although production decreased 32%. Higher world prices for copper offset to some degree the drop in output.

Over 90% of the population of Uganda derive their livelihood from agriculture, the mainstay of the economy. Management changes for all industries decreed by the

[6] Prepared by Robert G. Clarke.

Government in 1972 made it difficult to retain professional non-African personnel in supervisory, technical, and maintenance positions.

In addition to the decline in copper output, production of all other minerals and mineral-related commodities either remained stable or declined. Shortages of raw materials and spare parts, equipment breakdowns, and a lack of qualified repairmen and technicians were contributing factors.

Mineral industry reports were not obtainable from the Government of Uganda on a regular basis. Hence, much of the information for this chapter was derived indirectly from other sources such as the East African Community Monthly Trade Statistics[r] and Industry in East Africa.[s]

[r] East African Community (Mombasa, Kenya). East African Customs and Excise Monthly Trade Statistics for Tanzania, Uganda, and Kenya, 1973. Monthly Issues.

[s] United Africa Press Ltd. (Nairobi, Kenya). Industry in East Africa, 1972–73. 9th ed. 1974.

Table 7.—Uganda: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 [p]
METALS			
Beryllium, beryl concentrate, gross weight	221	62	[e] 60
Bismuth, mine output, metal content ——kilograms	[r] 780	3,960	[e] 4,000
Columbium and tantalum, ore and concentrate, gross weight ——do	7,900	1,800	1,800
Copper:			
Mine output, metal content	[r] 17,064	15,691	15,517
Metal, blister, primary	15,731	14,168	9,692
Iron and steel, steel ingots	16,435	11,000	[e] 10,000
Tin, mine output, metal content ——long tons	129	79	43
Tungsten, mine output, metal content	110	109	[e] 110
NONMETALS			
Cement, hydraulic	[r] 205,000	166,000	[e] 150,000
Fertilizer materials, phosphatic:			
Crude, apatite	[r] 15,000	15,000	18,000
Superphosphate	23,888	[e] 24,000	[e] 24,000
Lime (quicklime and hydrated lime) [e]	18,000	18,000	18,000
Salt, evaporated	2,409	[r e] 3,000	[e] 3,000

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

Table 8.—Uganda: Exports of mineral commodities to countries outside the East African Economic Community[1]

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Beryllium, beryl ore and concentrate	230	64
Copper metal, including alloys, all forms	16,808	14,141
Iron and steel semimanufactures	[r] 198	496
Tin ore and concentrate ——long tons	172	102
Tungsten ore and concentrate	206	246
Other:		
Ores and concentrates:		
Of titanium, vanadium, molybdenum, tantalum, zirconium	3	7
Of base metals, n.e.s	10	9
Nonferrous metal scrap	647	504
NONMETALS		
Cement	1,809	148
Fertilizer materials, manufactured:		
Phosphatic	--	30
Other, including mixed	1	2
Gypsum and plasters	--	1
Lime	--	20
Salt and brine	1,783	1,105
Sulfur, sulfuric acid	1	4
MINERAL FUELS AND RELATED MATERIALS		
Hydrogen, helium, rare gases [2] ——value	$5,293	$3,255

[r] Revised.

[1] Excludes reexports.

[2] Includes oxygen, nitrogen, hydrogen, and rare gases.

Table 9.—Uganda: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, including alloys, all forms	1,151	949
Copper metal, including alloys, all forms	478	413
Gold:		
Gold bullion, troy ounces	76	--
Metal, partly worked, do	48	--
Iron and steel:		
Scrap	1	--
Pig iron, ferroalloys, similar materials	1,197	82
Steel, primary forms	12	5
Semimanufactures	56,478	24,748
Lead metal, including alloys, all forms	78	43
Nickel metal, including alloys, all forms	1	(1)
Platinum-group metals, including alloys, all forms, troy ounces	31	--
Silver metal, including alloys, all forms, do	285	--
Tin metal, including alloys, all forms, long tons	55	10
Zinc metal, including alloys, all forms	1,799	1,117
Other:		
Nonferrous metal scrap	80	--
Metallic oxides, chiefly used in paints	487	204
Other inorganic bases and metallic oxides, hydroxides and peroxides, n.e.s, value	$2,361	$2,869
Miscellaneous nonferrous base metals	2	1
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	37	26
Grinding and polishing wheels and stones	45	17
Asbestos	277	1,094
Cement	674	1,008
Clays and clay products, including all refractory brick:		
Crude clays, n.e.s	512	568
Products:		
Refractory, including nonclay brick	2,071	1,819
Nonrefractory	1,036	291
Diamond, gem, not set or strung, carats	140	--
Feldspar and fluorspar	919	403
Fertilizer materials:		
Crude:		
Nitrogenous	250	--
Phosphatic	--	1
Potassic	92	--
Manufactured:		
Nitrogenous	r 8,435	5,156
Phosphatic	958	958
Potassic	1,596	2,992
Other, including mixed	16,092	9,238
Ammonia	16	17
Graphite, natural	22	5
Lime	1	8
Mica, crude, including splittings and waste	16	--
Pigments, mineral, including processed iron oxides	487	204
Precious and semiprecious stones, except diamond:		
Natural, value	$1,534	$691
Manufactured, do	$739	--
Salt and brine	11,734	32,766
Sodium and potassium compounds, n.e.s	5,823	2,679
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	6	23
Worked	151	65
Dolomite, chiefly refractory grade	740	147
Gravel and crushed rock, n.e.s	314	79
Limestone[2]	219	106
Quartz and quartzite	(3)	7
Sand, excluding metal bearing	6	39
Sulfur:		
Elemental	5,850	5,472
Sulfuric acid	55	10
Other nonmetals, n.e.s.:		
Crude, value	$153,762	$19,999
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	1,167	267
MINERAL FUELS AND RELATED MATERIALS		
Coal, anthracite and bituminous	--	40
Coke and semicoke	558	323
Hydrogen, helium, rare gases[4], value	$29,586	$593

See footnotes at end of table.

Table 9.—Uganda: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1971	1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum refinery products:			
Gasoline, including natural	thousand 42-gallon barrels	21	12
Kerosine	do	7	5
Jet fuel	do	3	--
Residual fuel oil	do	5	--
Lubricants	do	24	6
Other:			
Mineral jelly and wax	do	4	3
Nonlubricating oils, n.e.s	do	2	2
Bitumen and other residues	do	1	12
Bituminous mixtures	do	3	4
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals		63	16

r Revised.
1 Less than ½ unit.
2 Includes gypsum, plasters, limestone flux, and similar stone used for the manufacture of lime and cement.
3 Revised to none.
4 Includes oxygen, nitrogen, hydrogen, and rare gases.

COMMODITY REVIEW

Metals.—*Beryllium.*—Beryl pegmatites are concentrated in South-West Uganda, and a comprehensive scheme for prospecting and evaluating the deposits was proposed as a result of studies.[9]

Copper.—Kilembe Copper Cobalt Ltd. experienced inordinately low production of 9,692 tons of blister copper in 1973 compared with 14,168 tons in 1972.[10] Serious trouble in the copper smelter at Jinja, including breakdowns of furnace equipment and premature converter lining failures, resulted in a substantial cutback in production of blister copper during the last 5 months of 1973. The Government offered new terms to Kilembe Copper Cobalt Ltd. for the renewal or extension of its subsidiary Kilembe Mines Ltd.'s 21-year lease in Uganda.[11]

Tungsten.—The Nyamalilo mine, approximately 20 kilometers west of Kobale in Kigezi District, South-West Uganda, contains several million tons of low-grade tungsten ore. However, the average grade of ore is about 2.5 pounds of WO_3 (tungsten trioxide) per ton of ore, and renders operation of the mine unprofitable at low prices.[12]

Nonmetals. — *Cement.* — Limestone was mined at Sukulu for the cement plant of Uganda Cement Industry Co. The limestone deposit yields a raw material under 2% in P_2O_5 (phosphorous pentoxide) and about 4% in Fe_2O_3 (iron oxide).[13] The phosphorous content of the limestone yielded a clinker within the limit of the specified 2.25% P_2O_5 for cement and the Fe_2O_3 content was ideal since iron need not be added to the mix. Reserves at the quarries are adequate for many years' operation of the cement plant.

Fertilizers.—Deposits of apatite at Sukulu were mined for phosphate raw material feed for the fertilizer chemicals made by Tororo Industrial Chemicals & Fertilizers Ltd. Reserves at the Sukulu deposits were estimated at just over 200 million tons, assaying 13% to 15% P_2O_5. The deposits at Bukusu were estimated to have reserves up to 50 million tons assaying from 20% to 34% P_2O_5.

[9] Reedman, A. J. Prospection and Evaluation of Beryl Pegmatites in South-West Uganda. Overseas Geology and Mineral Resources. Inst. of Geol. Sci., Nat. Environment Res. Council, London, No. 41, 1973, pp. 86–100.

[10] Engineering and Mining Journal (Uganda). V. 175, No. 7, July 1974, p. 130.

[11] Engineering and Mining Journal (Uganda). V. 174, No. 9, September 1973, p. 225.

[12] Reedman, A. J. Partly Remobilized Syngenetic Tungsten Deposit at Nyamalilo Mine. Overseas Geology and Mineral Resources. Inst. of Geol. Sci., Nat. Environment Res. Council, London, No. 41, 1973, pp. 101–106.

[13] Bloomfield, K. Economic Aspects of Uganda Carbonatite Complexes. Overseas Geology and Mineral Resources. Inst. of Geol. Sci., Nat. Environment Res. Council, London, No. 41, 1973, pp. 139–165.

The Mineral Industry of North Korea

By Frank B. Fulkerson [1]

In 1973 North Korea completed the first 3 years of its 6-year plan. Under the plan, industrial output has increased 17% per year on the average, according to government statements. During the 3 years, iron and steel furnaces were rebuilt and expanded, and more large, modern sintering ovens and coke batteries were built at iron and steel works. The Musan mine and other iron mines were further expanded. Ore-dressing plants were modernized. Several new chemical fertilizer plants were built. Also, the country's first oil refinery was reported to have been built and placed in operation.

Requirements laid down for 1973 included improvement of mining methods, greater production from the moderate-sized integrated steel industry, and accelerated development of the chemical fertilizer industry. Greater emphasis on foreign trade was apparent. Exports and imports increased, compared with those of 1972, and negotiations were in progress for the purchase of complete manufacturing plants from foreign countries.

Production goals of the next perspective plan were announced. For the mineral industry, ambitious objectives were listed as follows, in million tons:

Commodity	1970 output [e]	1976 goal	Next perspective plan goal
Steel ingot and castings	2.2	3.8–4.0	12
Nonferrous metals	.16	.45	1
Coal	27.5	50–53	100
Cement	4.0	7.5–8.0	20
Chemical fertilizers	1.5	2.8–3.0	5

[e] Estimated.

PRODUCTION

North Korea produced a variety of mineral commodities in 1973, with coal, iron ore, lead, zinc, tungsten, barite, graphite, and magnesite considered to be significant by world production standards. Gold, copper, nickel, asbestos, pyrite, apatite, and other minerals also were produced. North Korea possesses diverse mineral resources, but ores are often low grade, and petroleum and natural gas have not been discovered.

Output of minerals was reportedly 30% greater in 1973 than in 1972, but no annual production statistics were released. In the manufacturing industries, production of steel evidently fell short of the planned objective, but output of chemical fertilizers seemed to be approaching the 1976 target.

[1] Industry economist, Division of Nonmetallic Minerals—Mineral Supply.

Table 1.—North Korea: Estimated production of mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Cadmium, smelter output ---metric tons--	110	110	110
Copper:			
Mine output, metal content	13	13	13
Metal, refined primary	13	13	13
Gold, mine output, metal content ---thousand troy ounces--	160	160	160
Iron and steel:			
Iron ore and concentrate	8,500	8,600	8,900
Pig iron and ferroalloys [2]	2,500	2,600	2,700
Steel, crude	2,400	2,500	2,600
Steel semimanufactures	2,200	2,300	2,400
Lead:			
Mine output, metal content	80	90	95
Metal, primary	[r] 70	75	80
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	135	140	145
Metal, primary	100	120	130
NONMETALS			
Barite	120	120	120
Cement, hydraulic	4,800	5,300	5,800
Fertilizer materials, crude, natural phosphates (apatite)	[r] 275	300	360
Fluorspar	30	30	30
Graphite	75	75	75
Magnesite:			
Crude	1,700	1,800	1,800
Clinker	800	900	900
Pyrite and pyrrhotite (including cupreous):			
Gross weight	500	500	500
Sulfur content	200	200	200
Salt, all types	550	550	550
Talc, soapstone, steatite, pyrophyllite	90	100	110
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Anthracite	24,300	27,300	30,000
Bituminous [3]	6,000	6,500	7,000
Other	200	200	200
Total	30,500	34,000	37,200
Coke	2,200	2,200	2,200

[p] Preliminary. [r] Revised.

[1] In addition to the items listed, a number of other mineral commodities apparently are produced, but information is inadequate to make reliable estimates of output levels. These include (but are not limited to) antimony, arsenic (in arsenopyrite), asbestos, beryl, bismuth, boracite, china clay (kaolin), chromium, cobalt, columbite, germanium, indium, lithium minerals (lepidolite), manganese ore, mica (phlogopite), molybdenite, monazite, selenium, tellurium, titanium minerals (ilmenite and rutile), zircon, and a variety of crude construction materials including miscellaneous clays, glass sand, building sand, stone, and gravel.

[2] Includes Krupp-Renn granulated iron.

[3] Includes low-calorie coal, much of which might be classified as low-rank coal.

TRADE

Despite its goal of chuche (self-sufficiency), North Korea increased its trade with the outside world. The Japanese Government removed an obstacle to North Korean-Japanese trade when it decided to permit the use of long-term export credits and Japanese Export-Import Bank loans to finance exports to North Korea. The decision enabled the North Koreans to purchase a $57 million cement plant from Japan. The decision also caused major Japanese steel producers to agree to study the feasibility of providing financial and technical aid for North Korea's planned construction of a large integrated steel mill. Negotiations between North Korea and Japan over the purchase of two chemical fertilizer plants were discontinued, and it appeared that the transactions would not take place; however, discussions about the purchase of an aluminum-processing plant continued. In addition to acquiring complete plants, the North Koreans expected to step up imports of mining machinery and steel semimanufactures from Japan.

North Korea's exports to Japan in 1973

totaled approximately $92 million, and total imports from Japan were valued at about $74 million. Mineral-industry exports, principally refined zinc and lead, silver, iron ore, pig iron, and magnesite clinker, were valued at about $30 million. Mineral-industry imports from Japan were chiefly steel plates and sheets with a value of approximately $7 million.

The U.S.S.R. and the People's Republic of China (PRC) also were principal trading partners. Under a long-term trade agreement, North Korea exported nonferrous metals, magnesite clinker, and manufactured products to the U.S.S.R. in exchange for coke, petroleum and petroleum products, ferrous and nonferrous metals, chemicals, and machinery and tools. The trade pattern with the PRC was presumably similar.

Greater quantities of nonferrous metals and magnesite were exported to European countries in 1973 than in 1972. A news report stated that North Korea might buy from Finland a copper smelter worth $100 to $175 million, depending upon the size of the smelter. North Korea, in turn, would deliver to Finland minerals and chemicals. Bulgaria, in a protocol agreement signed in 1973, expressed readiness to provide North Korea with technical guidance in the production of lead and sulfuric acid.

Table 2.—North Korea: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Bismuth	10	NA	
Cadmium	r 29	33	All to U.S.S.R.
Copper and alloys, all forms	431	1,040	West Germany 718; Belgium-Luxembourg 322.
Iron and steel:			
Iron ore and concentrate	449,838	527,081	All to Japan.
Pig iron and cast iron	122,245	135,702	Japan 75,802; U.S.S.R. 59,900.
Sponge iron, powder and shot	2,977	NA	
Ferroalloys	r 2,032	3,295	Romania 1,900; U.S.S.R. 1,395.
Steel:			
Primary forms	9	NA	
Semimanufactures	r 108,800	96,300	U.S.S.R. 82,900; Romania 13,400.
Lead metal and alloys, all forms	17,551	36,109	Italy 13,302; West Germany 10,516; U.S.S.R. 9,776.
Silver, unworked and partly worked thousand troy ounces	1,649	(2)	(2)
Tungsten ore and concentrate	r 10	NA	
Zinc:			
Ore and concentrate	r 12,135	3,508	All to U.S.S.R.
Metal and alloys, all forms	r 46,983	52,221	France 16,753; U.S.S.R. 11,095; Belgium-Luxembourg 8,426.
Other metals and alloys, all forms	r 144	89	Belgium-Luxembourg 53; West Germany 36.
NONMETALS			
Barite	82,800	72,100	All to U.S.S.R.
Cement	358,000	428,000	Do.
Clay products, refractory	375,500	341,800	Do.
Feldspar and fluorspar	r 14,204	10,198	Poland 7,068; Japan 3,130.
Fertilizer materials, crude, nitrogenous	10,200	15,000	All to U.S.S.R.
Graphite	20,502	9,351	All to Japan.
Magnesite	r 568,023	522,777	U.S.S.R. 367,800; Poland 83,720; West Germany 47,138.
Quartz and quartzite	5,726	1,971	All to Japan.
Sand, gravel and crushed stone	582	NA	
Talc, soapstone, and steatite	76,046	86,236	Japan 43,592; U.S.S.R. 32,000; Poland 10,644.
Other nonmetals, slag and similar materials from steel manufactures	283	NA	
MINERAL FUELS AND RELATED MATERIALS			
Coal and coal briquets	r 72,587	61,667	Japan 57,067; Romania 4,600.

r Revised. NA Not available.

[1] Compiled from import data of Australia, Austria, 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.

[2] Value only reported at $5,847,000. Principal destinations and value are Japan $3,238,000; France $1,819,000; and West Germany $790,000.

Source: For 1971—Official import statistics of Poland, Romania, and the U.S.S.R., and for all other countries 1971 edition of: Statistical Office of the United Nations, Supplement to the World Trade Annual. V. 5, Walker and Company, New York, 1974. For 1972—Official import statistics of Poland, Romania, and the U.S.S.R.; and for all other countries 1972 edition of: Statistical Office of the United Nations, World Trade Annual. V's. I, II, and III, Walker and Company, New York, 1974.

Table 3.—North Korea: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum metal and alloys, unwrought and semimanufactures	r 1,311	1,308	All from U.S.S.R.
Chromium and chromite, ore and concentrate	21,000	21,000	Do.
Cobalt oxide and hydroxide	5	NA	
Copper ore and concentrate	NA	3,050	All from Japan.
Iron and steel:			
Ferroalloys	7,639	7,183	U.S.S.R. 6,900.
Semimanufactures	r 10,677	29,097	Japan 19,881; U.S.S.R. 9,216.
Lead ore and concentrate	NA	1,466	All from Japan.
Manganese ore	20,000	21,000	All from U.S.S.R.
Other, nonferrous metal and alloy semimanufactures	r 272	248	Do.
NONMETALS			
Asbestos	4,286	4,416	Do.
Sodium and potassium compounds, soda ash	3,000	NA	
Sulfur, elemental	7,051	7,094	All from U.S.S.R.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	4,100	3,400	All from Romania.
Coal, all grades ----thousand tons	500	356	All from U.S.S.R.
Coke ----do----	159	135	Do.
Petroleum, crude and refinery products ----do----	r 700	398	Do.
Petroleum-, coal-, and gas-derived crude chemicals	13	10	Do.

r Revised. NA Not available.

[1] Compiled from export data of Australia, Austria, 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.

Source: For 1971—Official export statistics of Poland, Romania, and the U.S.S.R., and for all other countries 1971 edition of: Statistical Office of the United Nations, Supplement to the World Trade Annual. V. 5, Walker and Company, New York, 1974. For 1972—Official export statistics of Poland, Romania, and the U.S.S.R., and for all other countries 1972 edition of: Statistical Office of the United Nations, World Trade Annual. V's. I, II and III, Walker and Company, New York, 1974.

COMMODITY REVIEW

METALS

Iron Ore and Steel.—A 60-mile conveyor pipeline reportedly was being built from the Musan mine to the Kimchaek steelworks in North Hamgyŏng Province, by which the transport of iron concentrate, now carried by rail, would be accomplished. Annual capacity of the Musan mine was being expanded to 6.5 million tons. Other large iron ore mines were Chaeryŏng, Unyul, and Hasŏng in South Hwanghae Province, and Tŏkhyŏn in North P'yŏngan Province. Magnetite was mined in the eastern coastal area and northern inland areas, limonite and siderite in the western coastal area, and hematite in South Hamgyŏn Province. Reportedly, the annual capacity of the Tŏkhyŏn mine would increase to 750,000 tons by 1976, new mines would be developed at Sŏngnam and Sŏhae-ri, and the Yongwon and Kaech'ŏn siderite pits would be developed to a combined output of 1.2 million tons of iron ore as part of the 6-year plan.

North Korea's exports of iron ore to Japan averaged over 500,000 tons per year between 1969 to 1973. According to a Japanese report, these exports would reach 700,000 tons by 1974. Kawasaki Steel Corporation signed a contract with North Korean Mineral Products Export-Import Corp. to import 200,000 tons of iron ore.

The iron and steel industry plan for 1973 called for an increase of 20% in output of pig iron, 40% in output of luppe (granulated iron), and 20% in production of steel compared with 1972; however, the industry seemingly did not reach these objectives. To meet requirements, North Korea was trying to buy as much Japanese steel as possible.

A steelmaking furnace with a capacity of 1 million tons of crude steel per year

was being installed at the Kimchaek works, on the northeastern coast. The Soviet Union was providing assistance on this project. In 1969 it was reported that a basic oxygen furnace shop would be built, but there has been no further news on this. The Kimchaek expansion, one of the biggest construction projects in North Korea, also includes a continuous-sintering furnace, a coking furnace, a continuous-casting bay, and a mill to produce hot- and cold-rolled products. The existing equipment includes two blast furnaces and a Bessemer converter. The goal announced in 1972 for completing the steelworkers expansion by the end of 1973 was not achieved.

North Korea hoped to obtain technical and financial assistance from Japan on construction of a large integrated steel mill near Nampo, situated at the mouth of the Taedong River south of P'yŏngyang. The mill would have an initial annual capacity of 1 million tons of crude steel; this capacity would eventually be increased to 5 million tons. The cost of the project might exceed $500 million, according to a Japanese news report.

There were a number of other developments in the steel industry. At the major Hwanghae steel plant south of P'yŏngyang, work continued on rebuilding and enlarging the No. 1 blast furnace. Also, through use of technical innovations, output of coking coal reached a record high since the works were placed in operation. Production targets for the first quarter of 1973 were exceeded. Also near P'yŏngyang, work was completed on installing a large forging mill at the Kangsŏn steel plant, which already was equipped with a rolling mill, a pipe mill, and a wire and cable plant. Production of steel ingot was increased, and the continuous-roughing process was automated.

Success was reported at the Sŏngjin plant in producing sponge iron from two special furnaces. Produced from low-quality ores, the sponge iron is charged into electric furnaces, where it is melted and refined into steel. Personnel of the Ch'ŏngjin plant, which produces mainly luppe, introduced technical innovations and exceeded the first quarter plan. In South P'yŏngan Province, operators of a small plant known as the April 13 Steelworks increased output of crude steel 4.7-fold and of luppe by 1.7-fold in the first half of 1973, as compared with the same period of 1972, as the result of plant modernization.

Nonferrous Metals.—Directives called for increased output of nonferrous ores, fuller utilization of capacity at smelters, and construction of a large-scale smelter in the T'anchŏn area. It was reported that output of major nonferrous ores rose 1.4 to 1.7 times, compared with that in 1970. Personnel of the Sŏng-ch'on lead-zinc mine conducted a mechanization program, and operators of the Kŏmdŏk lead-zinc mine introduced remote-control systems in the ore-dressing plant, and were commended for their work. The annual plan was said to have been fulfilled by the end of September at the Kapsan copper mine. Concerning smelters, installation of two additional furnaces at the Munp'yŏng lead-zinc smelter on the eastern coast reportedly increased raw ore processing capacity at the plant by 40%. The smelting shop reached the production envisaged for the end of the 6-year plan through improvement in the feeding system. Increased automation was reported at the Nampo lead-zinc smelter on the eastern coast.

According to Finland's Minister of Foreign Trade, North Korea planned to buy a copper smelting plant from Finland worth $100 to $175 million. The transaction was to be concluded in 1974, with the actual deliveries taking place in 1975. North Korea, in turn, would deliver to Finland minerals and chemicals.

NONMETALS

Cement.—North Korea purchased a $57 million cement plant from Japan. Delivery of a rotary kiln and other equipment was to begin by the end of 1973. The Japanese Ministry of International Trade and Industry approved the sale after Tokyo commercial banks agreed to help finance the transaction. The main Japanese negotiator was Shinwa Bussan, Ltd., a trading company.[2]

In the first half of 1973, North Korea produced over 1.2 times as much cement as in the corresponding period of 1972. Such large cement factories as Ch'ŏnnae-ri, Haeju, Sŭngho-ri, and Komusan were reported to have boosted their output through a technical improvement drive. Medium- and small-scale cement plants were built in various parts of the country.

[2] Rock Products. V. 26, No. 12, December 1973, p. 76.

With the expansion of existing plants and construction of new plants, the cement output of North Korea was slated to reach 7.5 to 8 million tons in 1976, the last year of the 6-year plan, as compared with 4 million tons in 1970. Quantities of cement were exported to the Soviet Far East.

Fertilizer Materials.—The North Koreans attempted to double apatite output before the 1974 crop year. The apatite is used in producing phosphate fertilizers. In 1973, new mines were opened at Tongam in the Mach'ŏn Range, South Hamgyŏng Province; at Sinp'ung, South Hwanghae Province; and elsewhere. Capacity of the Sinp'ung mine was to be over 100,000 tons per year. Also, work was begun to open large reserves at Koksan, in North Hwanghae Province, and construct modern housing and other facilities there. The claim was made that exploration throughout the country uncovered 10 new apatite deposits in 1973. Pyrite was mined at Hach'ŏn. About 500,000 tons of pyrite containing 200,000 tons of sulfur was produced in 1973. Sulfur was also recovered during the smelting of nonferrous sulfide ores. Elemental sulfur might have been imported from the PRC. Ammonia was produced, using as raw material hydrogen recovered by gasification of coal.

Newly completed or under construction was productive capacity of 1.5 million tons of chemical fertilizers (principally ammonium nitrate, phosphate, and sulfate and superphosphate). A new automated phosphate fertilizer plant was placed in operation at Haeju. The Hŭngnam chemical fertilizer complex, probably the biggest in North Korea, completed an expansion program ahead of schedule. Ammonium sulfate and superphosphate were produced at Hŭngnam, along with agricultural chemicals. Also, it was claimed that phosphate fertilizer and sulfuric acid production systems were nearing completion at the Munp'yŏng lead-zinc smelter. The Sinp'ung mine will provide apatite to the new facilities. The sulfuric acid shop and phosphate fertilizer shop at the Nampo copper-lead-zinc smelter were being expanded. Capacity to produce an ammonium nitrate-limestone mixture at the Ch'ŏngsu chemical plant was increased 2.7-fold. An ammonia recovery tower was fabricated at the Aoji chemical plant. Capacity of the Sunch'ŏn nitrogen fertilizer works was greatly increased. As the result of new facilities being placed in operation, North Korea asserted that chemical fertilizer output gained 30% over that of 1972, and that annual capacity reached 2.8 to 3.0 million tons. The latter claim, if not an exaggeration, meant that the 1976 production target for chemical fertilizers was already within reach.

Magnesite.—Magnesite was mined in large quantities in the Yongyang area of South Hamgyŏng Province. Ore was shipped by rail to the Tanch'on, Sŏngjin, and Ch'ŏngjin clinker plants, where it was heated in shaft kilns and rotary kilns to 800°–950° C, and again to 1,500°–1,600° C. The clinker produced at the three plants was used domestically, and, along with crude magnesite, was shipped overland and by sea to foreign countries as well. At the Sŏngjin clinker plant, construction was completed on a large rotary furnace to allow for increased output of good—quality clinker.

Other Nonmetals.—About 120,000 tons of barite were produced from large reserves embedded in limestone near Ch'angdo, Chaeryŏng, and Haeju. Over half of the barite was exported to the U.S.S.R. for use as a weighting agent in oil well drilling muds and for other uses. North Korea also produced a large tonnage of graphite. Much of the output was low-grade amorphous material that was burned as fuel. Asbestos was apparently produced at Hwangch'ŏng. Important quantities of soapstone and talc were exported. Production of fluorspar probably did not exceed 30,000 tons. Shipments of metallurgical grade fluorspar were made to the Soviet Union and Japan.

MINERAL FUELS

Coal.—The coal mining industry was directed to install large-size equipment, accelerate mechanization, and give more precedence to prospecting and tunneling in order to boost coal output.

The Bureau of Coal Industry claimed an increase in coal output of 1 million tons in the first 6 months of 1973, as compared with the same period of 1972. The bulk of the increase was for anthracite. Another report credited the northern coalfields, which produce bituminous coal, some of high rank, with turning out 410,000 tons more coal in the first 10½ months of 1973 than in the corresponding period of 1972. Aoji and other coal mines in the north

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raised output by introducing on a large scale better machinery, including the cylinder-style coal cutter.

The western region was the source of most of North Korea's anthracite coal production. The large Anju mine, South P'yŏngan Province, was credited with surpassing monthly quotas. There was no specific mention of the Sinch'ang mine, the Nation's leading coal producer.

Plans to increase anthracite exports to Japan did not materialize. Such exports amounted to 46,000 tons in 1973, less than in 1972.

Large new mines being developed included the Yonghŭng, Hoean, and Yangch'ŏng; their locations were not given. Preparations were made to develop the Toksan and Toknam areas in Tŏkch'on County, and the Inpo area in Pukchang County, which have large coal deposits. Other mines were to be established in the Sinŭiju, Hanyŏng, Hak-tong, and other areas to meet the demand for coal at major industrial plants that are to be built or expanded. Listed as leading mines to be expanded were Anju, Kangtong, Choyang, Pongch'on, and P'ungin.

The 1976 target for coal output is 50 to 53 million tons, of which over 10 million tons is to be produced by medium- and small-size mines.

Petroleum.—Petroleum requirements were met by imports from the Soviet Union and probably from the PRC. There was no news concerning the North Korean-Iraqi petroleum refinery project. Under terms of a 1972 protocol agreement, Iraq is to provide North Korea with credit for construction of a 3-million-ton-per-year refinery, and North Korea is to import crude oil from Iraq for use in the refinery.

The Mineral Industry of the Republic of Korea

By Harold J. Drake [1]

A rapidly expanding economy in the Republic of Korea during 1973 resulted in sharply increased production by its small mining industry. With 1970 equal to 100, the index for industrial production stood at 179 in 1973 compared with 132 in 1972; comparable figures for manufacturing were 187 and 136, and for mining 114 and 98. Of the principal products of mining operations, anthracite, tungsten, copper, zinc, kaolin, talc, fluorspar, and limestone recorded gains, whereas output of lead and refined gold and silver declined. The mineral processing sector reported increased production of fertilizers, petroleum products, iron and steel, cement, and nonferrous smelter products.

Production indexes (1970=100) of some of the major components of the mining and mineral processing sectors for the last 2 years were as follows:

	1972	1973
Petroleum products	118	139
Industrial chemicals	110	135
Cement	112	141
Anthracite coal	100	110
Metal mining	90	102
Nonmetal mining	116	158
Tungsten mining	91	102

Progress in the second year of the third 5-year economic development plan, 1972–76, was considerably better than in the first year. In terms of constant 1970 prices, the gross national product totaled 3,534 billion won ($8.9 billion) [2] in 1973, a 17% increase over that of 1972. The value of manufacturing rose 31% to 1,002 billion won ($2.5 billion). The mining and quarrying industry registered a sharp gain of 20% to 37.4 billion won ($94 million) after 3 years of little growth.

Inflation continued but at a lesser rate in 1973. The wholesale price index (1970=100) for all commodities stood at 132.4, a 7% increase over the 1972 level. In contrast, the level in 1972 was 14% over that of 1971. The index for total minerals stood at 126 in 1973, compared with 118 in 1971; for metallic ores, at 134, compared with 123 in 1972; and for nonmetallic ores, at 112, compared with 109 in 1972.

The Government of the Republic of Korea announced plans for a major high-growth industrial expansion through 1981. Investment requirements under the plan total about $15 billion. Included in the plan is the expansion of the petrochemical industry with the addition of three new oil refineries to supply basic feedstocks. Extensive plans were being formalized for a major expansion of the petrochemical complex at Ulsan, and the building of a petrochemical complex and a fertilizer facility at Yosu on the southern coast. A nonferrous metals processing complex, including refineries for copper, zinc, lead, and aluminum, was being planned for Onsan south of Ulsan. Steel production is to be increased by doubling the capacity of the Pohang Iron and Steel plant to 2.6 million tons, and by the construction of a second steel mill with a 5-million-ton capacity. A separate industrial complex based on the machine industry will be established at Changwon. Planning and construction of three large-scale shipyards was underway in 1973.

To meet the expected demand for min-

[1] Physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

[2] Where necessary, values have been converted from Korean won (Kw) to U.S. dollars at the rate of Kw398.3=US$1.00.

eral raw materials generated by the industrial expansion, the Government embarked on a program to encourage mining and exploration. Mining laws were revised to encourage development and expansion of mining properties, and a nationwide exploration program was encouraged, particularly with regard to iron, lead, zinc, and tungsten.

Foreign equity investments in the Republic of Korea, 1962–72, totaled $372.2 million, of which only $1.6 million went into the mining industry. The mineral processing sector of the industry, however, benefited considerably from foreign capital. Petroleum refining facilities received $33 million, equivalent to 8.8% of the total; the chemical industry, $23.3 million, or 6.3%; the fertilizer industry, $20.5 million, or 5.5%; the steel (and other metals) industry, $18.2 million, or 4.8%; and the ceramics, cement, and glass industries, $15.9 million or 4.2%. Of the total investment, the United States accounted for 48.2%, and Japan for 42.8%. The remainder was accounted for by a number of other countries.

PRODUCTION

At current prices, the value of production of mining and quarrying operations totaled Kw51.3 billion ($12.9 billion), up 35% from the preceding year. In constant 1970 prices, however, the gain was only 20%, indicating a high rate of inflation in mining operations.

Production, in terms of value, in 1973 was not available for most individual minerals. Production of anthracite coal totaled 13.6 million tons, a rise of 9% from that of 1972. Similarly, production of tungsten rose 7% to 2,174 tons and amorphous graphite, 5% to 42,712 tons. The Republic of Korea is one of the world's major producers of these commodities.

Production of nonferrous metals and ores was well above the levels of 1972. Output of refined copper was up 11%, refined lead, 22%, refined zinc, 20%, and crude steel, 98%. Production of precious metals, however, declined, with refined gold, continuing the trend of recent years, off 5% and refined silver off 16%.

Production of nonmetallic minerals recorded substantial gains in most of its large-volume products. Crushed and broken limestone at 12.9 million tons was up 28%, kaolin at 377,317 tons was more than doubled, and a similar performance occurred for pyrophyllite, which rose to 304,842 tons from 163,396 tons in 1972. Production of quartzite rose 56% to 238,219 tons, silica sands, 16% to 172,311 tons, talc 32% to 113,092 tons, and fluorspar, 3% to 29,877 tons. Production of feldspar returned to levels of prior years, doubling to 28,460 tons, and output of marine salt rose 64% to 742,000 tons.

A similar expansion in output by the mineral processing sector of the industry took place. Production of hydraulic cement rose 26%, fertilizers 10%, and carbon black, 46%. Growth in petroleum refinery operations continued at a rapid pace. Production of refinery products, in the aggregate, rose 15%, led principally by increases in residual and distillate fuel oils and in gasoline.

Table 1.—Republic of Korea: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Aluminum metal, primary	17,593	15,162	30,430
Antimony, mine output, metal content	--	9	11
Arsenic, mine output, white arsenic equivalent	NA	2	141
Bismuth, metal	r 95	90	99
Cerium, metal, kilograms	NA	1,500	12,000
Copper:			
Mine output, metal content	1,774	2,082	2,321
Metal, refined, including secondary	r 6,849	9,061	9,246
Gold, metal [1], troy ounces	28,807	17,072	16,268
Iron and steel:			
Iron ore and concentrate, gross weight, thousand tons	504	492	595
Pig iron, do	2	1	455
Ferroalloys, do	15	17	27
Crude steel (excluding castings), do	472	585	1,157
Lead:			
Mine output, metal content	16,543	14,718	12,786
Metal	3,111	3,803	4,640
Manganese ore and concentrate, gross weight	2,263	1,999	1,721
Molybdenum, mine output, metal content	105	50	51
Nickel, mine output, metal content	--	--	11
Rare-earth metals, monazite concentrate, gross weight	NA	8	9
Silver, metal, thousand troy ounces	1,543	1,770	1,490
Tin, mine output, metal content, long tons	5	(2)	8
Titanium, ore and concentrate (ilmenite), gross weight	NA	NA	165
Tungsten, mine output, metal content	2,059	2,031	2,174
Zinc:			
Mine output, metal content	28,161	35,925	48,151
Metal, primary	8,941	10,502	12,590
Zirconium, concentrates, gross weight	NA	13	23
NONMETALS			
Asbestos	2,172	5,279	5,707
Barite	21	30	204
Cement, hydraulic, thousand tons	6,872	6,486	8,175
Clays, kaolin	191,181	184,494	377,317
Diatomaceous earth	3,162	1,955	3,982
Feldspar	16,887	14,689	28,460
Fertilizer materials, manufactured:			
Nitrogenous (urea), thousand tons	669	691	698
Phosphatic (magnesium phosphate), do	140	160	157
Mixed, do	460	493	630
Fluorspar, all grades	57,886	28,975	29,877
Graphite:			
Crystalline	1,776	202	892
Amorphous	70,739	40,566	42,712
Kyanite and related materials, andalusite	74	32	83
Lime, slaked	86,593	e 87,000	e 87,000
Mica, sericite	NA	1,845	6,322
Pyrite:			
Gross weight	NA	1,171	1,261
Sulfur content	NA	410	378
Salt, marine, thousand tons	360	452	742
Stone, sand and gravel:			
Crushed and broken limestone, do	10,617	10,146	12,903
Quartzite, do	161	153	238
Sand (including glass sand), do	164	148	172
Talc and related materials:			
Pyrophyllite	142,335	163,396	304,842
Talc	70,114	72,352	113,092
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	r 8,074	9,131	13,311
Coal, anthracite, thousand tons	12,785	12,403	13,571
Fuel briquets, anthracite briquets, do	8,479	10,515	e 11,000
Peat, do	4	e 4	e 4
Petroleum refinery products:			
Gasoline, thousand 42-gallon barrels	6,504	5,873	6,529
Jet fuel, do	3,749	4,212	3,660
Kerosine, do	3,579	2,673	3,007
Distillate fuel oil, do	13,737	14,679	17,951
Residual fuel oil, do	45,980	48,359	56,696
Other, do	7,988	10,093	10,900
Refinery fuel and losses, do	4,076	6,692	e 7,700
Total, do	85,613	92,581	106,443

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

[1] Officially reported production only.

[2] Less than ½ unit.

TRADE

Total exports of minerals and related commodities in 1973 recorded sharp gains in general. Exports of crude minerals, on the whole, increased from $8.8 million to $18.4 million, and exports of metalliferous ores and scrap increased about 1% to $23.8 million. Shipments of coal, coke, and briquets totaled $2.7 million, a rise of 36%. The petroleum industry continued its movement into foreign markets, by doubling its exports to $31.1 million. The fertilizer industry encountered some difficulty, however, and exports declined from $11.6 million in 1972 to $5.1 million in 1973.

Shipments of nonmetallic minerals have dominated mineral exports in recent years, and 1973 was no exception. Dimension stone exports totaled 76,547 tons valued at $4.1 million, and crushed stone and sand and gravel totaled 460,114 tons valued at $6.3 million. Exports of clays totaled 107,495 tons valued at $2.4 million; amorphous graphite, 36,527 tons valued at $1 million; gypsum, 363,740 tons valued at $686,997; and fluorspar, 17,388 tons valued at $538,873. Japan is the principal foreign market for the Republic of Korea nonmetallic mineral exports, with Taiwan second.

Exports of metalliferous ores and metal scrap in 1973 totaled 349,151 tons valued at $23.8 million. The bulk of this material was iron ores and concentrate amounting to 260,930 tons but valued at only $2.6 million. Most of the value, $18.5 million, was accounted for by nonferrous ores and concentrates totaling 81,162 tons. The principal nonferrous materials were tungsten totaling 4,368 tons valued at $10.3 million; zinc, 59,260 tons valued at $5.1 million; and lead, 15,979 tons valued at $2.7 million.

Exports of manufactured products originating from mineral processing operations were considerably higher in 1973. Exports of petroleum products reached 973,554 tons valued at $30.9 million; fertilizers, 52,675 tons valued at $5.1 million; cement, 949,989 tons valued at $13.7 million; and cement clinker, 540,303 tons valued at $5.1 million. Mineral exports in 1972, the latest year for which detailed information is available, are shown in table 2.

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

Commodity	1971	1972
METALS		
Aluminum:		
Ore and concentrate	--	5
Metal, including alloys, all forms	4,089	7,296
Bismuth ore and concentrate	6	9
Chromium ore and concentrate	119	207
Cobalt metal, including waste and scrap	51	71
Copper metal, including alloys, all forms	12	592
Iron and steel:		
Ore and concentrate ---thousand tons	421	475
Scrap	1,647	2,015
Pig iron and ferroalloys	3,186	14,590
Steel, primary forms	180	4,763
Semimanufactures	185,698	658,761
Lead:		
Ore and concentrate	21,284	16,650
Metal, including waste and sweepings	187	504
Manganese oxides	52	145
Molybdenum:		
Ore and concentrate	141	112
Trioxide	5	10
Metal	--	6
Nickel metal	4	10
Selenium	--	1
Silver:		
Silver, platinum, and similar metal ores and concentrates	2,833	2,989
Metal, including alloys ---thousand troy ounces	248	364
Tin:		
Ore and concentrate ---long tons	--	197
Metal, including waste and scrap ---do	1	13
Titanium slag	350	--
Tungsten:		
Ore and concentrate	3,004	4,035
Metal, including waste and scrap	13	(1)
Vanadium ore and concentrates	--	5
Zinc:		
Ore and concentrate	37,498	46,180
Oxide	85	(1)
Metal, waste, scrap, dust	r 1,737	64

See footnotes at end of table.

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

Commodity	1971	1972
METALS—Continued		
Other:		
Ores and concentrates of nonferrous metals, n.e.s	2,099	206
Ash and residue containing nonferrous metals	963	754
Oxides, hydroxides, peroxides of metals, n.e.s	--	(1)
Base metals, including alloys, all forms, n.e.s	r 70	44
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum	--	488
Dust and powder of precious and semiprecious stones --kilograms--	2	--
Grinding and polishing wheels and stones	5	1
Asbestos	59	56
Cement and cement clinker ----thousand tons--	1,008	1,177
Chalk ----kilograms--	--	2
Clays and clay products:		
Crude clays, n.e.s.:		
Kaolin	77,522	77,693
Other	9,762	13,596
Products:		
Refractory	93	44
Nonrefractory	4,654	17,494
Diamond, industrial ----value--	$9,500	$3,075
Feldspar, fluorspar, and related materials:		
Feldspar	4,596	5,200
Fluorspar	45,878	27,626
Other	98,897	85,541
Fertilizer materials:		
Crude	(1)	(1)
Manufactured:		
Nitrogenous	96,600	78,565
Other, including mixed	68,972	94,307
Ammonia	--	(1)
Graphite, natural	32,118	28,402
Gypsum and plasters	30,107	26,128
Lime	1	150
Mica, all forms	1,561	772
Precious and semiprecious stones, except diamond, including synthetic	6,310	1,038,384
Salt	1	1,103
Stone, sand and gravel:		
Dimension stone	r 12,791	22,301
Dolomite, chiefly refractory grade	23,200	17,950
Gravel and crushed stone	3,335	18,956
Limestone	(1)	(1)
Quartz and quartzite	117,984	90,814
Sand, excluding metal bearing	10,404	15,587
Sulfur:		
Elemental	--	450
Sulfuric acid	(1)	(1)
Talc and related materials:		
Talc, crude and ground	r 34,028	37,119
Steatite, natural	756	--
Other nonmetals, n.e.s.:		
Crude:		
Meerschaum, amber, jet	1,950	330
Other	r 4,829	36,232
Slag, dross, and similar waste, not metal bearing	49,822	40,180
Building materials of asphalt, asbestos, fiber cement, unfired nonmetals, n.e.s	3	159
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	--	40
Carbon black and gas carbon	153	6
Coal, coke, peat	339,465	159,053
Petroleum:		
Crude ----42-gallon barrels--	--	(1)
Refinery products:		
Gasoline ----thousand 42-gallon barrels--	2,255	4,848
Kerosine ----do----	135	9
Distillate fuel oil ----do----	(1)	416
Residual fuel oil ----do----	222	391
Lubricants ----do----	2	10
Liquefied petroleum gas ----do----	r 71	187
Other ----do----	r 10	375
Total ----do----	2,695	6,236
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	2,743	5,533

r Revised.
1 Less than ½ unit.

Continued establishment and expansion of mineral processing facilities in 1973 led to sharply increased imports of mineral raw materials for feedstock. Imports of petroleum were valued at $296 million, an increase of 36% over similar imports in 1972. Crude petroleum accounted for about 93% of the total value. Imports of metalliferous ores and scrap were valued at $126 million, compared with $46 milion in 1972. The principal imported ores and concentrates were 467,568 tons of iron valued at $6.2 million, 20,866 tons of copper valued at $6.1 million, and 29,980 tons of manganese valued at $1 million. The bulk of the imported scrap was 807,790 tons of iron and steel valued at $74 million, 20,236 tons of copper valued at $27 million, 17,253 tons of aluminum valued at $4 million, and 8,194 tons of lead valued at $1.5 million. Crude fertilizer and other crude mineral imports were up 44% to $37 million.

Mineral imports in 1972. the latest year for which detailed information is available, are shown in table 3.

Table 3.—Republic of Korea: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Bauxite	58	50
Oxide and hydroxide	43,476	28,575
Metal, including alloys, all forms	5,999	10,067
Chromium, oxide, hydroxide	485	419
Cobalt:		
Ore and concentrate ---kilograms--	2,200	478
Oxide and hydroxide ---do---	4,000	3,769
Copper:		
Ore	11,982	16,188
Metal, including alloys, all forms	6,849	15,102
Iron and steel:		
Ore	31,245	20,200
Metal:		
Scrap	755,325	520,124
Pig iron, ferroalloys, and similar materials	53,961	83,124
Steel, primary forms	820,247	949,588
Semimanufactures	260,836	1,781,482
Lead:		
Ore and concentrate	989	3,960
Oxide	2	2
Metal, including alloys, all forms	3,969	3,019
Magnesium:		
Ore	3,599	4,620
Metal, including alloys, all forms	25	32
Manganese:		
Ore and concentrate	14,153	10,274
Oxide and hydroxide	1,095	807
Mercury ---76-pound flasks--	42,651	312
Molybdenum:		
Trioxide ---kilograms--	2	4
Metal, including alloys, all forms	r 4	9
Nickel:		
Oxide and hydroxide	900	454
Metal, including alloys, all forms	1,464	173
Platinum-group metals and alloys ---thousand troy ounces--	139,646	65,652
Rare-earth metals:		
Oxides ---kilograms--	73	570
Metal, including alloys ---do---	2,185	1,481
Silver ---thousand troy ounces--	41,360	232
Tantalum metal, all forms ---value--	$1,864	--
Tin:		
Oxides ---long tons--	1	1
Metal, including alloys, all forms ---do---	628	544
Titanium:		
Ore and concentrate	6,819	5,402
Oxides	5,655	1,695
Tungsten metal, including alloys, all forms	6	12
Vanadium pentoxide ---kilograms--	350	68
Zinc:		
Ore and concentrate	--	880
Oxide	154	212
Metal, including alloys, all forms	5,297	7,639
Zirconium ore and concentrate	150	50

See footnotes at end of table.

Table 3.—Republic of Korea: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS—Continued		
Other:		
Ore and concentrate of base metals, n.e.s	3,092	238
Ash and residue containing nonferrous metals	3,282	5,206
Oxides, hydroxides, peroxides of metals, n.e.s	77	20
Metals, including alloys, all forms:		
Metalloids	89	102
Pyrophoric alloys—kilograms	r 20,030	3
Base metals, including alloys, all forms, n.e.s	109	211
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	176	477
Dust and powder of precious and semiprecious stones, including diamond—value	$81,516	$55,187
Grinding and polishing wheels and stones	159	148
Asbestos	38,028	59,533
Barite	--	915
Boric oxide and acid	414	449
Bromine	1	2
Cement	712	1,635
Clays and clay products (including refractory brick):		
Crude clays, n.e.s	406,855	9,853
Products:		
Refractory (including nonclay bricks)	9,899	35,258
Nonrefractory	88	244
Chalk	--	2
Cryolite—kilograms	2	3
Diamond, industrial—value	$63,649	$66,014
Diatomite and other infusorial earth	14	99
Feldspar and fluorspar	1,746	1,009
Fertilizer materials:		
Crude:		
Phosphatic	466,754	528,934
Other	46	40
Manufactured:		
Nitrogenous	r 7,564	7,560
Phosphatic	2,534	3,000
Potassic	95,147	163,942
Other, including mixed	26,553	40,533
Ammonia	5	7,027
Graphite, natural—kilograms	102	120
Gypsum and plasters	61,312	514
Iodine	2	4
Lime	70	1,581
Magnesite, crude, calcined, magnesia clinker	r 446	37
Mica, all forms	28	87
Pigments, mineral, including processed iron oxide	1,056	529
Precious and semiprecious stones, except diamond, including synthetic—value, thousands	$153	$218
Pyrite, unroasted	3	--
Salt	413,543	275,600
Sodium and potassium compounds, n.e.s	11,756	7,661
Stone, sand and gravel:		
Dimension stone, crude and partly worked	r 135	53
Dolomite, chiefly refractory grade	640	224
Gravel and crushed rock—kilograms	--	403
Limestone—do	16	3
Quartz and quartzite	50	43
Sand, excluding metal bearing	9,186	54
Sulfur:		
Elemental:		
Other than colloidal	156,847	135,856
Colloidal	428	357
Sulfur dioxide	1	3
Sulfuric acid	361	292
Talc, steatite, soapstone, pyrophyllite	29	7
Other nonmetals, n.e.s.:		
Crude	11	253
Slag, dross and similar waste, not metal bearing—kilograms	--	5
Oxides, hydroxides, peroxides of magnesium, strontium, and barium	40	59
Building materials of asphalt, asbestos, fiber cement, unfired nonmetals, n.e.s	995	428

See footnotes at end of table.

Table 3.—Republic of Korea: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1971	1972
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural		50	4
Carbon black and gas carbon		2,265	1,549
Coal and briquets:			
Anthracite and bituminous		15,389	8,845
Briquets of coal	kilograms	289,400	20
Coke and semicoke		40,784	22,101
Hydrogen, helium, rare gases		69	84
Peat, including peat briquets and litter		5	--
Petroleum:			
Crude and partly refined	thousand 42-gallon barrels	103,915	86,886
Refinery products:			
Gasoline	do	844	24
Kerosine	do	204	2
Distillate fuel oil	do	--	24
Residual fuel oil	do	3	(1)
Lubricants	do	r 190	205
Other:			
Liquefied petroleum gas	do	5	5
Unspecified	do	290	239
Total	do	1,536	499
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals		17,876	18,482

r Revised.
1 Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—The joint venture between the Korean Development Bank and Aluminum Péchiney of France became a reality with the establishment of Toehan Aluminum Refinery Co. to operate the Ulsan aluminum refinery instead of Hankuk Aluminum Refinery Co.[3] The new company plans to expand production facilities and install rolling equipment to produce secondary aluminum products. The Government of the Republic of Korea is also planning to build another aluminum smelter with an annual capacity of 100,000 tons by the end of 1978.

Copper and Lead.—One phase of the Government's heavy industry development policy calls for the establishment of a copper smelter with an annual capacity of 150,000 tons and a lead smelter with an annual capacity of 50,000 tons. Both will rely on foreign sources for raw materials. The copper project will be a joint venture between Japanese and Korean interests with Taihan Electric Wire Co. of Korea the majority owner. The smelter is to be erected at Onsan near Ulsan by 1976.[4] Work progressed on the expansion of Chanhang copper smelter owned by Korea Mining and Smelting Co., Ltd., which will double current capacity to 13,000 tons per year.

Iron and Steel.—The hot-strip mill, with an annual capacity of 606,500 tons, of the iron and steel complex at Pohang began operating early in 1973, and the entire complex, capable of producing 1,030,000 tons of crude steel, was reportedly onstream by midyear. The Republic of Korea and Japan reportedly reached agreement whereby Japan would extend financial assistance for the expansion of the Pohang steelworks. Plans call for another blast furnace, a third converter, two continuous steel casting mills, a cold strip mill, zinc coating mills, and a large-size shape mill. The expansion work is expected to be completed by 1977, and will increase crude steel capacity to 2.6 million tons per year.

Tungsten.—Production of tungsten, from the Sangdong mine of the Korean Tungsten Mining Co. Ltd., was equivalent to 91% of the total output in 1973. The company commenced operating its ammonium paratungstate (APT) facility at the mine and plans to produce annually about 120,000 short ton units of APT.[5]

Zinc.—Zinc smelting operations were resumed during 1973 by Dongshin Chemical

[3] World Mining. South Korea. V. 26, No. 9, August 1973, p. 72.
[4] Mining Journal. Korean Copper Smelter Approved. V. 281, No. 7203, September 1973, p. 191.
[5] World Mining. South Korea. V. 26, No. 7, June 1973, p. 129.

Co., Ltd., raising the nation's ingot capacity to 15,170 tons. Other zinc-refining operations were conducted by Yong Poong Mining Co., which reportedly was developing plans to build a zinc refinery with a capacity of 80,000 tons per year to be completed by the middle of 1977.

NONMETALS

Cement.—The cement industry in 1973 was marked by extensive plans to expand production facilities. Ssangyong Cement Co., Tong Yang Cement Manufacturing Co., Hanil Cement Co., and Hyundai Cement Co. were planning plant expansions to meet rising domestic and export demands.[6] Japan was reportedly interested in financing the export to the Republic of Korea of cement production facilities with a capacity of 5 million tons per year.

Fertilizers.—The Korean Government planned to construct a large fertilizer plant with an annual capacity of 495,000 tons of ammonia, 660,000 tons of sulfate, 600,000 tons of compound fertilizers, 230,000 tons of urea, 200,000 tons of phosphate, and 45,000 tons of nitrogen fertilizers. The cost is estimated at $151.5 million, and completion date was set for 1975. Yong-Nam Chemical Co., Ltd., was planning to expand its fertilizer manufacturing complex at Uslan at a cost of $20 million. Chung Ju Fertilizer Corp. began operating its new 700-ton-per-day urea plant in September.

MINERAL FUELS

Petroleum.—Expansion of petroleum refining operations, with the addition of two new refineries to the already existing three refineries, was being planned in 1973. The two new refineries will each have a processing capacity of 150,000 barrels of crude oil per day and were scheduled for completion by 1975. Most of the output from the new refineries is intended for the export market in and around Japan.

[6] Sam-o, K. South Korea Expands. Far Eastern Economic Review, v. 82, No. 52, December 1973, p. 53.

The Mineral Industry of Kuwait and Saudi Arabia

By John L. Albright [1]

CONTENTS

The former Kuwait-Saudi Arabia Neutral Zone was partitioned into two equal administrative areas in December 1969; the northern half is administered by Kuwait and the southern half by Saudi Arabia. Petroleum is the only marketable mineral commodity produced in the partitioned zone, and the two countries share the revenue from the crude oil production. Three oil companies work concessions in the Neutral Zone: Arabian Oil Co., Ltd. (AOC), American Independent Oil Co. (Aminoil), and Getty Oil Co. (Getty). AOC is the concessionaire for both Kuwait and Saudi Arabia offshore operations, Aminoil is the onshore concessionaire for Kuwait, and Getty is the onshore concessionaire for Saudi Arabia. AOC and Aminoil activities are discussed under Kuwait and Getty activities are discussed under Saudi Arabia, although many Getty facilities are located in the Kuwait-administered area.

KUWAIT

During 1973, Kuwait's economy was almost entirely dependent on the petroleum industry; more than 90% of its income came from royalties and taxes paid by oil companies. The country was the third largest oil producer and exporter in the Middle East and operated the largest tanker fleet in the Middle East. Oil and natural gas produced accounted for an estimated 80% of the country's gross national product (GNP), reported as $4.2 billion [2] for the fiscal year ending March 31, 1973. Recoverable oil reserves totaled 78,131 million barrels, of which 93% was in Kuwait proper and the remainder in the Neutral Zone. Kuwait's oil reserves exceeded those of North and South America combined and were the world's second largest; only Saudi Arabia's vast oil reserves were greater. Kuwait's yearend 1973 natural gas reserves were estimated at 65,257 billion cubic feet, including Neutral Zone reserves, up 16,709 billion cubic feet from 1972. These gas reserves were the third largest in the Middle East, behind Iran and Saudi Arabia.

Several related mineral industries served the country. Natural gas was utilized in oil company operations and as fuel for electric powerplants, and fertilizer materials were produced at petrochemical plants using natural gas feedstocks. Sulfur was recovered for export at the country's petroleum refineries. Nonpetroleum-mineral activities were insignificant.

Plans were made during the year to establish new industrial plants. Another fertilizer materials installation may be built, liquefied natural gas (LNG) and liquefied petroleum gas (LPG) plants may be constructed, and a large petrochemical complex will go onstream in the near future. During 1973, planning was underway for

[1] Mineral specialist (petroleum), Division of Fossil Fuels—Mineral Supply.

[2] Where necessary, values have been converted from Kuwaiti dinars (KD) to U.S. dollars at the rate of KD1 = US$3.38.

the establishment of an aluminum smelter in Kuwait, and a government tender was issued for the construction of a steel mill.

Government-initiated negotiations were held with British Petroleum (Kuwait) Ltd. and Gulf Kuwait Co., owners of Kuwait Oil Co., Ltd. (KOC), concerning the Government's proposed participation in KOC activities. During 1973 the Government imposed limits on petroleum production and exports, as the Organization of Arab Petroleum Exporting Countries (OAPEC) attempted to gain political support for the Arabs concerning their continuing conflict with Israel. In 1973, a petroleum resources conservation law was passed which required oil company operations to be conducted in a prudent manner to protect natural resources, public and private property, and human lives. Petroleum industry developments will be monitored by the Ministry of Finance and Oil, and the industry will be required to submit reports periodically to the ministry relating to company activities.

PRODUCTION

Crude oil and natural gas production declined in 1973, but significant increases were reported in refined petroleum products and fertilizer materials output. Production of crude oil, by KOC in Kuwait proper and the country's one-half share from AOC and Aminoil operations in the former Neutral Zone, totaled 1.1 billion barrels in 1973, off nearly 100 million barrels from the previous year. Aminoil produced oil jointly and equally shared the output with Getty Oil Co. in the former Neutral Zone. Combined Kuwaiti-Neutral Zone share crude oil production for 1973 was the third largest in the Middle East, behind Saudi Arabia and Iran, accounting for approximately 14% of the area's crude oil production. KOC's output during the year totaled 1,007 million barrels (off 8.3% from 1972), Kuwait's share of the AOC production totaled 71.9 million barrels (down 4.1% from the previous year), and Aminoil's 1973 production was 23.5 million barrels (a decrease of 17.8% from 1972). KOC was Kuwait's largest producer with 91% of the country's total output. The Kuwait Government limited KOC's crude oil production to 3 million barrels per day in 1972, announced in mid-1973 that production increases would be allowed if new fields were found, and reinstated the production ceilings in the fourth quarter 1973. During the first 9 months of 1973 KOC oil was produced at the rate of 2.83 million barrels per day (compared with 2.98 million barrels per day during the corresponding period in the previous year), but government-imposed cutbacks during the fourth quarter reduced KOC's 1973 yearly average production to 2.76 million barrels per day (off 240,322 barrels per day from 1972).

Gross natural gas output produced entirely in association with crude oil was 581 billion cubic feet in 1973, down 10% from the previous year; KOC accounted for more than 90% of the total. About one-half of KOC's natural gas was used in company operations or sold to local consumers, and the rest was flared. An estimated 90% of natural gas produced in the former Neutral Zone was flared.

Three refineries processed crude oil at a daily rate of nearly 383,500 barrels. Crude oil throughput declined at Aminoil's Mina Abdullah refinery from 75,100 barrels per day during October to 51,600 barrels per day in December, giving the company an annual average of 70,400 barrels per day. All of the company's crude oil was processed at Mina Abdullah; none was exported. Due to increased domestic demand for refined petroleum products, KOC's throughput at Mina al Ahmadi increased during 1973. December's throughput was reported at 212,300 barrels per day, up 62,500 barrels per day from KOC's October rate, giving the company an average throughput of 178,000 barrels per day for the year. Throughput at Kuwait National Petroleum Co.'s (KNPC) Shuaiba petroleum refinery was 135,000 barrels per day, an increase of nearly 20,000 barrels per day over 1972 activities.

Fertilizer materials production increased during 1973, and all of the output was destined for export.

TRADE

Japan and the United States continued to be Kuwait's major trading partners, and petroleum was Kuwait's largest export commodity. During 1973 trade agreements were negotiated with Bahrain and the United Arab Emirates. The accord with Bahrain provided for the removal of customs barriers and the free movement of capital

Table 1.—Kuwait: Production of mineral commodities

Commodity	1971	1972	1973 p
NONMETALS			
Clay products, nonrefractory, sand-lime bricks _cubic meters__	196,446	230,451	148,383
Fertilizer materials, manufactured, nitrogenous:			
Ammonium sulfate ----------metric tons__	65,450	92,179	118,795
Urea ----------do____	182,227	514,249	580,075
Lime, hydrated and quicklime ----------do____	2,306	1,811	401
Salt ----------do____	4,731	4,977	10,030
Sulfur ----------do____	r 41,565	51,884	65,070
MINERAL FUELS AND RELATED MATERIALS			
Natural gas:			
Gross production [1] ----------million cubic feet__	r 643,710	647,808	581,065
Marketed production [1] ----------do____	r 157,053	181,643	186,045
Natural gas liquids:			
Natural gasoline ----------thousand 42-gallon barrels__	5,403	5,580	e 5,888
Liquefied petroleum gas (propane and butane) ____do____	13,664	15,005	e 16,261
Petroleum:			
Crude [1] ----------do____	1,167,329	1,201,346	1,102,446
Refinery products: [2]			
Motor gasoline ----------do____	r 16,699	14,373	14,922
Jet fuel ----------do____	r 810	874	855
Kerosine ----------do____	r 5,440	6,158	7,787
Distillate fuel oil ----------do____	r 27,035	25,079	27,196
Residual fuel oil ----------do____	r 86,451	75,294	70,439
Other:			
Naphtha ----------do____	11,066	11,503	12,698
Asphalt ----------do____	169	232	328
Unspecified ----------do____	r 6,279	4,900	4,535
Refinery fuel and losses ----------do____	r 2,561	2,912	3,246
Total ----------do____	r 156,510	141,325	142,006

e Estimate. p Preliminary. r Revised.
[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.

and labor between the two countries. Increased exchange of capital investment and the free trade of manufactured goods were the salient features of the agreement with the United Arab Emirates. Early in the year the French commercial officer in charge of the Middle East regional trade promotion relocated his office from Lebanon to Kuwait, and France signed an economic and industrial cooperation agreement with Kuwait, which should lead to increased trade between the two countries.

Exports of crude oil and refined petroleum products decreased in fourth-quarter 1973, as Kuwait and the other Arab oil-producing states implemented an oil embargo of "unfriendly" western countries in an effort to gain support in their conflict with Israel. Despite the embargo, Kuwait was the world's third largest crude oil exporter (surpassed only by Saudi Arabia and Iran), and the second largest exporter of refined petroleum products in the Middle East and Africa (Saudi Arabia retained its position as the largest exporter of refined products). KOC accounted for most of the oil exports, and more than one-half of total shipments were destined for European consumers. Exports of fertilizer materials increased significantly in 1973, as foreign markets were developed for this growing industry. Ammonium sulfate, sulfuric acid, and urea shipments recorded increases over those of the previous year and were valued at $19.5 million. India and the People's Republic of China were the largest importers of Kuwaiti fertilizer materials.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973
METALS			
Aluminum metal, including alloys, unwrought and semimanufactures	84	127	36
Copper metal, including alloys, unwrought and semimanufactures	4	3	7
Iron and steel metal:			
Scrap	27,870	18,429	51,680
Pig iron, ferroalloys, and similar materials	--	45	--
Semimanufactures	12,231	36,637	36,041
Lead metal, including alloys, unwrought and semimanufactures	8	34	5
Tin metal, including alloys, unwrought and semimanufactures long tons	1	--	(2)
Zinc metal, including alloys, unwrought	--	--	32
Other:			
Nonferrous metal scrap	4,939	5,445	5,721
Metal, including alloys, all forms	--	1	(2)
NONMETALS			
Abrasives, natural, n.e.s., grinding and polishing wheels and stones	2	2	6
Asbestos	300	--	--
Cement	r 18,218	12,351	20,360
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	--	--	15,929
Products:			
Refractory (including nonclay bricks)	1,001	232	2
Nonrefractory	129	56	630
Fertilizer materials:			
Crude	25	100	--
Manufactured:			
Nitrogenous	182,210	559,334	692,407
Other, including mixed	76,427	1,157	32
Ammonia	--	--	77,822
Gypsum and plasters	14	--	3
Lime	--	23	11
Pigments, mineral, including processed iron oxides	--	--	145
Salt (excluding brine)	1,101	113	362
Sodium and potassium compounds, n.e.s., caustic soda	--	--	2,398
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	47	188	56
Worked	45	--	276
Gravel and crushed rock	334	394	77
Limestone (except dimension)	--	--	(2)
Sand	7,880	18,659	25,783
Sulfur:			
Elemental, all forms	--	--	39,252
Sulfuric acid	--	--	4,732
Other nonmetals, n.e.s.:			
Crude	1	57	2
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	--	--	6,278
MINERAL FUELS AND RELATED MATERIALS			
Coal and coke, including briquets	1	29	10
Petroleum:			
Crude—thousand 42-gallon barrels	1,011,933	1,071,964	1,059,906
Refinery products:			
Shipments other than bunkers:			
Gasoline—do	6,994	[3] 24,967	14,661
Kerosine and jet fuel—do	5,038	8,201	3,053
Distillate fuel oil—do	37,419	22,936	15,033
Residual fuel oil—do	47,270	42,640	28,070
Other:			
Liquefied petroleum gas—do	13,174	15,724	805
Unspecified—do	[4] 9,305		
Total—do	119,200	114,468	61,622
Bunkers:			
Aviation gasoline—do	6	1,268	501
Jet fuel—do	389		
Distillate fuel oil—do	13,838		
Residual fuel oil—do	28,262	33,588	34,783
Total—do	42,495	34,856	35,284

r Revised.
[1] Includes Kuwait's share of former Neutral Zone exports of petroleum.
[2] Less than ½ unit.
[3] Apparently includes natural gasoline, and may also include naphtha for petrochemical feedstocks.
[4] Including natural gasoline as follows in thousand barrels: 1971—2,198.

Table 3.—Kuwait: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, including alloys, unwrought and semimanufactures	1,619	1,657
Copper metal, including alloys, unwrought and semimanufactures	321	597
Iron and steel metal:		
Scrap	6,217	4,826
Pig iron, ferroalloys, and similar materials	115	103
Semimanufactures:		
Bars, rods, angles, shapes, sections	132,252	107,928
Universals, plates, sheets	28,652	51,860
Wire	1,814	3,752
Tubes, pipes, fittings	63,234	62,525
Lead metal, including alloys, unwrought and semimanufactures	141	739
Nickel metal, including alloys, unwrought and semimanufactures	(1)	(1)
Silver and platinum ----troy ounces	--	804
Tin metal, including alloys, unwrought and semimanufactures ----long tons	4	4
Uranium, radium, thorium, and alloys ----grams	7,683	289
Other:		
Nonferrous metal scrap, not subdivided	1,075	1,234
Metal, including alloys, unwrought and semimanufactures	126	28
NONMETALS		
Abrasives, natural, n.e.s., grinding and polishing wheels and stones	54	134
Asbestos	1,969	4,971
Cement	687,392	639,040
Clay products:		
Refractory (including nonclay bricks)	620	339
Nonrefractory	r 7,469	8,752
Diamond, gem, not set or strung ----carats	1,020	1,995
Fertilizer materials:		
Crude, natural, all types	126	--
Manufactured, other, including mixed	256	183
Gypsum and plasters	8,572	9,460
Lime	216	549
Precious and semiprecious stones, except diamond ----carats	167,875	371,325
Salt	4,792	4,276
Stone, sand and gravel:		
Dimension stone:		
Unworked:		
Marble	5,058	4,942
Mosaic stones, pebbles, powder	58,890	56,150
Other	1,808	1,143
Worked	3,502	3,985
Gravel and crushed stone	40,740	31,566
Sand	94	31
Other:		
Agricultural soil and clay	33	28
Unspecified crude minerals, chalks, colored soil, clay	233	281
MINERAL FUELS AND RELATED MATERIALS		
Coal and coke, including briquets	172	98
Petroleum refinery products:		
Gasoline ----thousand 42-gallon barrels	18	22
Kerosine and jet fuel ----do	(1)	--
Lubricants ----do	155	176
Other, asphalt ----do	41	75
Total ----do	214	273

r Revised.
1 Less than ½ unit.

COMMODITY REVIEW

Metals.—*Aluminum.*—Two Japanese firms, C. Itoh & Co. and Nippon Light Metal Co., Ltd. conducted surveys of possible plant sites and envisaged a feasibility study for participating with the Kuwaiti Government in building a 200,000-ton-per-year aluminum smelter in Kuwait. At year-end, the plant site had not been selected for the $200 million project.

Iron and Steel.—A government tender was issued inviting offers from international steel companies for the construction and operation of a steel mill at an unspecified location in Kuwait. Directly reduced iron ore will provide the raw materials for the electric furnaces. Downline processing, including continuous casting and roiling mills, will produce bars, billets, rods, and light sections at the rate of 300,000 tons per year.[3]

Nonmetals.—*Fertilizer Materials.*—A pro-

[3] Metal Bulletin. No. 5826, Aug. 17, 1973, p. 27.

posal was submitted to the Kuwaiti Government by the Indian Petrochemicals Corp. for the establishment of a second fertilizer materials plant at Shuaiba which would utilize domestically produced ammonia and sulfur. Phosphates will be imported from nearby countries. The proposed plant, to be owned 49% and 51% by India and Kuwait respectively, will produce phosphoric and sulfuric acids and export superphosphate fertilizers to India.

After lengthy negotiations, Kuwait Petrochemical Industries Co. (KPIC) acquired the 40% share that British Petroleum (BP) (Kuwait) Ltd. and Gulf Kuwait Co. had held in Kuwait Chemical Fertilizer Co. (KCFC). During 1973 KCFC operated at 90% capacity, and the company's output exceeded the previous year's production by the following percentages, ammonium sulfate 29.3%, liquid ammonia 9.4%, sulfuric acid 30.4%, and urea 15.3%. Sales recorded significant increases, as the company concluded 158 sales contracts during the year. By yearend, construction was completed on KCFC's third sulfuric acid storage tank at Shuaiba. The new tank has a 4,000-ton capacity. Studies continued concerning the proposed expansion of the 550-ton-per-day urea plant, but company plans were not finalized.[4]

Commencing in 1974, a Kuwaiti plant will manufacture polypropylene containers, using raw materials from the KNPC and KOC petroleum refineries. Three million containers will be made available annually to the KNPC fertilizer plant and other consumers.

Mineral Fuels and Related Minerals.—*Natural Gas.*—Gross natural gas production for 1973 was 581 billion cubic feet, a decrease of nearly 67 billion cubic feet from that of the previous year, and marketed production for 1973 totaled 186 billion cubic feet. Yearend 1973 natural gas reserves were placed at 39,257 billion cubic feet for Kuwait plus 26,000 billion cubic feet for the country's share of Neutral Zone resources. Reserves for the previous year had been estimated at 39,798 and 8,750 billion cubic feet for Kuwait and the Neutral Zone respectively. Kuwaitis expressed interest in establishing LNG export plants, similar to those in Algeria and Libya. AOC studied the possibility of building such a plant for LNG exports to Japan, and the Bechtel Corp., a U.S. firm, prepared a feasibility study for liquefaction of gas for export.

AOC planned to drill several wells in the Dorra Field, where large quantities of nonassociated gas were found in 1967. Company plans called for the annual production of 2 million tons of LNG, equivalent to some 274 million cubic feet of gas per day, beginning in 1975.

KNPC and the Ministry of Finance and Oil requested the gas liquefaction study, which concerns utilizing available supplies of surplus natural gas otherwise flared. In November 1973, the completed feasibility study called for the construction of a $300 million liquefaction plant with a capacity to produce 5 million tons per year of butane, propane, and natural gasoline. Bechtel recommended that 15 special LPG tankers costing a total of $500 million be purchased, and that the plant be made ready for operation by 1977. Before yearend KNPC and the Government approved the $800 million project and began preparing tenders for bids by international contractors.[5]

The French engineering firm Sodeteg conducted a study for the Kuwaiti Government for a $500 million petrochemical complex based on associated gas, which will specialize in plastic products. Ethylene for the plant's operations will be produced from a steam cracking unit at the rate of 300,000 tons per year. Sodeteg plans to have the plant in service in 1978.

Petroleum.—The Organization of Petroleum Exporting Countries (OPEC) members held an early October 1973 meeting with representatives of the major oil companies to discuss a revision of the 1971 Teheran agreement. Effective October 16, 1973, the OPEC countries unilaterally established posted prices for their countries approximately 70% above the then-current prices. At that time OAPEC members agreed to restrict production and carry out an embargo of petroleum shipments to the Netherlands and the United States. By yearend further cuts had been made in crude oil production, and the OAPEC embargo spread to numerous Western countries that failed to support the Arab cause in their struggle with Israel. Earlier in the year, Kuwait's Oil Minister signed an

[4] Middle East Economic Survey (Beirut, Lebanon). V. 17, No. 33, June 7, 1974, pp. 5–8.
[5] Middle East Economic Survey (Beirut, Lebanon). V. 17, No. 32, May 31, 1974, p. 6.

agreement with British Petroleum (Kuwait) Ltd. and Gulf Kuwait Co., coowners of KOC, providing for the Government's initial purchase of a 25% interest in KOC, with the Government's participation share reaching 51% in 1982. Kuwait's Council of Ministers approved the agreement, but it was rejected by the National Assembly after a long debate. Government negotiators then asked the companies for a revision of the agreement, and talks were held during the second half of 1973 concerning Kuwait's immediate controlling interest in the oil companies' operations. A new participation arrangement was discussed which would provide for 60% ownership of KOC by the Kuwaiti Government, but no agreement had been reached by yearend.

American Independent Oil Co. (Aminoil).—Onshore joint oil production operations continued in the former Neutral Zone with Getty Oil Co., and crude oil throughput at Aminoil's Mina Abdullah petroleum refinery averaged 70,400 barrels per day. Diminishing worldwide demand for low-gravity, high-sulfur oils seriously hindered the company's sales, and Kuwaiti production and shipment restrictions further hampered Aminoil operations in 1973.

Arab Maritime Petroleum Transport Co. (AMPTC).—Eight OAPEC members, Abu Dhabi, Algeria, Bahrain, Iraq, Kuwait, Libya, Qatar, and Saudi Arabia formed AMPTC in January 1973 with head offices in Kuwait and a charter providing for an initial capital investment of $500 million. Preliminary plans were developed to purchase several supertankers for the export of OAPEC crude oil and an order was negotiated with the French firm Chantiers Navals de l'Atlantique for the construction of two 278,000-deadweight-ton supertankers, with tentative delivery dates set for October 1977 for the first tanker and April 1978 for the second. AMPTC planned to order two or three more supertankers in 1974. Several OAPEC members recently signed participation agreements with foreign oil companies operating in their countries, which will provide them with large amounts of crude oil for their disposition.

Arabian Oil Co. Ltd. (AOC).—AOC prepared plans to expand its facilities to provide for a 42.9% increase in crude oil production by 1975. Estimated costs for this expansion program were placed at $113 million, and the company's output in 1975 would reach 700,000 barrels per day.[6] Two rigs were in operation during 1973, Arabian Drilling Co.'s **AD–1** in the Dorra Field and Atwood Oceanic Inc.'s *Bull Run* in the Khafji Field. Twenty wells were drilled in the offshore Khafji Field during the year, and the company planned to drill 25 more in the concession area in 1974.

Kuwait National Petroleum Co. (KNPC).—During 1973, refinery operations were expanded at Shuaiba. Although hampered by an estimated $2 million fire on July 8, repairs were quickly carried out, and the plant resumed operations on August 1. Early in the year plans were finalized to expand the refinery's throughput capacity to about 180,000 barrels per day, and an Italian engineering firm, Snam Progetti, S.p.A., began expansion work. Completion was scheduled for the first quarter of 1975. Company storage and tanker-loading facilities were also being enlarged during the year. Eighteen storage tanks were being constructed, with a combined capacity of 5.5 million barrels, and a new pier with modern loading equipment was under construction. KNPC also finalized plans for a lubricating oil blending plant. Construction will begin at Shuaiba in the near future, and the plant is scheduled to be placed onstream early in 1976. KNPC refined products sales increased significantly until October when the Arab oil embargo of Western countries was implemented. During the year, 10 tankers were chartered for deliveries of KNPC products, and the company made plans to acquire its own tanker fleet to strengthen its international marketing operations. Initial orders for tankers will be placed with Western shipyards in 1974. KNPC took over KOC's ship bunkering services in Shuwaykh, and a bunkering tanker was put in service in the Arabian Gulf. A jointly-owned KNPC-Yemen National Petroleum Co. firm, the Yemeni-Kuwait Bunkering (Aden) Co., Ltd., was established which will operate a marine petroleum terminal at al-Hajif near Aden for crude oil and refined petroleum products.

Kuwait Oil Co. (KOC).—Crude oil output by Kuwait's largest producer dropped slightly from 1972 operations because of government-directed production cutbacks. KOC did not report any new drillings during 1973, and the company's oil was pro-

[6] Oil and Gas Journal. V. 71, No. 4, Jan. 22, 1973, p. 65.

duced from 380 wells in 12 oilfields at the average rate of 2.75 million barrels per day. Geological studies were carried out based on seismic surveys conducted during 1972 in northern areas, and one exploratory location in the Bahra area was selected for drilling in 1974. During 1972 the Kuwait Government held talks with KOC's owners concerning the Government's proposed 25% ownership in KOC's concessions and operations, but in early 1973 the National Assembly failed to ratify the negotiated agreement and talks resumed concerning a new agreement. By yearend the new agreement had not been signed, but a 60% government participation agreement was taking shape for probable signing and ratification in 1974.

Crude oil throughput increased at the Mina al Ahmadi refinery during 1973, unaffected by the oil production and foreign shipment cutbacks. Because of higher government demands and KNPC orders, the volume of oil processed increased to 212,300 barrels per day in December, from the October 150,000-barrel-per-day average, giving the company a yearly average of 178,000 barrels per day. LPG production set a record, an estimated 11.5 million barrels. The proportion of Kuwaitis employed by KOC rose to 44.5% in 1973, up 4.1% from the previous year, and may reach 60% by 1976.

Kuwait Oil Tanker Co. (KOTC).—Under a long-term charter to the Kuwait Oil Co. crude oil shipments were made by KOTC's fleet of six tankers that had an aggregate tonnage of 793,000 deadweight tons. During 1973 KOTC assumed direct management of its fleet, previously managed by Common Brothers (Management) Ltd., a British firm. Three of the KOTC ships were 208,000 deadweight tons, and the remainder were smaller vessels of 60,000 and 40,000 deadweight tons. During the year KOTC placed orders with foreign shipyards for three supertankers valued at a total of $170 million. Chantiers Navals de La Ciotat, of France, will build a $54 million, 328,000-deadweight-ton ship, and Japanese shipbuilder Mitsubishi Heavy Industries, Ltd. was contracted to construct a 395,000-deadweight-ton vessel. Both firms scheduled deliveries for yearend 1976. KOTC then requested Sasebo Heavy Industries Co., Ltd., also of Japan, to build a 270,000-deadweight-ton tanker at an estimated cost of $52 million. Final contracts for this ship were to be signed early in 1974, for delivery in the first half of 1977.[7] In addition to these three ships, another supertanker was under construction at a Spanish shipyard, which KOTC had ordered in association with Gulf Oil Co. The original contract called for a 324,000-deadweight-ton vessel to be completed in March 1974, but in 1973, a supplementary contract was signed by Gulf Oil Co., KOTC, and Astilleros y Telleres del Norocste, S.A., increasing the ship's size to 360,000 deadweight-ton and changing the completion date to 1975.

Kuwait Spanish Petroleum Co. (KSPC).—In early 1973, exploratory well No. 5 (Ruqei No. 2) was abandoned after reaching a depth of 4,473 meters. KSPC suspended its drilling program and concentrated activities on geological studies of its concession area.

SAUDI ARABIA

With more crude oil reserves than any other country in the world, Saudi Arabia continued as the undisputed leader of OPEC, and as the major owner (25%) of the Arabian American Oil Co. (Aramco), the world's largest oil producing and exporting company. Saudi Arabian crude oil reserves are recorded at 102 billion barrels, nearly 19% of the world's 546 billion barrels of crude oil reserves. Aramco crude oil reserves were estimated at 96.9 billion barrels, 95% of the country's total. The country still contains vast frontier offshore areas waiting to be drilled; these areas are surrounded by giant productive fields containing multiple productive horizons.

Few mineral resources have been developed in Saudi Arabia, except for petroleum and natural gas, but in 1973, plans were studied to establish aluminum, ethylene, iron and steel, and methanol plants and to expand the country's cement production facilities. During the year a nickel discovery continued to be delineated and exploration activities were scheduled to begin for possible other metallic deposits.

[7] Kuwait Oil Tanker Co. S.A.K. 1973 Annual Report. Pp. 6–10.

Construction activities intensified as petroleum industry production, processing, and transportation facilities were enlarged. The Harmaliyah and Zuluf oilfields began producing in 1973, more than 560 kilometers of pipelines were built, and port facilities were constructed at Jidda, Ju'aymah, Ras Tanura, and Zuluf. Demand for electricity and water increased steadily during 1972 and 1973, and the Government planned expansions to the country's electricity generating capacity and potable water facilities. Saudi Arabia's planned aluminum and steel industries will require large amounts of electricity, and thermal powerplants will be built to serve both industries. During 1973 plans were reviewed to expand the country's existing electric powerplants and place new installations in service. Water desalination facilities will be constructed at most of the powerplants.

Saudi Arabia's state budget for the fiscal year August 10, 1972, to July 31, 1973, was balanced at $3,718 million, and 91.6% of the revenues were expected to come from the petroleum sector of the economy. Aramco payments of royalties and taxes to the Government in 1973 exceeded projected figures and totaled $4,215.5 million, a growth of 60.1% over the $2,632.7 million paid during the previous year. Payments averaged $1.57 per barrel for the 2,677 million barrels of crude oil produced during the year, rising steadily throughout the year from $1.33 during the first quarter to $2.19 in the last quarter. Mineral producing and processing industries contributed an estimated 80% of Saudi Arabia's GNP of $6,400 million at 1973 prices.[8] The GNP grew 38% during 1973, attributable mainly to increased crude oil production and significant petroleum price increases. The general budget for the 1973–74 fiscal year (August 1, 1973, to July 31, 1974) was set at $6,425 million, a 72.8% increase over the previous budget. Oil revenues in 1973–74 were estimated at $5,946 million, representing 92.5% of the total revenue.

Domestic consumption of petroleum products reached 24.9 million barrels in 1973, up 24.3% or 13,300 barrels per day from that of 1972. Nearly 12.8 million barrels of industrial fuels (51.3% of the total), 5.9 million barrels of motor gasoline, and 6.2 million barrels of other products were consumed.

PRODUCTION

Two new oilfields were brought into production in 1973, and the country's crude oil output set another record at 2,773 million barrels, (7.6 million barrels per day). Aramco's fields supplied 97% of the oil, and the remainder came from Saudi Arabia's one-half share of the Aminoil–Getty joint venture and AOC output from the partitioned former Kuwait-Saudi Arabia Neutral Zone. Aramco's production and export facilities were expanded during the year, and the company realized a crude oil output increase of 27.6% above 1972 production.

Production levels for Saudi Arabia's largest producer reached an average of 7.6 million barrels per day for the first 9 months of the year, but government-directed cutbacks during the fourth quarter brought Aramco's yearly average down to 7.3 million barrels per day. New gas-oil separator plants (GOSP), pipelines, and water injection plants were placed in service, allowing for higher production levels in several fields. The Harmaliyah oilfield went onstream in August 1973, using a GOSP rated at 150,000 barrels per day. Initial production was at the rate of 100,000 barrels per day of Arabian light crude oil. This new onshore field was discovered in December 1971 about 30 kilometers east of Ghawar Field, Saudi Arabia's largest. Offshore, the Zuluf Field came onstream in 1973 with a GOSP rated at 450,000 barrels per day and loading facilities capable of handling the largest tankers in international service. AOC's offshore Neutral Zone oil output declined 4.1% from 1972, and Getty's onshore production reportedly fell 17.5% in 1973. Estimated gross production of natural gas in 1973 was 1,440 billion cubic feet, up 27.8% from 1972. Marketed production was estimated at only 105 billion cubic feet or 7.3% of the total, and nearly all of the remainder was flared.

Saudi Arabia's refineries produced at a record rate during 1973. The Ras Tanura plant, the most important in the country and one of the largest in the world, was the country's sole source of jet fuel.

Cement was the only significant nonpetroleum commodity produced in Saudi Arabia. The industry reported increased

[8] Where necessary, values have been converted from Saudi Arabian riyals to U.S. dollars at the rate of SRls3.73 = US$1.00.

production during 1973 of 1% above that of 1972 output. Production in 1972 had been nearly one-third more than recorded in the previous year.

TRADE

Crude oil and refined petroleum products were essentially the only mineral commodities exported in 1973, and the major mineral imports were cement and iron and steel semimanufactures. Approximately one-fourth of the iron and steel imports originated in Europe, and nearly all of the remainder came from Japanese manufacturers.

In October 1973, OAPEC ordered production cutbacks by member countries, and an oil embargo began against the United States and the Netherlands. Soon nearly all petroleum shipments from OAPEC members ceased to Europe, Japan, and other selected countries. Oil companies operating in Saudi Arabia were directed by the Government to participate in the OAPEC embargo, and the petroleum production-shipment slowdown continued into 1974. Nevertheless, Saudi Arabia's total 1973 trade rose, owing to extensive exports during the first 9 months of the year. In May 1973, the General Petroleum and Mineral Organization (Petromin) signed contracts with more than 20 foreign companies for the sale of the Government's "participation crude" from its share of Aramco's operations. Exports to Brazilian, Egyptian, Japanese, United States, and Western European consumers will be carried out during the next 2 years.

The Persian Gulf members of OPEC announced their new oil-pricing arrangement effective October 16, 1973. Member states will establish posted prices for crude oil produced in their countries based on market prices and adjusted for sulfur content,

Table 4.—Saudi Arabia: Production of mineral commodities [1]

Commodity	1971	1972	1973 [p]
METALS			
Steel semimanufactures, hot rolled ---------- metric tons	10,300	10,076	NA
NONMETALS			
Cement, hydraulic [2] ---------- thousand metric tons	703	910	[e] 920
Gypsum [3] ---------- do	36	[e] 45	[e] 45
Lime [3] ---------- do	[e] 22	13	[e] 15
Stone, marble [3] ---------- metric tons	[e] [4] 2,000	NA	NA
Sulfur [e] ---------- do	5,000	5,000	5,000
MINERAL FUELS AND RELATED MATERIALS			
Gas, natural:			
Gross production ---------- million cubic feet	938,347	1,126,974	[e] 1,440,000
Marketed production ---------- do	96,050	98,578	[e] 105,000
Natural gas liquids:			
Propane and butane ---------- thousand 42-gallon barrels	[e] 10,000	15,784	25,628
Natural gasoline and other ---------- do	[e] 3,000	4,007	9,822
Total ---------- do	[e] 13,000	19,791	35,450
Petroleum:			
Crude ---------- do	1,741,149	2,098,422	2,772,590
Refinery products:			
Gasoline ---------- do	31,200	30,873	[5] 44,900
Jet fuel ---------- do	13,277	16,323	13,413
Kerosine ---------- do	5,300	5,042	5,217
Distillate fuel oil ---------- do	23,053	23,410	26,948
Residual fuel oil ---------- do	136,954	119,413	101,663
Other:			
Liquefied petroleum gas ---------- do	17,897	15,854	25,674
Naphtha ---------- do	5,246	6,171	([5])
Asphalt ---------- do	1,081	939	1,574
Unspecified ---------- do	35	70	
Refinery fuel and losses ---------- do	4,568	7,044	5,662
Total ---------- do	238,611	225,139	225,051

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

[1] Includes Saudi Arabia's one-half share of crude oil and natural gas production in the Kuwait-Saudi Arabia partitioned zone, and Saudi Arabia's share of refinery output by its concessionaires in that area.

[2] Series revised from that heretofore published to reflect output on basis of normal 365 day calendar year rather than Hejira calendar year (see footnote 3).

[3] Data presented are from Hejira calendar years as follows: 1971—Hejira year 1391 (February 27, 1971–February 15, 1972); 1972—Hejira year 1392 (February 16, 1972–February 3, 1973); and 1973—Hejira year 1393 (February 4, 1973–January 24, 1974).

[4] Estimate based on 1970 reported figure.

[5] Naphtha apparently included with gasoline.

geographical location, and gravity differentials. Posted prices will be adjusted by the member state governments as market prices fluctuate.[9] During November, Petromin raised the price of May 1973 participation crude oil sales, in accordance with the OPEC pricing arrangement, to $4.76 per barrel for Arabian light, $4.56 per barrel for Arabian medium, $4.31 per barrel for Arabian heavy, and $5.08 per barrel for Berri crude.

Saudi Arabia and the United States discussed economic cooperation plans under which Saudi Arabia investments will be made in U.S. marketing outlets, pipeline systems, petroleum refineries, and other energy industries. A Saudi-U.S. petroleum refinery, to be built in Texas with a 100,000-barrel-per-day throughput capacity, was reportedly the first project under consideration by the two countries. Lebanon and Saudi Arabia approved the preliminary plan for a jointly owned, 140,000-barrel-per-day refinery to be built in southern Lebanon and designed to process Saudi Arabian crude.

Aramco loaded 4,131 ships with 2,263 million barrels of crude oil and 203 million barrels of refined petroleum products in 1973, an increase of 10.6% over the number of ships loaded in 1972. Of the 2,677 million barrels of crude oil produced by the company during 1973, 2,259 million barrels, or 84.4% of the total, was destined for export at the Persian Gulf tanker loading terminals, 157.2 million barrels was piped to Qaisumah to be pumped through the Trans-Arabian Pipeline (TAPline) to Mediterranean Sea ports, and 64.7 million barrels were piped to Bahrain. The remaining 195.3 million barrels was sent to the Ras Tanura refinery for processing or consumed locally. TAPline deliveries to Mediterranean ports decreased in 1973. The export pipeline and its Lebanon terminal were the targets of saboteurs, and eastern Mediterranean tanker loading operations were slowed due to Arab-Israeli hostilities in the area. More than one-half of Aramco's petroleum sales in 1973 were to North American and European consumers, and Asian markets accounted for nearly one-third of the shipments. Saudi Arabia's second supertanker terminal was placed in service in 1973 at Zuluf, and its third supertanker port was under construction at Ju'aymah near Ras Tanura.

COMMODITY REVIEW

Two Japanese companies, Mitsui & Co., Ltd., and Nippon Mining Co. Ltd., signed a contract with Petromin which permits prospecting in a 10,000-square-kilometer area in the Negrah District, northeast of Jidda. Geological surveys were scheduled to begin before yearend 1973, and the company's drilling program will commence in 1974. Deposits of copper, gold, lead, silver, and zinc are believed to be located in the Negrah District.[10] A Canadian company planned an aerial survey

[9] Petroleum Intelligence Weekly. V. 12, No. 43, Oct. 22, 1973, pp. 1–9.
[10] Mining Journal. V. 281, No. 7199, Aug. 10, 1973, p. 113.

Table 5.—Saudi Arabia: Exports of crude petroleum and petroleum refinery products[1]

(Thousand 42-gallon barrels)

Commodity	1971	1972	1973
Crude petroleum	1,528,220	r 1,992,487	2,560,342
Petroleum refinery products:[2]			
Shipments other than bunkers:			
Gasoline	17,271	28,320	38,435
Jet fuel	641	13,675	3,092
Kerosine	3,060	3,500	1,318
Distillate fuel oil	20,758	27,409	13,784
Residual fuel oil	68,734	47,200	35,108
Other	19,162	17,448	26,775
Total	129,626	137,552	118,512
Bunkers:			
Distillate fuel oil	786	842	1,000
Residual fuel oil	59,596	60,598	72,477
Total	60,382	61,440	73,477

r Revised.
[1] Includes Saudi Arabia's share of exports from the Kuwait-Saudi Arabia partitioned zone.
[2] Excludes exports (if any) by General Petroleum and Mineral Organization (Petromin).

Table 6.—Saudi Arabia: Aramco petroleum exports, by destination

(Percentage of totals)

Area	1971	1972	1973
Africa	4.9	3.2	3.4
Asia	30.6	29.1	29.2
Australia	1.0	.7	.7
Europe	53.2	56.5	52.0
North America	4.0	4.5	5.2
South America	6.3	6.0	9.5
Total	100.0	100.0	100.0

for uranium in undisclosed areas of Saudi Arabia.

Metals.—*Aluminum.*—During the year a Japanese mission visited Saudi Arabia and held preliminary discussions with Government officials concerning a proposed aluminum smelter for this energy-rich country. A natural-gas-fueled thermal powerplant would be built, according to the proposal, to supply electricity for the plant, and raw materials would be imported.[11] The aluminum smelter will probably be a joint venture between Japanese interests and the Saudi Arabian Government. By year-end 1973, neither the construction timetable nor the plant site had been selected.

Iron and Steel.—In 1973, Marcona Corp., heading a group of U.S. companies which included Gilmore Steel Corp. and Midland-Ross Corp., concluded an agreement with Petromin to conduct a feasibility study for the establishment of a steel mill in Saudi Arabia. Two Japanese companies, Nippon Kokan K.K. and Nippon Steel Corporation, joined the Americans in the feasibility study, and European steel manufacturers have also shown interest in participating in the project. A joint venture company will be formed in which Petromin will hold 50% ownership and the Marcona group the remaining shares. Initial plans call for iron ore to be imported from Brazil in slurry form, Saudi Arabia's natural gas will fuel the mill,[12] and the plant's thermal electric powerplant will also be gas fired. The feasibility study will examine all economic and technical factors concerning the project. The Marcona group's project calls for the iron ore slurry to be pelletized and reduced for subsequent conversion to steel in electric furnaces, and a continuing-casting facility will be built to produce bars, plates, slabs, semifinished products, and spiral-weld pipes. Petromin hopes to have the 1-million-ton-per-year plant in operation near Ras Tanura on the Arabian Gulf Coast by late 1976 or early 1977.[13] Ultimate production is targeted at approximately 10 million tons per year. The Marcona Corp. has invested in Brazil's iron ore mining industry, and the corporation has perfected a process for pumping low-grade iron ore through pipelines in liquid suspension form.

Two Japanese firms, Nippon Steel Corporation and Sumitomo Metal Industries, Ltd. announced plans in 1973 to establish a plant in Saudi Arabia to manufacture 51- to 66-centimeter-diameter spiral-weld steel pipes. Saudi Arabia will hold 51% ownership in the project. Initially, the new mill will import Japanese plates, but supplies will come later from the Marcona group-Petromin steel works.[14]

General Motors Corp. (GMC) concluded an agreement in 1973 for a $40 million motor vehicle assembly plant to be built in Saudi Arabia, probably at Jidda. The plant will be GMC's first in the Middle East and will have an initial annual output of 5,000 units. The corporation does not plan to purchase steel components from the proposed Saudi Arabian steel mill.

Nickel.—Arabian Shield Development Co., a U.S. firm, reported a discovery of nickel at Wadi Qatan, a mineral exploration license area held jointly with Saudi Arabia's National Mining Co. Nickel was first found there in March 1972. During 1973, massive sulfides were encountered, and preliminary analysis of core samples indicated traces of nickel ranging from 1.5% to 3.9%.[15]

Nonmetals.—*Cement.*—Saudi Arabia continued to import large quantities of cement in 1973 because domestic cement plants could not meet the growing demand for the product. Arabian Cement Co. finalized plans to double the capacity of its Jidda plant and issued a contract to Nichimen Co., Ltd., a Japanese firm, to supply a 1,000-ton-per-day dry-process unit.[16]

Mineral Fuels.—*Natural Gas.*—Saudi Arabia's industrialization plans, being devel-

[11] Metal Bulletin. No. 5837, Sept. 28, 1973, p. 19.
[12] Journal of Metals. V. 25, No. 8, August 1973, p. 8.
[13] Iron Age. V. 212, No. 6, Aug. 9, 1973, pp. 28–29.
[14] Metal Bulletin. No. 5831, Sept. 7, 1973, p. 35.
[15] Mining Record. Sept. 5, 1973, p. 1.
[16] Rock Products. V. 76, No. 11, November 1973, p. 94.

oped in 1973, envisaged utilizing natural gas to fuel aluminum and steel plants, generate electricity, and be feedstock for ethylene and methanol plants. These industrial plants will be joint ventures by the Saudi Arabian Government and foreign companies. Saudi Arabia's extensive natural gas reserves were estimated to be 56,126 billion cubic feet at yearend 1973, up 3,488 billion cubic feet from 1972, and the country's share of reserves in the Neutral Zone rose from 3,750 billion cubic feet in 1972 to 26,000 billion cubic feet in 1973. Gas reserves available to Saudi Arabia were the second largest in the Middle East, surpassed only by those in Iran. They exceeded the combined gas reserves of Austria, the Netherlands, Spain, and West Germany.

Petromin and Japanese negotiators from Mitsubishi Petrochemical Co., Ltd. reached a basic agreement for building a 500,000-ton-per-year ethylene plant in Saudi Arabia, and discussions included the possible construction of a large methanol export plant. Proposed plant sites were not revealed. Preliminary Mitsubishi-Petromin plans call for their plant to be onstream by 1979–80, producing ethylene and its derivatives from natural gas feedstocks. Financing of the project, estimated at more than $1 billion, would be shared equally by Petromin and the Japanese group.[17] Houston Natural Gas Co. (HNG), a U.S. company, and Petromin signed a letter of intent for the construction of a methanol plant in eastern Saudi Arabia. HNG and Petromin will operate the plant jointly, and methanol will be produced from natural gas and shipped to the United States in tankers for use as a direct fuel to generate electricity. Large quantities of natural gas have been flared annually in the country. Exports will range from 10,000 to 12,500 tons per day, with deliveries expected to begin in 1976.[18]

Early in the year, Petromin asked Kraft Anglagen, a West German firm, to prepare a study for a proposed natural gas trunkline from Osmanieh to Riyadh. The pipeline will be approximately 300 kilometers long and have an annual capacity to transport 70 million cubic meters of gas to consumers in the capital city and to a planned thermal electric powerplant. Approximately 95 kilometers of natural gas pipelines were under construction in 1973, scheduled for completion in 1974. These new lines, of 41-, 56-, and 61-centimeter pipe, will connect Abqaiq with Ju'aymah and Ras Tanura.

Petroleum.—Expansions and improvements of the petroleum industry's production, refining, storage, and transportation facilities, carried out during the year, enabled Saudi Arabia to strengthen its position as one of the world's leading oil producers and the largest oil exporter. Only two countries, the United States and the U.S.S.R., produced more oil in 1973 than Saudi Arabia.

In 1973, Italy's Azienda Generale Italiana Petroli (AGIP) S.p.A. and the U.S.-owned Phillips Petroleum Co. relinquished two large service-contract exploration areas totaling 86,434 square kilometers in the Hofuf and Rub'al-Khali areas. AGIP S.p.A., the operator for the two companies, drilled several wells in the area under a 6-year contract signed in 1967, and 4,500 barrels per day of 31° gravity oil was reportedly discovered in 1972 near the Abu Dhabi border.[19] Société Auxiliare de l'Enterprise de Recherches et d'Activités Pétrolières (Auxerap), a subsidiary of France's state-owned Essence et Lubrifiant de France-Entreprise de Recherches et d'Activités Petrólières (Elf-ERAP), and Tenneco Oil Co. released their Saudi concession along the Red Sea coast during the year, as did Sun Oil Co., operator for itself, Natomas Co., Dillingham, Santa Fe, Texas International, and the Government of Pakistan. Vitol Exploration BV of the Netherlands received Saudi Arabia's approval to search for petroleum offshore of Ra's al Khaymah, and the company planned to commence operations during third quarter of 1973.

Arabian American Oil Co. (Aramco).—Seismic teams continued surveys in the company's central and northern oilfields, coastal, Rub'al-Khali, and western areas of the concession. In 1973, drilling was carried out at nearly twice the 1972 rate, as 323 wells were drilled for deep exploratory evaluation, delineation and observation, pressure maintenance, and production. The company planned to drill 350 wells during 1974. Wells were completed at the rate of one every 1.1 days in 1973, and Aramco also drilled 43 water supply wells. Twenty-

[17] Petroleum Press Service. V. 40, No. 7, July 1973, p. 273.
[18] Petroleum Intelligence Weekly. V. 12, No. 40, Oct. 1, 1973, p. 3.
[19] Oil and Gas Journal. V. 71, No. 12, Mar. 19, 1973, p. 37.

two drilling rigs were in operation during the year, 18 onshore and 4 offshore. In the previous year, 19 rigs drilled a total of 176 wells. Ten new water injection plants went onstream in 1973, with an aggregate daily capacity to inject 8.5 million barrels of nonpotable water into more than 100 wells.

Three new oilfields were discovered in 1973, Abu Jifan and Qirda Fields onshore south of Khurais and the Maharah offshore field near the Marjan and Zuluf Fields. Yearend estimated probable crude oil reserves were placed at 164,520 million barrels (up 76.9% from the previous year) of which proved reserves were 96,922 million barrels. During 1973, a total of 565 kilometers of crude oil gathering, supply, and water pressure maintenance pipelines were constructed, approximately 165 kilometers more than in 1972. Production facilities were expanded in 1973, and two new oilfields, Harmaliyah and Zuluf, came onstream. During the first 9 months, eight onshore GOSPs were completed, with a combined capacity of 2.09 million barrels. Newly installed offshore GOSPs included a 300,000-barrel-per-day unit on Abu 'Ali Island serving Berri Field, an addition of 50,000 barrels per day at Abu Sa'fah, and a 450,000-barrel-per-day unit at the Zuluf Field. Four crude oil stabilizer columns, with a combined capability to treat 1.86 million barrels of crude oil per day, were constructed at Abqaiq.

During 1973, the Ras Tanura petroleum refinery processed 222.9 million barrels of crude oil, natural gas liquids, and reproduced injected products at the rate of 610,656 barrels per day, an increase of 49,733 barrels per day over the plant's 1972 operation. In 1973, production totaled 217.2 million barrels of refined petroleum products, up 8.9% from 1972. Fuel oil output fell 4.1 million barrels during the year, jet fuel production decreased 2.9 million barrels, or 7,972 barrels per day, but all other products recorded production increases.

Natural gas liquids (NGL) plants were expanded during the year. New compression facilities and a de-ethanizer column for raw liquefied petroleum gas (LPG) were added at the Abqaiq facility, and a new treatment plant and 62,000-barrel-per-day capacity fractionation plant were installed at Ras Tanura.[20] Two serious explosions and fires 11 days apart during August disrupted operations at the Abqaiq LPG facility. The mishaps were apparently caused by equipment failures.

Aramco's export facilities were significantly expanded in 1973. At the beginning of the year, the Ras Tanura terminal was the only tanker-loading facility in Saudi Arabia for Aramco crude oil, but an additional supertanker terminal was placed in service at Zuluf, and construction began on a third terminal at Ju'aymah during the year. Two single buoy moorings (SBM's) and an offshore GOSP were constructed at the Zuluf oilfield and placed in service in April 1973. The Zuluf Field is approximately 65 kilometers offshore in the Persian Gulf, near the former Neutral Zone. Crude oil from the company's offshore wells was processed at the GOSP at the rate of 450,000 barrels per day. Water at the terminal site is 30 meters, deep enough to permit loading supertankers of up to 500,000 deadweight tons. The buoys were built 12 meters in diameter and anchored 1.6 kilometers apart. Tankers will load crude oil for export at one SBM; a 1.8-million-barrel-capacity storage vessel—formerly the tanker *F.A. Davies*—has been permanently moored to the other SBM.[21] Earlier in 1973 plans were finalized for the construction of the company's third marine petroleum terminal for exporting crude oil. Aramco awarded a $100 million contract to the U.S. construction firm J. Ray McDermott to build the new facility at Ju'aymah, 25 kilometers northwest of the Ras Tanura terminal. Design engineering was completed in 1972, construction began in 1973, and the Ju'aymah marine petroleum terminal will be placed in service in September 1974. Initial loading capacity will be about 1 million barrels per day.[22]

Two ships will be served simultaneously from two SBM's to be installed 11 kilometers offshore at Ju'aymah. One SBM will serve supertankers with a maximum 27-meter draft, and the other will accommodate ships drawing up to 29 meters. Three crude oil storage tanks of 1.25 million barrels each and one 250,000-barrel bunker fuel oil tank will be constructed onshore,

[20] Arabian American Oil Co. Aramco 1973, A Review of Operations, pp. 3–8.
[21] Middle East Economic Survey (Beirut, Lebanon). V. 16, No. 27, Apr. 27, 1973, p. 5.
[22] Middle East Economic Survey (Beirut, Lebanon). V. 16, No. 29, May 11, 1973, p. 5.

and a crude oil pipeline will be built from the terminal to Qatif.[23]

Ras Tanura's terminal facilities were also expanded in 1973 when the West Pier was lengthened by 83 meters, providing more than 7,500 square meters of additional pier space and deepwater berths for two ships. Two crude oil loading systems, each rated at 135,000 barrels per hour, were installed at the fourth tanker-loading sea island, and three oil storage tanks, with a combined capacity of 3.5 million barrels, were completed at the Ras Tanura terminal. Eight supertanker berths served the terminal, the largest oil export port in the world.

A total of 565 kilometers of major pipelines were laid in 1973. Construction contracts valued at more than $9 million were awarded to Mothercat, Ltd., Beirut, Lebanon, for pumping equipment and more than 250 kilometers of high-capacity crude oil pipelines. Pipes of 102 to 107 centimeters were planned for construction during 1973 to form the 58-kilometer pipeline from the Berri oilfield to the Ras Tanura processing and shipping complex,[24] and nearly 105 kilometers of 8- to 64-centimeter diameter gathering lines were to be constructed before yearend 1973. The contract for installing additional pumping equipment at Abqaiq was valued at $1.2 million. During 1973, major crude oil pipelines were also constructed to Ju'aymah from Abqaiq, 'Ain Dar, Qatif, and Ras Tanura.[25]

Saboteurs staged two attacks on the TAPline during the year. On January 20, 1973, an explosion severed the line in northern Saudi Arabia at a point between the Shu'bah and Rafha pumping stations, approximately 24 kilometers from the Iraqi border. Repairs were completed in 4 days. On April 16, two explosive charges detonated on the pipeline at Dair al-Zahrani, near Sidon, Lebanon, failed to cut the line. Two days earlier TAPline's Zahrani terminal sustained an attack by saboteurs which resulted in the destruction of one 100,000-barrel storage tank and damage to four others.[26]

Saudi Arabia became the principal owner of Aramco in January 1973, according to the terms of a December 1972 participation agreement signed by the Government and Aramco's parent companies—Exxon Corp., Mobil Oil Corp., Standard Oil Co. of California, and Texaco Inc. Under the agreement the Government will hold one-fourth ownership in the company, with the option to purchase additional annual increments which would raise the Government's participation share to 51% in 1982. Aramco's ownership was shared as follows: Exxon Corp. 22.5%, Mobil Oil Corp. 7.5%, Saudi Arabian Government 25%, Standard Oil Co. of California 22.5%, and Texaco Inc. 22.5%. In August, Aramco received a partial payment of $510 million from the Saudi Arabian Government for its initial share in the company. During the fourth quarter of 1973 the Government reviewed its position in Aramco and expressed interest in gaining control of more than 51% of the company in the immediate future. Earlier in the year Saudi Arabia held talks with Aramco's U.S. owners concerning increasing the oil "buy-back" prices of the participation agreement. The Government was not satisfied with the prices at which the former owners had agreed to buy back quantities of participation crude. Petromin's first sales of participation crude in May 1973 were well above the buy-back prices.[27]

About 79% of Aramco's workforce were native Saudi Arabians, 9% were U.S. nationals, and the balance consisted of other nationalities. At yearend 1973, company employees totaled 13,001, up 15.2% from 1972. Approximately 3,400 employees were enrolled in the company training program, and more than 100 studied in colleges, universities, and technical institutes. In 1973, Aramco employed 41 students of Saudi Arabia's College of Petroleum and Minerals.

General Petroleum and Mineral Organization (Petromin).—During 1973, Petromin began construction to expand the throughput capacity of the Jidda petroleum refinery to 45,000 barrels per day. New units will produce asphalt, diesel oil, fuel oil, gasoline, jet fuel, kerosine, and LPG. New Red Sea loading facilities will be constructed approximately 4 kilometers offshore to serve tankers up to 40,000 deadweight tons. The new terminal will be connected to the refinery's tank farm by sub-

[23] Oil and Gas Journal. V. 71, No. 10, Mar. 5, 1973, pp. 119, 122.
[24] Petroleum Times. V. 77, No. 1956, Mar. 9, 1973, p. 10.
[25] Oil and Gas Journal. V. 71, No. 40, Oct. 1, 1973, p. 128.
[26] Middle East Economic Survey (Beirut, Lebanon). V. 16, No. 26, Apr. 20, 1973, p. 8.
[27] Petroleum Intelligence Weekly. V. 12, No. 35, Aug. 27, 1973, p. 3.

marine pipelines ranging from 20 to 61 centimeters in diameter. An additional expansion may be made to the Jidda refinery in 1978, raising the crude oil throughput capacity to 60,000 barrels per day. UOP Management Services, Inc., a subsidiary of the U.S. firm Universal Oil Products Co. (UOP), agreed to manage the expanded Jidda and the new Riyadh petroleum refineries. UOP will recruit and train refinery personnel, operate the two plants, and develop local managers to assume control of the refineries.

Petromin began marketing its participation crude oil during 1973 to "buyer-users" only. The company announced that it would not permit any of the oil to be purchased by brokers or middlemen. Contracts were signed with more than 20 consumer groups for deliveries of more than 210 million barrels of oil over a 31-month period, June 1973 to December 1975, at the annual rate of 70.4 million barrels. Of the total crude oil sold, Japanese firms bought 27.4%, U.S. firms 24.7%, European firms 18.2%, and others 29.7%[28] All buyers will be paying the same prices, which were set at 93% of current postings with an escalation clause to maintain the same relation to future posted prices.[29]

Getty Oil Co. (Getty).—The company's jointly operated onshore oilfields in the former Neutral Zone reduced output during 1973, in line with the OAPEC oil cutbacks. Total production for the year was off about 18% from that of 1972. The oil embargo and production limitations affected company operations, and increasing worldwide resistance to purchases of high-sulfur oil further hindered oil sales. During 1973 the company continued negotiations with the Saudi Arabian Government concerning increases in wages and social allowances for employees in the former Neutral Zone, but by yearend no agreement had been reached. Getty and Aminoil equally shared the ownership of the 387 producing and 47 nonproducing wells in the zone. At the end of 1973 Getty's cumulative share of oil produced from the zone since operations began in 1954 totaled 464 million barrels.

[28] Middle East Economic Survey (Beirut, Lebanon). V. 16, No. 31, May 25, 1973, pp. 3–6.
[29] Petroleum Press Service. V. 40, No. 6, June 1973, p. 223.

The Mineral Industry of Liberia

By Henry E. Stipp [1]

Iron ore mining and production of iron ore concentrates and pellets for export constituted the main activity of the Liberian mineral industry in 1973. Iron ore production (including concentrates and pellets) was valued at $211.4 million [2] in 1973, a 9.0% increase over the 1972 iron ore production value of about $194 million. The value of iron ore output represented 40.3% of Liberia's gross domestic product, estimated at $525 million in 1973. Prices for iron ore on world markets improved substantially and Liberia's iron ore mining industry recovered from the worldwide recession suffered by the iron and steel industry in 1971.

Other mineral commodities produced in significant quantities were diamond and petroleum refinery products.

The Governments of Liberia and Guinea reached an agreement on the Guinean Iron Mining Co. (MIFERGUI) iron mine project in the Nimba Mountains. Liberia agreed to participate in the MIFERGUI-NIMBA project by subscribing to a 5% share in the project valued at $50,000 and to guarantee by treaty transportation of Guinean iron ore, goods, and supplies related to the MIFERGUI-NIMBA project through Liberian territory.

The Government of Liberia and the Liberia Mining Co., Ltd. (LMC), a 59.18% subsidiary of Republic Steel Corp. of the United States, concluded an agreement covering exploration of iron ore reserves at Bie Mountain, about 15 miles north of the company's Bomi Hills deposit.[3] Under the agreement, LMC will be given a 50% interest in the area to be explored; the remaining area will be held by National Iron Ore Co., Inc. (NIOC). An international consortium, including United States, European, and Japanese interests, will be organized when development of the deposit is appropriate.

At yearend, Liberian American-Swedish Minerals Co. (LAMCO) and the Government of Liberia reached agreement on LAMCO's iron ore concession rights, under which the Government will gain an additional $2.0 million annually as its share of LAMCO's profits. The West German-owned Bong Mining Co. Inc. (DELIMCO) also was renegotiating its concession agreement with the Liberian Government at yearend.

A 10-year program of geologic exploration and resource appraisal by the Governments of Liberia and the United States reportedly identified several new areas of mineralization. An intensified minerals exploration program conducted by the Liberian Government and the United Nations Development Program (UNDP) from 1969 to 1972, evaluated mineral deposits discovered under the previous geologic program and also found new mineralized areas.

The Government was expected to put into effect a program to Liberianize certain retail businesses in the country, beginning with petroleum retailing.

PRODUCTION AND TRADE

Production of iron ore in 1973 increased 4.6% to 23.5 million tons compared with 22.5 million tons in 1972. DELIMCO reported a large production increase (12%) despite a brief strike in August. LAMCO, in which Bethlehem Steel Co. of the United States holds a 25% interest, followed with an 11.1% increase. Production of iron ore by LMC and NIOC in 1973 decreased 11% and 17%, respectively, compared with out-

[1] Physical scientist, Division of Ferrous Metals—Mineral Supply.

[2] Liberia uses U.S. dollar currency.

[3] Skillings Mining Review. Liberia Mining Contract With Government for Bie Mountains. V.6E, No. 39, Sept. 29, 1973, p. 12.

put in 1972. Production of iron ore, by company, is shown in the following tabulation, in thousand metric tons:

	1972	1973
Liberia Mining Co.:		
Lump ore	919	896
Fines	934	678
Concentrates	793	779
Bong Mining Co., Inc.:		
Concentrates	r 3,484	3,973
Pellets	2,103	2,286
Liberian American-Swedish Minerals Co.:		
Lump ore	3,488	4,816
Fines	5,513	5,578
Pellets	1,930	1,757
National Iron Ore Co., Inc.:		
Lump ore	1,091	619
Fines	r 2,254	2,161

r Revised.

Diamond production increased 6.9% in quantity compared with output in 1972. The value of diamond increased sharply to $49.3 million in 1973 compared with about $31.7 million (revised)[4] in 1972. An increase in the price of diamond on the world market was mainly responsible for the large increase in total diamond value.

Gold production was estimated at about the same level as output in 1972. Official figures on gold production are not reported.

Petroleum refinery products produced in 1973 were valued at $20.3 million compared with $13.2 million in 1972. Petroleum refinery input of crude oil was valued at about $14 million in 1973.

Shipments of iron ore increased 10.9% in 1973 to 25.3 million tons compared with 22.8 million tons in 1972. In addition, stocks that were built up in the 1971 recession period were reduced to low levels in 1973. LAMCO accounted for more than 50% of total shipments in 1973, with DELIMCO contributing 27% of total shipments. Iron ore shipments in 1973 were valued at about $207.5 million compared with about $182.7 million in 1972. Exports of iron ore to European Communities (EC) countries in 1973 totaled 19.1 million tons or 75.5% of total exports of iron ore. West Germany continued as Liberia's best customer, receiving 33% of total shipments. Italy, which received 18.8% of total iron ore shipments, and the United States, which received 11.8%, were the next largest customers, as shown in the following tabulation, in thousand tons:

[4] Actual value reported to be five times official Department of Mines figures.

	LMC	NIOC	DELIMCO	LAMCO	Total
Belgium-Luxembourg	--	267	--	1,322	1,589
France	309	356	--	785	1,450
Germany, West	726	643	4,018	2,979	8,366
Italy	--	59	2,195	2,003	4,257
Japan	--	--	--	2,618	2,618
Netherlands	902	1,118	547	--	2,567
United Kingdom	--	882	27	--	909
United States	374	--	--	2,607	2,981
Others	26	--	114	472	612
Total	2,337	3,325	6,901	12,786	25,349

Table 1.—Liberia: Production of mineral commodities

Commodity [1]		1971	1972	1973 [p]
METALS				
Gold	troy ounces	[2] 2,547	[2] 1,324	[e] 1,300
Iron ore	thousand metric tons	23,398	22,509	23,542
NONMETALS				
Cement, hydraulic	do	91	91	[e] 91
Diamond: [3]				
Gem	thousand carats	532	414	509
Industrial	do	277	350	309
Total	do	809	764	818
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Gasoline	thousand 42-gallon barrels	470	574	497
Jet fuel	do	89	142	205
Kerosine	do	87	83	91
Distillate fuel oil	do	1,166	1,125	1,646
Residual fuel oil	do	1,585	1,553	1,304
Other	do	133	137	23
Refinery fuel and losses	do	216	226	223
Total	do	3,746	3,840	3,989

[e] Estimate. [p] Preliminary.
[1] In addition to the commodities listed, a variety of crude construction materials such as clays, stone, and sand and gravel were produced, but available information is inadequate to make reliable estimates of output levels.
[2] Purchases by the Bank of Monrovia.
[3] Exports for fiscal year ending August 31 of that stated.

Table 2.—Liberia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Iron and steel:			
Ore and concentrate ---thousand tons--	21,235	22,978	Netherlands 4,597; Italy 4,596; United Kingdom 4,542.
Primary forms and semimanufactures --	37	12	Guinea 11.
Nonferrous metal scrap, n.e.s ---value--	$452,168	$217,705	Norway $80,676; West Germany $50,696; Spain $32,329.
Platinum and platinum-group metals troy ounces--	102	--	
NONMETALS			
Cement	155	33	Guinea 31.
Diamond, industrial ---carats--	738,938	879,575	Belgium-Luxembourg 645,942; United Kingdom 106,632.
Salt	11,431	(1)	All to Guinea.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products: [2]			
Gasoline ---42-gallon barrels--	--	7,622	Guinea 7,548.
Residual fuel oil ---do---	--	227	Senegal 207.
Lubricants ---do---	18	6	Ivory Coast 4.
Other ---do---	18	--	

[1] Less than ½ unit.
[2] Does not include manufactured natural gas or nonlubricating oils, which have a value of $4,536 but are unspecified quantities.

Table 3.—Liberia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Oxide and hydroxide	1	134
Metal, semimanufactures including alloys	101	326
Arsenic trioxide, pentoxide, acids	107	--
Copper semimanufactures, including alloys	18	28
Gold ---troy ounces--	4,817	700

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

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS—Continued		
Iron and steel:		
Scrap	--	225
Pig iron and ferroalloys	138	2,088
Ingots and other primary forms	523	1,603
Semimanufactures	15,947	10,535
Lead, including alloys, all forms	60	36
Mercury ---76-pound flasks--	2	1
Platinum-group metals, including alloys, all forms ---troy ounces--	10	7
Silver:		
Silver and platinum ore ---value--	$463	--
Metal, including alloys, all forms ---troy ounces--	1,321	11
Tin metal, including alloys, all forms ---long tons--	(1)	1
Zinc metal, including alloys, all forms	4	1
Other:		
Oxides, hydroxides, and peroxides of metals, n.e.s	28	86
Metals, including alloys, all forms:		
Alkali, alkaline earth and rare-earth metals	79	6
Base metals, including alloys, all forms, n.e.s	3	1
NONMETALS		
Abrasive materials, natural, grinding and polishing wheels and stones	33	16
Asbestos	620,503	281
Cement	56,459	42,223
Clay products, refractory and nonrefractory, including nonclay brick ---value--	$624,301	$442,000
Fertilizer materials:		
Natural:		
Nitrogenous	87	140
Phosphatic	80	682
Potassic	6	46
Manufactured:		
Nitrogenous	2,012	11,114
Phosphatic, basic slag	176	1,698
Potassic	711	542
Mixed	618	878
Ammonia	3,225	1,777
Gypsum and plasters	565	1,006
Lime	1,384	1,067
Salt	3,329	3,304
Sodium and potassium compounds:		
Caustic soda	3,729	2,509
Caustic potash	--	290
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked, mainly calcareous	33,887	876
Worked ---value--	$35,118	$49,071
Gravel and crushed rock	1,212	441
Limestone, except dimension	443	--
Sand	2	--
Sulfur:		
Elemental	1	--
Sulfur dioxide	31	1
Sulfuric acid	106	135
Other:		
Refractory minerals, clays, graphite, dolomite, and magnesite	19,174	31,738
Slag, dross and similar waste, not metal bearing	467	19,358
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s ---value--	$349,243	$521,918
Crude minerals, n.e.s	19	(1)
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	9,786	9,678
Carbon black and gas carbon	(1)	--
Coal, coke and briquets	22,235	21
Gas, hydrocarbon, manufactured ---value--	$934	$2,513
Petroleum:		
Crude and partly refined ---thousand 42-gallon barrels--	2,906	3,329
Refinery products:		
Gasoline ---do---	7	10
Jet fuel ---do---	--	(1)
Kerosine ---do---	--	(1)
Distillate fuel oil ---do---	(1)	1
Residual fuel oil ---do---	--	1
Lubricants ---do---	78	73
Mineral jelly and wax ---do---	1	(1)
Other ---do---	9	(1)
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	26	28

[1] Less than ½ unit.

COMMODITY REVIEW

METALS

Cassiterite.—Traces of tin minerals were discovered in 1961 near Greba, Bong County. Cassiterite was identified in 1969 and mineral exploration has continued in order to delineate and evaluate the mineralized area.[5]

Iron Ore.—In January, LAMCO opened its new Tokadeh mine, which was scheduled to produce 1.5 million tons of iron ore annually. Production at Tokadeh was about 750,000 tons in 1973 because of startup problems and some difficulty with the grade of ore.[6] However, production from LAMCO's Mt. Nimba mine increased and total output rose significantly. LAMCO continued to explore iron ore deposits at Gangra, Yuelliton, and Beeton. Additional operations of the size of the new Tokadeh mine could be developed at these deposits.

DELIMCO conducted mineral exploration work in the Putu Range, Grand Gedeh County. Iron ore samples weighing 60 tons were sent to West Germany for testing. If the results of these tests are favorable, development work valued at $400 million will be initiated.

LMC continued negotiating with the Government to obtain concession rights to the Bie Mountain deposit, near the Sierra Leone border. Reportedly, the Bie Mountains contain a large reserve of iron ore that will have to be concentrated before shipping. Ore is of the magnetic taconite type, which should yield a high-grade iron pellet. To mine the deposit, LMC would have to extend the railroad a distance of 15 miles from its Bomi Hills operation. The LMC deposit at Bomi Hills was rapidly approaching the end of its economic life at yearend 1973.

NIOC production and exports declined when its Mano II expansion project developed startup problems. NIOC was hampered by increased fuel costs primarily because it exploits low-grade ore. However, the company expects that problems at the Mano II operation will be solved and the mine will be viable for another 15 to 20 years.

Liberian Iron and Steel Corporation (LISCO), which has been exploring the large low-grade deposits of the Wologisi Range in Lofa County, near the border with Guinea, reportedly estimated minable ore reserves at nearly 900 million tons and probable additional reserves at 250 million tons. The outlook for developing the Wologisi deposit by 1976 has not been encouraging; however, prospects improved in 1973 when the U.S. firm American Metals Climax, Inc. announced that it was interested in joining the group of Japanese companies investing in the Wologisi deposit. The project will require an investment estimated at $500 million for a new railroad, port, powerplant, beneficiation facilities, and miscellaneous costs.

Heavy Minerals.—Reserves of 512,000 tons of ilmenite, rutile, zircon, and monazite have been estimated in about one-third of the coastal sands of Liberia. Extensive deposits of silica sands suitable for manufacturing glass also were discovered.[7] Preliminary studies conducted by William H. Muller Explorations of beach sand deposits between the Cestos and Cavala rivers indicated a reserve of 900,000 tons of heavy minerals consisting of titanium ore, zircon, and monazite. A company, Liberian Beach Co. (LIBSEE) has been formed by William H. Muller Explorations, Bos Kalis Westminster Dredging Group, and Hoogovens, who signed a 25-year agreement with the Government to explore and exploit the heavy mineral deposit.

NONMETALS

Barite.—High-grade barite veins have been discovered in the Gibi Mountains. Reserves were estimated at 1 to 2 million tons.

Clays.—A deposit of about 7 million tons of high-grade ceramic clay was discovered about 6 miles from Monrovia. Clay deposits useful for manufacturing brick also were found in the Monrovia Area. A 16-million-ton deposit of high-quality clay has been located on Bushrod Island in Monrovia.

Diamond.—Some diamonds are recovered from concessions along the Lofa River, northwestern Liberia. However, most of the gems are smuggled across the border from Sierra Leone to the open competitive market in Monrovia.[8] The Government of

[5] Republic of Liberia, Ministry of Lands and Mines. Liberia's Mineral Resources. The Financial Times (London). Jan. 29, 1974, p. 20.
[6] U.S. Embassy, Monrovia, Liberia. State Department Airgram A-18, Mar. 5, 1974, 3 pp.
[7] Work cited in footnote 5.
[8] Financial Times (London). Liberia—Towards an African Identity. Jan. 29, 1974, pp. 13-22.

Liberia redistributed all of the country's Lofa River concessions in 1973, mainly to small alluvial miners. However, Globex of California, a U.S. firm, was given a sizable concession area.

Kyanite.—A schist deposit containing kyanite was discovered along the Monrovia-Buchanan highway near Mt. Montro in Grand Bassa County. Reserves of kyanitic rock were estimated at 10 million tons, containing 2.5 million tons of kyanite.

MINERAL FUELS

Petroleum.—Four exploratory wells have been drilled off the coast of Liberia, reportedly, with encouraging results. However, in 1972, Chevron Oil Co. of Liberia and Frontier Liberian Oil Co. relinquished concession areas after reevaluating geophysical and well-log data. Ashland Oil Co. was the only remaining concession holder in 1973. Apparently, there was no exploration activity in its concession area.

Petroleum Products.—On November 1, the price of all petroleum products was raised 8 cents per gallon because of the sharp increase in crude oil prices and higher petroleum shipping rates. Liberia's only refinery is a 4-million-barrel-per-year facility of Liberia Refinery Co. (LRC) located in Monrovia. LRC is a subsidiary of Sun Oil Co. (SUNOCO) of New York and Dynalectron Corp. The refinery, which is set up to use Saudi Arabian or similar sour crude oil, operated near full capacity in 1973. Most refinery output is for the domestic market, with small shipments to Guinea and Sierra Leone. In addition, jet fuel is sold to international air lines and fuel and gas oil for use as ships bunkers.

The Mineral Industry of Libya

By John L. Albright [1]

Libya's drive for control of petroleum operations in the country dominated mineral activities during 1973. The Nelson Bunker Hunt Petroleum Co. (Hunt) was nationalized; four companies, Gelsenburg Benzin, A.G., Grace Petroleum Corp., Oasis Oil Co. of Libya, Inc., and Occidental of Libya, Inc. (Occidental) relinquished 51% ownership of their Libyan operations to the Government; and the Government unilaterally acquired 51% control of the remaining major oil company activities. Government restrictions kept oil production below that of the previous year, and Libya participated in the Arab embargo of Western countries during the fourth quarter of 1973.

Government planners studied proposals for numerous industrial plants, including an aluminum smelter and a steel mill. Ammonia and methanol were to be produced from natural gas feedstocks, and several electric powerplants and water desalination plants were scheduled to be built to serve the country's growing industrial sector. Construction continued during the year on a petroleum refinery and a lubricating oil blending plant. Export petroleum refineries were planned for Marsá al Burayqah and Tobruk.

A $1.9 million [2] contract was awarded to an Egyptian firm for geological mapping and aerial photography of 14,000 square kilometers in the Ghāt area of Fazzān.

Transportation facilities were scheduled to be enlarged. Expansions were planned to port facilities in Benghazi, Darnah, Marsá al Burayqah, Miṣrātah, Ṭarābulus, and Zuwārah, and a new airport was to be built at Ṭarābulus. More than 100 kilometers of pipelines were to be built in northwest Libya, and approximately 1,300 kilometers of railways were planned which will connect Wadi Shatti with Miṣrātah, Benghazi with as Sallūm, Arab Republic of Egypt, and Ṭarābulus with Gabés, Tunisia. Orders were placed with several foreign shipbuilders for the construction of 11 petroleum tankers.

PRODUCTION

During 1973, crude oil output, down 3.1% from that of the previous year, averaged 2.17 million barrels per day, compared with 2.24 million barrels per day during 1972. Production of crude oil has dropped steadily over the past 3 years, after reaching 3.32 million barrels per day during 1970. However, production by Libya's own Arabian Gulf Exploration Co. from the British Petroleum Co., Ltd. (BP)-Hunt Sarir oilfield increased 11.0%, from a daily rate of 212,541 barrels in 1972 to 235,959 barrels in 1973. Including declining output from the small Umm Farad oilfield (down 30% to 2,234 barrels per day), total output by the Libyan state oil companies was 10.4% higher than in 1972. Yearend 1973 oil reserves were 23.2 billion barrels, down 3.7% from 1972. During 1973, Italy's AGIP S.p.A. increased crude oil production 426.9%, but all other foreign companies produced below their 1972 operations. In May, Esso Standard Libya, Inc. (ESSO) was ordered by the Government to reduce its production rate from 360,000 barrels per day to 300,000 barrels per day.

Natural gas production reached 562.9 billion cubic feet in 1973, up 13.5% from 1972, and 193.7 billion cubic feet—34.4% of the total gas output—was flared.

[1] Mineral specialist, Division of Fossil Fuels—Mineral Supply.

[2] Where necessary, values have been converted from Libyan pound/dinars (Lpd) to U.S. dollars at the rate of 1 Lpd = US$3.38.

Table 1.—Libya: Production of mineral commodities

Commodity [1]		1971	1972	1973 [p]
NONMETALS				
Cement, hydraulic	thousand metric tons	72	[e] 80	[e] 80
Gypsum [e]	do	4	4	4
Salt	do	16	16	16
MINERAL FUELS AND RELATED MATERIALS				
Gas, natural:				
Gross production	million cubic feet	556,531	496,075	562,900
Marketed production [e]	do	25,000	100,000	160,000
Petroleum:				
Crude	thousand 42-gallon barrels	1,007,687	819,619	793,839
Refinery products:				
Gasoline	do	607	606	511
Kerosine and jet fuel	do	335	374	516
Distillate fuel oil	do	1,078	717	840
Residual fuel oil	do	1,337	1,360	1,168
Other	do	96	103	172
Refinery fuel and losses	do	330	158	42
Total	do	3,783	3,318	3,249

[e] Estimate. [p] Preliminary.
[1] In addition to the commodities listed, construction materials such as sand, gravel, crushed stone, brick, and tile are produced, but information is inadequate to make reliable estimates of output levels. Natural gas liquids are also produced, but are blended with crude oil and are reported as a part of that total.

TRADE

Mineral exports were dominated by crude oil, and shipments were made from five ocean terminals, Az Zuwaytinah, Marsá al Burayqah, Ras es-Sidr, Ras Lanuf, and Tobruk, at the rate of 2.2 million barrels per day. Oil-loading facilities were available for supertankers at all crude oil export ports. During the year, several contracts were signed by Libyan officials and foreign construction firms for expansions and improvements to the country's port facilities.

Exports decreased 15.6 million barrels in 1973, down 1.9% from the previous year, and were off 34.3% from the 1970 record high of 1.2 billion barrels. In the fourth-quarter of 1973, Libya, along with other Arab oil-producing states, implemented an oil embargo of "unfriendly" nations in an effort to gain support in their conflict with Israel. Despite the yearend reduced exports, overall increases were recorded during 1973 in crude oil exports to Japan, up 168.5%; and to the United States, up 17.9%. Nearly 85% of Libya's 1973 crude oil exports supplied refiners in Western Europe. Italy, West Germany, and the United Kingdom received the largest shipments. The United States displaced France as the fourth largest outlet for Libyan crude in 1973, and the U.S.S.R. and other Eastern European countries imported 29.1 million barrels of crude oil.

At yearend, the Libyan Government was seeking bids for the sale of oil it acquired in the disputed takeover of several foreign oil company properties. The oil was offered by the state-owned Al Burayqah Petroleum Marketing Co. for delivery in 1974. Earlier in the year, a bilateral economic protocol was signed by Libya and Yugoslavia. Libya agreed to supply Yugoslavia with 15.2 million barrels per year starting in 1974, and Yugoslavia would build six oil tankers for Libya.[3]

Bulgaria and Libya signed a barter agreement under which Bulgarian goods and equipment would be sent to Libya in exchange for 26.6 million barrels of crude oil annually in 1974 and 1975. Libya carried out other oil-for-goods negotiations with Greece and Japan during the year. ESSO exported 90 billion cubic feet of liquefied natural gas in cryogenic tankers to Western European consumers; Italy received 63.5% of the shipments, and the remainder went to Spain. Italy received 49.4 billion cubic feet of Libyan gas in 1972.

[3] Middle East Economic Survey (Beirut, Lebanon). Yugoslav-Libyan Oil Cooperation. V. 17, No. 6, Nov. 30, 1973, p. 16.

Table 2.—Libya: Crude oil exports by country

(Thousand 42-gallon barrels)

Country	1971	1972	1973 p
Argentina	1,196	--	--
Austria	400	4,658	4,526
Bahamas	--	41,417	31,792
Belgium-Luxembourg	25,115	9,432	19,893
Brazil	5,068	3,782	9,308
Bulgaria	188	4,230	6,023
Canada	4,929	12,921	12,593
Denmark	3,545	678	1,278
Egypt, Arab Republic of	--	--	5,293
France	131,308	71,788	44,238
Germany, West	180,124	202,527	181,442
Greece	--	1,304	--
Italy	236,990	159,440	206,590
Japan	2,680	2,406	6,461
Netherlands	54,232	37,916	31,427
Norway	3,177	1,710	1,424
Romania	561	6,020	9,490
Spain	45,624	20,620	12,009
Sweden	--	661	--
Switzerland	15,300	13,482	11,863
Trinidad and Tobago	60,409	25,843	3,577
Turkey	2,300	--	183
United Kingdom	162,041	111,031	90,922
United States	54,867	63,546	74,898
U.S.S.R	--	13,855	--
Not specified	--	--	28,463
Total	990,054	809,267	793,693

p Preliminary.

Source: Libya Department of Census and Statistics, External Trade Statistics 1971 and 1972 and Organization of the Petroleum Exporting Countries, Annual Statistical Bulletin, 1973.

Table 3.—Libya: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
EXPORTS		
METALS		
Iron and steel, scrap	--	175
Nonferrous metals, scrap	180	1,997
NONMETALS		
Sulfur and iron pyrites, unroasted	--	100
Other crude minerals, n.e.s	35	60
MINERAL FUELS AND RELATED MATERIALS		
Gas, natural, liquefied ---million cubic feet[1]	16,350	70,160
Natural gas liquids (including those derived from oil refining) ---thousand 42-gallon barrels	--	2,740
Petroleum:		
Crude and partly refined:		
Crude ---do---	990,054	808,118
Partly refined ---do---	--	1,149
Refinery products:		
Gasoline, motor spirit ---do---	--	(2)
Kerosine, white spirit ---do---	--	(2)
Distillate fuel oil ---do---	--	(2)
Residual fuel oil ---do---	--	2,628
Total ---do---	--	2,628
REEXPORTS		
METALS		
Iron and steel, semimanufactures, tubes, pipes, fittings	46	128
Zinc metal, including alloys, unwrought	(2)	--
NONMETALS		
Cement	27	1
Lime	2	--
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Gasoline, motor spirit ---thousand 42-gallon barrels	1	(2)
Kerosine, white spirit ---do---	(2)	--
Distillate fuel oil ---do---	(2)	--
Lubricants ---do---	(2)	(2)
Total ---do---	1	(2)

[1] Converted from British thermal units (Btu) at the rate of 1 Btu = 726,137 cubic feet.
[2] Less than ½ unit.

Table 4.—Libya: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum metal, including alloys, unwrought and semimanufactures	4,563	4,390	Italy 2,265; Greece 1,048; Lebanon 502.
Arsenic, natural sulfides	50	--	
Copper metal, including alloys, unwrought and semimanufactures	1,016	427	Italy 113; Spain 81; France 71.
Iron and steel:			
Ore and concentrate	3,145	8,990	Brazil 5,150; France 2,400; Italy 1,440.
Metal:			
Scrap	2	--	
Pig iron, ferroalloys, similar materials	1,420	5	All to Italy.
Steel, primary forms	564	575	Italy 417; Czechoslovakia 89; West Germany 32.
Semimanufactures:			
Bars, rods, angles, shapes, sections	26,272	59,364	Italy 24,052; Belgium 13,114; West Germany 9,312.
Universals, plates, sheets	9,134	31,092	Italy 13,230; Japan 7,144; Belgium 3,729.
Hoop and strip	1,666	4,356	West Germany 1,438; Italy 1,140; Japan 861.

Table 4.—Libya: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Semimanufactures—Continued			
Rails and accessories	131	1,981	Belgium 1,373; U.S.S.R. 272; West Germany 214.
Wire	82,737	147,741	Italy 67,694; West Germany 24,608; Belgium 13,838.
Tubes, pipes, fittings	79,209	84,184	Italy 33,109; West Germany 11,878; Japan 8,700.
Castings and forgings, rough	54	64	Italy 53; Belgium 9; Sweden 2.
Lead metal, including alloys, unwrought and semimanufactures	498	1,780	Tunisia 520; Italy 507; Netherlands 305.
Nickel metal, including alloys, unwrought and semimanufactures	3	24	Mainly to Italy.
Platinum-group metals and silver:			
Ore and concentrate ——troy ounces	19,515	17,361	Mainly to United Kingdom.
Metals, including alloys:			
Platinum group ——do	5,080	4,855	Italy 2,411; West Germany 2,411.
Silver ——do	275,628	265,565	France 122,494; West Germany 53,660; United Kingdom 48,355.
Tin metal, including alloys, unwrought and semimanufactures ——long tons	9	45	United Kingdom 17; West Germany 14; Italy 12.
Zinc metal, including alloys, unwrought and semimanufactures	717	364	Italy 178; Japan 72; Romania 68.
Other:			
Ores and concentrates of nonferrous base metals	1,000	50	All to Lebanon.
Nonferrous base metals employed in metallurgy	1	--	
NONMETALS			
Abrasives:			
Crude, natural, including industrial diamonds	2,847	2,149	Mainly to Italy.
Grinding and polishing wheels and stones	153	287	Do.
Asbestos	528	1,913	Cameroon 872; Canada 447; Italy 250.
Barite and witherite	67	(1)	All to United Kingdom.
Cement	538,308	1,353,965	Greece 478,340; Arab Republic of Egypt 257,331; Lebanon 146,055.
Chalk	59	136	Mainly to United Kingdom.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	7,366	14,676	Italy 7,680; Ireland 4,280; Turkey 1,520.
Products	124,009	155,393	Tunisia 106,116; Italy 36,495; West Germany 1,791.
Fertilizer materials:			
Crude	--	498	All to West Germany.
Manufactured:			
Nitrogenous	27,878	20,216	Italy 13,846; West Germany 2,406; Netherlands 2,010.
Phosphatic	3,053	1,040	Italy 1,000; Netherlands 40.
Potassic	200	200	All to West Germany.
Other	5,414	9,093	Italy 8,513; Belgium 450; Netherlands 100.
Gypsum and plasters	1,488	1,048	Lebanon 536; Italy 198; Arab Republic of Egypt 115.
Lime	61,858	121,603	Lebanon 55,421; Italy 50,058; Greece 8,037.
Magnesite	3	34	Mainly to West Germany.
Mica, all forms	8	2	All to Italy.
Pigments, mineral, natural crude	415	6,844	Italy 3,400; Turkey 2,750; West Germany 396.
Salt	33	30	Mainly to Turkey.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	8,327	18,939	Italy 16,992; Greece 1,474; Bulgaria 395.
Worked	4,836	8,526	Italy 7,849; Bulgaria 381; Arab Republic of Egypt 147.
Gravel and crushed rock	36,766	86,149	Mainly to Italy.
Limestone (except dimension)	--	311	Do.
Sand, excluding metal bearing	1,908	3,008	Netherlands 1,956; Belgium 606; Italy 220.

See footnote at end of table.

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

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Sulfur and iron pyrites, unroasted	51	58	United Kingdom 42; Belgium 16.
Talc, steatite, soapstone, pyrophyllite	35	--	
Other nonmetals, n.e.s.:			
Crude	--	290	India 120; Italy 95; West Germany 75.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	11,166	1,461	Italy 897; Spain 259; United Kingdom 245.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	6,953	6,799	Italy 2,703; Albania 1,200; Japan 1,128.
Coal and coke, including briquets	507	542	Italy 428; United States 68; Lebanon 42.
Petroleum refinery products:			
Gasoline, motor spirit thousand 42-gallon barrels	1,871	2,082	Mainly to Italy.
Kerosine, white spirit ---do---	134	512	All to Italy.
Distillate fuel oil ---do---	1,993	2,274	Do.
Residual fuel oil ---do---	18	83	Do.
Lubricants ---do---	139	141	Netherlands 71; Tunisia 37; United Kingdom 16.
Other:			
Liquefied petroleum gas ---do---	174	5	Italy 4.
Mineral jelly and wax ---do---	1	1	Mainly to Italy.
Miscellaneous products ---do---	275	591	Venezuela 287; United Kingdom 86; Netherlands 83.
Total ---do---	4,605	5,689	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	711	13	Mainly to Netherlands.

[1] Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—A preliminary agreement was reached between Libya and Yugoslavia for the establishment of an aluminum smelter in Libya that will use Yugoslavian raw materials and Libyan natural gas. The plant's location, capacity, and initial production date have not been announced.

Iron Ore.—Exploration activities were carried out at the Wadi Shatti iron ore deposit in central Libya, and reserves, in three main ore-bearing horizons, were estimated at 3.6 billion tons of ore. More than half of the reserve contains ores of 50% Fe content, and the rest contain ores of 40% to 50% Fe. Plans were studied to construct an 800-kilometer-long railroad from the Wadi Shatti deposit to Miṣrātah, on the northern coast approximately 200 kilometers east of Ṭarābulus, the site selected for the country's first steel mill.

NONMETALS

Cement.—Production facilities at Benghazi were expanded during the year, in an effort to meet the country's growing demand for cement. Capacity of the Benghazi cement plant reached 600,000 tons per year, 58.3% of the country's total, and production facilities at al Khums, on the coast near Ṭarābulus, had a capacity of 430,000 tons per year. During the year, plans were reviewed calling for Libyan financial participation in a cement plant scheduled to be built near Gabés, Tunisia, approximately 350 kilometers west of Ṭarābulus.

Lime.—During the second quarter of 1973, an $18.9 million contract was awarded to two West German firms for the construction of a lime-processing plant near Tarhūnah.

Potash.—Libya's Industrial Research Center issued a tender calling for technical and marketing assistance in developing the country's potash resources. Promising accumulations of salts and brine occurred in a salt marsh covering approximately 20 square kilometers near Marādah, 190 kilometers southwest of the port of Marsá al Burayqah. These deposits were worked in 1939–40 by an Italian consortium. Shallow pits were dug, brine was percolated into the pits and evaporated, and a mixture of magnesium, potassium, and sodium salts

was recovered. Pre-World War II production by fractional recrystallization totaled 21,000 tons of 40% to 42% K_2O equivalent, and more than 10,000 tons of potash remained stockpiled in Libya.[4]

The potash deposits were further explored in 1964, but no production was reported and interest subsided until 1973. Abundant petroleum and natural gas fuels were available for exploiting the Marādah salts, but neither adequate roads nor a railroad was available for transporting the production to the coast.

MINERAL FUELS

Natural Gas.—Production during 1973 was 562.9 billion cubic feet, of which 193.7 billion cubic feet was flared, and proved reserves were about 30 trillion cubic feet. ESSO processed 136 billion cubic feet of natural gas at the Marsá al Burayqah liquefied natural gas (LNG) plant and produced 1.1 million barrels of liquefied petroleum gas (LPG) and 5.4 million barrels of natural gasoline; 94.4 billion cubic feet of methane was liquefied. Two companies signed contracts calling for a total of 220 million cubic feet per day of associated gas to be supplied to ESSO's LNG plant. American Overseas Petroleum Ltd. was scheduled to supply 100 million cubic feet daily, and the remainder was to be supplied by Oasis Oil Co.

Plans were reviewed for the construction of an ammonia and methanol plant at Marsá al Burayqah. Natural gas would be used to produce ammonia at the rate of 1,000 tons per day, and methanol production for export would also be at the rate of 1,000 tons per day. The new facilities at Marsá al Burayqah may include a thermal electric powerplant and a seawater desalination plant.

Petroleum.—Libyan National Oil Corp. (LINOCO) acquired half-interest in AGIP's two concessions, where the Government had blocked production for half of 1972. LINOCO agreed to pay the Italian company $50 million for concession 100, and payment for concession 82 will be made with crude oil over a 20-year period. The Libyan Government plans to be more active in future exploration activities in the country. A joint Italian-Libyan onshore and offshore drilling company was formed in early 1973, with the Libyans holding 51% of the company, and talks were held with Argentina regarding the establishment of a joint oil exploration company with that country.

In 1972, the Libyan Government began pressing for 50% participation in Hunt's half-share of the Sarir field and half of the profits from oil sold by Hunt from its share, since BP was nationalized in December 1971. BP had been Hunt's partner in operating the Sarir oilfield. On May 24, 1973, Libya imposed an embargo on Hunt's oil liftings in an effort to force acceptance of the participation agreement. A similar ban on Hunt's liftings had been imposed during the second half of December 1972, when Hunt was accused of overlifting its half-share of Sarir crude oil. On June 11, 1973, the Revolutionary Command Council (RCC) announced its decision to nationalize Hunt's interests in Libya.

BP continued to contest ownership of half of the Sarir crude oil produced since December 1971. A Sicilian court rejected BP's claim to ownership of a shipload of Sarir oil landed in Sicily, and the company filed an appeal against that decision. In Greece, BP also initiated legal proceedings against a refiner who obtained disputed Sarir crude oil.

Occidental and Libya's RCC signed an August 12, 1973, agreement that provided Libya with 51% ownership of the company. Occidental will continue as operator of its concessions. The agreement called for an immediate cash compensation of $135 million, based on the net asset value of company properties. Occidental obtained the right to buy back all of the Government's share of oil produced for the duration of the concession agreement, and the initial buy-back price was set at $4.90 per barrel of 40° API oil.[5]

On August 16, 1973, Libya and Oasis Oil, the country's largest producer, signed an agreement that provided for 51% Government ownership of the company's concessions, facilities, and crude oil. Compensation, in the form of crude oil from the Government's share of operations, was scheduled to be paid on the basis of the net book value of the company's property in four installments. Oasis was scheduled to have priority in buying the Government's share of oil. According to the agreement, Oasis was scheduled to be completely

[4] Phosphorus and Potassium. Libya—Assistance Required to Develop Potash Resources. No. 63, January–February 1973, p. 41.

[5] Middle East Economic Survey (Beirut, Lebanon). Oxy's Libyan Deal Sets New Precedent in Participation Terms. V. 16, No. 43, Aug. 17, 1973, pp. 1–5.

taken over by the Government before January 1975, but would be retained as service contractors. Shell Oil Co. Ltd. refused to accept the Government's request for 51% of the company's assets in Libya.

On September 1, 1973, the Libyan Government issued a decree that unilaterally acquired 51% control of the major oil companies in the country. ESSO's LNG plant at Marsá al Burayqah and the small oil producers were not included in the September order. The Libyan decree was opposed by the major oil companies.[6] The Government refused to submit its demands to arbitration and warned the oil companies that they would be completely taken over if they did not submit to the participation offer. Grace Petroleum and Gelsenberg Benzin, signed participation agreements with Libya during September, providing 51% Government ownership. The agreements stipulated that compensation will be at net book value, and the companies may buy back nationalized crude oil at $4.90 per barrel. At yearend, the major oil companies continued to hold out against the Government's demands, and complete nationalization seemed probable during 1974.

Following the February 1973 devaluation of the U.S. dollar, talks were held between the Organization of the Petroleum Exporting Countries (OPEC), including Libya, and representatives of the major international oil companies concerning proposed petroleum price increases. A June 2 agreement signed by OPEC and the oil companies permitted a posted price of $4.25 per barrel for Libya's 40° API oil, up 12.5% from the January 1 price.[7] Posted prices for 40° API oil more than doubled on October 19, when they reached $8.92 per barrel. On November 1, the prices were further increased to $9.06 per barrel. Libya's buy-back price for crude oil rose on October 19 to $7.60 per barrel.

Exploration activities increased in 1973, despite the Government-oil company negotiations and reduced production and shipments. During the year, the Government awarded four concessions totaling 11,321 square kilometers to LINOCO. Fourteen drilling rigs were in service and 83 wells were drilled, including 20 wildcats, compared with 65 wells drilled during 1972. A sharp increase in development and exploratory drilling was expected in 1974, when more than 300 wells were scheduled to be drilled, of which at least 58 would be wildcats.

In 1973, a new oilfield was discovered in the Ra's al Hilāl Area, approximately 150 kilometers east of Benghazi in northeast Libya. The discovery was reported as "substantial," but details were not given. LINOCO announced that new deposits had been discovered with estimated reserves of 1 billion barrels near Ghadāmis, 400 kilometers southwest of Ṭarābulus, adjacent to the Algerian-Tunisian border.

During 1973, the General Organization for Maritime Transport signed agreements with 3 foreign shipyards for the construction of 11 petroleum tankers with a combined tonnage of more than 1 million tons. Japanese shipbuilders Nippon Kokan Kabushiki Kaisha will construct two 118,000-deadweight-ton vessels at a total cost of $45.3 million, Sweden's Gotaverken AB shipyard will build three 152,700-deadweight-ton supertankers costing $40.75 million each, and an unknown Yugoslavian firm was contracted to build two crude oil ships of 100,000 to 120,000 deadweight-tons each and four refined petroleum product carriers of 30,000 deadweight tons each. The Yugoslavian ships are part of a barter agreement for 2 million tons annually of Libyan crude oil for an unspecified period of time. The Japanese ships are to be delivered in 1975, and the Swedish supertankers are scheduled for delivery in 1976. Planned delivery dates were not published for the Yugoslavian tankers. Libya's tanker fleet will be used to distribute refined petroleum products to domestic coastal depots and to transport crude oil to the Az Zāwiyah petroleum refinery near Ṭarābulus, and to consumers along the Mediterranean Sea and Northern European ports.

The Italian firm Snam Progetti S.p.A. continued construction on the 60,000-barrel-per-day petroleum refinery at Az Zāwiyah. Refinery construction activities were not completed by mid-1973 as scheduled, but the facility was nearly ready for initial testing by yearend. Production was scheduled to begin during the first quarter of 1974. Principal processing units constructed at Az Zāwiyah included catalytic cracking, fractional distillation, and sulfur recovery.

[6] Petroleum Times. Libya—Oil Majors Contest the Takeover. V. 77, No. 1969, Sept. 21, 1973, p. 3.

[7] Petroleum Times. OPEC—Oil Company Agreement at Geneva. V. 77, No. 1963, June 15, 1973, p. 49.

LPG will be bottled at the refinery for distribution to domestic consumers. Refinery bulk storage facilities totaled 2.3 million barrels, of which 1.1 million barrels were to be used for crude oil. During 1973, plans were finalized to construct additional processing and storage units at Az Zāwiyah, doubling the plant's throughput capacity.

Plans were discussed for three additional refineries, one of 180,000 barrels per day at Marsá al Burayqah, one at Tobruk near the Egyptian border, and a jointly owned Libyan-Tunisian plant at Gabés, Tunisia. Throughput capacity of the Tobruk refinery was to be 120,000 barrels per day, with most of the products exported. Tunisia's plant was expected to process 120,000 to 150,000 barrels per day of crude oil.

Construction activities continued during 1973, at the Shell Oil Co. lubricating oil blending plant, Libya's first, and were expected to be completed early in 1974. The plant's capacity was to be 220,000 barrels per year.

Compagnia Italiana Montaggi Industriali, S.p.A., was awarded a $30 million contract for the construction of a 64-kilometer-long, 25-centimeter-diameter pipeline to transport refined petroleum products from the Az Zāwiyah petroleum refinery to Ṭarābulus. The contract also called for construction of terminal facilities at Ṭarābulus, and a 20-centimeter fuel oil pipeline 40 kilometers in length from the refinery to Janzūr, the site of a new electric powerplant. Storage tanks for more than 2.2 million barrels of petroleum products were to be built at Ṭarābulus. Construction was scheduled to begin in early 1974.

The Mineral Industry of Malaysia

By Keith L. Harris [1]

Strong world demand and high prices for Malaysia's primary commodities, especially rubber and timber, fueled an economic boom during the year. The gross national product (GNP) increased by 6.8%, slightly above the Government's projected annual growth rate of 6.5% for the second Malaysia plan period of 1970–75. Exports were up 52% while imports were up only 30% from 1972 levels, resulting in a trade surplus of $627 million [2] compared with $134 million for 1972.

Malaysia's mineral industry did not fare as well as the general economy. Production of all major minerals, except bauxite, stabilized or fell. Total employment in the mining sector declined from 47,200 at yearend 1972 to 43,972 at yearend 1973.

Malaysia continued to be the world's largest tin producer, mining over 30% of the world's output, even though heavy monsoon rains, low prices during the first half of 1973, and export controls imposed by the International Tin Council, caused a 6% decrease in mine output.

Crude petroleum production, all from the State of Sarawak, dropped slightly from the 1972 level, but offshore fields discovered off Sarawak, Sabah, and West Malaysia strengthened future production potential.

The Asian Development Bank provided loans to the Malaysian Government to enhance its infrastructure. A loan of $9.3 million to build five bridges on a 114-kilometer section of the East-West Highway now under construction in West Malaysia was granted in March. A deepwater seaport will be constructed at Kuantan to facilitate development of the eastern portion of West Malaysia. A loan of $9.8 million was granted to the Sabah Electricity Board to increase power supplies to Kota Kinabalu, Sandakan, and Labuan.

PRODUCTION

Production levels for most of Malaysia's minerals remained about the same or recorded decreases from 1972 levels. Tin mine output dropped 6% from the 1972 level but increased prices toward yearend eased the revenue losses. Crude petroleum production declined during the year from a high of 2.9 million barrels in January to 2.7 million barrels during December. Total iron ore production dropped 1% to 517,178 tons. Bauxite production recorded a 6% increase over that of 1972. Except for September, when bauxite output dropped to a low of 60,000 tons because only three mines were in operation, four mines operated, with a maximum output of 111,000 tons occurring during July.

[1] Physical scientist, Division of Nonferrous Metals—Mineral Supply.

[2] Where necessary, values have been converted from Malaysian dollars (M$) to U.S. dollars at the rate of M$2.41=US$1.00.

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

Commodity [2]	1971	1972	1973 [p]
METALS			
Aluminum, bauxite, gross weight -- thousand tons --	978	1,076	1,143
Antimony, mine output, metal content (Sarawak) --	289	205	200
Columbium and tantalum concentrates, gross weight -	24	89	42

See footnotes at end of table.

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

Commodity [2]	1971	1972	1973 [p]
METALS—Continued			
Copper, mine output, metal content [e 3]	r 210	r 60	50
Gold, mine output, metal content:			
West Malaysia troy ounces	4,491	3,853	e 2,800
Sarawak do	1,180	e 1,047	1,000
Total do	5,671	4,900	3,800
Iron and steel:			
Iron ore and concentrate thousand tons	950	520	517
Pig iron and blast furnace ferroalloys [e] do	r 65	80	100
Crude steel [e] do	r 65	80	100
Manganese ore and concentrate, gross weight	12,700	33,528	28,801
Rare-earth minerals: [4]			
Monazite, gross weight	1,471	1,748	e 2,000
Xenotime (yttrium mineral), gross weight	101	40	NA
Tin:			
Mine output, metal content long tons	74,253	75,617	71,119
Smelter output [5] do	r 85,170	88,004	81,166
Titanium, ilmenite concentrate, gross weight [4]	r 155,945	152,174	152,200
Tungsten, mine output, metal content	r 8	5	e 7
Zirconium, zircon concentrate, gross weight [4]	r 2,643	1,651	e 2,000
NONMETALS			
Cement, hydraulic thousand tons	r 1,095	1,160	1,143
Clays, kaolin	11,655	104,978	105,398
MINERAL FUELS AND RELATED MATERIALS			
Gas, natural (Sarawak):			
Gross production [e] million cubic feet	25,000	35,000	35,000
Marketed production do	2,297	3,325	3,187
Petroleum:			
Crude (Sarawak) thousand 42-gallon barrels	r 25,249	34,170	33,450
Refinery products:			
Gasoline:			
Sarawak do	8,543	7,491	5,270
West Malaysia do	2,600	3,016	e 2,300
Jet fuel:			
Sarawak [4] do	6,138	5,772	NA
West Malaysia do	1,500	--	--
Kerosine:			
Sarawak do	1,501	1,605	2,500
West Malaysia do	--	1,613	e 6,200
Distillate fuel oil:			
Sarawak do	1,738	1,967	1,928
West Malaysia do	4,300	4,502	e 4,500
Residual fuel oil:			
Sarawak do	8,978	7,459	NA
West Malaysia do	7,000	8,313	e 3,900
Lubricants (West Malaysia) do	--	344	--
Other:			
Sarawak do	--	414	6,541
West Malaysia do	4,000	7,347	e 8,300
Refinery fuel and losses (West Malaysia) do	--	650	NA
Total:			
Sarawak do	26,898	24,708	16,239
West Malaysia do	19,400	25,785	e 25,200
Grand total do	46,298	50,493	41,439

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] All production is from West Malaysia unless otherwise indicated in commodity column.
[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 general information is inadequate for the formulation of reliable estimates of output levels.
[3] Estimate based on exports of copper concentrates.
[4] Based on export figures.
[5] Includes tin concentrates imported for refining and reexport. These imports yielded 9,402 long tons of metal in 1971 and 11,763 long tons of metal in 1972. Data for 1973 not available at time of publication.

TRADE

Tin, Malaysia's leading export among mineral commodities, is third behind rubber and timber as an overall foreign exchange earner. Malaysia exports only tin metal, some of which is mined in surrounding countries and imported into Malaysia for smelting. Exports of tin metal were down 11% from the 1972 level to

80,397 long tons in 1973 with a corresponding value decrease of 3% to $381 million, 12% of the total export revenue. Exports of tin were about 113% of the total tin mined in the country. The major recipients were Japan (31%) and the United States (30%).

The volume of petroleum exports decreased because of increased domestic demand, but the value of exports increased 20% to $114 million as petroleum prices increased worldwide.

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

Commodity	1971				1972
	Sabah	Sarawak	West Malaysia	Total	West Malaysia
METALS					
Aluminum:					
Bauxite	--	--	983,707	983,707	987,377
Metal, including alloys:					
Scrap	2	28	539	569	628
Unwrought	--	--	23	23	84
Semimanufactures	(2)	(2)	535	535	1,376
Copper:					
Ore	--	--	1,109	1,109	250
Metal:					
Scrap	332	104	604	1,040	844
Unwrought and semimanufactures	(2)	3	622	625	654
Iron and steel:					
Iron ore thousand tons	--	--	879	879	371
Metal:					
Iron and steel scrap	2,520	594	6,277	r 9,391	2,528
Pig iron, ferroalloys, and similar materials	--	--	11	r 11	19
Steel, primary forms	(2)	(2)	110	r 110	374
Semimanufactures:					
Bars, rods, angles, shapes, and sections	5	7	25,513	r 25,525	54,863
Universals, plates, and sheets	31	4	9,440	r 9,475	9,483
Hoop and strip	--	8	56	r 64	373
Rails and accessories	1,585	246	5,912	r 7,743	1,446
Wire	--	(2)	596	r 596	2,443
Tubes, pipes, and fittings	1	54	3,883	2 3,938	7,375
Castings and forgings, rough	(2)	--	163	r 163	312
Lead:					
Oxides	--	--	7	7	65
Metal, including alloys, all forms	53	71	252	r 376	177
Magnesium metal, including alloys, all forms	--	--	1	1	(2)
Manganese ore	--	--	12,904	12,904	33,530
Mercury 76-pound flasks	--	--	(2)	(2)	3
Monazite	--	--	1,471	1,471	1,830
Thorium ore	--	--	99	99	61
Tin:					
Ore long tons	--	--	494	494	(2)
Metal, including alloys:					
Residues (slag and hardhead) do	--	--	2,559	r 2,559	8,146
Unwrought do	--	--	85,334	85,334	90,016
Semimanufactures do	--	--	94	r 94	3
Titanium ore and concentrate	--	--	155,992	155,992	154,321
Tungsten ore and concentrate	--	--	273	273	347
Zinc metal, including alloys:					
Scrap	(2)	3	403	406	298
Blue powder	--	--	4	4	1
Unwrought	--	--	--	--	4
Semimanufactures	--	(2)	95	r 95	73
Other:					
Ash and residue containing nonferrous metals	--	--	666	666	1,074
Oxides, hydroxides, and peroxides of metals, n.e.s	--	--	71	r 71	189
Metals, including alloys, all forms: alkali, alkaline earth, and rare-earth metals	--	--	11	11	(2)
NONMETALS					
Abrasives, natural, n.e.s., pumice, emery, natural corundum, etc	--	--	20	20	35
Asbestos	--	2	17	19	13
Barite and witherite	2,183	--	5	2,188	3
Boron materials, crude	--	--	1	1	2
Cement	19	11	313,077	r 313,107	177,572

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971				1972
	Sabah	Sarawak	West Malaysia	Total	West Malaysia
NONMETALS—Continued					
Clays and clay products (including all refractory brick):					
Crude:					
China clay (kaolin)	--	--	7,389	7,389	5,187
Fuller's earth	--	--	20	20	18
Other clays	--	--	1,206	r 1,206	3,458
Products:					
Refractory	--	(2)	481	r 481	228
Nonrefractory	2	137	24,467	2 24,606	51,204
Diamond, gem, not set or strung --- value --	--	--	$451,518	r $451,518	$332,952
Diatomite and other infusorial earth	--	--	24	24	1
Fertilizer materials:					
Crude, phosphatic	--	--	2,187	2,187	2,868
Manufactured:					
Nitrogenous	--	--	1,049	r 1,049	477
Phosphatic	--	--	148	r 148	158
Potassic	--	--	109	r 109	79
Other, including mixed	--	(2)	30,036	r 30,036	34,890
Ammonia	--	(2)	301	301	270
Gypsum and plasters	--	--	83	83	53
Lime	(2)	(2)	4,937	r 4,937	5,545
Pigments, mineral, natural crude	--	--	46	46	17
Precious and semiprecious stones, except diamond, natural value --	$753	--	$65,514	$66,267	$41,011
Salt and brine	(2)	3	328	331	269
Sodium and potassium compounds, n.e.s.:					
Caustic soda	--	--	466	r 466	170
Caustic potash, sodic and potassic peroxides	--	--	(2)	(2)	8
Stone, sand and gravel:					
Dimension stone:					
Crude and partly worked	--	1,563	234	r 1,797	403
Worked	--	(2)	378	r 378	280
Dolomite, chiefly refractory grade	--	--	2,594	r 2,594	2,915
Gravel and crushed rock	37,663	27,495	126,261	r 191,419	519,035
Limestone (except dimension)	--	--	15,393	r 15,393	19,087
Quartz and quartzite	--	--	165	165	218
Sand, excluding metal bearing	--	898	25,461	r 26,359	34,067
Talc, steatite, soapstone, and pyrophyllite ---	--	--	484	r 484	246
Other nonmetals, n.e.s.:					
Crude	--	--	164	r 164	547
Slag, dross, and similar waste, not metal bearing	--	--	67	67	2
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	9	33	18,726	r 18,768	21,567
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural	--	3	3	r 6	14
Carbon black and gas carbon	(2)	(2)	12	12	51
Coke and semicoke	--	--	165	r 165	110
Petroleum:					
Crude ---- thousand 42-gallon barrels --	--	51,180	(2)	r 51,180	--
Partly refined do	--	9,414	2,659	r 12,073	1,115
Refinery products:					
Gasoline do	98	1,192	390	r 1,680	307
Jet fuel do	43	(2)	52	r 95	36
Kerosine do	12	1,486	398	r 1,896	215
Distillate fuel oil do	53	1,587	476	r 2,116	461
Residual fuel oil do	3	398	194	r 595	(2)
Lubricants do	2	(2)	98	r 100	126
Other:					
Mineral jelly and wax -- do	--	(2)	(2)	(2)	(2)
Nonlubricating oils, n.e.s do	(2)	--	5	5	17
Bitumen and bituminous mixtures, n.e.s do	(2)	(2)	87	87	42
Unspecified do	1	7,161	(2)	7,162	(2)
Total [3] do	212	11,824	1,700	r 13,736	1,204

r Revised.

[1] Figures given for each region include exports to each of the other regions of Malaysia as well as to foreign destinations. Data for 1972 for Sabah and Sarawak unavailable at the time of publication.

[2] Less than ½ unit.

[3] Excluding liquefied petroleum gas which was reported only in terms of value.

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

(Metric tons unless otherwise specified)

Commodity	1971				1972
	Sabah	Sarawak	West Malaysia	Total [2]	West Malaysia
METALS					
Aluminum:					
Oxide and hydroxide	(3)	(3)	3,239	3,240	2,873
Metal and alloys, all forms	42	140	7,673	r 7,855	9,662
Chrome oxide and hydroxide	(3)	(3)	42	42	49
Cobalt oxide and hydroxide	3	--	3	6	15
Copper:					
Ore and concentrate	(3)	--	269	269	18
Metal and alloys, all forms	111	105	4,034	4,250	4,533
Iron and steel:					
Iron and steel scrap	1	5	2,922	r 2,928	15,597
Pig iron, including cast iron	7	--	171	178	1,018
Sponge iron, powder and shot	(3)	--	107	107	112
Ferroalloys:					
Ferromanganese	--	1	1,521	r 1,522	2,322
Other	--	--	997	997	1,180
Steel, primary forms	425	6	25,074	25,505	38,929
Semimanufactures:					
Bars, rods, angles, shapes, and sections	6,522	8,378	100,062	114,962	80,653
Universals, plates, and sheets	7,580	4,428	157,545	169,553	183,003
Hoop and strip	100	388	36,429	36,917	43,585
Rails and accessories	95	103	5,254	5,453	4,123
Wire	1,183	3,437	25,649	30,270	37,173
Tubes, pipes, and fittings	1,800	3,850	14,142	r 19,792	31,268
Castings and forgings, rough	406	99	1,355	1,860	1,746
Lead:					
Ore and concentrate	--	--	5	5	16
Oxides	(3)	1	776	777	1,049
Metal, including alloys, all forms	380	18	1,400	r 1,798	2,386
Magnesium metal, including alloys, all forms	24	--	9	r 33	24
Manganese:					
Ore and concentrate	--	--	1,187	r 1,187	283
Oxides	(3)	(3)	1,029	1,029	494
Mercury 76-pound flasks	1	4	24	29	21
Molybdenum metal, including alloys, all forms	(3)	--	3	3	3
Nickel metal, including alloys, unwrought and semimanufactures	548	1	53	602	74
Platinum-group metals, including alloys troy ounces	--	--	1,137	1,137	1,196
Silver do	12	--	1,896	r 1,908	8,400
Tin:					
Ore long tons	--	--	14,868	14,868	17,824
Metal, including alloys, all forms do	48	(3)	334	r 382	185
Titanium oxides	--	2	1,997	1,999	2,197
Zinc:					
Ore	--	--	3,558	3,558	4,980
Oxide	3	(3)	623	626	369
Metal, including alloys, all forms	19	56	3,901	3,976	4,502
Other:					
Ash and residue containing nonferrous metals	--	(3)	1,059	1,059	40
Metals, including alloys, all forms:					
Metalloids	66	9	114	189	261
Alkali, alkaline earth, and rare-earth metals	2	(3)	--	2	44
Pyrophoric alloys	1	1	24	26	23
NONMETALS					
Abrasives, natural, n.e.s., pumice, emery, corundum, etc	(3)	1	167	168	166
Asbestos	1	2	13,796	13,799	12,772
Barite and witherite	2,845	--	1,541	4,386	122
Boron materials:					
Crude natural borates	2	1	399	r 402	285
Oxide and acid	(3)	(3)	85	85	109
Cement	30,190	27,762	9,032	66,985	20,950
Chalk	(3)	--	218	r 218	162
Clays and clay products:					
Crude:					
Bentonite	--	1	47	48	336
China clay (kaolin)	(3)	1	1,041	1,042	1,234
Fuller's earth	2	11	1,204	1,217	1,035
Mullite, charmotte, and dinas earths	--	--	280	r 280	341
Other clays	17	4	1,745	1,766	2,944

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971				1972
	Sabah	Sarawak	West Malaysia	Total [2]	West Malaysia
NONMETALS—Continued					
Clays and clay products—Continued					
Products:					
Refractory	134	47	16,252	16,433	12,579
Nonrefractory	2,698	611	4,392	7,701	3,422
Diamond, gem, not set or strung value, thousands	(3)	$1	$1,620	r $1,621	$1,913
Diatomite and other infusorial earth	1	--	179	180	70
Feldspar	--	(3)	3,338	r 3,338	3,535
Fertilizer materials:					
Crude:					
Nitrogenous	--	--	91	r 91	315
Phosphatic	32	7,729	106,121	113,882	125,838
Potassic	19	505	447	971	436
Other	5	859	39,070	39,934	38,258
Manufactured:					
Nitrogenous	3,457	7,986	59,297	70,740	74,338
Phosphatic:					
Thomas (basic) slag	--	2	727	729	344
Other	1,695	153	6,482	8,330	10,144
Potassic	6,411	623	96,683	103,717	138,924
Other, including mixed	2,589	7,371	32,213	42,172	33,466
Ammonia	15	3	8,981	9,000	9,692
Fluorspar, nepheline, leucite, and nepheline syenite	--	(3)	4,374	4,374	4,611
Graphite, natural	(3)	--	409	409	200
Gypsum and plasters	--	13	30,589	30,602	13,129
Lime	3,659	40	1,525	5,224	2,500
Magnesite	--	(2)	192	192	245
Pigments, mineral:					
Natural, crude	1	(3)	593	594	--
Iron oxides	(3)	2	692	694	772
Precious and semiprecious stones, except diamond:					
Natural value	$14,757	$12,029	$53,215	r $80,001	$75,711
Manufactured do	$65	$78	$6,619	r $6,762	$3,075
Pyrite	(3)	--	33	33	2
Salt and brine	4,150	6,805	126,034	r 136,989	84,384
Sodium and potassium compounds, n.e.s.:					
Caustic soda	36	242	6,914	7,192	6,375
Caustic potash, sodic and potassic peroxides	40	9	523	572	1,449
Stone, sand and gravel:					
Dimension stone, crude and worked	52	82	1,728	1,862	1,431
Dolomite, chiefly refractory grade	--	83	88	171	77
Gravel and crushed rock	63	144	1,069	1,276	1,226
Limestone (except dimension)	37	99	1,525	1,661	903
Quartz and quartzite	(3)	--	214	r 214	6
Sand, excluding metal bearing	17	(3)	678	695	430
Sulfur:					
Elemental, all types	7	3	10,208	10,218	12,854
Sulfur dioxide	--	--	2	2	3
Sulfuric acid	38	33	20	r 91	57
Talc, steatite, soapstone, and pyrophyllite	261	2	3,083	3,386	3,466
Other nonmetals, n.e.s.:					
Crude	1,687	1,257	21,928	24,873	31,614
Slag, dross, and similar waste, not metal bearing	(3)	--	194	194	121
Oxides and hydroxides of magnesium, strontium, and barium	(3)	(3)	32	32	29
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s	2,062	3,323	2,489	7,875	5,291
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural	438	753	702	1,893	1,185
Carbon black	9	5	5,317	5,331	5,747
Coal, coke, and briquets:					
Anthracite and bituminous coal	7	--	15,584	15,591	4,472
Lignite and lignite briquets	--	--	19	19	(3)
Coke and semicoke	38	9	47,141	47,188	9,982
Petroleum:					
Crude thousand 42-gallon barrels	(3)	46,008	17,965	r 63,973	19,220
Partly refined do	(3)	256	1,412	r 1,668	1,100
Refinery products:					
Gasoline do	560	275	914	r 1,749	1,169
Jet fuel do	187	132	336	r 655	651

See footnotes at end of table.

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

Commodity	1971				1972
	Sabah	Sarawak	West Malaysia	Total [2]	West Malaysia
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum—Continued					
Refinery products—Continued					
Kerosine thousand 42-gallon barrels	85	87	554	r 726	530
Distillate fuel oil ---- do ----	677	342	4,073	5,092	6,125
Residual fuel oil ---- do ----	29	--	551	580	374
Lubricants ---- do ----	26	26	328	r 380	352
Other:					
Mineral jelly and wax ---- do ----	(3)	(3)	31	31	41
Nonlubricating oils ---- do ----	4	19	34	r 57	212
Bitumen and other residues do ----	40	30	76	146	72
Petroleum coke ---- do ----	1	--	38	r 39	65
Unspecified ---- do ----	75	(3)	64	139	145
Total [4]	1,684	911	6,999	r 9,594	9,736

r Revised.
[1] 1972 trade data for Sabah and Sarawak unavailable at the time of publication.
[2] Data may not add to totals shown, because of independent rounding.
[3] Less than ½ unit.
[4] Excludes liquefied petroleum gas, which was reported in terms of value only.

COMMODITY REVIEW

METALS

Copper.—Overseas Mineral Resources Development Sabah Berhad signed an agreement with the Malaysian Government in February, paving the way for further development of the Mamut copper mine project in northwest Sabah. Production is due to commence in 1975 at a rate of 30,000 tons per year of copper-in-concentrate plus byproduct gold and silver. The agreement allows the Malaysian Government to select the companies shipping all copper exports. Provisions for training Malaysians in all aspects of copper mining and a feasibility study on establishing copper smelting and refining operations in Sabah were also included in the agreement.

Tin.—Malaysia continued to lead the world in production, smelting, and exports of tin in 1973. A total of 71,119 long tons of tin-in-concentrate was mined, the lowest level since 1966 and down 6% from the 1972 production level because of export controls, heavy flooding during May in many mining areas, and low prices of tin during the first half of the year. At yearend there were 58 tin dredges, 873 gravel pump mines, and 43 opencast, underground, and other miscellaneous mines in operation, reflecting a 7% drop in total active mines through the year. The gravel pump mines bore the brunt of the decreased mining activity with a loss of 67 mines during the year.

Gravel pump operations, worked for the most part by the same families that own the mines, accounted for about 54% of the concentrates produced, while dredging by corporations furnished another 31%. Opencast mines brought in 5% of the production, underground mines accounted for 3%, and the remaining 7% came from miscellaneous sources. The tin mining labor force declined 9% to 41,744 workers at yearend.

Metal production, at 81,166 long tons, was 9% below the 1972 level and the lowest since 1967. Exports of metal declined to 80,397 long tons from 90,016 long tons in 1972.

Perbadanan Nasional Berhad (Pernas), Malaysia's national mining corporation, was granted tin exploration rights to a concession of over 39,000 square kilometers offshore from Penang, Perak, and Selangor States. After an initial 3-year exploration period, Pernas can apply for a mining lease for 5% of the area. The remainder of the concession will revert to the Malaysian Government, but Pernas will retain first option on the areas surrendered.

Several new dredging operations started during the year. Conzinc Riotinto Malaysia Sdn. Bhd., a joint venture with The Rio Tinto-Zinc Corp., Ltd. (41.25%),

Conzinc Riotinto of Australia Ltd, (CRA) (13.75%), and Bethlehem Steel Corp. (45%), started dredging for tin at Labohan Dagong, Selangor. The 5,300-ton dredge built by IHC Holland can dig to a depth of 46 meters and has an annual throughput of 7.6 million cubic meters. The dredge has circular jigs and produces a low-grade concentrate prior to further upgrading onshore. Selangor Dredging Berhad No. 2 dredge began operation late in 1973. The $4.7 million 0.68-cubic-meter bucket dredge is capable of an annual throughput of 9 million cubic meters.

Other new dredges were in the planning stage. Selangor State Development Corp. contracted for the design of its first dredge. The $4.1 million dredge, scheduled to begin mining in 1976, will be operated by the corporation subsidiary, Syarikat Timah Langat Sdn. Berhad, on an 800-hectare area at Dengkil in Selangor's Kuala Langat forest reserve.

Berjuntai Tin Dredging Berhad, the largest private tin mining company in the world, decided to proceed with the construction of its eighth bucket dredge. The new dredge will have 0.62-cubic-meter-capacity buckets, monthly throughput of 460,000 cubic meters, and a maximum dredging depth of 40 meters. Reserves sufficient for 11 years of operation have been allocated for the dredge. When No. 8 begins production, Berjuntai will close down its No. 1 dredge which has been mining in Selangor for nearly 50 years. Berjuntai tin concentrate production was down 366 long tons to 4,551 long tons for its fiscal year because of the lower grade ground worked by all but the No. 7 dredge. The two newer 0.57-cubic-meter bucket dredges, Nos. 6 and 7, produced 2,248 long tons of concentrate, or about as much as the five older units combined. Output of the five older dredges reached 2,467 long tons compared to 2,197 long tons for the corresponding period in 1972.

Malayan Tin Dredging Ltd., and Southern Malayan Tin Dredging Ltd., reduced output during the fiscal year 1973. Malayan Tin planned to divert the River Kinta so an additional 146 hectares of land on its Kampong Gajah property would be available for dredging. The project is expected to be completed in 1979. The work will proceed in stages so the company dredges can work systematically through the area.

Ayer Hitam Tin Dredging Ltd., increased tin concentrate output to 3,384 long tons in fiscal 1973 compared with 3,059 long tons in 1972. Production during the fiscal year is expected to decrease because lower grade ground is being worked and the No. 2 dredge was temporarily shutdown.

The Sungei Besi Mines Ltd., which operated three opencast mines in southeastern Selangor, had a record production in fiscal year 1973 of 2,472 long tons of concentrate assaying 74.3% tin. Stripping operations continued at the new 3/5 mine with production scheduled to start in 1974.

Gopeng Consolidated Ltd., produced 2,686 long tons of concentrate during the year, slightly less than in 1972. Gopeng purchased 877 hectares of land, some of which is to be used for a tailings dump. This will ease the company's task in meeting government water purification requirements prior to returning water to the normal river courses. Gopeng also concluded a lease-purchase agreement for 219 hectares of mining land in the Batang Padang district of Perak.

Pahang Consolidated Company Ltd.'s mine at Sungei Lembing, the largest lode tin venture in Southeast Asia, produced 2,535 long tons of concentrate, slightly less than during 1972. Pahang realized $3.5 million through the sale of its wholly-owned subsidiary, The Kuala Reman Rubber Estates. Some of the funds will be used in sinking the Gakak shaft and installing a new heavy media separation plant. Ore reserves were estimated at 11,500 long tons of contained cassiterite.

Pacific Tin Consolidated Corp., the only U.S. company mining tin in Malaysia, showed decreases in total volume treated and tin recovered from that of 1972. The No. 5 dredge was shutdown in February when its minable reserves were exhausted. Dredge No. 8, operating at Batang Berjuntai, dug 56% of the total yardage and produced 43% of the total tin recovered by all plants in 1973. Dredge No. 2 operated on leases along the Selangor River. Four gravel pump mines operated in the Ampang area but one was closed down in September after allocated reserves were exhausted. Estimated tin ore reserves at yearend were about 8,000 long tons.

A new regional tin center will be constructed in Ipoh by the Conference of Asian Nations on Geology. The center

will conduct research on better methods of mining and treating tin ore.

Titanium.—The Malaysian Titanium Corp. contracted with Woodall-Duckham, Ltd., of the United Kingdom, for construction of an ilmenite upgrading facility at Ipoh, Perak. The $9 million plant will use a hydrochloric acid leaching process to produce 65,000 tons per year of beneficiated ilmenite.

By yearend the Pacific Tin Consolidated Corp. completed construction of a plant to make an ilmenite concentrate as a by-product of its tin recovery.

MINERAL FUELS

Petroleum.—Sarawak Shell Berhad accounted for all of Malaysia's petroleum output during 1973 from operations offshore Sarawak State. Production was down 2% from that of 1972. Offshore exploration continued in Malaysia and encouraging results were reported. Sarawak Shell struck oil in its Tukau-3 well 29 kilometers west of Miri, Sarawak. Short tests on two intervals yielded 1,650 barrels per day from a deep zone and 1,100 barrels per day from a shallow zone.

Early in the year, Sabah Shell Petroleum Co. Ltd. discovered oil offshore at the Erb West wildcat well, about 56 kilometers northwest of Kota Kinabalu, Sabah, and at Samarang, about 137 kilometers west-southwest of Kota Kinabalu. By yearend Shell had started development work to bring the fields into production by 1975.

Exxon Exploration Malaysia Inc. announced that three out of five wells drilled in the Tembungo area, about 85 kilometers northwest of Kota Kinabalu, tested oil at rates of more than 2,000 barrels per day. Exxon began building a fixed production platform over the field and estimated production of about 100,000 barrels per day when the field is developed.

The Continental Oil Co. (Conoco) group, consisting of Conoco (50%), Broken Hill Pty. Co., Ltd. (BHP) (25%), and El Paso Natural Gas Co. (25%), struck oil 161 kilometers off Kuantan on West Malaysia's east coast, the first oil discovery off West Malaysia. The area was originally awarded to Conoco under a 40-year concession agreement in 1968, but was renegotiated as a production-sharing contract to go into effect when proposed legislation is approved by the Malaysian Government. Terms include retention of up to 40% of the annual crude production by the Conoco group to cover exploration and production costs with the remaining 60% being split 65%–35% in the Government's favor.

The Mineral Industry of Mexico

By John M. Hague [1] and Burton E. Ashley [2]

The value of mineral production (excluding petroleum) grew from $574 million in 1972 to $729 million in 1973, a 27% increase due mainly to increased prices for metals. The volume index of mineral production increased by 5.3% from 1972 to 1973. Mexico's gross domestic product increased by 6.8% in real terms over the same period; the mineral industry accounted for 1.6% of domestic production.

Petroleum (crude, condensate, and liquids), and natural gas production increased by 3.5% and 2.5%, respectively. Exploration effort by Petróleos Mexicanos (PEMEX), a government monopoly, was stepped up with some success, and plans were made for increased refinery capacity looking toward self-sufficiency by 1975. The sales value of domestic crude and refined petroleum production was about $1,200 million.

The Mexican Government continued to promote a policy of aiding the minerals industry through public sector investments and through encouraging private investments, mainly in joint ventures with government enterprises. Foreign equity participation appeared to be permitted up to 40%.

About 130,000 persons were employed in Mexico's mining industry, 3.55% of the total industrial employment. Another 70,000 were employed by PEMEX in the petroleum industry.

Incentives to be offered by the Mexican Government for the development of the Tehauntepec Isthmus were announced by Presidential decree on April 6. Fiscal incentives for qualifying firms included 100% exemption from duties on imported raw materials, machinery, and parts, and complete exemption from stamp taxes and sales taxes; a 40% reduction in income taxes may also be allowed. Added benefits allowed to firms with capital of less than $400,000 included: Technical assistance, credits from special government funds, assistance in making market and feasibility studies, and discounts on rail freight charges. Benefits were to be extended for a period of 7 to 10 years.

Eligibility requirements for the benefits include Mexican management control of the enterprise and at least 51% Mexican capital ownership. At least 60% of total production costs must derive from national sources unless the required raw materials are not available in Mexico. Foreign remittances in payment of patent, royalty, and trademark rights and technical assistance were not to exceed 3% of annual net sales.

A new agency, Servicios Portuarios del Istmo, S.A., was created to improve shipping and customs operations at the ports of Salina Cruz and Coatzacoalcos.

PRODUCTION

The value of metal and nonmetal minerals production in 1973 was $729 million,[3] an increase in value of 27% over 1972 production value.[4] In the metals sector, copper ore, iron ore, lead, manganese, and silver showed increases in quantity produced, but nine other metals showed decreases. Of the nonmetals, 14 showed increases in production and 6 declined. The large increase in overall value was due mostly to price increases.

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[3] Values have been converted from Mexican pesos to U.S. dollars at the rate of Mex$1=US$0.08.

[4] Consejo de Recursos Naturales No Renovables. Anuario Estadistico de la Mineria Mexicana–1973. Mexico, D.F., July 1974.

Petroleum refinery production increased by 7%, to 210 million barrels in 1973. The sales value of petroleum products produced was about $1,200 million.

Coal and coke production increased because of greater demand from a growing steel industry. The production of raw, unwashed coal, included with nonmetals in Mexican statistical reports, increased from 3.6 million tons in 1972 to 4.3 million tons in 1973; most of this was destined for coke production.

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

Commodity [1]	1971	1972	1973 [p]
METALS			
Aluminum, primary	39,931	39,483	39,160
Antimony:			
Mine output, metal content	3,361	2,976	2,388
Metal (in mixed bars)	1,055	758	NA
Arsenic, white [2]	11,483	5,097	4,380
Bismuth, content of exported concentrates, bullion, and refined metal	570	629	585
Cadmium:			
Mine output, metal content	1,662	1,757	1,477
Metal, refined	192	186	182
Copper:			
Mine output, metal content	63,150	78,720	80,501
Electrolytic solution [3]	98	67	[e] 62
Metal:			
Blister	61,936	74,236	73,034
Refined	52,577	59,591	57,212
Gold:			
Mine output, metal content troy ounces	150,915	146,061	132,557
Metal, refined do	147,057	137,412	123,201
Iron and steel:			
Iron ore:			
Gross weight [4] thousand tons	4,354	5,089	5,189
Metal content do	2,819	3,053	3,113
Pig iron and sponge iron do	2,357	2,674	2,775
Ferroalloys do	67	77	[e] 80
Crude steel do	3,821	4,431	4,696
Steel semimanufactures do	3,024	3,473	[e] 3,600
Lead:			
Mine output, metal content	156,852	161,358	179,296
Smelter (in refined and mixed bars)	151,471	155,820	172,929
Manganese ore:			
Gross weight [5]	266,892	295,622	364,025
Metal content	96,081	106,424	131,049
Mercury, mine output, metal content 76-pound flasks	35,390	22,510	28,000
Molybdenum, mine output, metal content	79	78	41
Nickel, mine output, metal content	[e] 50	[e] 50	32
Selenium, metallic	52	44	39
Silver:			
Mine output, metal content thousand troy ounces	36,657	37,483	38,788
Metallurgical products, metal content do	35,349	36,263	[e] 35,093
Tin:			
Mine output, metal content long tons	471	348	287
Smelter, primary do	471	348	287
Tungsten, mine output, metal content	408	362	348
Zinc:			
Mine output, metal content	264,972	271,844	271,373
Smelter, primary	77,862	79,378	67,233
NONMETALS			
Asbestos	--	--	15
Barite	279,742	261,403	255,257
Cement, hydraulic thousand tons	7,360	8,602	9,787
Clays:			
Bentonite	57,628	37,984	45,793
Fuller's earth	20,245	30,392	50,303
Kaolin	72,587	71,891	94,364
Refractory	189,888	111,080	141,263
Diatomite	21,802	9,077	19,559
Feldspar	99,342	98,363	97,107
Fertilizer materials:			
Crude, phosphate rock	58,286	62,674	71,542
Manufactured:			
Nitrogenous, gross weight thousand tons	709	906	[e] 990
Phosphatic, gross weight do	402	456	[e] 460
Mixed, gross weight do	306	329	[e] 360

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity [1]		1971	1972	1973 [p]
NONMETALS—Continued				
Fluorspar, all grades		1,180,955	1,042,392	1,085,894
Graphite, all grades		50,916	55,110	65,392
Gypsum and anhydrite, crude	thousand tons	1,298	1,498	1,514
Magnesite		13,018	20,858	28,725
Mica, all grades		708	826	782
Perlite		11,146	12,868	13,479
Salt, all types	thousand tons	4,360	4,558	[e] 4,600
Stone, sand, and gravel:				
Calcite, common		7,707	3,984	4,378
Dolomite		453,362	485,956	410,120
Limestone [7]	thousand tons	3,001	4,068	NA
Marble		8,632	5,826	3,767
Quartz, quartzite, glass sand		393,350	404,567	411,432
Cobblestone		4,331	5,112	NA
Strontium minerals		35,063	24,424	18,273
Sulfur, elemental:				
Frasch process	thousand tons	1,091	861	1,544
Other native mined	do	23	21	--
Byproduct from natural gas	do	64	62	64
Total	do	1,178	944	1,608
Sulfates, natural sodium		132,615	127,890	173,991
Talc and related materials		1,714	3,130	2,108
Wollastonite		3,224	599	1,593
MINERAL FUELS AND RELATED MATERIALS				
Carbon black [e]		32,000	33,500	33,500
Coal, bituminous	thousand tons	3,552	2,959	[e] 3,000
Coke:				
Metallurgical	do	1,497	1,735	1,904
Breeze	do	111	130	[e] 156
Gas:				
Manufactured, all types	million cubic feet	7,400	6,573	[e] 6,620
Natural:				
Gross production	do	643,416	660,232	676,750
Marketable production	do	478,552	496,019	[e] 510,000
Natural gas liquids:				
Field condensate	thousand 42-gallon barrels	(8)	39	28
Other	do	(8)	23,644	26,573
Petroleum:				
Crude	do	[8] 177,274	161,328	164,881
Refinery products:				
Aviation gasoline	do	520	504	459
Other gasoline	do	52,100	55,602	57,964
Jet fuel	do	3,265	3,621	
Kerosine	do	11,556	11,572	16,795
Distillate fuel oil	do	30,195	34,502	38,355
Residual fuel oil	do	45,951	52,116	54,885
Lubricants	do	1,995	2,270	2,433
Other	do	26,550	27,594	35,245
Refinery fuel and losses	do	11,635	9,440	4,630
Total	do	183,767	197,221	210,766

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

[1] In addition to the commodities listed, lime, pumice, and additional types of crude construction materials are also produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[2] Calculated white arsenic equivalent of metallic arsenic content of products reported.

[3] For export.

[4] Calculated on the basis of ore containing 60% iron, from reported metal content of mine production.

[5] Calculated on the basis of ore containing 36% manganese, from reported metal content of mine production.

[6] Refined only, excludes content of impure bars.

[7] Excluding that for cement production.

[8] Field condensate and other natural gas liquids included with crude oil.

Table 2.—Mexico: Percentage of total national production by State, 1973

Commodity	State	Percentage of total national output, volume
Metallic minerals:		
Gold	Durango	33
Silver	Chihuahua	29
Copper	Sonora	53
Lead	Chihuahua	60
Zinc	____ do	56
Iron	____ do	41
Manganese	Hidalgo	90
Nonmetallic minerals:		
Sulfur	Vera Cruz	96
Fluorite	San Luis Potosí	30
Mineral fuels:		
Coal	Coahuila	100
Petroleum	Tabasco (Zona Sur)	56

TRADE

Export trade in minerals during 1973 was valued at $373 million, a 73% increase from that of 1972. Mineral imports were valued at $191 million, a 79% increase from that of 1972. The resulting favorable balance in minerals trade, $182 million, represented a 69% increase from the previous year. The increase in value of imports was due to worldwide price increases for metals and minerals as well as an increase in domestic demand. The favorable balance in minerals helped to reduce Mexico's overall unfavorable balance of trade of $1,750 million in 1973. The share of mineral exports destined for the United States was 61%, and the U.S. share of Mexican imports was 60%.

Mineral trade values do not include petroleum, which is managed by PEMEX. Petroleum exports in 1973 are reported to be valued at $35.4 million and imports at $288 million.[5] Crude oil imports accounted for about 10% of consumption in 1973, but the Government hoped to increase domestic production sufficiently to achieve an export balance by 1975.

The following tabulation shows trade in selected mineral commodities as values and percentages of total metal and nonmetal trade in 1973.

Commodity	1973 value, million U.S. dollars	Percent
Exports:		
Silver	178.8	48.0
Fluorite	38.2	10.3
Copper	38.1	10.2
Zinc	28.3	7.6
Lead	23.9	6.4
Sulfur	18.0	4.8
Salt	12.1	3.3
Other	35.1	9.4
Total	372.5	100.0
Imports:		
Iron	73.8	38.7
Aluminum	18.5	9.7
Coke	16.9	8.8
Asbestos	13.7	7.2
Phosphates	11.7	6.1
Tin	9.0	4.7
Alumina	7.7	4.0
Coal	7.4	3.9
Other	32.2	16.9
Total	190.9	100.0

[5] U.S. Embassy, Mexico City, Mexico. State Department Airgram A-282, June 2, 1974, pp. 5-6.

Table 3.—Mexico: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Oxide (alumina)	1	14	Venezuela 12.
Metal, including alloys, all forms	2,912	1,282	Colombia 1,096; United States 129.
Antimony:			
Ore and concentrate, gross weight [1]	8,769	7,605	United States 7,603; Spain 2.
Metal, including alloys, all forms	259	258	United States 183; El Salvador 30.
Arsenic:			
Oxide, gross weight:			
White	6,040	2,539	All to United States.
Black	960	209	Do.
Speiss and similar materials, oxide content	71	49	Do.
Bismuth:			
Ore and concentrate, gross weight	--	2	All to United Kingdom.
Metal, including alloys, all forms	577	761	United States 287; United Kingdom 268.
Cadmium:			
Concentrate and speiss, gross weight [1]	21	--	
Flue dust, metal content	777	452	All to United States.
Metal	136	152	United States 67; Brazil 64; Netherlands 20.
Copper:			
Ore and concentrate, gross weight [1]	60	15,204	Turkey 10,143; Canada 5,052.
Copper sulfate	282	375	Brazil 321; United States 46.
Metal, including alloys:			
Scrap	186	289	All to United States.
Unwrought and semimanufactures	[r] 13,560	31,699	United States 16,186; Yugoslavia 3,733; Greece 3,492.
Gold troy ounces	879	[2] 1,133	All to United States.
Iron and steel:			
Ore and concentrate, gross weight [1]	8	24	All to Sweden.
Metal, including alloys:			
Scrap	[r] 8,189	6,630	Mainly to United States.
Ferroalloys (silicomanganese)	2,858	4,493	All to United States.
Steel, primary forms	8,518	1,072	Guatemala 1,070.
Semimanufactures	[r] 335,126	390,365	United States 324,535; Cuba 22,624.
Lead:			
Ore and concentrate, gross weight	573	199	All to United States.
Oxides:			
Litharge	33,625	29,077	United States 16,087; Italy 2,478; Netherlands 2,078.
Red lead	7,205	2,739	United States 1,172; Colombia 469; France 308.
Metal, including alloys:			
Scrap	--	8	All to United States.
Unwrought:			
Antimonial and other bars	8,974	8,637	Netherlands 4,900; Venezuela 1,580; United States 1,422.
Refined	67,315	66,253	Italy 27,347; United States 20,110; Brazil 4,819.
Semimanufactures	828	1,038	United States 1,000.
Manganese ore and concentrate, gross weight	63,075	147,706	United States 112,265; Japan 32,213; Colombia 1,807.
Mercury 76-pound flasks	37,003	23,913	United States 10,029; India 3,211; Netherlands 2,804.
Molybdenum concentrate, gross weight	3	--	
Nickel metal, including alloys, all forms	(3)	2	Colombia 1; El Salvador 1.
Selenium:			
Elemental	20	43	United States 27; United Kingdom 14.
Matte speiss, anode slimes and smelter residues	--	67	All to United Kingdom.
Silver thousand troy ounces	21,534	[2] 12,927	United States 4,155; West Germany 1,797; France 1,572.
Tin metal, including alloys, all forms long tons	4	3	Mainly to United States.
Tungsten ore and concentrate, gross weight [1]	522	475	United Kingdom 208; United States 99; West Germany 82.
Zinc:			
Ore and concentrate, gross weight	[r] 271,360	301,023	United States 200,686; West Germany 30,880; Poland 10,481.
Oxide, white	7,499	7,119	United States 6,888.
Sulfate	2,359	2,389	United States 2,352.

See footnotes at end of table.

Table 3.—Mexico: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Zinc—Continued			
Metal, including alloys:			
Powder	1,143	1,098	Argentina 932; Colombia 156.
Unwrought	41,914	40,277	Brazil 16,927; United States 7,046; Colombia 5,191.
Semimanufactures	--	2	Panama 1.
Other nonferrous base metals:			
Ores, concentrates, and metallurgical residues except scrap	1,220	2,072	All to United States.
Metal, all forms	500	34	United States 33; Sweden 1.
NONMETALS			
Abrasives, natural, n.e.s.			
Emery	46	1	Mainly to Guatemala.
Pumice	167	56	Mainly to United States.
Asbestos	3	34	Guatemala 26.
Barite and witherite	93,421	132,263	Mainly to United States.
Cement	159,018	267,647	United States 267,303.
Clays and clay products:			
Crude clays, n.e.s.:			
Bentonite	225	211	West Germany 110.
Fuller's earth and other earths	7,320	10,259	Brazil 4,129; Peru 1,858; Colombia 1,168.
Kaolin (china clay)	30	94	Venezuela 80; Colombia 13.
Other	r 196	132	Peru 52; Colombia 52; Guatemala 10.
Products:			
Refractory	3	142	Dominican Republic 122; Argentina 15; El Salvador 4.
Nonrefractory	57,581	81,664	United States 80,042; Guatemala 1,349.
Diamond, industrial ------ carats	20,000	5,000	All to Nicaragua.
Diatomite and other infusorial earth	8,543	9,339	Argentina 2,501; Brazil 1,597; Peru 1,215.
Feldspar	14	102	All to Venezuela.
Fertilizer materials:			
Crude, phosphatic	10,087	6,482	United States 6,435; Canada 47.
Manufactured:			
Nitrogenous, including urea	r 69,216	134,978	Peru 43,119; United States 26,011; Costa Rica 20,752.
Phosphatic	99,527	124,625	United States 48,591; Brazil 47,555; Chile 20,000.
Potassic	265	525	Mainly to Guatemala.
Other, including mixed	1,894	942	Panama 544; United States 287.
Ammonia	899	190	All to Guatemala.
Fluorspar:			
Acid grade	374,716	390,180	United States 390,163; Venezuela 17.
Metallurgical grade	719,412	631,793	United States 558,556; Canada 68,377.
Graphite, natural	42,315	44,359	United States 44,338; Brazil 21.
Gypsum:			
Crude ------ thousand tons	1,660	1,464	United States 1,164; Japan 114; People's Republic of China 88.
Calcined	11	17	United States 13.
Lime	664	1,167	United States 937; British Honduras 190.
Mica	5	10	All to United States.
Perlite	1,222	916	Colombia 250; Peru 218; Venezuela 217.
Precious and semiprecious stones, except diamond ----- kilograms	r 553	289	Switzerland 93; West Germany 72; Japan 64.
Salt ---------- thousand tons	3,365	4,969	Japan 3,354; United States 1,180; Canada 350.
Stone, sand and gravel:			
Dimension stone	10,492	10,719	United States 10,538.
Crushed rock	r 21,121	13,703	All to United States.
Limestone, dolomite, calcite	r 1,046	4,067	Do.
Quartz and quartzite	8,991	3,386	Do.
Sand:			
Construction	475	439	United States 437.
Glass	20,126	26,555	Guatemala 26,230; Costa Rica 245.
Stone, industrial, not specified	120	20	All to United States.
Strontium minerals	32,138	24,332	Do.
Sulfur:			
Elemental, all forms	682,825	479,407	United States 261,733; United Kingdom 153,892; Chile 31,382.
Sulfates, natural sodium-magnesium (bloedite)	41,189	47,716	Brazil 36,655; Venezuela 4,626; Colombia 2,269.
Talc, steatite, soapstone, pyrophyllite	1	4	Mainly to Venezuela.
Wollastonite	1,675	544	United States 494; Netherlands 50.

See footnotes at end of table.

Table 3.—Mexico: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural (including gilsonite)	99	31	Spain 21; Denmark 10.
Carbon black	1,136	1,306	Brazil 624; Costa Rica 521; Guatemala 110.
Coal and coke	1	(3)	
Gas, natural—million cubic feet	23,353	9,830	All to United States.
Petroleum refinery products:			
Distillate fuel oil—thousand 42-gallon barrels	r 30	40	United Kingdom 9; United States 8; Liberia 7.
Residual fuel oil—do	7,745	5,055	United States 4,981; Greece 34; Liberia 12.
Lubricants—do	1	1	Mainly to Guatemala.
Mineral jelly and wax—do	5	12	Mainly to United States.
Other:			
Asphalt—do	4,894	4,086	Do.
Liquefied petroleum gas—do	8	8	Do.

r Revised.

[1] Erroneously reported to be in terms of metal content rather than gross weight in previous edition.

[2] Consejo de Recursos Naturales No Renovables. Departmento de Estudios Economicos. Anuario Estadistico de la Mineria Mexicana 1972. Mexico, D.F., 1973 128 pp.

[3] Less than ½ unit.

Source: Unless otherwise specified, official Mexican export returns.

Table 4.—Mexico: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite and concentrate	28,591	25,986	All from United States.
Oxide and hydroxide	90,057	88,996	Switzerland 60,402; United States 27,800.
Metal, including alloys, all forms	r 5,244	13,672	United States 10,300; Canada 1,517; West Germany 116.
Antimony metal, including alloys, all forms—kilograms	37	266	United States 239; Italy 27.
Arsenic:			
Trioxide, pentoxide, acids	(2)	3	Mainly from United States.
Metal, including alloys, all forms	62	11	United States 5; France 5.
Beryllium metal, including alloys, all forms—kilograms	4,652	3,044	United States 1,704; West Germany 1,340.
Bismuth metal, including alloys, all forms—do	2,605	1,783	All from United States.
Cadmium metal, including alloys, all forms—do	30	56	United States 47; West Germany 9.
Chromium:			
Chromite	38,169	26,144	United States 25,755; West Germany 389.
Oxide and hydroxide	489	330	Belgium-Luxembourg 130; United States 107; West Germany 69.
Cobalt:			
Oxide and hydroxide	r 91	88	Belgium-Luxembourg 59; United States 27; United Kingdom 2.
Metal, including alloys, all forms	4	27	Belgium-Luxembourg 24; Canada 2.
Copper metal, including alloys:			
Scrap	74	392	United States 4.
Unwrought	34	116	United States 69; Sweden 11.
Semimanufactures	889	964	United States 401; West Germany 181.
Gold metal, unworked or partly worked troy ounces	r 3,037	3,524	West Germany 820; United Kingdom 384; United States 369.
Iron and steel:			
Ore and concentrate, gross weight	87,444	109,667	Panama 93,959; United States 15,206.
Metal:			
Scrap	511,145	527,380	United States 525,328; Canada 1,122.
Pig iron, including cast iron	5,115	11,795	United States 7,561; Brazil 4,212.
Sponge iron, powder, shot	1,235	977	United States 923.
Ferroalloys	3,344	3,115	United States 2,481; Brazil 244; France 99.
Steel, primary forms	r 46,693	8,197	United States 2,131.
Semimanufactures [3]	160,299	210,295	United States 125,723; Japan 16,396.

See footnotes at end of table.

Table 4.—Mexico: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Lead:			
Oxides	160	183	United States 59; Denmark 30.
Metal, including alloys, all forms	r 100	127	United States 25.
Magnesium metal, including alloys, all forms	572	1,655	United States 921; West Germany 422; France 167.
Manganese:			
Ore and concentrate, gross weight	--	2,789	All from United States.
Oxides	2,014	1,937	United States, 1,070; Japan 760.
Mercury 76-pound flasks	27	25	Netherlands 13; United States 7.
Molybdenum:			
Ore and concentrate, gross weight	286	433	United States 415.
Metal, including alloys, all forms	44	6	United States 5.
Nickel:			
Matte, speiss, similar materials	1,151	1,147	France 446; Canada 357; United States 151.
Metal, including alloys, all forms	1,288	1,241	United States 840; West Germany 103; France 83.
Platinum-group metals, all forms:			
Paladium troy ounces	4,727	6,900	United States 4,358; United Kingdom 998; U.S.S.R. 289.
Platinum do	667	794	United States 580; United Kingdom 113; U.S.S.R. 48.
Other do	431	447	United States 392; Netherlands 32.
Rare-earth metals:			
Oxides and fluorides	13	49	United States 35; India 7; France 6.
Metals, including alloys kilograms	43	26	All from United States.
Selenium, elemental do	9	442	Canada 420; United States 21.
Silver metal, including alloys troy ounces	r 6,047	15,071	United States 10,939; Switzerland 1,797; Belgium-Luxembourg 649.
Tantalum metal, all forms kilograms	72	26	United States 5.
Tellurium, elemental do	231	192	All from United States.
Tin:			
Ore and concentrate, gross weight long tons	2,670	1,455	United States 1,165; Bolivia 290.
Oxides do	56	77	United Kingdom 57; United States 17.
Metal, including alloys, all forms do	17	458	United States 454.
Titanium:			
Ore and concentrate, gross weight	956	1,183	Australia 1,028; United States 80; West Germany 6.
Oxides	232	337	United States 1.
Slag and residues	28,073	23,411	All from Canada.
Metal, including alloys, all forms	7	9	United States 6; United Kingdom 2.
Tungsten metal, including alloys, all forms	15	26	United States 25.
Uranium and thorium oxides kilograms	105	15	All from United States.
Vanadium pentoxide	20	25	United States 15; Switzerland 9.
Zinc:			
Oxides	127	64	United States 37; West Germany 23.
Metal, including alloys, all forms	73	134	United States 45; West Germany 10; United Kingdom 10.
Zirconium ore and concentrate, gross weight	2,475	3,367	United States 2,716; Australia 551; West Germany 100.
Other:			
Ore and concentrate, n.e.s	3,578	302	Mainly from United States.
Ash and residue containing nonferrous metals	r 200	75	United States 70.
Oxides, hydroxides, and peroxides of metals, n.e.s	346	578	United States 473.
Metals, including alloys, all forms:			
Metalloids:			
Phosphorus, elemental (white, black, red)	17,997	18,815	United States 18,635; Canada 178.
Silicon	804	639	United States 422; France 190.
Other, n.e.s	5	4	Mainly from United States.
Alkali and alkali earth	3,469	2,981	United States 2,872.
Pyrophoric alloys kilograms	475	1,778	United States 757.
Base metals, including alloys, all forms, or n.e.s	267	166	United States 156; France 8.

See footnotes at end of table.

Table 4.—Mexico: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS			
Abrasives, natural, n.e.s.			
Pumice, emery, natural corundum, etc	830	1,153	United States 787; Austria 80; West Germany 33.
Dust and powder of precious and semiprecious stones, except diamond ---- kilograms	--	389	Mainly from Switzerland.
Grinding and polishing wheels and stones	r 154	226	United States 156; United Kingdom 24; Italy 21.
Asbestos, crude	r 38,320	39,448	Canada 18,508; United States 10,286; Republic of South Africa 7,866.
Barite and witherite	111	140	United States 102.
Boron materials:			
Crude natural borates	4	66	Argentina 10; United States 8.
Oxide and acid	1,397	1,610	United States 1,598.
Bromine	132	192	United States 82; Israel 6.
Cement	3,886	2,609	United States 1,567; West Germany 820.
Chalk	1	--	
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Fuller's earth	155	537	United States 163.
Kaolin (china clay)	23,228	28,980	United States 28,778.
Refractory	r 94,719	96,440	United States 93,881; France 1,395.
Other	r 842	1,283	United States 566; West Germany 71.
Products:			
Refractory (including nonclay bricks)	5,426	3,333	United States 1,590; West Germany 541.
Nonrefractory ---- value, thousands	$252	$317	United States $10.
Cryolite and chiolite	49	(2)	NA.
Diamond:			
Gem, not set or strung - carats	r 44,820	24,985	United States 7,820; Belgium-Luxembourg 6,135; Netherlands 3,360.
Industrial - thousand carats	6,160	2,040	United States 1,840; Netherlands 200.
Powder ---- do	6,235	405	United States 275; United Kingdom 75; Belgium-Luxembourg 30.
Diatomite	3	156	United States 2.
Feldspar and nepheline syenite	971	1,902	United States 1,443; Canada 459.
Fertilizer materials:			
Crude:			
Nitrogenous [4]	14,016	15,398	Chile 15,253.
Phosphatic rock ---- thousand tons	1,075	1,147	United States 815; Morocco 327.
Manufactured:			
Nitrogenous	r 165,405	248,750	United States 94,466; West Germany 75,002; Costa Rica 32,138.
Phosphatic	8,719	1,519	Mainly from Guatemala.
Potassic	72,835	82,717	United States 82,325.
Other, including mixed	7,802	5,137	Chile 5,094; United States 43.
Ammonia	99,303	150,759	Mainly from United States.
Fluorspar	r (3)	4	All from West Germany.
Graphite, natural	476	709	Canada 376; United States 272; Switzerland 57.
Gypsum	19,161	20,369	United States 748; Italy 30.
Iodine	87	154	Chile 120; Japan 15; West Germany 12.
Lime	2,996	3,138	United States 570; West Germany 11.
Magnesite	r 8,883	952	United States 932.
Mica:			
Crude, including splittings and waste	342	213	Brazil 153; Argentina 40; United States 15.
Worked, including agglomerated splittings	19	39	United States 33.
Pigments, mineral:			
Natural, crude	12	45	United States 25.
Iron oxides, processed	21	24	United States 19; West Germany 1.
Precious and semiprecious stones, except diamond:			
Natural ---- kilograms	76	360	Italy 207; United States 115.
Manufactured ---- do	849	4,558	Switzerland 1,871; United States 1,539; France 993.
Pyrite, unroasted	77	9	West Germany 5; United States 2.
Salt	498	640	United States 550.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	r 6,280	15,026	United States 12,787; West Germany 14.

See footnotes at end of table.

Table 4.—Mexico: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Sodium and potassium compounds, n.e.s—Continued			
Caustic potash, sodic and potassic peroxides	941	1,385	United States 1,022; West Germany 308.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	7,999	5,897	Italy 4,521; Guatemala 1,047; United States 234.
Worked:			
Slate	514	584	Italy 581.
Paving and flagstone	91	59	NA.
Other	4,228	5,684	United States 686; Brazil 175; Italy 54; Argentina 51.
Dolomite, chiefly refractory grade	47	6	Mainly from West Germany.
Gravel and crushed rock	6,426	6,574	United States 3,762; France 73; Italy 30.
Limestone	--	55	All from United States.
Quartz and quartzite	413	1,554	Belgium-Luxembourg 845; United States 659; West Germany 43.
Sand, excluding metal bearing	182,426	216,000	United States 213,726; Canada 947; Switzerland 215.
Strontium	(2)	11	United States 5.
Sulfur:			
Elemental:			
Other than colloidal	756	333	United States 219.
Colloidal	186	176	United States 168; West Germany 8.
Sulfur dioxide	5	(2)	NA.
Sulfuric acid	1,870	2,451	United States 3.
Talc, steatite, soapstone, pyrophyllite:			
Pyrophyllite	283	269	All from United States.
Steatite	76,136	80,918	United States 78,723; Italy 1,995.
Talc	225	210	Canada 55; United States 47; Italy 40.
Vermiculite	328	504	United States 406.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum, amber, jet kilograms	86	26	All from United States.
Other do	148	5,628	West Germany 3,532.
Slag, dross, and similar waste, not metal bearing:			
From iron and steel manufacture do	17,593	55	All from United States.
Slag and ash, n.e.s do	40,274	20,300	Do.
Oxides and hydroxides of magnesium, strontium, and barium	882	488	United States 481.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	4	1,068	United States 60.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	737	701	United States 700.
Carbon black and gas carbon:			
Carbon black	1,706	1,557	United States 726; Canada 382; Japan 210.
Gas carbon	46	3	Mainly from United States.
Coal, all grades, including briquets	263,216	388,318	United States 382,077.
Coke and semicoke	68,156	132,683	United States 132,227.
Gas, hydrocarbon, natural million cubic feet	14,261	13,890	United States 13,868; West Germany 2.
Hydrogen, helium, rare gases	990	898	United States 123.
Peat, including peat briquets and litter	83	313	United States 293; Canada 20.
Petroleum:			
Crude thousand 42-gallon barrels	409	9,345	All from Venezuela.
Refinery products:			
Gasoline do	4,692	5,102	Netherlands Antilles 2,496; Venezuela 156; United States 20.
Kerosine do	588	102	United States 1.
Distillate fuel oil do	3,778	1,478	Venezuela 706; Netherlands Antilles 346.
Residual fuel oil do	1,998	1,803	United States 5.
Lubricants do	123	197	United States 79.
Mineral jelly and wax do	r 148	205	United States 143; Japan 25.
Other:			
Liquefied petroleum gas [5] do	9,696	11,986	United States 8,749; Venezuela 2,032; Netherlands Antilles 188.
Petroleum coke do	988	1,658	United States 1,618; Switzerland 26; Bermuda 6.
Pitch and pitch coke do	51	45	United States 44.

See footnotes at end of table.

Table 4.—Mexico: Imports of mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Other—Continued			
Bitumen and other residues and bituminous mixtures, n.e.s do	101	179	United States 12.
Other do	r 732	364	United States 262.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	17,648	15,150	United States 12,227; United Kingdom 777; West Germany 344.

r Revised. NA Not available.
[1] Includes free trade materials in totals but excluded in principal sources.
[2] Less than ½ unit.
[3] Does not include ingots of high-carbon and alloy steel.
[4] May include a small quantity of manufactured materials.
[5] Includes that derived from natural gas plants.

COMMODITY REVIEW

METALS

Aluminum.—Output of aluminum ingot was 39,160 tons, a decline of 0.8% from the 1972 level. Slackening production was attributed to a reduction in the energy supply and to a strike in the early part of the year at Aluminio S.A. de C.V. (Alumsa). Alumsa completed preliminary studies for a $20 million expansion program to raise annual capacity to 67,000 tons, given adequate electricity at a favorable price.

The possibility of bauxite occurrences in the Yucatan Peninsula was appraised.[6]

Copper.—Tormex Mining Developers Ltd.[7] reexamined drill cores from 26 test holes and other samples on its Santo Tomas porphyry copper prospect in northern Sinaloa. It was estimated that there were 150 million tons of ore averaging 0.5% recoverable copper down to river level. Of this amount, 14 million tons of 0.74% copper ore occurs in the upper central part of the ore body and would be mined first. A program to drill a total of 10,000 feet, costing $160,000, was to be carried out to gain information to guide pit design.

Norlex Mines Ltd. appraised five copper properties which it had under option near Altamirano, Guerrero. Surface sampling and electromagnetic surveys indicated copper mineralization in a series of shear zones on the Lindero property. Trench samples gave copper values of 2.24% and 0.74% over widths of 15.7 feet and 23 feet, respectively. Work progressed on other sections of the property. Norlex has the right to acquire 49% of Minera Sierra de la Silla, a Mexican company.

An abstract of a paper was published that discussed the age of the Cananea granite in the Cananea copper mining district.[8]

Iron Ore.—Production of iron ore in 1973 was 5,189,000 tons gross weight (3,113,000 tons metal content), a 2% increase over 1972 production.

Oxide iron ore pelletizing plants were under construction and scheduled for completion in 1975–76 at Peña Colorada in Manzanillo, at Fundidora de Monterrey, S.A., in Monterrey, and for Siderúrgica Lázaro Cárdenas Las Truchas, S.A. (SICARTSA) at Las Truchas; all three had a nominal capacity of 1.5 million tons per year gross weight. Altos Hornos de Mexico S.A. (AHMSA) received U.S. equipment for the La Perla mine pelletizing plant.

Iron and Steel.—Production of steel ingots in 1973 reached 4.7 million tons, compared with 4.4 million tons in 1972. In January 1974, Mexico's principal steel producers announced expansion plans requiring $800 million which should result

[6] Isphording, W. C. Origin, Mineralogy, and Economic Potential of the Residual Terra Rosa Soils of the Yucatan Peninsula. Geol. Soc. of America, ann. meetings, Dallas, Tex. November 12–14, 1973. Abs. with program, v. 5, No. 7, October 1973, p. 630.
[7] The Northern Miner (Toronto). V. 59, No. 11, May 31, 1973, p. 214.
[8] Anderson, T. H., and L. T. Silver. The Cananea Granite—Implications of its Precambrian Age. Geol. Soc. of America, ann. meetings, Dallas, Tex. November 12–14, 1973. Abs. with program, v. 5, No. 7, October 1973, p. 534.

in an eventual installed annual capacity of 9 million tons.

Hojalata y Lámina, S.A. (HYLSA) was constructing a new sponge iron plant in Monterrey with a 400,000-ton-per-year capacity. HYLSA was also working on a new electric furnace that could increase ingot capacity from 600,000 to 800,000 tons per year.

Fundidora de Monterrey was planning a stainless steel facility as part of a plant with a capacity of 1.5 million tons. The new enterprise will be called Mexinox, S.A.; Péchiney Ugine Kuhlmann, participating in the construction, will be a minority (40%) holder.

Fundidora also arranged with Allis-Chalmers Corp. for the design, erection, and equipment for a 1.5-million-ton grate-kiln pelletizing plant to be built at its steelmaking center in Monterrey.

AHMSA, Mexico's largest steel producer, was to invest $376 million to raise its present annual capacity of 1.9 million tons to 3.7 million tons by the end of 1976.

SICARTSA obtained financing for the new steelworks being constructed near the town of Lázaro Cárdenas in Michoacan. The total cost was estimated at $648 million with SICARTSA contributing $300 million, the World Bank $70 million, the Inter-American Bank $54 million, and other sources of credit $224 million. Iron ore for the plant will come from the Las Truchas deposits 13 miles away. A port was being built at the mouth of the Balsas River to handle imported coal, and the Government was planning to finance construction of a railway to enable finished products to reach the Mexico City area. Contracts for the blast furnace were placed with an Italian firm, for the wire rodmill with a British concern, and for a 2-million-ton-per-year pellet plant with Lurgi Gesellschaft fur Chemie und Huttenwesen m.b.H.

During 1973, the U.S. Tariff Commission completed its investigation into dumping of deformed concrete reinforcing bars of nonalloy steel from Mexico. It was found that no U.S. industry was being injured by the imports; as a consequence, the case was closed and special dumping duties were not applied to imports of such merchandise.

Lead.—La Encantada lead-silver property in Coahuila started operations in September and was nearing crude ore capacity of 15,000 tons per month to produce 7,500 tons of concentrate.[9] Tormex had a 40% interest, with the remaining 60% owned by Industrias Peñoles, S.A. Proven ore reserves of 750,000 tons containing 23% lead and 20.8 ounces of silver per ton were reported. An additional 200,000 tons of similar-grade ore was classified as indicated reserve. It was expected that more ore would be discovered as mining progressed.

Empresa Minera del Perú (Minero Perú) and Met Mex Peñoles, S.A., agreed that beginning in 1975 shipments of Peruvian lead concentrates, to be refined in Mexico, would increase from 112,000 tons annually to 300,000 tons.

Manganese.—Compañía Minera Autlan, S.A. de C.V., in which Bethlehem Steel Co. has a minority interest, was nationalized on September 13; Nacional Financiera, S.A. (NAFINSA), acquired controlling interest of the stock, with the remainder held by various Mexican interests. Annual production of manganese by Minera Autlan was at the rate of about 117,000 tons, or about 90% of Mexico's total output.

Silver.—Pure Silver Mines was appraising a silver-gold prospect at its Las Torres property on the Veta Madre (Motherlode) near Guanajuato. Underground development was also in progress at two nearby ore bodies, the Peregrina and Cebada. Pure Silver had a 30% interest in the properties, and the remaining 70% was shared by Industrias Peñoles, S.A., and Cía. Fresnillo, S.A. The main production shaft was completed to 2,130 feet, and a drive 601 feet in length was opened in the footwall at the 1,600-foot level. It was reported that over the length of the drive the average grade of ore assayed 28.2 ounces of silver and 0.12 ounce of gold per ton over the average drift width of 14.6 feet. Of two crosscuts driven through to the hangingwall, one averaged 51.2 ounces of silver and 0.26 ounce of gold over a width of 79.9 feet and still in ore.

A feasibility study was in the final stages of completion. The study was based on a plant operation of 2,000 tons per day from the three mines. The proposed daily plant run, which was tested by a 100-ton-

[9] The Northern Miner (Toronto). V. 59, No. 38, Dec. 6, 1973, p. 15.

per-day pilot plant, was to be 1,400 tons from Las Torres, 400 tons from the Peregrina, and 200 tons from the Cebada.

MacLan Exploration, Ltd., let a contract to Exploraciones y Minas, S.A., for a minimum of 3,000 feet of diamond drilling at its silver property near Taviche, Oaxaca. Old workings of the El Zapote, Los Varones, and La Esquadra properties were the sites of proposed drilling for the purpose of testing silver-bearing quartz veins below the old workings.

Titanium Dioxide.—The 23,000-ton sulfate-process pigment plant of Pigmentos y Quimicos, S.A. de C.V., at Altamira, Tamaulipas, was being replaced with a chloride-process plant of 35,000-ton capacity. A chlorine-caustic soda facility to supply the necessary chlorine was also approved for construction at the site. The cost of both plants was estimated at $8 million.

Zinc.—Mine production of zinc in 1973 was slightly over 271,000 tons, about the same as in 1972, but smelter output fell from 79,000 tons to 67,000 tons. Exports of concentrate to the United States fell from 52,000 tons in 1972 to 31,000 tons in 1973, and slab zinc exports fell from 7,600 tons to 1,700 tons. The increased Mexican demand for zinc cut significantly into exports.

Industrias Peñoles, S.A., began operating its new electrolytic zinc refinery at Torreon in October. The plant was rated at 105,000 tons of refined zinc annually and was expected to operate on Mexican ore. Total investment in the plant was $72 million; when operating at full capacity, the plant was expected to save about $160,000 per day in foreign exchange. The plant was said to be the largest of its kind in Latin America, and one of the most modern in the world. In addition to refined zinc the plant was expected to produce 850 tons of cadmium metal and 180,000 tons of sulfuric acid per day.

Two feasibility studies on the construction of new zinc refineries in Mexico were made in 1973, one by Industria Minera Mexico (formerly Asarco Mexicana S.A.) and The Dowa Mining Company, Ltd. of Japan, and the other by Zincamex, S.A. and Mitsui Mining & Smelting Co. Ltd. The studies indicated that additional smelting capacity might require imports of zinc ores or concentrates.

NONMETALS

Cement.—Cementos Anahuac, S.A., formed a new company, Cementos Anahuac del Golfo, S.A., in which Sociedad Mexicana de Credito Industrial (SOMEX), a Mexican holding company, will hold a 49% interest. Anahuac also arranged a $20 million loan for a 6-year term to help pay off a $50 million short-term draft incurred for expansion of its producing facilities. Anahuac's plant on the Gulf of Mexico was to be expanded to an annual capacity of 1.6 million tons, of which initially 275,000 tons was to be purchased by General Portland Cement Co. for distribution in the southeastern part of the United States. General's purchases were to rise to 750,000 tons per year by 1979.

Fluorspar.—Mexico led the world in fluorite production, supplying 74% of U.S. imports and 66% of U.S. requirements in 1973. Mexico consumed less than 10% of its own production in domestic steel, aluminum, and chemical industries.

The largest fluorspar mine was Las Cuevas mine, in San Luis Potosi. A subsidiary of Noranda Mines Ltd. has a 49% interest in Las Cuevas; shipments in 1973 were about 307,000 tons of metallurgical fluorspar. Concentrate from the flotation plant was stockpiled at the mine.

Other major fluorspar producers were Industrias Peñoles, S.A., in San Luis Potosi and Guanajuato; Fluorita de Mexico, S.A., in Coahuila; Minera Frisco, S.A. de C.V., in Chihuahua; Reynolds Fluorspar, S.A., in Coahuila; Compañía Minera Dominica, S.A., in Coahuila; Asarco Mexicana, S.A., in Chihuahua; and Cía. Minera Rio Colorada, S.A., in Guanajuato.

A hydrofluoric acid plant with a capacity of 70,000 tons per year was under construction near Matamoros. E.I. du Pont de Nemours & Co. was in charge of the operation, and ownership was shared with Comision de Fomento Minero, Minera Frisco, and Banco de Comercio.

Salt.—Exportadora de Sal S.A. (ESSA) operated a solar evaporation salt plant at Guerrero Negro near Scammon Lagoon on the west coast of Baja California. Production has expanded from the initial 70,000 tons produced by Guerrero Negro in 1957 to 4,400,000 tons per year in 1973. In April 1973 the Mitsubishi Corporation acquired the property from National Bulk

Carriers, the founder and previous operator.[10]

Seawater pumped from Scammon Lagoon is concentrated in ponds covering 50,900 acres and then crystallized in harvest areas of 8,900 acres. Two harvester machines load truck trailer trains carrying 420 tons each trip to a washing plant where the salt is loaded on barges for transfer to Cedros Island, a deep water port. Ships with capacity up to 160,000 tons carry about two-thirds of the production to Japan and the remainder to the United States and Canada.

Sulfur.—The Government-controlled company Azufrera Panamericana increased sulfur production by 64% to meet increasing world demand. Total Mexican production during 1973 was 1,608,000 tons, a 70% increase over output in 1972. About 96% of sulfur production was by the Frasch process.

MINERAL FUELS

Coal.—The Consejo de Recursos Naturales no Renovables announced a program intended to increase the production and use of coal in Mexico, thereby alleviating difficulties of overdependence on the petroleum sector. The Consejo, a government entity, planned to increase output of metallurgical coal at Sabinas and Monclova in Coahuila and of anthracite in Sonora and Oaxaca. Asarco Mexicana, S.A., and AHMSA, also planned to increase production by 15%. The added output would be used for production of electricity in an effort to ease the demand for petroleum, which was increasing at an annual rate of 9%.

It was estimated that by 1980, 70.5% of the energy needs would be supplied by petroleum, 21% by coal, 3.4% by nuclear sources, and 5.1% by hydroelectricity.

Consumption of coal in 1973 exceeded 5 million tons. Imports in 1973 were 423,000 tons of coal and 475,000 tons of coke, primarily from the United States. The steel industry used 90% of the coal consumed, power generation about 8%, and other metallurgical industries 1.4%.

Although Mexican coal reserves are located in three basins, in Coahuila, Sonora, and Oaxaca States, only the Coahuila Area produced in 1973. Reserves in the Coahuila deposits were reported to be 875 million tons of exploitable coal.

Petroleum.—Production of crude oil, condensate, and natural gas liquids by PEMEX in 1973 totaled 191.5 million barrels, a 3.5% increase from that of 1972. Gross natural gas production increased by 2.5% to 676,750 million cubic feet. Reserves of crude oil, condensate, and gas, converted to liquid equivalent, were 5,432 million barrels at the end of 1973, an increase of 44 million barrels over reserves in 1972.

The following tabulation presents statistics for PEMEX in 1972–73:

	1972	1973
Production:		
Crude oil ---- million barrels	161.3	164.9
Natural gas liquids ---- do	23.7	26.6
Gas ---- million cubic feet	660,232	676,750
Petrochemicals ---- million tons	2.3	2.65
Reserves ---- billion barrels	5.39	5.43
Refinery capacity ---- barrels per day	625,000	760,000
Imports:		
Crude oil ---- million barrels	11.5	23.6
Diesel fuel ---- do	2.6	4.4
Gasoline ---- do		9.9
Employees	69,000	70,000
Tanker fleet:		
Number of ships	21	22
Deadweight tons, total	362,846	388,494
Capacity ---- million barrels	2.7	2.9
Pipelines ---- billion ton-kilometers per year	15.3	17.3
Highway tank trucks owned	NA	674
Highway tank trucks rented	936	1,055
Railway tank cars owned	1,163	1,115
Railway tank cars rented	2,217	2,309
Airplanes	20	20
Helicopters	14	16

NA Not available.

[10] World Mining. Salt Harvest in Baja California. V. 27, No. 10, September 1974, pp. 56–58.

As the price of crude oil imports increased on a worldwide basis, PEMEX began an expansion program late in 1973 designed to achieve self-sufficiency in crude petroleum production by the end of 1974, and imports were scheduled to decline to 5,000 barrels per day.

During 1973, PEMEX had 81 exploration teams in the field including 43 geological parties, and 29 seismological, 5 gravimetric, 1 magnetometric, and 3 gravimetric-magnetometric teams. One of the more promising developments was in southern Mexico in the Reforma (Chiapas) and Samaria (Tabasco) Fields. Also, new wells in the Tamaulipas Fields of Nuevo Laredo and Soto La Marina developed gas and oil that can be used in the Monterrey industrial area. Of 103 exploratory wells drilled during 1973, 24 became producing wells. Twelve new oil or gasfields were discovered. Exploration off the coast was hampered by a shortage of offshore drilling equipment, but 10 platforms were in place with 22 producing wells.

A new refinery was placed in operation at Salamanca and capacity was increased at Madero and Minatitlan. Other construction underway or planned for 1974 was scheduled to increase refinery capacity to 930,000 barrels per day by 1976.

Despite increases that almost doubled the price for consumer gasoline, domestic sales continued to rise in 1973. The demand for all petroleum products increased by 14.7% to a 1973 value of $1,440 million. Domestic sales volume was divided as follows: Gasoline 50.9%, diesel fuel 11.7%, natural gas 5.6%, fuel oil 4.9%, liquid gas 4.9%, kerosine 4.2%, lubricants 5%, paraffins 0.9%, asphalt 0.6%, greases 0.3%, and petrochemicals 11%. Petroleum imports in 1973 were valued at $288 million, and exports, mainly residual mixes, asphalt, and fuel oil, were equivalent in value to $35.4 million.

Mexico has taken steps to achieve the refinery capacity necessary for self-sufficiency by 1975; it has begun to explore and develop new fields in southeastern Mexico as new sources of domestic crude oil, and has planned to install the transportation and distribution system required to support the refineries. The development of new oilfields could lead to an exportable surplus by 1975.

The Mineral Industry of Morocco

By W. F. Stowasser [1]

The recent sharp increases in international commodity prices stimulated the Moroccan mining industry and, in particular, the phosphate rock mining and processing segment. Morocco is the world's largest exporter of phosphate rock. With world demand for phosphate rock exceeding supplies, Morocco led other phosphate rock producing countries by initiating increases in the average price from $14 to $42 [2] per ton during the year. The range of listed export prices for phosphate rock effective January 1974 in dollars per ton, free-along-side (f.a.s), and in percent of bone phosphate of lime $Ca_3(PO_4)_2$ (BPL) follow:

Percent	Value (per ton)
80	$50.00
77	47.25
75	42.00
72	40.00
70	37.50

Source: Phosphorus & Potassium. No. 68, November–December 1973, p. 3.

The Office Cherifien des Phosphates (OCP) in early 1973 implemented a price of $14.20 f.a.s. for 75% BPL material, the highest price in 16 years. During the late 1960's, the price was only $11.75 per ton, and sales were made below this level. Between 1971 and 1973, price increases were linked to devaluation of the dollar and did not have much of an effect on Moroccan exchange. If the 1952 selling price of $14.20 per ton had been increased at an annual rate of 5%, the price in 1974 would have been $41.55. This factor, as well as the recent rapid increases in world fertilizer prices, was considered in establishing the price level in late 1973.

The trend in Moroccan mineral production is toward producing higher value products by increased processing of raw materials before export. The Oued El Heimer lead smelter has been reconstructed, and active plans exist for two additional smelters on the Atlantic coast to process ores. Of far greater importance are construction plans for two phosphoric acid plants and an expanded fertilizer complex at Safi. These plants will, by 1977, consume about 17% of Morocco's phosphate rock production. They will be prototypes of a major mineral-chemical industrial complex that will be in operation by the end of the century.

Moroccan Government mineral policy was described in the 1973–77 5-year plan that was released in late 1973. The Government is dedicated to encouraging mineral production and developing new mines. The Mines Office in the Ministry of Commerce is committed to basic geological research programs with particular attention to the Rif Mountains and the Mediterranean Shelf. The Bureau de Recherches et de Participations Minières (BRPM) is Morocco's chief mining group in all areas except phosphorus. In addition to participating in the operation of some two dozen operating mines, BRPM is searching for new commercial deposits of copper, lead, zinc, and nickel in nine specific regions in the country. BRPM will spend $74 million on these programs during the plan period and anticipates an additional expenditure of about $200 million from private investors and bank credits.

As part of the general revision of the 1961 Investment Code, the Government of Morocco issued a new code in 1973 relating specifically to mining.[3] It grants to any investor of more than $21,000 (1) exoneration from customs duties and certain local taxes, (2) guaranteed retransfer of dividend income, (3) permission to deduct from the profits tax, the accelerated amortization of capital equipment, and (4) a partial rebate of interest due on project loans from the National Development Bank. In-

[1] Physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

[2] Where necessary, values have been converted from Moroccan Dirhams (MD's) to U.S. dollars at the rate of MD's 4.66=US$1.00.

[3] U.S. Embassy, Rabat, Morocco. Department of State Airgram A-67, June 17, 1974.

vestors supplying equipment worth at least $107,000 and creating at least 50 new jobs are also eligible for special financial assistance. Investors bringing more than $6 million into the country can negotiate additional benefits from the Government.

These incentives are only applicable to foreign investors who form a joint venture in which Moroccan capital is at least 50%. New foreign investors usually enter into joint mining ventures with the BRPM or with private Moroccan interests. The Mines Office of the Ministry of Commerce issues all exploration permits, and the BRPM applies for permits in the same manner as would a private company.

The code also proposes two intragovernmental reforms which would further stimulate the mining industry in Morocco. A 0.5% ad valorem tax on certain mineral exports would be ended, and the National Transport Office's monopolistic control over the movement of mineral production from mine to port would be ended.

PRODUCTION

Moroccan mineral production, excluding the volumes of water and natural gas, increased from 16.8 million tons in 1972 to 19.0 million tons in 1973, a gain of 13%. Most of this 2.2 million ton increase was attributed to greater output of phosphate rock. Production of phosphate rock increased 14% to 17.1 million tons in 1973 and represented 90% of Morocco's total mineral production tonnage. With the selling price averaging $42 per ton in 1973, revenue from phosphate rock exports represented about 50% of Morocco's total export receipts and about 30% of the country's budget. In the expectation that the market for phosphate rock will remain strong for many years, the OCP is planning new mines and ordering equipment to increase production to over 50 million tons annually by the mid-1980's.

Nonphosphate minerals production and exploration programs are increasing but to a much lesser degree. Production increased for a number of minerals, reflecting a strong export demand. Several new copper, lead, and fluorspar mines will open in 1974 and 1975. The current high price of petroleum is stimulating the oil-short Moroccans to find new energy sources.

Among the mineral fuels, anthracite production increased 3% to 565,000 tons in 1973; natural gas output rose to 65.2 million cubic meters, a gain of 26% over that of 1972; and production of crude petroleum increased by 48% to 42,153 tons.

In the metals sector, antimony concentrate output increased 34% to 2,698 tons and copper concentrate, lead concentrate, and iron ore increased 8%, 9%, and 60%, respectively, over 1972 levels of production. Manganese production increased sharply by 52%. Zinc concentrate production declined 10%, and tin ore production increased 25%. Cobalt concentrate production declined 11% to 10,157 tons.

Bentonite clay and montmorillonite clay production declined 1% and 32%, respectively. Smectite clay production increased 24%. Barite output increased 10% to 102,691 tons.

Table 1.—Morocco: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Antimony concentrate:			
Gross weight	4,266	2,008	2,698
Metal content	[r] 1,972	832	1,133
Cobalt concentrate:			
Gross weight	9,777	11,444	10,157
Metal content	978	1,602	1,422
Copper			
Concentrate:			
Gross weight	[r] 2,843	3,831	4,251
Metal content	[r] 13,347	13,528	14,660
Matte (byproduct of lead smelter)	198	--	--
Iron and steel:			
Iron ore, direct shipping, gross weight	623,257	234,180	374,749
Pig iron [e]	10,000	10,000	10,000
Steel [e]	1,000	1,000	1,000
Lead:			
Concentrate:			
Gross weight	122,630	146,282	158,830
Metal content	[r]78,000	86,600	108,004
Smelter, primary	18,716	--	--
Manganese ore, chemical grade	101,456	96,067	146,149
Nickel, content of cobalt ore	100	200	[e] 200
Silver: [2]			
From Imiter operation ---thousand troy ounces	809	878	818
Domestic smelter recovery ---do---	746	--	--
Content of exported lead concentrate ---do---	1,387	2,498	[e] 2,700
Total ---do---	[r] 2,942	3,376	[e] 3,518
Tin:			
Concentrate:			
Gross weight ---long tons---	[r] 13	12	15
Metal content ---do---	8	8	10
Smelter, primary ---do---	12	12	12
Zinc concentrate:			
Gross weight	22,015	36,417	32,677
Metal content	[r] 12,300	19,500	18,299
NONMETALS			
Barite	84,474	93,240	102,691
Cement, hydraulic ---thousand tons---	1,475	1,542	1,619
Clays, crude:			
Bentonite	3,801	8,700	8,628
Smectite	14,253	15,438	19,122
Other, including fuller's earth	4,880	7,050	4,820
Fertilizer materials, crude, natural, phosphate rock thousand tons---	12,008	14,971	17,077
Goethite	37	25	[e] 27
Mineral water ---cubic meters---	12,597	14,215	16,869
Pyrites and pyrrhotite:			
Gross weight	440,549	430,006	407,098
Sulfur content	132,165	133,301	134,339
Salt, all types	53,102	45,508	27,601
MINERAL FUELS AND RELATED MATERIALS			
Coal, anthracite ---thousand tons---	475	547	565
Fuel briquets ---do---	21	17	9
Gas, natural:			
Gross production ---million cubic feet---	1,680	1,822	2,302
Marketed ---do---	[r] 1,608	1,763	[e] 2,200
Petroleum:			
Crude oil ---thousand 42-gallon barrels---	172	216	320
Refinery products:			
Gasoline ---do---	2,895	2,968	[e] 3,600
Jet fuel ---do---	536	541	[e] 700
Kerosine ---do---	333	508	[e] 600
Distillate fuel oil ---do---	2,941	3,983	[e] 5,000
Residual fuel oil ---do---	3,178	4,628	[e] 5,700
Other ---do---	992	648	[e] 800
Refinery fuel and losses ---do---	1,444	1,299	[e] 1,600
Total ---do---	12,319	14,575	[e] 18,000

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

[1] In addition to the commodities listed, Morocco also produces manufactured phosphatic fertilizers, fluorspar, and a variety of crude construction materials, but available information is inadequate to make reliable estimates of output levels.

[2] Total Moroccan silver production has been revised upward to include silver content of lead concentrates exported from Morocco for smelter; data in previous year's edition of this chapter reported as "content of domestically processed and exported lead concentrates" in reality represented only the silver content of domestically processed concentrates.

Table 2.—Morocco: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum metal, including alloys, all forms	816	594	France 224; Italy 132; Netherlands 76.
Antimony, ore and concentrate	4,070	3,302	France 1,875; Belgium-Luxembourg 452; Spain 390.
Cobalt, ore and concentrate	4,750	12,606	France 8,306; People's Republic of China 4,300.
Copper:			
Ore and concentrate	12,323	13,598	Belgium-Luxembourg 5,895; West Germany 5,703; People's Republic of China 2,000.
Metal and alloys, all forms	1,043	1,077	France 379; West Germany 235; Spain 187.
Iron and steel:			
Ore and concentrate ---thousand tons--	457	--	
Roasted pyrites	60	308,210	Czechoslovakia 167,140; West Germany 101,780.
Scrap	30,775	31,566	Italy 10,596; Spain 6,090; People's Republic of China 5,277.
Ferroalloys	--	66	All to Netherlands.
Semimanufactures	10	3,321	Italy 3,300.
Lead:			
Ore and concentrate	85,014	138,194	France 59,289; Spain 23,231; Greece 14,025.
Crude, unalloyed	16,071	--	
Manganese, ore and concentrate	91,787	117,693	United States 27,587; Netherlands 24,770; France 22,310.
Nickel including alloys, all forms	60	--	
Silver, all forms ----------troy ounces--	492,976	NA	
Tin, all forms ----------long tons--	7	--	
Zinc:			
Ore and concentrate	19,456	21,649	Belgium-Luxembourg 8,363; Italy 5,513; France 4,073.
Oxides	NA	2,495	Spain 1,575; Italy 920.
Matte	NA	164	France 135; Belgium-Luxembourg 29.
Metal, including alloys, all forms	23	78	Mainly to France.
Other:			
Ore and concentrate	r 19,456	18,055	France 16,895; Spain 1,160.
Ash, slags, residues	848	2,861	France 2,587; Belgium-Luxembourg 70. (Not reported 203.)
Oxides	3	1	Mainly to Algeria.
NONMETALS			
Barite and witherite	87,477	84,934	United Kingdom 49,770; United States 24,384.
Boron minerals, natural	NA	8	NA.
Cement	452	--	
Clays and clay products (including refractory brick):			
Bentonite	288	1,139	Spain 388; United Kingdom 150. (Not reported 601.)
Fuller's earth	2,899	7,333	Tunisia 5,548; Algeria 1,770.
Refractory	2,456	14,167	NA.
Smectite	9,520	6,721	Spain 5,259.
Other	--	180	Mainly to Spain.
Feldspar and related materials	NA	2	NA.
Fertilizer materials:			
Crude, phosphatic ------thousand tons--	11,868	13,581	Spain 1,670; France 1,546; Belgium-Luxembourg 1,338; United Kingdom 1,312.
Manufactured:			
Nitrogenous	3,469	1,400	All to France.
Phosphatic	197,096	260,318	Brazil 80,795; Bulgaria 38,776; Yugoslavia 29,800.
Other, including mixed	61,312	4,951	Kenya 2,951; Netherlands 2,000.
Fluorspar	8	--	
Gypsum and plasters	105,762	130,587	Japan 61,386; Portugal 30,810; Zaire 14,430; Senegal 13,965.
Lime	172	110	NA.
Pigments, mineral, including processed iron oxides	--	25	All to France.
Precious and semiprecious stones, natural and synthetic ----------kilograms--	735	556	Netherlands 300; United States 206.
Salt and brine	160	(1)	All to ship stores.
Sodium and potassium compounds, n.e.s	22	--	
Stone, sand and gravel:			
Dimension, crude and partly worked	4,237	3,709	Italy 2,807; Belgium-Luxembourg 421; West Germany 323.
Gravel and crushed rock	38,245	51,721	Gibraltar 9,497.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Stone, sand and gravel—Continued			
Sand, excluding metal bearing	29,047	56,741	NA.
Quartz and quartzite	20	204	NA.
Sulfur, elemental, all forms	83	1,359	NA.
Vermiculite, perlite, chlorite	NA	9	All to Spain.
Other nonmetals, n.e.s., crude	2	3	All to France.
MINERAL FUELS AND RELATED MATERIALS			
Coal and coke, including briquets	47,397	21,185	Italy 9,940; Algeria 8,545; France 2,700.
Petroleum refinery products:			
Gasoline (including natural) 42-gallon barrels	12,915	804	All to ship stores.
Kerosine and jet fuel ---do---	77,741	55,930	Do.
Distillate fuel oil ---do---	25,526	57,098	Mainly to ship stores.
Residual fuel oil ---do---	r 3,046	5,266	Italy 3,536; ship stores 1,730.
Lubricants ---do---	r 2,460	2,525	Mainly to ship stores.
Liquefied petroleum gas ---do---	852	1,160	All to Gibraltar.
Other ---do---	9	610	Mainly to ship stores.

r Revised. NA Not available.
1 Less than ½ unit.

Table 3.—Morocco: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Ore (bauxite) and concentrate	2,070	1,200
Oxide and hydroxide	774	726
Metal, including alloys, all forms	2,934	3,405
Antimony metal, including alloys, all forms	5	15
Arsenic trioxides, pentoxides, and acids	16	25
Bismuth, crude ---kilograms---	93	215
Cadmium metal, all forms ---do---	205	277
Chromium:		
Ore and concentrate	--	23
Oxide and hydroxide	7	20
Metal, including alloys, all forms ---kilograms---	153	85
Cobalt oxides ---do---	20	23
Copper:		
Matte	3	--
Copper sulfate ---kilograms---	335	440
Metal, including alloys, all forms	2,889	3,652
Gold metal, including alloys ---troy ounces---	1,327	48,425
Iron and steel:		
Roasted pyrites	--	3,755
Metal:		
Scrap	30	431
Pig iron, ferroalloys, etc	1,449	1,743
Powders, blooms, billets, slabs	43	8,386
Semimanufactures	17,488	297,478
Lead:		
Ore and concentrate	(1)	(1)
Oxides	188	318
Metal:		
Unwrought	225	1,861
Semimanufactures	136	114
Magnesium metal, including alloys, all forms	214	1
Manganese:		
Ore and concentrate	79	52
Oxides	127	102
Mercury ---76-pound flasks---	87	98
Molybdenum, including alloys, all forms ---kilograms---	32	50
Nickel:		
Matte	--	1
Scrap	5	--
Unwrought	18	5
Semimanufactures	586	803
Platinum-group metals, including alloys, all forms ---troy ounces---	(1)	129
Selenium ---kilograms---	2 203	202
Silver metal, including alloys ---troy ounces---	9,331	12,843
Tin metal, all forms ---long tons---	293	399
Titanium oxides	736	865

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity		1971	1972
METALS—Continued			
Zinc:			
Oxides		483	596
Metal and alloys:			
Unwrought		1,084	873
Blue powder	kilograms	193	54,898
Semimanufactures		197	180
Other:			
Ore and concentrate of vanadium and molybdenum		--	3
Ash and residue of metals, n.e.s		17	--
Oxides, hydroxides, etc., of metals, n.e.s		10	17
Metals, including alloys, all forms:			
Arsenic and tellurium	kilograms	[3] 150	(1)
Cobalt, columbium, manganese, tantalum, titanium, tungsten, cermets, and rare-earth metals	do	16	177
Pyrophoric alloys	do	1	156
NONMETALS			
Abrasives, natural, n.e.s		404	24
Asbestos		3,638	3,145
Barite		1	4
Boron materials:			
Bromine	kilograms	46	221
Crude natural borates		1,150	1,600
Oxide and acid		9	12
Cement, hydraulic		102,705	77,859
Chalk		3,265	3,422
Clays and clay products:			
Crude clays:			
Bentonite		1	(4)
Fuller's earth		14	(4)
Kaolin and refractory		15,447	3,050
Smectite		6,459	2,000
Other		18	10,267
Diatomite and other infusorial earth		421	321
Feldspar		274	25
Fertilizer and fertilizer materials:			
Crude and manufactured:			
Nitrogenous		111,134	123,742
Phosphatic		(1)	(1)
Potassic		37,892	43,410
Mixed		1,667	134
Ammonia		14,921	203,240
Fluorspar		--	681
Graphite, natural		4	16
Gypsum and plasters		NA	(1)
Iodine		(1)	(1)
Kyanite and sillimanite		20	--
Lime		279	225
Magnesite		271	328
Mica:			
Crude, including splittings and waste		21	20
Worked, including agglomerated splittings		1	2
Pigments, mineral, including processed iron oxides:			
Natural		554	446
Iron oxides, processed		570	541
Precious and semiprecious stones (except diamond)	kilograms	963	434
Salt		49	7,740
Sodium and potassium compounds, n.e.s		6,252	11,515
Stone, sand and gravel:			
Dimension stone, including slate		828	618
Dolomite		1,106	1,374
Gravel and crushed rock		509	44
Quartz and quartzite		105	65
Sand, excluding metal bearing		13,858	18,498
Sulfur and pyrites:			
Pyrites, unroasted, gross weight		--	2
Elemental		361	36,712
Sulfur dioxide		100	162
Sulfuric acid		28	5,051
Talc, steatite, soapstone, pyrophyllite		1,324	1,164
Vermiculite and related materials		340	79
Other:			
Crude nonmetals, n.e.s		610	516
Oxides and hydroxides of barium, magnesium, and strontium		18	10
MINERAL FUELS AND RELATED MATERIALS			
Carbon black and gas carbon		1,878	2,579
Coal and coke, including briquets		67,100	52,401
Hydrogen, helium, rare gases		12	9
Peat, including peat briquets and litter		1,079	522

See footnote at end of table.

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

Commodity		1971	1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum:			
Crude	thousand 42-gallon barrels	12,175	13,082
Refinery products:			
Gasoline	do	39	22
Kerosine and jet fuel	do	232	246
Distillate fuel oil	do	489	647
Residual fuel oil	do	1,089	594
Lubricants	do	181	201
Other:			
Liquefied petroleum gas	do	533	649
Asphalt and bitumen	do	r 492	1
Mineral jelly and waxes	do	143	130
Other	do	2	72
Crude chemicals derived from coal, gas, and oil distillation		2,679	8,785

r Revised. NA Not available.
[1] Less than ½ unit.
[2] Including tellurium, if any.
[3] Excludes tellurium.
[4] Included with other.

TRADE

Phosphate rock was the principal commodity exported from Morocco. From 11,868,000 tons in 1971, exports increased to 13,581,000 tons in 1972. Iron ore exports declined from 457,000 tons in 1971 to none in 1972. Exports of lead concentrate increased sharply from 85,000 tons in 1971 to 138,000 tons in 1972. Refractory clay, cobalt concentrate, copper concentrate, manganese ore and concentrate, and zinc concentrate all showed degrees of higher exports. Reduction in export tonnage was shown for anthracite coal, antimony concentrate, barite, and smectite clay.

The principal metal imported into Morocco was semifinished steel shapes. Cement, nitrogenous and potassic fertilizers, ammonia, sulfur, coal and coke, and crude petroleum were the principal nonmetals and mineral fuels imported into Morocco in 1972.

COMMODITY REVIEW

METALS

Copper.—Copper concentrate output from four small mines in the High Atlas Mountains did not increase significantly in 1973. Only 14,600 tons was produced. Production will probably dwindle at these four small mines in 1974 when new mines at Ouansimi and Talat Nouame, near Agadir, operated by BRPM and Geomin of Romania, respectively, will open. A new copper-washing plant at Tazallaght is scheduled to start-up in 1974. Another mine, at Beni-Mellal, under BRPM Czech ownership, is scheduled to start-up in 1975. BRPM, Onium, and Mitsui have agreed to open a large mine at Bleida in the pre-Sahara near Zagora. The plant, valued at about $15 million, will process 800 tons of ore per day. It is scheduled to come onstream in 1976. Two other pre-Saharan copper deposits, at Merija and Oumjerane, appear to be suitable for future mines. A study of a low-grade copper deposit at Allous, Middle Atlas Area, will determine if it can be economically mined. With current high world copper prices, these previously marginal deposits located in remote areas may become economically attractive to mine. The 5-year plan forecasts that by 1977 copper production will increase threefold and the Government will install and operate a 30,000-ton-per-year copper foundry at Safi.

Iron Ore.—The BRPM-owned Société d'Exploitation des Mines du Rif (SEFERIF) started pelletizing concentrates produced from low-grade ore near Nador. SEFERIF produced 150,000 tons of pellets in the second half of 1973. The plant is expected to attain the design production level of 850,000 tons in 1974. All of the production is exported to Europe. The decision of the

Government of Morocco to construct a new port, ending dependence on the Spanish enclave port of Melilla, and a steel mill at Nador, will restrict exports of pellets to 50% of production. The reserves at Nador are an estimated 35 million tons.

Lead.—Production of lead concentrate increased 9% to 159,000 tons in 1973. Lead is Morocco's second most important export mineral, and with higher world prices as an incentive, the country's principal mines were producing as much as possible. When the Touissit mine near the Algerian border and the nearby Ouel el Heimer smelter start operating in late 1974, annual production will increase by about 20,000 tons. Plans are proceeding to construct another smelter with a capacity of 100,000 tons per year. It will be erected in Kenitra within the next few years and receive concentrates from the Middle Atlas Area.

The largest lead mine operating in Morocco is the BRPM-owned Zellidja mine at Zaida near Midelt. From an estimated 8 million tons of reserves assaying 3.2% lead, 40,000 tons of concentrate is produced annually. Production costs are about $6.44 per ton of concentrate. The ore is mined from open pits, crushed, ground, and floated. Byproduct barite will be produced in 1974.

Manganese.—Increased export demand for chemical grade manganese resulted in production from Morocco's one mine at Imini increasing by 52% to 146,000 tons in 1973. If markets for the 23 grades of manganese dioxide continue strong in 1974, production may increase slightly but will be restricted from any further large increase by the limited capacity of the mine and plant. The mine and mill are operated by the joint French–BRPM firm Société Anonyme Chérifienne d'Études Minières (SACEM). Two shafts descend to 50- to 100-foot levels at Tifnkit and Bou Tazoult along a 20-kilometer-long vein which runs due west of the Quarzazate-Marrakech road. Exploration is continuing east of the road to find additional reserves. Proven reserves are 1.5 million tons with another one-half to 1 million tons probable.

NONMETALS

Fluorspar.—Production of fluorspar from the El Hamman deposit in central Morocco is planned to begin in 1974. At full capacity, 80,000 tons of 50% refined ore and 60,000 tons of 98% refined ore will be produced. The reserves are of the order of 5 million tons. In addition, BRPM and Zellidja have agreed to exploit a smaller deposit with reserves of the order of 1 million tons near Tarourit.

Phosphate Rock.—Morocco produced 17,076,900 tons in 1973, an increase of 14% over that of 1972. This 2.0-million-ton increase represented 35% of the total increase in world production in 1972. Morocco maintained its position as the world's leading exporter of phosphate rock with record exports of 16.1 million tons, an increase of 2.5 million tons over that of 1972. Exports to Western European markets rose by 0.9 million tons in 1973. The largest increases in shipments were to Ireland, an additional 168,700 tons; France, an increase of 245,800 tons; Italy, an increase of 104,000 tons; and the United Kingdom, an increase of 129,000 tons.

All Eastern European markets received additional tonnages from Morocco in 1973 except for Czechoslovakia, where imports declined by about 50,000 tons. Romanian imports from Morocco increased to 503,200 tons, compared with 91,000 tons in 1972. Morocco's exports to Latin America expanded by 254,300 tons, most of which went to Brazil and Mexico. For the first time, Morocco exported phosphate rock to Algeria, some 27,500 tons.

Exports to Asia from Morocco increased by over 0.7 million tons. This increase was mainly due to higher shipments to the People's Republic of China, an additional 251,200 tons; to India, an increase of 215,800 tons; and to Japan, an increase of 445,500 tons. Shipments to Lebanon, Taiwan, and Turkey also showed increases. Shipments to Australia from Morocco almost doubled, to reach nearly 60,000 tons.

The disruptive effect of high phosphate rock prices and tight supplies began in 1972 when demand for phosphate rock exceeded production, and stocks were reduced to the practical irreducible limit. Modest price increases of $1 to $1.50 per ton were made in 1972 and early 1973. In October 1973, Morocco increased its price from $15 to $42 per ton for 75% BPL grade rock. Of interest is the combined effect of higher rock prices and concurrent accelerating freight rates on the delivered price of Moroccan phosphate rock in Belgium, the Netherlands, and India, in the early 1972 and late 1973–early 1974 periods. In early 1972, 75% BPL rock was delivered to Bel-

gium and the Netherlands for $14.55 per ton and to India for $19.10 per ton. In late 1973–early 1974, the price in Belgium and the Netherlands was $48.50 per ton, and in India it was $76 per ton.

It is probable that the high prices for phosphate rock will encourage the OCP to expand production and exports. OCP plans to produce and sell 19.5 million tons in 1974 by utilizing all available capacity and reducing stocks to a minimum. Future plans call for production to reach 25 million annual tons by 1977. The expansion will be accomplished by increasing the productivity at OCP's two existing mining complexes—Khouribga and Youssoufia.

Khouribga's open pit mines at Sidi Daoui and Meraa el-Arech produce two-thirds of Morocco's output. These mines are already mechanized and output will increase only by 9% over the next 4 years. Two new drying plants will be added at Khouribga to process Layer II ore.

At Youssoufia, a long-wall mechanized mining system has been installed in one of the two underground mines. The other mine's ore bed is too uneven to use this system. When the "black phosphate" is mined at Youssoufia within a few years, a long wall system will be installed. The black rock contains organic material and 18% to 20% water. Reserves of black phosphates have been estimated to exceed 230 million tons and will be the basis for Youssoufia's production in future years. The rock after calcining will range from 67% to 75% BPL.

A pilot calcination plant for the Youssoufia complex is expected to be operable in 1975. If successful, OCP plans to order two additional calcining kilns. The three calcining kilns will have a capacity of 1.2 million tons and all will be onstream in 1978. This production will be consumed by "Maroc Chimie" and OCP's projected new phosphoric acid plants, "Maroc Phosphore I and II," each with a capacity of 1,000 tons per day P_2O_5, located at Safi.

OCP has announced a number of new projects associated with phosphate rock. An open pit mine is planned at Ben-Gueria near Marrakech. The deposit covers 12,000 hectares, has six layers of medium-quality rock (68% BPL average), and if the schedule is maintained, production will start in September 1977 at an annual rate of 1 million tons. By the mid-1980's production will rise to 5 million tons annually and to 12 million tons by 1988.

Another open pit mine is planned for Sidi Hajjaj, east of Khouribga. Production is scheduled to start in 1980 and reach 10 million tons per year in 1990. The product will range from 75% to 82% BPL.

The Mescala deposit near Essaouira is being explored with U.S.S.R. assistance.

The first preparations are being made to construct a 6-million-ton annual capacity washing, drying, and shipping complex at Oued Zem to handle Khouribga ore in 1977.

The Government of Morocco is planning a third major port at Jorf Lasfar 10 miles south of El Jadida on the Atlantic coast. The new port will be needed to supplement the export capabilities of Casablanca and Safi. It will be capable of handling vessels of up to 100,000 tons displacement. Operation is scheduled for 1979.

MINERAL FUELS

Coal.—The price of coal in Morocco was permitted to rise 35% for the first time in years, indicating that the Government of Morocco intends to continue to operate the anthracite mine at Jerada. This coal mine is difficult to work from its 450-meter shafts and highly faulted 35- to 70-centimeter veins. Progress has been made to improve productivity, and with the increase in coal prices the mine should operate profitably. Reserves of minable coal are uncertain. Estimates of from 20 to 40 million tons have been made, but the limited local markets will restrict production. Production in 1973 was 565,000 tons. A modernization program in a new gallery and a new crushing plant were completed in 1973. By 1977, production will increase to 380,000 tons to fuel an adjacent powerplant, for burning in sugar mills, and for home heating.

Natural Gas.—A production increase at the Société Chérifienne des Pétroles (SCP–50% BRPM and 50% French ownership) principal field near Esaaouira raised output to 65 million cubic meters in 1973. Before the new gasfield in the Gharb can be exploited, a pipeline to Kenitra must be completed. The reserves of natural gas, estimated to be about 750 million cubic meters, will continue to be used at the Youssoufia phosphate rock mines but do not represent a large energy source for the future. Morocco will import Algerian gas by pipeline to fuel a number of industrial

projects in eastern Morocco and the new steel mill at Nador.

Oil Shale.—There are several known deposits of oil shales. In addition to a promising deposit at El Borg near Tangier and Tarfaya, the most important is near Timahdit, about 40 kilometers south of Azrou in the Middle Atlas Mountains. The increased price of crude oil has stimulated interest in the oil shales. Studies completed indicate that the shale at Timahdit is a 30-meter-thick section extending 20 kilometers to the south. The formation contains an estimated 5 to 7 billion tons of rock averaging 10% oil and 3% sulfur. BRPM plans to make further geological and extractive process studies in 1974.

Petroleum.—Morocco's small petroleum wells, operated by SCP, produced 42,000 tons of crude oil in 1973. Unless new commercial finds are made, crude oil production will probably end within a few years. Almost all of the crude oil refined in Morocco is imported from the U.S.S.R. and Algeria. Each country supplies about half of the 2.5 million tons imported annually. Diversification of suppliers will be a goal in 1974 when Iraq, Iran, Kuwait, and Saudi Arabia will ship oil to Morocco. A third oil refinery, the Mohammedia, is planned for Casablanca. This additional capacity (2.5 million tons per year) will give Morocco a total refining capacity of 5.8 million tons per year in 1977. Although the pace of oil exploration did not change in 1974, it is expected to markedly increase in future years. Burmah Oil Ltd. is conducting seismic studies in a 10,000-square-kilometer area beyond the 200-meter depth between Tangier and Rabat. BRPM discussed other Atlantic deep water permits with foreign concessionaries, and new activity is expected offshore from Agadir-Tarfaya. There is interest in unexplored areas along the Mediterranean coast, but granting concessions is complicated by the question of jurisdiction over seas adjacent to the Spanish-held enclaves of Ceuta and Melilla. BRPM conducts most all oil exploration onshore. Seismic work and core drilling continued in the Doukkala Region and between Beni-Mellal and Khouribga. Other areas are to be prospected within the next few years where prior prospecting showed some promise.

The Mineral Industry of the Netherlands

By Norman A. Matthews [1]

The Netherlands economy was moderately buoyant in 1973 with real gross national product (GNP) increasing 5%, investment 8%, exports 14%, and consumer demand 4% compared with respective figures in 1972. The country participated fully in the Western European buoyant cycle, but satisfaction was tempered by unemployment caused by increased productivity, overall inflation of 8%, and low profits in some key industries.

The new government initiated stringent measures in September to control inflation in wages and prices. Upward revaluation of currency by 5% reduced the cost of imports and pressure on wages and promoted domestic investment. At the same time, direct tax reductions were introduced to promote investment in new building construction over a 2-year period. Concurrently, increased taxes were announced on new automobiles, gasoline, real property, capital, and inheritances. The Government monetary policy was designed to limit the national liquidity ratio as well as maintain competitive interest rates. The large surplus of trading funds declined during the year; the central bank discount rate, increased several times during the year, was finally raised to 7% in mid-October.

Growth in production of goods was promoted by a strong increase in productivity, estimated at 9%, as production facilities were operated at near capacity. Profit margins, although still relatively low, improved significantly over those of 1972.

The Government equated the importance of environmental concerns to growth in the economy, and programs are being implemented to cleanse the river and canal systems and minimize further congestion in the western industrial sector.

Exports and imports increased in 1973 and remained essentially in balance, but the increased prices paid for animal feeds and agricultural oil products and crude petroleum caused a modest trade deficit in contrast to the positive balance in 1972. Currency revaluations have slowed investment by United States firms but at the same time improved the competitive position of U.S. products. For the first time, U.S. consumer items are being marketed in the Netherlands.

Finally, late in the year, the oil embargo and subsequent high prices for crude petroleum required a reassessment of future plans by the important petroleum and petrochemical industries. Stringent steps were initiated promptly to reduce consumption of petroleum products for transportation and electrical power generation and to preserve higher proportions as feedstock for the petrochemical industry. On the other hand, significant new finds of natural gas were reported in the North Sea that substantially increased reserves. An overall reassessment of energy sources was underway at yearend.

PRODUCTION

Production of most mineral commodities and their derivatives increased in 1973 compared with that of 1972, but the magnitude of the increase varied widely. Production increases in petrochemical products and natural gas led all other commodities. Coal production declined 39% as the planned closing of mines continued, but

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productivity per man-day increased 10%. Coke production, principally from coals imported from West Germany, the United States, and Australia, increased 33% to 2.7 million tons as new coke batteries operated at capacity. Natural gas volume delivered increased 20% to 70,800 million cubic meters, of which 46% was exported to West Germany, Belgium-Luxembourg, and France. Electrical energy generated at 52,600 gigawatt-hours represented a 7% increase compared with that of 1972 with approximately 48% each generated by petroleum products and natural gas fuels and the balance of 4% from coal.

Total imports of crude oil in 1973 were estimated at 100 million tons of which 73 million tons were processed at refineries, representing a 6% increase over refinery production in 1972. Domestic consumption was approximately 35 million tons or about one-half of the total with the balance exported. Refinery capacity approximated 99 million tons per year at yearend.

Nonferrous metals production, principally from imported raw materials, increased substantially. Primary copper and copper alloys production at 11,900 tons represented an 11% increase compared with that of 1972; primary lead and alu-

Table 1.—Netherlands: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]		1971	1972	1973 [p]
METALS				
Aluminum metal, primary		116,387	166,353	190,018
Cadmium metal [e]		120	120	120
Iron and steel:				
Sintered ore (from imported ore)	thousand tons	3,289	3,642	3,426
Pig iron including blast furnace ferroalloys	do.	3,760	4,289	4,707
Crude steel	do.	5,083	5,585	5,624
Semimanufactures	do.	4,429	5,077	5,085
Lead metal, primary		23,743	21,981	25,256
Tin metal, primary	long tons	824	--	--
Zinc metal, primary		41,400	50,300	30,500
NONMETALS				
Cement	thousand tons	4,045	4,023	4,077
Fertilizer materials, manufactured:				
Nitrogenous, nitrogen content	do.	991	1,119	NA
Phosphatic, phosphorus pentoxide content	do.	280	304	NA
Salt, all types	do.	3,167	2,803	3,044
Sand, industrial	do.	4,200	23,500	24,600
Sulfur:				
Elemental, byproduct		33,500	45,300	[e] 47,000
Sulfuric acid (100% H_2SO_4)	thousand tons	559	556	[e] 525
MINERAL FUELS AND RELATED MATERIALS				
Carbon black		92,500	93,400	[e] 95,000
Coal, anthracite and bituminous	thousand tons	3,609	2,811	1,721
Coke oven	do.	1,900	1,994	2,655
Fuel briquets, all grades	do.	585	465	250
Gas:				
Manufactured, all types [2]	million cubic feet	74,479	82,426	101,433
Natural:				
Gross production	do.	1,546,669	2,063,073	2,501,467
Marketable	do.	1,536,499	2,052,443	2,494,687
Peat [e]	thousand tons	400	400	400
Petroleum:				
Crude oil	thousand 42-gallon barrels	11,727	10,885	10,169
Refinery products:				
Aviation gasoline	do.	2,011	1,958	1,558
Motor gasoline	do.	41,081	44,965	48,918
Jet fuel	do.	17,544	24,896	27,912
Kerosine	do.	9,602	9,757	9,447
Distillate fuel oil	do.	126,246	145,664	153,370
Residual fuel oil	do.	157,016	177,163	180,886
Lubricants	do.	3,906	3,346	3,290
Bitumen	do.	5,618	5,909	5,490
Liquefied petroleum gas	do.	9,106	9,953	11,206
Other	do.	50,727	61,158	68,096
Refinery fuel and losses	do.	31,642	34,129	[e] 35,900
Total	do.	454,499	518,898	546,073

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

[1] In addition to the commodities listed, the Netherlands presumably produces a variety of crude construction materials (clays, sands, stone and gravel) but production is not reported and available information is inadequate to make reliable estimates of output levels.

[2] Coke oven and blast furnace gas only.

minum tonnages at 25,300 and 190,000 tons, respectively, represented 15% and 14% increases compared with 1972 volumes. Zinc production declined. In the products area, copper and lead tonnages increased 5% compared with 1972 tonnages, and the 96,000 tons of aluminum products produced represented a 12% increase compared with 1972 production.

Investment in industrial buildings increased 4% in 1973 compared with 1972 totals with the largest increase associated with the metals and chemical industries. As a result, the production of industrial building materials overall showed a moderate increase with cement production at 4.1 million tons increasing 1% compared with that of 1972. Sand production increased 4% in 1973 compared with that of 1972.

The rubber industry continued its expansion; raw materials consumed increased 10% compared with 1972 volumes. Overall value of chemical industry shipments increased approximately 8%, but most of the increase was attributable to higher prices. Volumes of sulfuric acid, and nitrogenous and phosphatic fertilizers produced remained essentially the same in 1973 as in 1972. Total plastics production reached 1.3 million tons in 1973, a 21% increase compared with 1972 tonnage; domestic consumption increased 12%.

The steel industry continued to operate at capacity, consuming record volumes of iron ore pellets and sinter in the production of 4.7 million tons of pig iron and 5.6 million tons of raw steel. Steel production represented a slight increase compared with the 5.5 million tons produced in 1972. The tonnage of steel products shipped in 1973 (5.06 million tons) declined slightly compared with shipments in 1972.

TRADE

The foreign trade of the Netherlands increased substantially in 1973 with the value of imports exceeding exports by a small margin of $252 million.[2] The deficit in the trade balance was influenced, to a large degree, by the much higher prices paid for imported animal feed grains and additives. Exports, based upon preliminary figures and excluding trade with Belgium and Luxembourg, increased from $14.3 billion in 1972 to $20.7 billion in 1973; imports on the same basis increased from $14.4 billion in 1972 to $20.8 billion in 1973. The 1973 figures, in terms of dollars, are inflated by the devaluation of the dollar in relation to the guilder during 1973, which amounted to 16%; similarly over the last 2-year period, the relative value of the dollar to the guilder declined 22%.

Eliminating the effects of inflation on prices, it is estimated that export and import volumes increased approximately 14% in 1973 compared with 1972 volumes.

Export expansion in terms of value was highlighted by food products (24%), chemical and allied products (30%), natural gas (83%), rubber products (38%), textiles and garments, (2%), primary metals and products (25%), machinery of mechanical and electrical types (20%), and instrumentation and precision instruments (20%). Imports expansion by value of goods was highlighted by food products (37%), paper and paper products (16%), metals and metal products (23%), machinery of mechanical and electrical types (15%), transportation equipment (45%), and mineral products (16%).

Details of trade distribution by countries have been delayed; however, it is clear that West Germany remained in first place as trading partner, and the U.S. share of the Netherlands imports increased from 8% in 1972 to 11% in 1973.

[2] Where necessary values have been converted from the Netherlands guilders (f.) to U.S. dollars at the rate of f.2.70=US$1.00.

Table 2.—Netherlands: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Bauxite	1,433	7,906	West Germany 7,552.
Oxide and hydroxide	r 14,443	15,113	Japan 3,719; Italy 2,609; West Germany 2,601.
Metal, including alloys:			
Scrap	20,033	32,218	West Germany 16,399; Belgium-Luxembourg 8,250; France 4,306.
Unwrought	88,748	154,767	Belgium-Luxembourg 70,255; West Germany 44,986; France 25,534.
Semimanufactures	47,864	64,049	West Germany 27,470; Belgium-Luxembourg 12,658; France 6,687.
Bismuth, including alloys, all forms	43	50	West Germany 28.
Cadmium, including alloys, all forms	r 121	158	West Germany 50; France 43; Belgium-Luxembourg 46.
Chromium:			
Chromite	5,437	6,715	Italy 1,693; United Kingdom 1,626; France 1,291.
Oxide and hydroxide	r 153	434	West Germany 307; Italy 80; Belgium-Luxembourg 19.
Cobalt:			
Oxide and hydroxide	24	33	West Germany 15; Italy 10; Yugoslavia 6.
Metal, including alloys, all forms	29	97	Japan 37; West Germany 19; United Kingdom 17.
Columbium and tantalum: Tantalum, including alloys, all forms	r 10	9	France 1; United States 1.
Copper metal, including alloys:			
Scrap	28,213	30,749	West Germany 15,463; Belgium-Luxembourg 12,444.
Unwrought	5,393	8,608	France 5,272; West Germany 1,867.
Semimanufactures	23,003	28,541	West Germany 9,906; United States 5,459; France 3,407.
Gold [1] thousand troy ounces	3,071	1,186	West Germany 727; France 266; United Kingdom 174.
Iron and steel:			
Ore and concentrate, except roasted pyrite thousand tons	21	77	West Germany 53.
Roasted pyrite do	28	13	All to United Kingdom.
Metal:			
Scrap do	668	836	West Germany 590; Belgium-Luxembourg 156.
Pig iron and ferroalloys [2] do	10	10	United Kingdom 3; West Germany 2.
Steel, primary forms do	1,372	1,731	Belgium-Luxembourg 325; West Germany 324; Spain 222.
Semimanufactures:			
Bars, rods, angles, shapes, sections do	492	557	West Germany 179; United Kingdom 130; Belgium-Luxembourg 83.
Universals, plates and sheets do	1,447	1,767	United States 387; West Germany 325; United Kingdom 214.
Hoop and strip do	138	169	West Germany 126.
Rails and accessories do	11	21	West Germany 11.
Wire do	32	35	West Germany 11; France 9; Belgium-Luxembourg 5.
Tubes, pipes, fittings do	257	383	West Germany 177; Belgium-Luxembourg 52; Nigeria 45.
Castings and forgings do	8	9	Belgium-Luxembourg 4; West Germany 3.
Lead:			
Oxides	r 1,786	878	West Germany 356; Czechoslovakia 150; Hungary 145.
Metal:			
Scrap	7,766	17,281	France 6,129; West Germany 5,702; Belgium-Luxembourg 5,138.
Unwrought	18,309	22,857	West Germany 15,587; France 3,341.
Semimanufactures	1,883	2,836	Norway 617; Belgium-Luxembourg 546; Libya 327.
Magnesium, including alloys, all forms	518	1,038	United Kingdom 468; United States 319.
Manganese:			
Ore and concentrate	37,998	46,159	West Germany 9,487; France 8,895; Italy 5,782.
Oxide	490	237	West Germany 116; Yugoslavia 40.
Mercury 76-pound flasks	377	1,131	United States 493; West Germany 261; Italy 261.
Molybdenum, including alloys, all forms	192	117	West Germany 25; France 22; Japan 16.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Nickel:			
Oxide and hydroxide	1,504	729	Belgium-Luxembourg 366; West Germany 255.
Metal, including alloys:			
Scrap	2,201	3,199	West Germany 949; United Kingdom 689; Austria 399; Belgium-Luxembourg 317.
Unwrought and semimanufactures	7,951	9,696	Sweden 4,857; Italy 881; United Kingdom 729; Spain 727.
Platinum-group metals, all forms troy ounces	[3] 267,912	38,131	Hong Kong 25,785; Belgium-Luxembourg 6,302.
Silver metal, including alloys, all forms thousand troy ounces	[r] 4,610	4,324	Belgium-Luxembourg 1,701; Czechoslovakia 1,121; West Germany 699.
Tellurium, elemental and arsenic	--	5	Mainly to West Germany.
Tin:			
Ore and concentrate long tons	39	--	
Metal, including alloys:			
Scrap do	715	1,017	United Kingdom 834.
Unwrought do	3,096	1,228	West Germany 882.
Semimanufactures do	400	471	West Germany 148; Belgium-Luxembourg 115.
Titanium dioxide	[r] 22,368	25,526	West Germany 8,360; Italy 5,189; France 4,304.
Tungsten:			
Ore and concentrate	345	374	West Germany 221.
Metal, including alloys, all forms	[r] 252	125	West Germany 29; United Kingdom 22; France 19.
Zinc:			
Ore and concentrate	13,374	13,069	Belgium-Luxembourg 8,635; France 2,625; Norway 1,809.
Oxide	10,858	13,240	Belgium-Luxembourg 2,064; West Germany 2,025; Italy 567.
Metal including alloys:			
Scrap	9,496	7,348	France 6,072.
Dust (blue powder)	[r] 287	542	NA.
Unwrought	31,008	49,179	West Germany 18,919; France 9,502; Switzerland 4,125.
Semimanufactures	787	1,034	Belgium-Luxembourg 587.
Other:			
Ore and concentrate	[r] 12,717	16,482	NA.
Ash and residues containing nonferrous metals:			
Aluminum [4]	6,124	5,598	West Germany 4,252.
Lead	2,543	7,933	Belgium-Luxembourg 3,507; West Germany 2,702; United Kingdom 865.
Zinc	5,765	7,633	West Germany 3,219; Sweden 1,217; Belgium-Luxembourg 1,137.
Other [4]	[r] 5,001	5,091	West Germany 1,988; France 1,368; Sweden 1,214.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum	5,163	5,107	West Germany 1,080; France 950; Belgium-Luxembourg 120.
Dust and powder of precious and semiprecious stones, including diamond thousand carats	2,147	1,929	Italy 386; France 344; Switzerland 223.
Grinding and polishing stones	1,673	1,676	West Germany 575; United Kingdom 242; France 235.
Asbestos	861	248	Belgium-Luxembourg 118; West Germany 61; France 42.
Borates, crude natural	322,568	353,273	West Germany 88,327; France 62,919; United Kingdom 54,406.
Cement	115,605	126,467	West Germany 106,112; Belgium-Luxembourg 15,898.
Chalk	31,773	24,886	Belgium-Luxembourg 24,098.
Clays and clay products:			
Crude clays:			
Kaolin	47,094	50,274	Belgium-Luxembourg 50,062.
Refractory	7,122	10,928	West Germany 7,120; Belgium-Luxembourg 918; Sweden 736.
Other, including bentonite	107,328	128,006	West Germany 77,001; Belgium-Luxembourg 39,826; France 7,849.
Products:			
Refractory, including nonclay bricks	21,337	19,007	West Germany 8,883; Netherlands Antilles 1,716; Belgium-Luxembourg 1,503.
Nonrefractory thousand tons	598	742	West Germany 602; Belgium-Luxembourg 88.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Diamond, not set or strung, except dust and powder [5]—thousand carats	943	1,591	NA.
Diatomite and other infusorial earth	396	144	West Germany 63; Indonesia 30; Belgium-Luxembourg 25.
Feldspar and leucite	172	10	Belgium-Luxembourg 2.
Fertilizer materials:			
Crude:			
Nitrogenous	55	--	
Phosphatic	370	6,258	West Germany 5,261; Belgium-Luxembourg 977.
Other	35,262	32,691	Belgium-Luxembourg 19,782; West Germany 7,176; France 4,994.
Manufactured:			
Nitrogenous—thousand tons	958	2,203	United States 337; Brazil 303; Turkey 225.
Phosphatic (including Thomas slag)—do	199	388	France 124; Belgium-Luxembourg 17 (231 unreported).
Potassic	282	135	United Kingdom 68; Lebanon 20.
Other, including mixed—thousand tons	679	817	France 251; Belgium-Luxembourg 10 (551 unreported).
Ammonia, anhydrous	392,681	556,582	Belgium-Luxembourg 263,957; West Germany 104,490; United Kingdom 103,024.
Fluorspar	82	159	France 129.
Lime	2,949	1,199	France 441; West Germany 257; Belgium-Luxembourg 199.
Magnesite	23,417	20,764	West Germany 8,304; United Kingdom 3,055; France 2,469.
Mica	67	208	France 60; West Germany 53; Norway 29.
Pigments, mineral, including processed iron oxides	589	1,117	East Germany 337; West Germany 261; Indonesia 121.
Precious and semiprecious stones, except diamond—kilograms	r 6,728	7,169	West Germany 3,443; United States 3,340.
Salt—thousand tons	1,938	1,824	Belgium-Luxembourg 576; Sweden 425; West Germany 422.
Stone, sand and gravel:			
Dimension stone:			
Unworked and partly worked	3,678	4,486	Belgium-Luxembourg 2,062; West Germany 1,695.
Worked	2,966	4,179	Belgium-Luxembourg 2,259; West Germany 1,629.
Gravel and crushed stone—thousand tons	3,929	4,895	Belgium-Luxembourg 4,589; West Germany 302.
Quartz and quartzite	8,301	9,509	West Germany 6,631; Belgium-Luxembourg 2,148.
Sand, excluding metal bearing—thousand tons	940	9,886	Belgium-Luxembourg 9,136; France 338.
Sulfur:			
Elemental, all forms	296	16	Belgium-Luxembourg 9.
Sulfur dioxide	1,052	1,228	Belgium-Luxembourg 113 (1,115 unreported).
Sulfuric acid, oleum—thousand tons	116	46	Italy 7; Belgium-Luxembourg 6.
Talc and steatite	497	508	Belgium-Luxembourg 190; France 83; Zaire 60.
Other nonmetals, n.e.s.:			
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture—thousand tons	r 148	160	Belgium-Luxembourg 86; West Germany 73.
Other—do	35	45	Belgium-Luxembourg 26; France 11; West Germany 4.
Other, n.e.s—do	180	186	West Germany 72; Belgium-Luxembourg 53; France 51.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	21	108	Belgium-Luxembourg 100.
Carbon black	75,722	77,875	France 33,862; West Germany 16,728; Belgium-Luxembourg 10,221.
Coal and briquets:			
Anthracite and bituminous coal—thousand tons	8,582	1,701	Belgium-Luxembourg 664; West Germany 603; France 331.
Briquets of anthracite and bituminous coal—do	450	376	Belgium-Luxembourg 185; West Germany 96; France 73.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Coke and semicoke---thousand tons----	632	760	France 213; Belgium-Luxembourg 166; West Germany 162.
Gas, hydrocarbon: Natural, including liquefied petroleum gas-------do----	560	572	Belgium-Luxembourg 307; West Germany 60; United Kingdom 58.
Hydrogen, helium, and rare gases-------	2,171	4,800	Belgium-Luxembourg 2,679; West Germany 1,030; United Kingdom 368.
Peat----------	46	60	Belgium-Luxembourg 46; France 10.
Petroleum: [6]			
Crude thousand 42-gallon barrels--	92,255	134,418	Belgium-Luxembourg 55,046; West Germany 33,862; United Kingdom 13,094.
Refinery products:			
Gasoline----------do----	51,119	60,444	West Germany 35,377; United Kingdom 13,957; Belgium-Luxembourg 3,493.
Kerosine and jet fuel----do----	16,337	23,134	United Kingdom 7,420; West Germany 6,957; Denmark 1,951.
Distillate fuel oil-------do----	100,561	107,252	West Germany 73,459; Ship stores 7,811; Belgium-Luxembourg 6,409.
Residual fuel oil--------do----	122,344	167,206	Ship stores 75,631; United Kingdom 36,170; West Germany 16,710.
Lubricants----------do----	4,025	3,857	Belgium-Luxembourg 669; United Kingdom 581; West Germany 262.
Mineral jelly and wax---do----	609	489	West Germany 207; Morocco 120; France 30.
Bituminous mixtures----do----	218	231	West Germany 99; Belgium-Luxembourg 43; Nigeria 19.
Other----------do----	1,786	2,893	United Kingdom 704; Belgium-Luxembourg 418; Denmark 410.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals-------	212	316	West Germany 89; Belgium-Luxembourg 58; France 43.

r Revised. NA Not available.

[1] Figure for 1971 excludes gold coin, monetary gold, and gold and alloys shipped by post; figure for 1972 excludes only monetary gold.

[2] Including sponge iron, shot, grit, pellets, powder, spiegeleisen, and ferromanganese.

[3] Excludes exports to Belgium-Luxembourg for which no quantity is given, but which were valued at $75,967.

[4] Exports of ash and residues containing aluminum to Belgium-Luxembourg are included with other ash and residue.

[5] Excludes exports to Belgium-Luxembourg for which no separate quantity is given, but which were valued at $1,473,756 in 1971 (comparable 1972 value not available).

[6] Includes bunkers.

Table 3.—Netherlands: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite----------	71,077	145,873	Greece 140,461; Guyana 4,213.
Alumina----------	291,004	342,753	Surinam 184,219; West Germany 115,611.
Metal, including alloys:			
Scrap----------	9,790	19,150	West Germany 6,761; East Germany 6,729; Belgium-Luxembourg 2,726.
Unwrought, including alloys---	46,717	65,249	Norway 34,767; West Germany 11,777; France 5,516.
Semimanufactures----------	58,251	61,371	West Germany 27,683; Belgium-Luxembourg 17,275.
Antimony:			
Ore and concentrate----------	1	--	
Metal including alloys, all forms----	55	99	People's Republic of China 70; Belgium-Luxembourg 10; Italy 10.
Arsenic, oxides and acids----------	414	756	France 366; Sweden 249.
Beryllium, including alloys, all forms----	--	5	West Germany 4.
Bismuth, including alloys, all forms-----	145	111	Mexico 54; West Germany 25.
Cadmium, including alloys, all forms----	101	130	Belgium-Luxembourg 36; United States 15; U.S.S.R. 15.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Chromium:			
Chromite	9,645	10,635	Finland 5,821; Mozambique 2,820; West Germany 1,994.
Oxide and hydroxide	774	1,203	West Germany 546; U.S.S.R. 301; Poland 127.
Metal, including alloys, all forms	9	43	France 17; U.S.S.R. 13; United Kingdom 10.
Cobalt:			
Oxide and hydroxide	210	251	Belgium-Luxembourg 231.
Metal, including alloys, all forms	118	156	Belgium-Luxembourg 96; France 25; United States 17.
Columbium and tantalum: Tantalum	4	2	France 1; United States 1.
Copper metal, including alloys:			
Scrap	6,982	6,936	West Germany 2,484; Belgium-Luxembourg 1,355.
Unwrought	46,743	45,165	Belgium-Luxembourg 8,899; Zaire 8,262; Chile 8,213.
Semimanufactures	58,441	69,748	Belgium-Luxembourg 35,783; West Germany 19,700; France 9,918.
Germanium, including alloys, all forms	1	1	All from United Kingdom.
Gold [1] thousand troy ounces	53	512	West Germany 397; Denmark 74.
Iron and steel:			
Ore and concentrate, except roasted pyrite thousand tons	5,991	5,666	Liberia 1,773; Brazil 1,064; Sweden 884.
Metal:			
Scrap do	214	173	Belgium-Luxembourg 70; West Germany 57; United Kingdom 24.
Pig iron [2] do	79	67	West Germany 31; Norway 6; Belgium-Luxembourg 5.
Ferroalloys do	48	41	Norway 12; France 7; West Germany 6.
Steel, primary forms do	504	720	Belgium-Luxembourg 224; West Germany 177; Spain 161.
Semimanufactures:			
Bars, rods, sections do	1,154	1,331	Belgium-Luxembourg 789; West Germany 357; France 118.
Universals, plates and sheets do	814	969	Belgium 458; West Germany 345; France 55.
Hoop and strip do	152	217	West Germany 123; Belgium-Luxembourg 58; France 28.
Rails and accessories do	50	45	West Germany 23; France 19.
Wire do	100	98	Belgium-Luxembourg 59; West Germany 35.
Tubes, pipes, fittings do	757	714	West Germany 476; France 112; Belgium-Luxembourg 47.
Castings and forgings do	12	11	West Germany 5; Belgium-Luxembourg 4.
Lead:			
Oxides	11,064	10,318	West Germany 3,409; France 3,292; Mexico 2,158.
Metal, including alloys:			
Scrap	6,287	12,911	West Germany 7,454; United States 2,445; Canada 1,097.
Unwrought	70,762	50,761	United Kingdom 14,285; Belgium-Luxembourg 13,439; Australia 9,988.
Semimanufactures	2,532	2,749	Belgium-Luxembourg 1,962.
Magnesium metal, including alloys:			
Scrap	302	612	Norway 153.
Unwrought	786	1,319	West Germany 389; U.S.S.R. 289; Norway 245.
Semimanufactures	173	189	West Germany 84; United Kingdom 58.
Manganese:			
Ore and concentrate	119,021	74,778	West Germany 17,958; U.S.S.R. 5,403.
Oxide	2,430	839	Belgium-Luxembourg 818.
Mercury 76-pound flasks	1,102	1,740	Norway 899; Spain 377.
Molybdenum metal, including alloys, all forms	56	128	United States 55; West Germany 28; France 26.
Nickel:			
Matte, speiss and similar materials	2	333	Cuba 325.
Metal, including alloys:			
Scrap	3,019	3,835	West Germany 1,031; France 850; United Kingdom 612.
Unwrought	4,751	4,222	Mozambique 1,476; United Kingdom 888.
Semimanufactures	4,997	3,759	Sweden 2,066; West Germany 847.
Platinum-group metals, all forms thousand troy ounces	110	95	West Germany 34; France 29; United Kingdom 12.
Silver metal, including alloys, all forms do	7,606	6,520	West Germany 1,743; France 1,494; Belgium-Luxembourg 718.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Tellurium, elemental and arsenic	8	8	U.S.S.R. 4; Sweden 3; Japan 1.
Tin:			
Ore and concentrate—long tons	1,188	611	Republic of South Africa 273; Burma 218; Peru 120.
Oxide—do	41	71	Belgium-Luxembourg 43; West Germany 13; United Kingdom 12.
Metal, including alloys:			
Scrap—do	61	81	West Germany 35; Belgium-Luxembourg 27; United States 18.
Unwrought—do	5,660	5,507	United Kingdom 1,635; Thailand 1,236; People's Republic of China 1,175.
Semimanufactures—do	185	245	West Germany 164; Belgium-Luxembourg 65.
Titanium:			
Ore and concentrate	729	8,363	Canada 8,095.
Dioxide	5,458	5,816	West Germany 3,600; Spain 658; Italy 648.
Tungsten:			
Ore and concentrate	467	1,205	People's Republic of China 255; Thailand 200; Portugal 152.
Metal, including alloys, all forms	146	240	West Germany 81; United Kingdom 60; United States 38.
Zinc:			
Ore and concentrate	95,640	78,924	Canada 25,666; West Germany 13,476; Sweden 5,868.
Oxides	3,495	4,965	France 1,896; West Germany 1,200; Belgium-Luxembourg 896.
Metal, including alloys:			
Scrap	1,167	3,688	West Germany 1,774; North Korea 1,377.
Dust (blue powder)	2,321	2,486	West Germany 1,290.
Unwrought	23,078	21,355	West Germany 11,095; North Korea 2,829; Bulgaria 1,884.
Semimanufactures	5,365	4,991	Belgium-Luxembourg 2,067; North Korea 1,436; West Germany 1,422.
Other:			
Ores and concentrates of nonferrous metals, n.e.s	19,675	19,749	United States 15,825; Australia 1,697.
Ash and residues containing nonferrous metals:			
Aluminum [3]	802	289	East Germany 245.
Lead	8,960	6,513	Sweden 3,270; West Germany 2,404.
Zinc	43,388	40,744	West Germany 23,053; United Kingdom 3,787; East Germany 3,291.
Other [3]	r 71,176	68,239	Canada 40,692; U.S.S.R. 18,639; Belgium-Luxembourg 4,317.
Metals, including alloys, all forms:			
Metalloids:			
Phosphorus	62	72	West Germany 62.
Selenium	6	12	West Germany 5; United Kingdom 4.
Silicon	973	856	France 496; Norway 354.
Alkali, alkaline earth and rare-earth metals	232	182	West Germany 175.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc—thousand tons	557	842	West Germany 815.
Dust and powder of precious and semiprecious stones—thousand carats	2,432	5,325	Ireland 5,016; United Kingdom 245.
Grinding and polishing stones	2,041	1,888	West Germany 1,033.
Asbestos	23,870	26,522	Canada 19,068.
Barite and witherite	41,292	65,437	West Germany 40,121; Peru 22,385.
Boron materials:			
Crude natural borates	374,237	370,839	United States 360,656.
Oxide and acid	2,002	2,089	Turkey 1,058; United States 628; France 317.
Cement—thousand tons	2,386	2,333	Belgium-Luxembourg 1,187.
Chalk	151,654	151,610	Belgium-Luxembourg 75,375; France 49,415; West Germany 17,482.
Clays and clay products:			
Crude clays:			
Bentonite [4]—thousand tons	29	23	United States 12; West Germany 7.
Kaolin—do	229	230	United Kingdom 162; United States 22; Czechoslovakia 18.
Refractory—do	208	199	West Germany 176.
Other [4]—do	r 444	421	West Germany 382; United Kingdom 26.
Products:			
Refractory, including nonclay bricks—do	113	74	West Germany 33; United Kingdom 18.
Nonrefractory—do	202	211	West Germany 96; Belgium-Luxembourg 71; Italy 20.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Cryolite and chiolite	2,078	948	All from Denmark.
Diamond, all types [5] thousand carats	1,468	1,276	NA.
Diatomite and other infusorial earth	9,626	8,948	France 2,496; Spain 1,654; Denmark 1,602.
Feldspar and leucite	39,343	42,416	Norway 27,108; Belgium-Luxembourg 7,937; Italy 3,248.
Fertilizer materials:			
Crude:			
Nitrogenous	31,375	22,950	All from Chile.
Phosphatic thousand tons	1,624	2,046	United States 682; Togo 524; Morocco 522.
Potassic salts do	28	21	West Germany 15.
Other do	39	47	West Germany 40.
Manufactured:			
Nitrogenous do	19	49	Belgium-Luxembourg 28; France 16.
Phosphatic:			
Thomas slag (P_2O_5 content) do	118	218	Belgium-Luxembourg 198; West Germany 20.
Other (P_2O_5 content) do	21	20	Morocco 8; Tunisia 5; Belgium-Luxembourg 5.
Potassic do	439	440	West Germany 165; France 75; East Germany 69.
Other, including mixed do	74	80	Belgium-Luxembourg 31; West Germany 22; France 15.
Ammonia	4,255	3,067	Belgium-Luxembourg 3,018.
Fluorspar	24,265	24,394	Italy 1,950; West Germany 1,543 (20,781 unreported).
Graphite, natural	612	453	West Germany 203; People's Republic of China 141.
Gypsum and plasters thousand tons	255	288	France 153; West Germany 132.
Lime do	985	1,072	Belgium-Luxembourg 590; West Germany 481.
Magnesite	31,301	25,187	Greece 15,442; People's Republic of China 3,048.
Mica:			
Crude, including splittings and waste	1,129	1,610	United Kingdom 589; United States 399; India 334.
Worked, including agglomerated splittings	47	62	Switzerland 23.
Pigments, mineral:			
Natural, crude	1,524	965	Austria 480; Cyprus 138; United States 101.
Iron oxides, processed	12,625	14,020	West Germany 12,273; France 715; Spain 663.
Precious and semiprecious stones, except diamond kilograms	190,479	164,230	Brazil 94,308; Republic of South Africa 46,441; United States 5,604.
Pyrite thousand tons	86	43	Mainly from Cyprus.
Salt	86,491	25,133	West Germany 19,978.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	104,760	111,808	West Germany 51,778; Belgium-Luxembourg 26,029; United States 19,316.
Caustic potash	6,942	4,172	Belgium-Luxembourg 2,081; France 1,841.
Stone, sand and gravel:			
Dimension stone:			
Unworked and partly worked thousand tons	2,214	1,666	Belgium-Luxembourg 992; Sweden 483; West Germany 152.
Worked	45,419	30,600	Italy 18,015; West Germany 4,424; Belgium-Luxembourg 3,159.
Dolomite thousand tons	753	757	Belgium-Luxembourg 679; West Germany 38.
Gravel and crushed rock do	12,266	13,299	West Germany 9,254; Belgium-Luxembourg 2,380; United Kingdom 1,177.
Limestone do	800	818	Belgium-Luxembourg 776.
Quartz and quartzite	32,850	32,343	Norway 15,043; Belgium-Luxembourg 11,892.
Sand, excluding metal bearing thousand tons	7,446	7,317	West Germany 6,546; Belgium-Luxembourg 461.
Sulfur:			
Elemental do	444	452	United States 319; Poland 73; France 56.
Sulfur dioxide	542	80	All from West Germany.
Sulfuric acid, oleum	55,089	139,399	West Germany 116,960; Belgium-Luxembourg 20,631.
Talc and steatite	13,375	13,078	Norway 4,776; Austria 3,810; France 1,184.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Other nonmetals, n.e.s.:			
Crude:			
Quartz, electronic grade kilograms	74	112	Japan 55.
Other thousand tons	3,322	2,680	Belgium-Luxembourg 1,885; West Germany 749.
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture do	2,824	3,109	West Germany 2,910; Belgium-Luxembourg 1,406.
Slag and ash, n.e.s. do	580	522	West Germany 320; Belgium-Luxembourg 202.
Oxides of barium, strontium, and magnesium	3,535	1,319	West Germany 818; United States 281; United Kingdom 122.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,943	1,581	United States 637; West Germany 616.
Carbon black (including gas carbon)	11,142	10,323	West Germany 6,930; United Kingdom 1,988; United States 743.
Coal and briquets:			
Anthracite and bituminous coal thousand tons	3,219	3,117	West Germany 616; Australia 495; Poland 446.
Briquets of anthracite and bituminous coal do	1	2	Mainly from Belgium-Luxembourg.
Lignite and lignite briquets do	29	22	All from West Germany.
Coke and semicoke do	1,243	982	West Germany 920.
Gas, hydrocarbon, natural including liquefied petroleum gas do	85	67	West Germany 61.
Peat do	159	174	West Germany 171.
Petroleum: [6]			
Crude thousand 42-gallon barrels	487,807	667,228	Saudi Arabia 223,193; Kuwait 135,316; Iran 113,712.
Refinery products:			
Gasoline do	17,009	27,115	U.S.S.R. 10,039; Italy 3,261; Belgium-Luxembourg 3,211.
Kerosine and jet fuel do	3,792	3,527	Italy 2,068; Belgium-Luxembourg 700; United Kingdom 686.
Distillate fuel oil do	23,283	13,861	United Kingdom 3,525; Belgium-Luxembourg 2,045; Spain 1,512.
Residual fuel oil do	9,863	9,677	West Germany 2,667; Italy 2,171; United Kingdom 1,176.
Lubricants do	3,737	3,081	Netherlands Antilles 1,170; Belgium-Luxembourg 592; United Kingdom 456.
Mineral jelly and wax do	185	159	West Germany 71; France 39; Indonesia 17.
Bituminous mixtures do	99	87	Belgium-Luxembourg 57; West Germany 23.
Other do	5,223	4,595	Belgium-Luxembourg 1,909; United States 1,257; West Germany 1,065.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals thousand tons	105	123	Belgium-Luxembourg 28; West Germany 26; United Kingdom 14.

r Revised. NA Not available.

[1] Figure for 1971 excludes gold coin, monetary gold, and gold and alloys shipped by post; figure for 1972 excludes only monetary gold.

[2] Including spiegeleisen, sponge iron, shot, grit, and pellets.

[3] Imports of ash and residue containing aluminum from Belgium-Luxembourg are included with other ash and residues.

[4] Imports of bentonite from Belgium-Luxembourg are included with other clay.

[5] Excludes imports from Belgium-Luxembourg for which no quantity is given, but which were valued at $7,494,473 in 1971 (comparable 1972 value not available).

[6] Includes bunkers.

COMMODITY REVIEW

METALS

Nonferrous.—Péchiney-Nederland N.V. initiated construction of a second aluminum potline of 85,000 tons per year capacity to be in operation by 1975. A third potline is also planned at Vlissingen for operation in 1977 if the electrical power outlook remains favorable. Billiton N.V. of the Netherlands and the Government of Surinam signed an agreement in August

for the joint development and exploitation of the bauxite deposits of Surinam. The corporation created under Surinam law, Billiton Surinam N.V., involves 25% participation by the Government of Surinam.

Scandex Aluminum N.V., specializing in aluminum extruded products, completed its expansion program with the installation of anodizing facilities capable of handling extrusions of 8 meter lengths.

Iron and Steel.—The plan of the Netherlands-West German steel firm, ESTEL N.V. (Hoesch-Hoogovens), to establish a new steel plant on the plain of the River Meuse near Rotterdam has been rejected, first by the municipality of Rotterdam and later by the Rhine Estuary Authority, primarily on the basis of labor supply in the local area. Early in the year ESTEL announced a series of plans to increase steel capacity at Ijmuiden by 600,000 tons per year at a projected cost of $40 million. This will raise total capacity in the country to 6 million tons per year. ESTEL recently has been linked with the Saudi Arabian company Petromar and Nippon Steel Corp. and Nippon Kokan K.K. of Japan in detailed planning for a large prereduced pellet facility in Saudi Arabia to utilize flared natural gas for reduction of iron ore from Brazil. A project is visualized involving capital costs of $500 million, producing 3.5 million tons of prereduced pellets and 1 million tons of steel per year in continuously cast slab form.

Montan Staal B.V., the Netherlands subsidiary of Klöeckner-Werke AG of Germany, and Mitsubishi Metal Corp. have established a joint venture, Namascor B.V., to produce sheet steel from hot rolled coils. The facility, with an initial output of 150,000 tons per year, will start operations in late 1974 or early 1975.

Uranium.—During the year Royal Dutch Petroleum Corp. and Gulf Oil Corp. entered into a partnership to promote the high-temperature gas reactor (HTGR), which has been developed in the United States. Marketing of this type of second-generation reactor and fuels required will be carried out by General Atomic International in Europe.

NONMETALS

Fertilizer Materials.—Unie Van Kunstmestfabriken B.V. (UKF) (Shell Co.) initiated construction of new phosphoric and sulfuric acid units at Rotterdam-Pernis of 200,000 and 300,000 tons per year capacity respectively. Both facilities replace older phosphoric and sulfuric acid units of 150,000 and 140,000 tons per year capacity, respectively, and are scheduled for startup in early 1975. Zuid-Chemie announced a new plant for the production of complex fertilizers at Sas van Ghent. With capacity of 250,000 tons per year, startup is scheduled for 1975. Dutch State Mines (DSM) announced a 400,000 tons per year gypsum plant at Beck to utilize phosphoric acid process byproducts, with startup scheduled for 1975. Norsk Gypsplatefabriek announced a new gypsum board plant at Delfzijl with a capacity of 3.5 million square meters per year. Natural gypsum supply of 60,000 tons per year will be imported from France.

A considerable number of additional chemical and petrochemicals plant projects have been announced. However, reassessment has been taking place since yearend in view of the overall petroleum outlook, and numerous changes in plans are expected.

DSM signed an agreement with Bowfonds Nederlands Gemeenter (Netherlands Municipalities Building Fund) to engage in large-scale research and development activities in novel building materials with emphasis on insulation qualities and efficient construction processes.

MINERAL FUELS

Coal production has declined steadily in recent years since exploitation of natural gas discoveries began in 1965. Coal tonnage mined in 1973 (1.8 million tons) declined 39% from the quantity produced in 1972. A decision has not been announced as to whether or not, in view of petroleum prices, the trend that would have phased out coal production completely in the next few years will be reversed.

Coal of coking quality had been the primary need in the Netherlands and cannot be supplied from the South Limburg coalfields, which represent the principal remaining domestic source. The steel industry consumed approximately 2.2 million tons of coke in 1973, all of which was produced from imported coal, principally from West Germany, the United States, and Australia.

Expansion of the petroleum refining in-

dustry continued in 1973. The new refinery of Total Raffinaderij Nederland N.V. at Vlissingen in Zeeland Province was to have a capacity of 140,000 barrels per day (6.5 million tons per year) and was scheduled for completion in 1974. The Euromin N.V. refinery proposed for either the Rotterdam or Amsterdam area by the West German firm Mabanaft has been abandoned because of inflated construction costs, environmental specifications, and finally the uncertainty of crude supplies. At yearend the Netherlands refinery capacity approximated 99 million tons per year. In 1973, approximately 73 million tons of crude petroleum were processed with domestic consumption taking 35 million tons of the product; the balance or approximately 35 million tons of product was exported and utilized in fueling ships.

Natural gas production continued to increase and approximated 70.8 billion cubic meters in 1973. Production is expected to plateau at 85 to 90 billion cubic meters per year in perhaps 1975 with 50% of the product exported to West Germany, France, and Belgium-Luxembourg and limited quantities to Italy and Switzerland through a pipeline to be completed in late 1974. The Netherlands will reassess total reserves as additional fields are discovered in the North Sea and reestablish depletion rates dependent on projected total reserves. Gas distribution projects announced include:

A. The Nederlandse Gas Unie liquifaction plant at Maasvlakte of 13,400 million cubic fet per day capacity to serve as a peak shaving facility and to be in operation late in 1975.

B. The Noordzee Transport B.V. (40% DSM and 60% Placid International Oil Co.) gasline of 100 miles length from the North Sea L-10 block to the process station at Uithuizen to be completed in 1975.

C. The Nederlandse Gas Unie pipelaying projects involving 71 miles of large-diameter lines of 38- to 48-inch diameter and 69 miles of smaller distribution lines of 12- to 20-inch diameter.

Overall, the Netherlands will attempt to maximize national revenue from natural gas by apportioning total production to domestic and foreign consumption in a manner to minimize the deficit trade balance associated with crude petroleum imports required for fuel, transportation, and feedstock purposes.

A state-supported large incinerator complex (N.V. Alvalverwerking Rijnmond) was commissioned to serve the Rotterdam industrial area, including 23 satellite towns. With a capacity of 190,000, 440,000 and 70,000 tons per year of garbage, industrial waste, and solid and liquid chemical wastes, respectively, the huge facility will generate power and produce distilled water for sale to industrial customers.

A large bulk storage and transshipping facility was completed on the New Waterway, seaward from Rotterdam, by the Rotterdam Department of Municipal Works. It will be capable of unloading the largest ore or coal carriers and storing or directly reloading lighters for transport to the Netherlands, Belgium, or West German steel complexes. The primary commercial operator is Verenigd Overslagbedrif Maasvlakte (United Transshipment Industry Maasvlakte). Project cost has been estimated at $17 million.

The City Energy Utility of Rotterdam began construction of a very large powerplant on 540 acres at Maasvlakte. The plant, to utilize seawater for cooling, will have an eventual 6,000-megawatt capacity. The first two gas-fired units will be commissioned in late 1974 and 1975. Subsequent units may be nuclear to supply the growing Rim City and Rijnmond industrial area. Great attention to environmental effects will be required since further air pollution cannot be tolerated.

The Mineral Industry of New Zealand

By Robert A. Clifton [1]

The value of New Zealand's mineral production increased 54% in 1973 to $131 million.[2] There was a respectable increase all across the board except for the metals value which, even with nearly a fourfold increase in iron sand production value, dropped to only 1.3% of total mineral value. Nonmetallic minerals, with a good general increase in value, climbed to 76.5% of the total. Fuels, with a 22% increase, dropped to 22.2% of total mineral value.

Value of mineral production by year is shown in the following tabulation:

Year	Percent			Total value, million U.S. dollars
	Metals	Nonmetals	Fuels	
1971	7.0	64.0	29.0	79.8
1972	10.0	61.0	29.0	93.6
1973	1.3	76.5	22.2	131.0

The year 1973 was not a spectacular one for the New Zealand minerals industry. One new metallic operation, iron sands, was initiated, but another operation that produced lead-zinc-copper concentrates was closed. Provisions of the new mining act were a force in the sharp decline of prospecting licenses issued.

Sand, rock, and gravel (including serpentine and glass sand) was the most valuable single category of New Zealand mineral production, with 37% of the value. Cement was next (23%), followed by iron ore and iron sand (8%), and limestone (3%).

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[1] Physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

[2] Unless otherwise indicated, values herein are in U.S. dollars converted from New Zealand dollars at the rate of $NZ1 = US$1.4619.

Table 1.—New Zealand: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 [p]
METALS			
Aluminum, smelter production [1]	[r] 22,277	87,661	[e] 109,700
Cadmium, mine output, metal content [2]	14	14	4
Copper, mine output, metal content [3]	85	123	41
Gold, mine output, metal content [4] ---troy ounces--	9,418	13,511	11,044
Iron and steel:			
Iron ore, gross weight	93	141	466
Iron sands, gross weight [5]	575,882	1,380,328	2,181,164
Sponge iron [e] ---thousand tons--	100	100	100
Crude steel ---do---	[r] 68	157	190
Lead, mine output, metal content [3]	1,246	1,155	328
Silver, mine output, metal content [3] ---troy ounces--	66,398	31,290	49,181
Tungsten, mine output, metal content	7	13	[e] 1
Zinc, mine output, metal content [2]	1,969	1,653	[e] 581

See footnotes at end of table.

Table 1.—New Zealand: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
NONMETALS			
Cement, hydraulic ---thousand tons--	823	899	1,058
Clays:			
Bentonite	11,761	620	1,031
Fire clay	284,478	206,496	210,021
Kaolin (including china clay)	20,243	9,489	9,218
Diatomite	6,338	4,996	4,501
Kauri gum	26	12	10
Magnesite	1,047	960	1,155
Perlite	2,032	2,540	1,599
Pumice	13,010	129,611	56,909
Salt	43,263	59,438	101,500
Sand and gravel:			
Glass sand	124,520	110,072	124,405
Common sand and gravel [6] ---thousand tons--	25,878	27,274	29,291
Stone: [6]			
Dolomite	8,311	11,875	15,713
Greenstone	4	5	4
Limestone:			
For agriculture ---thousand tons--	1,281	1,541	1,698
For industry, except cement ---do----	116	123	238
For cement ---do----	1,535	1,467	1,783
Serpentine ---do----	73	96	74
Unspecified:			
Dimension	31,322	23,407	36,547
Rock for harbor work ---thousand tons--	2,197	625	803
MINERAL FUELS AND RELATED MATERIALS			
Carbon dioxide, natural (produced with natural gas) million cubic feet--	4,250	4,993	5,485
Coal:			
Bituminous ---thousand tons--	389	382	415
Subbituminous ---do----	1,573	1,647	1,872
Lignite ---do----	162	152	143
Total ---do----	2,124	2,181	2,430
Coke:			
Metallurgical ---do----	e 6	4	--
Gashouse ---do----	e 36	22	27
Fuel briquets ---do----	15	13	15
Gas, natural: [7]			
Gross production ---million cubic feet--	r 6,378	7,491	9,339
Marketed production ---do----	e 6,059	r e 7,116	9,293
Natural gas liquids, condensate [8] ---thousand 42-gallon barrels--	802	1,118	1,299
Petroleum:			
Crude [9] ---do----	2	1	--
Refinery products:			
Gasoline ---do----	10,029	11,042	9,527
Distillate fuel oil ---do----	4,886	5,029	4,563
Residual fuel oil ---do----	5,385	7,536	8,787
Other ---do----	1,049	784	641
Refinery fuel and losses ---do----	1,529	1,769	1,806
Total ---do----	22,878	26,160	25,324

e Estimate. p Preliminary. r Revised.

[1] Previous year's data revised due to error which did not state aluminum smelter production in thousand metric tons units.

[2] Contained in zinc concentrate.

[3] Contained in lead-copper concentrate.

[4] Includes that contained in lead-copper concentrate.

[5] Average 60% iron.

[6] Crushed rock for building aggregate, roads, and ballast is included with sand and gravel.

[7] Revised to exclude carbon dioxide component of natural gas, which is reported separately.

[8] Used as a petroleum refinery feedstock.

[9] Revised to exclude natural gas liquids (condensate) which is reported separately.

TRADE

During 1971–72, the value of New Zealand's exports of mineral commodities apparently increased, and imports decreased compared with that of 1970–71. Iron sand is again assumed to account for the major portion of the increase in export value.

Table 2.—New Zealand: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum metal and alloys:			
Scrap	1,246	1,173	Australia 1,015.
Unwrought and semimanufactures	10,461	62,066	Japan 55,952; Hong Kong 2,577; Thailand 1,100.
Copper metal and alloys:			
Scrap	1,047	818	Australia 486; Japan 203.
Unwrought and semimanufactures	2,050	2,440	Australia 1,498; Japan 604.
Gold, refined ——value	[1] $2,507	NA	
Iron and steel:			
Ore and concentrate	339,021	990,462	All to Japan.
Metal:			
Scrap	5,595	2,801	Japan 2,637.
Semimanufactures:			
Bars, rods, angles, shapes, and sections	1,706	4,142	United States 1,296; Fiji Islands 858; New Hebrides 651.
Universals, plates and sheets	21,810	41,030	United States 31,783; Fiji Islands 2,603; New Caledonia 1,432.
Wire	646	1,003	United States 376.
Tubes, pipes, and fittings	48	589	Australia 156; American Samoa 86.
Lead:			
Ore and concentrate	2,560	2,138	All to Japan.
Metal and alloys:			
Scrap	549	NA	
Unwrought and semimanufactures	335	200	NA.
Platinum-group metals and silver ores value, thousands	NA	$78	NA.
Zinc ore and concentrate	4,730	3,332	Japan 3,327.
Other, ash and residue containing nonferrous metals ——value, thousands	$233	$157	Australia $91.
NONMETALS			
Cement	NA	7,245	New Caledonia 2,547.
Clay products (including all refractory brick) ——value, thousands	$262	$227	Australia $114.
Fertilizer materials, manufactures	NA	464	NA.
Precious and semiprecious stones, except diamond ——value, thousands	NA	$117	United Kingdom $78.
MINERAL FUELS AND RELATED MATERIALS			
Coal and coke, including briquets ——do	$223	$434	Venezuela $422.
Petroleum refinery products:			
Gasoline ——thousand 42-gallon barrels	NA	6	Mainly to ships stores.
Kerosine ——do	NA	514	Do.
Distillate fuel oil ——do	NA	1,200	Ships stores 1,171.
Residual fuel oil ——do	NA	1,324	Ships stores 1,222.
Lubricants ——value, thousands	$226	$755	Ships stores $680.
Other ——thousand 42-gallon barrels	NA	5	NA.

NA Not available.
[1] Figure shown is for period beginning July 1, 1970, and ending June 30, 1971.

Table 3.—New Zealand: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Oxides and hydroxides	64,738	165,760	Australia 141,528; Jamaica 20,020.
Metals and alloys:			
Unwrought	13,562	5,179	Australia 3,895; United States 799.
Semimanufactures	5,479	4,961	Canada 2,494; Australia 1,253.
Chromium oxides and hydroxides	80	213	NA.
Copper metal and alloys:			
Unwrought	13,562	5,179	Australia 486.
Semimanufactures	9,819	9,517	Australia 7,328; United Kingdom 1,443.
Gold metal ——troy ounces	[1] 12,265	NA	

See footnotes at end of table.

Table 3.—New Zealand: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Iron and steel:			
Pig iron, including cast iron	5,324	3,996	Australia 3,975.
Sponge iron, powder and shot	412	582	NA.
Ferroalloys	2,496	3,044	Republic of South Africa 1,784; India 803; Australia 133.
Steel, primary forms	847	17,278	Australia 7,429; Japan 4,629; Belgium-Luxembourg 2,915.
Semimanufactures:			
Bars, rods, angles, shapes, and sections	104,888	77,669	Australia 48,613; Japan 15,899; United Kingdom 11,173.
Universals, plates, and sheets	203,283	288,752	Japan 215,584; Australia 49,110; United Kingdom 17,185.
Hoop and strip	12,360	14,186	Japan 6,233; Australia 5,571; United Kingdom 1,864.
Rails and accessories	15,871	7,848	Australia 7,061.
Wire	19,227	18,292	Australia 9,088; United Kingdom 4,744; Japan 3,805.
Tubes, pipes, and fittings	47,804	25,972	Australia 10,799; United Kingdom 8,356; Japan 5,764.
Castings and forgings, rough	NA	107	Australia 105.
Lead:			
Oxides	567	390	Australia 346.
Metal and alloys:			
Unwrought	5,715	6,892	Australia 6,844.
Semimanufactures _value, thousands	$13	$12	NA.
Magnesium metal, unwrought	93	113	Norway 60; United States 53.
Manganese oxides	533	677	United States 315; Japan 189.
Mercury ——76-pound flasks	145	203	Sweden 87.
Nickel metal, including alloys:			
Unwrought	100	75	Canada 59; United Kingdom 15.
Semimanufactures	192	174	United Kingdom 115.
Platinum-group metals and silver metal, including alloys:			
Platinum group ——value, thousands	$167	$94	United Kingdom $51.
Silver ——do	$858	$695	Australia $643.
Tin:			
Oxides ——long tons	NA	13	NA.
Metal, including alloys:			
Unwrought ——do	304	326	Australia 321.
Semimanufactures ——do	NA	19	NA.
Titanium oxides	1,115	2,116	Australia 1,324; Japan 748.
Zinc metal and alloys:			
Unwrought	12,419	18,723	Australia 18,603.
Semimanufactures	344	310	Australia 159; United Kingdom 115.
Other:			
Ore and concentrate	576	586	All from Australia.
Oxides, hydroxides, and peroxides of metals, n.e.s	144	113	NA.
NONMETALS			
Asbestos	6,841	6,552	Canada 5,047; Republic of South Africa 1,345.
Barite	634	1,357	Australia 928.
Cement	196	3,735	Japan 1,988; United Kingdom 1,204.
Chalk	851	741	NA.
Clays and clay products:			
Crude	5,596	6,324	United States 3,304; United Kingdom 1,339; Australia 637.
Products ——value, thousands	$2,072	$1,775	United Kingdom $980; United States $269; Australia $201.
Cryolite and chiolite	[1] 17	NA	
Diamond:			
Gem, not set or strung _value, thousands	$1,025	$1,151	Republic of South Africa $659; United Kingdom $413.
Industrial ——do	$97	$51	NA.
Diatomite and other infusorial earth	756	930	United States 814.
Feldspar, fluorspar, and nepheline syenite	2,635	1,871	Sweden 1,372.
Fertilizer materials:			
Crude:			
Nitrogenous	NA	935	All from Chile.
Phosphatic ——thousand tons	1,121	1,075	Nauru 417; Gilbert Island 352; Australia 306.

See footnotes at end of table.

Table 3.—New Zealand: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Fertilizer materials—Continued			
Manufactured:			
Nitrogenous ——value, thousands	$1,532	$3,844	Japan $2,510.
Phosphatic, including basic slag	10,288	5,017	Belgium-Luxembourg 3,615; United States 1,026.
Potassic	177,452	218,449	United States 106,494; Canada 59,302; U.S.S.R. 26,376.
Gypsum and plasters	98,026	111,505	Australia 110,619.
Pigments, mineral, including processed iron oxides	973	1,058	West Germany 552; Austria 227.
Precious and semiprecious stones, except diamond ——value, thousands	$431	$549	Australia $261; West Germany $145.
Salt and brine	28,929	25,524	United Kingdom 21,694; Australia 2,463.
Sodium and potassium compounds, n.e.s	13,723	12,642	United Kingdom 9,142; Netherlands 2,079.
Stone, sand and gravel:			
Dimension stone	766	696	NA.
Quartz and quartzite	908	972	NA.
Sulfur, elemental, all forms	212,630	217,878	Canada 173,940; United States 43,224.
Talc, steatite, soapstone, and pyrophyllite	2,119	2,239	Australia 1,944.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black and gas carbon	6,600	6,620	Australia 5,724; United States 790.
Coal and coke, including briquets	3,993	NA	
Gas, hydrocarbon ——value, thousands	$203	$226	Australia $178.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	22,333	23,856	Kuwait 13,019; Iran 4,022; Saudi Arabia 2,296.
Refinery products:			
Gasoline ——do	2,124	2,405	Bahrain 792; Iran 665; Australia 485.
Kerosine and jet fuel ——do	1,605	1,581	Australia 812; Singapore 348; Iran 184.
Distillate fuel oil ——do	1,586	1,785	Bahrain 702; Australia 627; Kuwait 205.
Residual fuel oil ——do	--	73	All from Singapore.
Lubricants ——value, thousands	$5,739	$5,410	Australia $3,213; United States $1,038; United Kingdom $720.
Other:			
Mineral jelly and wax thousand 42-gallon barrels	21	29	Japan 10; United States 8.
Petroleum coke ——do	172	(2)	All from United States.
Unspecified ——do	150	129	Australia 69; United States 25.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals value, thousands	$741	$511	Japan $319; United Kingdom $65.

NA Not available.
[1] Figure shown is for period beginning July 1, 1970, and ending June 30, 1971.
[2] Quantity was not reported for 1972. Value reported was $1,475,000 for 1971 and $1,686,000 for 1972.

COMMODITY REVIEW

METALS

Aluminum.—The Bluff smelter reached full initial-design capacity of 110,000 long tons per year after one cutback during 1973. Further expansion will depend on the world market, as well as the New Zealand Government's ability to honor its contract for more electricity. Ecologists, fighting efforts to raise the level of Lake Manapouri 27 feet to give the necessary hydropower, have won a promise from the new government not to do so. The Government is reported as saying that the smelter will have to forego 200 of the 480 megawatts of power needed for the eventual 240,000-ton capacity.

Iron and Steel.—Waipipi Iron Sands Ltd. maintained full production at Waipipi during 1973. New Zealand Steel Mining Ltd. initiated a second operation at Taharoa late in the year. This operation is designed to produce 30,000 tons per year of concentrate. The Consolidated Silver Mining Co. of N.Z. Ltd., through its agent Joseph

Nathan and Company Ltd., is still seeking technical and financial assistance in developing its magnetite, ilmenite, and vanadium deposits on South Island.

Gold.—New Zealand's many previously subeconomic gold deposits were being thoroughly reinvestigated in the light of the rising and favorable world market prices. Dredging by Kanieri Gold Dredging Ltd. on the Taramakua River continued. Gold production value increased 8% over 1972.

Silver.—The value of silver produced in 1973 exceeded that of 1972 by 62%.

NONMETALS

Asbestos.—Cassiar Asbestos Corporation Ltd. of Canada is undertaking an exploration program of the Pyke Asbestos property, West Coast, South Island. New Zealand Asbestos Ltd. will acquire the mining privileges warranted by Cassiar's $585,000 program.

Perlite.—New Zealand Perlite Co. Ltd. was expanding its operations in the central plateau region of North Island. The reserves, reported to exceed 100 million tons, were deemed sufficient to support a much larger plant, and one was built in 1973 at Auckland.

Sulfur.—Further definition of the deposits at Lake Rotokaua by drilling was started in November by Gulf Resources and Chemical Corp. The Chemical Division of the New Zealand Geological Survey has patented an extraction method for producing sulfur that is more than 99% pure.

Salt.—Dominion Salt Ltd. of Mount Maunganui has contracted for the supply and erection of a vacuum-pan salt refinery for $730,000. The 5-ton-per-hour unit will process imported solar salt, and was scheduled for startup in 1974.

MINERAL FUELS

Coal.—The 12% increase in coal production during 1973 was a reflection of the worldwide energy shortage. The Government is actively investigating methods for mechanizing and modernizing the coal mines. Availability of coal for a new power station at Huntley was established.

Petroleum and Natural Gas.—Marketed production of natural gas continued to rise, with a 31% increase over that of 1972. All production was again from the Kapuni Field. The first of six new, producing wells was spudded in on December 31, 1973. The six, to be completed by mid-1975, are based on the enlarged reserve estimate and increased demand. New Zealand Natural Gas Corp. brought a plant onstream to liquefy a portion of the Kapuni gas; 1,383 cubic meters were liquefied in 1973. The negotiations between the Government and Shell-BP-Todd Oil Services Ltd. about ownership and price of the Maui gasfield were concluded. The Government paid $43.9 million for a 50% share of the Maui Field. Design work on the first production platform, the distribution pipelines, and four gas-powered generators was started.

The Mineral Industry of Nigeria

By Keith L. Harris [1]

Increased production and rising prices for crude oil and high world prices for traditional agricultural and other raw material exports sustained the rapid rate of growth that has characterized the post-civil-war period in Nigeria. Export earnings were up, as was government revenue, and foreign exchange reserves reached a new high. The gross domestic product (GDP) rose 7% compared with a 9% rise in 1972.

With production of about 2.3 million barrels per day at yearend 1973, Nigeria ranked seventh in world production of crude oil. Oil dominated the economy, accounting for 84% of the export revenue, about 80% of the budget revenue, and nearly 50% of the GDP.

In the free world, Nigeria maintained sixth place among tin-producing nations and continued as the third-ranking producer of columbite.

On January 1, Nigeria introduced a new decimal-based currency unit, the naria (₦), equivalent to one-half of the former Nigerian pound. On February 14, in response to the international monetary crisis, Nigeria maintained the exchange rate at ₦1.00 = US$1.52, thus devaluating the naria about 10%.

Compliance with the Indigenization Decree of early 1972, which fixed April 1, 1974, as the date when selected commercial, service, and light-manufacturing activities must have full or partial (40%) Nigerian equity participation, continued throughout the year. To insure an adequate flow of loan capital to Nigerian investors, in October the Government launched the Nigerian Bank for Commerce and Industry. The Bank will act as a buyer of last resort in the case of public offerings that are undersubscribed.

In keeping with its objective of increasing public participation in oil production, the Government concluded an agreement with the largest domestic oil producer, Shell-BP Petroleum Development Co. of Nigeria, Ltd. (Shell-BP), for an initial 35% share in the company. Negotiations with U.S. oil-producing firms continued at yearend.

The income tax on petroleum production profits was raised from 50% to 55%. The posted price of crude petroleum was increased several times during the year; the last increase raised the price from $4.287 [2] per barrel to $8.310 per barrel. In addition, the Government announced it would market directly the royalty and participation crude to which it was entitled.

To help supply the manpower to run the oilfields, the Government announced it would establish an oil production training center at Warri, Midwestern State, to train 250 students per year.

The Government allocated more than $42 million to establish a petrochemical industry. Materials slated for production are fertilizers, polyvinyl chloride, and polyethylene.

The Nigerian Ports Authority received approval for a loan of $55 million to help finance a $83.8 million project for the expansion of the port at Lagos.

PRODUCTION

The petroleum industry continued to dominate Nigeria's mineral production in 1973, as the output of crude and refined petroleum continued to record substantial

[1] Physical scientist, Division of Nonferrous Metals—Mineral Supply.

[2] Where necessary, values have been converted from naria (₦) to U.S. dollars at the rate of ₦1.00 = US$1.52.

increases. The production of crude petroleum increased from 1.9 million barrels per day in January to 2.3 million in December. Total crude output reached 750 million barrels, 13% above the 1972 level. Refinery production increased 28% over the 1972 output. Tin mine and smelter production decreased 13% and 11%, respectively, from the 1972 levels. Columbite production fell 2%, and coal production was off 5%. Cement, clays, limestone, and marble production all increased as domestic industrial minerals and construction materials became more important in Nigeria's industrial development.

Table 1.—Nigeria: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Columbium and tantalum:			
Columbite concentrate, gross weight	1,381	1,270	1,240
Tantalite concentrate, gross weight	4	1	1
Gold ---troy ounces	40	13	21
Lead, mine output, metal content	215	321	356
Rare-earth metals, monazite concentrate	r 91	10	5
Tin:			
Mine output, cassiterite concentrate:			
Gross weight ---long tons	9,899	9,249	7,762
Tin content ---do	7,210	6,625	5,736
Smelter ---do	r 7,232	6,637	5,889
Tungsten ore and concentrate, gross weight	(1)	1	3
NONMETALS			
Cement, hydraulic ---thousand tons	r 676	1,155	1,513
Clays:			
Kaolin	153	--	NA
Other	NA	8,768	29,988
Feldspar	NA	4,313	NA
Stone:			
Limestone ---thousand tons	474	1,189	1,801
Marble	3,326	757	8,631
Shale ---thousand tons	NA	114	133
MINERAL FUELS AND RELATED MATERIALS			
Coal ---do	r 197	346	327
Gas, natural:			
Gross production ---million cubic feet	446,840	601,237	815,152
Marketed production ---do	6,509	9,609	4,758
Petroleum:			
Crude ---thousand 42-gallon barrels	558,375	665,282	749,820
Refinery products:			
Gasoline ---do	3,767	4,389	NA
Kerosine and jet fuel ---do	2,117	2,361	
Distillate fuel oil ---do	3,532	4,093	
Residual fuel oil ---do	4,665	4,976	
Other, liquefied petroleum gas ---do	24	104	
Refinery fuel and losses ---do	411	292	
Total ---do	14,516	16,215	2 20,700

p Preliminary. r Revised. NA Not available.
1 Less than ½ unit.
2 Estimated deliveries of crude to refinery.

TRADE

Nigeria's foreign trade continued to grow in 1973. Exports increased 55% while imports rose only 25%, resulting in an overall rise in the favorable balance of trade to $1.51 billion in 1973, a 124% increase over the 1972 trade surplus. Total value of exports was $3.38 billion. Imports rose from $1.50 billion in 1972 to $1.88 billion in 1973.

Petroleum exports accounted for 84% of the total exports, up slightly over the 1972 figure, but the value of petroleum exports increased 61%, reflecting both the 13% increase in production and the 94% increase in price late in the year. The value of exported tin metal declined 21% even though prices rose during the last half of the year.

For the first time, the United States replaced the United Kingdom as the leading purchaser of Nigerian exports, due mostly to the increased amount of petroleum pur-

chased by the United States. The value of shipments to the United States totaled $835 million, up 84% from the 1972 level, and accounted for 24% of Nigeria's exports. Nigeria's imports from the United States totaled $191 million.

Table 2.—Nigeria: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Columbite, ore and concentrate, gross weight	1,218	1,486	United Kingdom 662; Japan 308.
Iron and steel metal, scrap	17,082	911	Netherlands 197; Italy 183; United Kingdom 132.
Lead, ore and concentrate, gross weight	150	173	Italy 71; Brazil 50; West Germany 50.
Tin metal, including alloys, all forms long tons	8,433	6,741	United Kingdom 5,462.
Zinc:			
Ore and concentrate, gross weight	--	299	All to United Kingdom.
Metal, including alloys	(1)	--	
Other nonferrous base metals, n.e.s.:			
Ore and concentrate, gross weight	81	212	Brazil 102; West Gemany 51.
Scrap	2,911	3,103	West Germany 1,512; Italy 517.
NONMETALS			
Fertilizer materials, crude	138	31	Togo 20.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	--	5	NA.
Coal and coke, including briquets	--	19,102	Ghana 17,933.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	512,317	781,787	United States 185,313; United Kingdom 144,724; France 125,295; Netherlands 101,223.
Refinery products:			
Gasoline ---do---	8	80	Equatorial Customs Union 55; Niger 13; Dahomey 11.
Jet fuel ---do---	6	185	United States 139; Equatorial Customs Union 41.
Kerosine ---do---	(1)	18	Equatorial Customs Union 17.
Distillate fuel oil ---do---	26	172	Equatorial Customs Union 63; Niger 55; Zaire 23.
Residual fuel oil ---do---	571	488	United States 440.
Lubricants ---do---	(1)	3	Equatorial Customs Union 1; Ghana 1.
Bitumen and bituminous mixtures, n.e.s. do---	(1)	1	Mainly to Togo.
Other ---do---	(1)	(1)	NA.

NA Not available.
[1] Less than ½ unit.

Table 3.—Nigeria: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum, metal and alloys:			
Unwrought	250	110	West Germany 100.
Semimanufactures	9,879	7,634	Switzerland 1,941; United Kingdom 1,376; Italy 939.
Copper, metal and alloys:			
Unwrought	45	9	United Kingdom 8.
Semimanufactures	2,309	1,877	United Kingdom 1,347.
Iron and steel:			
Ore and concentrates, including roasted pyrites, gross weight	18,073	3,935	All from Canada.
Metal:			
Scrap	--	6	All from United Kingdom.
Pig iron, including cast iron	421	883	West Germany 755; United Kingdom 128.
Sponge iron, including powder and shot	56	59	United Kingdom 38; United States 21.
Spiegeleisen	782	244	United Kingdom 183; United States 61.
Ferroalloys, other	54	11	All from France.
Steel, primary forms	32,891	47,787	West Germany 25,917; United Kingdom 12,273.
Semimanufactures	586,990	499,649	Japan 160,135; United Kingdom 91,238; West Germany 66,538.
Lead metal, including alloys:			
Unwrought	r 1,300	848	United Kingdom 800.
Semimanufactures	r 775	52	West Germany 20; United Kingdom 19.
Nickel metal, including alloys:			
Unwrought	NA	(1)	Mainly from West Germany.
Semimanufactures	52	77	United Kingdom 48; West Germany 13.
Platinum-group metals and silver:			
Ore and concentrate, gross weight	1,588	2	All from West Germany.
Metals, including alloys, all forms:			
Platinum group—thousand troy ounces	71	11	United Kingdom 8; West Germany 2.
Silver—do	1,925	877	United Kingdom 852; Netherlands 16.
Tin:			
Unwrought—long tons	605	462	All from United Kingdom.
Semimanufactures—do	525	296	United Kingdom 187; Italy 98.
Zinc:			
Unwrought	3,719	5,682	Zaire 4,013; United Kingdom 727.
Semimanufactures	775	253	United Kingdom 104; West Germany 64.
Other:			
Ore and concentrate of base metals, n.e.s., gross weight	78	1,657	West Germany 1,457.
Oxides, hydroxides, and peroxides of metals, n.e.s	r 1,071	1,608	United Kingdom 1,244.
Metals, nonferrous, including alloys, all forms, n.e.s	4,165	1,107	United Kingdom 748; Canada 205.
NONMETALS			
Abrasives:			
Natural	488	667	United States 655.
Grinding and polishing wheels and stones	575	474	United Kingdom 265; Italy 95.
Asbestos	50,598	37,234	Canada 29,014.
Cement, hydraulic	977,523	720,111	Turkey 167,057; Spain 141,162; United States 70,657.
Clays and clay products (including all refractory products)	17,184	11,131	United Kingdom 5,334; West Germany 2,384.
Diamond, industrial—value, thousands	NA	$21	All from India.
Fertilizer materials:			
Crude	13,803	6,125	United Kingdom 1,655; Netherlands 1,415.
Manufactured:			
Nitrogenous	5,215	32,892	West Germany 13,635; Netherlands 10,328.
Phosphatic	14,760	25,908	West Germany 6,405; Netherlands 6,220.
Potassic	483	3,968	West Germany 2,365; Netherlands 1,346.
Other, n.e.s	83,580	14,130	West Germany 9,020; Netherlands 5,015.
Ammonia	535	434	United Kingdom 212; Japan 82; Netherlands 70.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Lime	7,044	38,415	United Kingdom 37,814.
Mica, all forms	283	908	United Kingdom 761.
Pigments, mineral, including processed iron oxides	1,071	1,608	United Kingdom 1,244.
Precious and semiprecious stones, except diamond ——value, thousands	$29	$16	All from India.
Salt, excluding brine	273,871	156,187	United Kingdom 105,051; Poland 29,393.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	20,876	13,978	West Germany 4,740; United Kingdom 4,579; Italy 2,728.
Caustic potash, sodic, potassic peroxides	10,529	6,310	United Kingdom 4,104; West Germany 1,307.
Stone, sand and gravel:			
Worked	955	284	Italy 236.
Gravel and crushed rock	42,337	50,114	France 44,598.
Sulfur, all types, other than sublimed	465	311	Belgium-Luxembourg 306.
Other nonmetals, n.e.s	13,399	6,508	West Germany 1,582; Belgium-Luxembourg, 1,548; United Kingdom 1,215.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	101,065	68,875	United Kingdom 19,263; Greece 15,492.
Coal and coke, including briquets	14,331	1,448	West Germany 897; United Kingdom 541.
Petroleum refinery products:			
Gasoline ——thousand 42-gallon barrels	r 193	390	Netherlands Antilles 92; Netherlands 76; United Kingdom 67.
Jet fuel ——do	41	49	United Kingdom 24; Italy 18.
Kerosine ——do	19	104	Netherlands Antilles 49; Netherlands 32.
Distillate fuel oil ——do	14	22	Netherlands Antilles 15.
Residual fuel oil ——do	(1)	--	
Lubricants ——do	187	224	United Kingdom 90; United States 27; Italy 20.
Mineral jelly and wax ——do	26	29	West Germany 14; Netherlands 10.
Bitumen and bituminous mixtures, n.e.s ——do	233	416	Netherlands Antilles 133; West Germany 106; Venezuela 76.
Other ——do	r 18	12	Netherlands 4; United Kingdom 3; United States 3.

r Revised. NA Not available.
1 Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—Alcan Aluminium of Nigeria Ltd. reactivated its 5,000-ton-per-year aluminum-rolling mill at Port Harcourt. The mill, built between 1961 and 1963, had been out of operation since it was damaged in the civil war. Although its main production equipment was not seriously damaged, extensive rehabilitation and new working capital were required. Alcan furnished almost $3 million, and the remaining capitalization was supplied by an equity interest purchased by the Rivers State Government. The plant provides employment for about 250 workers.

Columbium.—Quebec Iron and Titanium Corp., a Canadian subsidiary of Kennecott Copper Corp., planned to sell its holdings in the Tin and Associated Mining, Ltd.'s (TAM) columbite mine near Jos. The sale was contingent upon the necessary investment guarantee by the Japanese Government to Mitsubishi Metal Corp. and Sumitomo Metal Mining Co., Ltd., as well as an agreement to the ownership transfer from the Nigerian Government. Difficulty in recruiting personnel to manage and operate the mine in its isolated location coupled with a general decrease in columbite prices reduced Kennecott's interest in the mine.

Lead.—Thunder Valley Mines Ltd. arranged to take over Standard Mining Co. (Nigeria) Ltd. and to expedite exploration work on Standard's lead-zinc property in

the Enugu-Abakaliki region of the East-Central State. Evaluation of the property reached the diamond-drilling stage.

Tin.—Production of tin in Nigeria declined for the fifth consecutive year to 5,736 long tons, its lowest level since 1959. Over the past several years, spiraling costs of production had lowered the profit margin of operators to a point where significant reinvestment and exploration programs had been curtailed, forcing rapid depletion of minable ore bodies. In May, the Government changed the royalty levied on tin production from 17% to a sliding scale of 11% to 16% based on world price. The new rates were retroactive to April 1. The lower royalty was expected to encourage reinvestment in the hard-pressed tin industry.

Amalgamated Tin Mines of Nigeria, Ltd., the largest tin producer in Nigeria, reported a 7% drop in tin concentrate production to 3,464 long tons for the year ending in March but had higher profits for the year because of improved tin prices. Production was adversely affected by heavy rains. Prospecting activities increased as the company sought extensions of alluvial deposits under the basalt.

Gold and Base Metal Mines, Ltd., continued exploration at its Liruie project in Kano State. Five exploratory shafts were sunk to varying depths along a strike length of 1,390 meters. The width of the lode was about 2.5 meters containing an average of 0.8% tin and 3.42% zinc, calculated over a minimum mining width of 1.5 meters. Planned throughput was based on 900 long tons per day.

All tin produced was refined by the Makeri Smelting Co. in Jos. Although the smelter has a capacity of 18,000 long tons per year, production of metal in 1973 was 5,889 long tons, down from a peak of 9,869 long tons in 1966.

NONMETALS

Cement.—Although Nigeria's cement production increased 31% in 1973 to 1,513,000 tons, cement was still in short supply, especially in the northern States. To remedy the shortage, several new plants were in the planning stages throughout the country. Feasibility studies were completed on a proposed cement factory at Yandev, Benue-Plateau State. KHD Klöckner-Humboldt-Deutz A.G. of West Germany and the Benue-Plateau State Government will be joint owners of the plant, to be completed in several years at a cost of $15 million. The New Nigeria Development Co., Northern Nigeria Investment Ltd., the Nigerian Industrial Development Bank, and the Kwara Investment Corp. planned a $49 million plant at Lokoja, Kwara State. The North-Eastern State Government and Associated Portland Cement Manufacturers, Ltd. (APCM) announced plans to construct a 600,000-ton-per-year plant at Gombe, and APCM will build another 600,000-ton-per-year plant in Western State. APCM operated the country's largest cement works at Ewekara, Western State, through its subsidiary West African Portland Cement Co., Ltd.

Fertilizers.—Nigeria will build a $12 million fertilizer complex at Kaduna, North-Central State, with production scheduled for 1975. The complex, the first of its kind in Nigeria, will include a 100,000-ton-per-year single superphosphate plant and a 37,500-ton-per-year sulfuric acid unit. Part of the sulfuric acid output will be available to other Nigerian industries. The phosphate rock will be imported from Togo.

MINERAL FUELS

Coal.—Nigeria was the only country in West Africa that produced coal. The Nigerian Coal Corp., a government statutory body, was responsible for the mining and distribution of coal. The main mines were at Enugu, East-Central State, but a new mine was opened in Okabba, Kwara State. Reserves were estimated at about 245 million tons.

The main consumers were the Nigerian Railway Corp., the Nigerian Electric Power Authority, the Nigerian Ports Authority, the cement companies, and firms operating river fleets.

Lignite coal is found extensively in Nigeria but was not yet being mined. Deposits most promising for development occur on both sides of the Niger River between Benin, Midwestern State and Onitsha, East-Central State. Drilling indicated reserves of 71 million tons in the Benin Area.

Natural Gas.—Production of natural gas in association with crude oil averaged over 2.2 billion cubic feet per day in 1973, a 37% increase over the 1.6-billion-cubic-foot-per-day average for 1972. About 98% of the output was flared at the wellhead. The re-

mainder was used by petroleum companies to generate electric power for their own needs, reinjected into the wells, or sold to industrial consumers, including the Nigerian Electric Power Authority for power generation.

The South Eastern State Government announced plans to exploit natural gas deposits in the coastal area of the State for power generation, leading to an extension of the electric system to cover areas of the State not presently covered.

Petroleum.—Petroleum production continued to rise during 1973, although at a slower rate than in previous years. Crude oil production averaged 2.1 million barrels per day, up from the 1.8-million-barrel-per-day average of 1972, and reached a high of about 2.3 million barrels per day at yearend. Total production reached 750 million barrels. Exports of crude, at 715 million barrels, were up 12% from the 1972 level. The United States, which received about 30% of the exports, continued to be the largest market for Nigerian crude oil. Deliveries to the Nigerian Petroleum Refinery Corp.'s Port Harcourt refinery totaled 20.7 million barrels, and refinery output rose 28% from the 1972 level.

With the Port Harcourt refinery operating at capacity and domestic demand for petroleum products increasing at about 9% per year, the Government announced plans to construct two new refineries, one at Warri, Midwestern State, to be commissioned in 1976, and one at Kaduna, North-Central State, to be commissioned in 1980–81. The Warri refinery will be wholly government-owned and have a capacity of 60,000 to 70,000 barrels per day. Details for the Kaduna refinery were not available.

The Government signed a participation agreement with Shell-BP, producer of about two-thirds of the country's oil. The contract gave the Nigerian National Oil Corp. (NOC) a 35% interest, retroactive to April 1, in the $1.5 billion operation with the option to increase its share to 51% by 1982. Computation for NOC's 35% share was based on the updated book value of the company and will be paid to Shell-BP in four installments. Government negotiations continued for at least a 40% participation in Nigerian Gulf Oil Co., Ltd., Mobil Exploration Nigeria, Ltd., and Texaco Overseas (Nigeria) Petroleum Co.–Chevron Oil Co. (Nigeria).

Within days of the announcement of the Shell-BP-NOC agreement, the Government signed its first production-sharing agreement with Ashland Oil Inc. The contract covered 1,119 square kilometers northwest of Owerri and near the coast of Calabar. Both areas are flanked by producing fields. Ashland would operate for NOC and explore at its own risk. If oil were discovered, Ashland would recover its costs, including taxes and royalties from a portion of production. The remainder, up to 50,000 barrels per day, would be shared 65% by NOC and 35% by Ashland, with NOC taking 70% of production above 50,000 barrels per day.

Occidental Petroleum Co. split its 49% share in four offshore blocks with Deminex (Nigeria) Ltd. Deminex reimbursed Occidental for its previous drilling expenses and will finance further development. Occidental will continue as operator. NOC holds the remaining 51% of the concessions. The Deminex group (Deminex (Nigeria) Ltd., 44%; Niger Petroleum Co., Ltd., 5% and NOC 51%) announced several oil and gas discoveries.

The AGIP Oil group reported a discovery in the Niger River delta. The strike flowed at a rate of about 15,000 barrels per day of 39° gravity low-sulfur oil from three zones below 10,500 feet. The group completed its Brass River oil terminal, with initial throughput of 89,000 barrels per day, increasing to over 120,000 barrels per day by yearend. Total capacity for the new system is 440,000 barrels per day.

Japan Oil Co. (Nigeria) Ltd. acquired Monsanto Oil Co. of Nigeria Ltd.'s share in two offshore blocks. Niger Oil Resources, a local company, owns 9% and NOC owns 51%. Several new offshore and onshore discoveries were reported by Japan Oil during the year.

Texaco-Chevron discovered oil 4 miles off the Rivers State coast. Tests indicated a flow potential of 8,800 barrels per day from five separate zones. Delta Oil (Nigeria), Ltd. and Pan-Ocean Oil Corp. discovered oil 20 miles south of Benin. The new discovery flowed at a rate of 8,000 barrels per day of 42° to 46° low-sulfur crude from a depth of 1,200 feet.

Although many companies discovered potential producing fields, only six companies actually produced during 1973. An example of the typical monthly production of crude oil and associated natural gas is given in table 4.

Table 4.—Nigeria: Production of crude petroleum and natural gas in October 1973

Company	Number of producing fields	Number of producing wells	Crude petroleum production		Natural gas production		Gas-oil ratio (thousand cubic feet per barrel)
			Total (barrels per day)	Percent	Total (thousand cubic feet per day)	Percent	
Shell-BP Petroleum Development Co. of Nigeria, Ltd	64	636	1,372,915	62.5	1,425,570	63.8	1,038
Nigerian Gulf Oil Co., Ltd	9	183	382,959	17.4	362,522	16.2	947
Mobil Exploration Nigeria, Ltd	7	61	245,961	11.2	196,994	8.8	801
Nigerian AGIP Oil Co., Ltd.-	7	76	122,417	5.6	204,181	9.2	1,668
Phillips Petroleum Co	3	24	64,254	2.9	30,738	1.4	478
Safrap (Nigeria), Ltd							
Texaco Overseas (Nigeria) Petroleum Co.-Chevron Oil Co. (Nigeria)	1	13	8,095	.4	13,287	.6	1,641
Total	91	993	2,196,601	100.0	2,233,292	100.0	1,017

Source: Department of Petroleum Resources, Federal Ministry of Mines and Power (Lagos). Monthly Petroleum Information. October 1973.

The Mineral Industry of Norway

By F. L. Klinger [1]

Strong foreign demand for Norwegian mineral industry products led to record production and exports of many commodities in 1973, including aluminum, copper concentrate, ferroalloys, iron and steel, ilmenite, nitrogen compounds, silicon, and zinc. Exports of other major commodities such as copper, magnesium, nickel, and cement were close to the levels of 1972. Gains were also evident in imports of raw materials such as alumina, manganese ore, and petroleum, as well as in iron and steel.

In the mining industry, the Knaben molybdenum mine was closed in May; the Grong (copper–zinc) and Repparfjord (copper) mines completed their first full year of production; a 5-year project for deepening of the Tverrfjellet (copper–zinc–sulfur) mine was begun; and expansion of production capacity for ilmenite was completed at Tellnes. An $8 million flotation plant was nearing completion at Løkken, as was the second pelletizing line for iron ore at Kirkenes. On Spitzbergen, continued production of coal and development of the Svea deposits seemed assured by government financial support.

In the metallurgical industry, the cobalt refinery at Kristiansand was rebuilt and resumed regular production in April. A $90 million investment program was authorized for the State iron and steelworks at Mo. Aluminum production capacity was being increased at Lista. Tentative plans for significant expansion of aluminum smelting capacity at Årdal and Sunndalsøra were announced, subject to availability of adequate power.

Elsewhere, production capacity for manufactured fertilizer was increased by 300,000 tons, and plans for 1-million-ton increase in cement-making capacity were announced.

In the petroleum industry, completion of offshore production facilities in the Ekofisk oilfield was expected by early 1975. In April, the Government authorized construction of the oil pipeline to Teesside, England and the gas pipeline to West Germany. Most of the oil pipeline was laid by the end of 1973; terminal facilities at Teesside were expected to be completed by early 1975; and construction of the gas pipeline was scheduled to start in the spring of 1974. Natural gas liquids sufficient for establishment of a petrochemical industry in Norway will be made available to the Government. Construction of Norway's third major petroleum refinery was continued near Bergen, with completion scheduled by 1975.

In other developments, a trade agreement was reached between Norway and the European Communities (EC) in May 1973. The agreement provides for reduction of EC tariffs on certain major Norwegian metallurgical products over periods of 7 to 9 years.

[1] Physical scientist, Division of Ferrous Metals—Mineral Supply.

PRODUCTION

Volume indices of production for various branches of the mineral industry from 1971 through 1973 are shown in the following tabulation:

Industry sector	1961=100 1971	1972	1973
Mining and quarrying:			
Coal mines	131	136	124
Metal mines	240	245	254
Mineral quarries	149	143	145
Stone, sand and gravel	241	213	204
All mining and quarrying[1]	227	257	259
Manufacturing:			
Primary metals	205	210	228
Nonmetallic mineral manufactures	171	176	175
Coal and petroleum products	215	228	233
Chemicals	179	185	198
All manufacturing	162	167	174
All industry	165	171	179

[1] Beginning with July 1972, index includes production of crude oil and natural gas.

Source: Statistisk Sentralbyrå (Oslo). Statistisk Månedshefte (Monthly Bulletin of Statistics). V. 91, No. 2, 1974; pp. 19–21.

The gains shown by the 1973 indices for metal mining and primary metals were primarily due to increased output of titanium, copper, and zinc ores and to record production of aluminum, ferroalloys, and iron and steel. The small increase in the index for mineral quarrying appeared to be generated mainly by increased output of nepheline syenite at Stjernøy and of the group of nonmetallic minerals produced by A/S Norwegian Talc near Bergen. The lower indices for stone, sand and gravel, and for nonmetallic mineral manufactures reflected the relatively static conditions in the construction industry. Sharply increased output of ammonia, sulfuric acid, and manufactured fertilizers contributed to the gain shown by the index for chemicals. Production of coal declined, but there was a 5% gain in output of petroleum refinery products. Output of crude oil from the offshore Ekofisk Field was slightly less than in 1972, but the major production facilities were not yet completed.

Production of individual commodities is shown in table 1.

Table 1.—Norway: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity		1971	1972	1973 p
METALS				
Aluminum metal:				
Primary ingot		r 530,230	542,210	620,365
Secondary ingot		18,403	r e 19,000	e 19,000
Superpure		3,400	3,500	3,500
Cadmium, smelter production		r 99	87	88
Cobalt, metal		869	320	912
Copper:				
Mine output, metal content:				
In copper concentrate		r 15,056	17,525	21,200
In cupriferous pyrite		r 6,616	7,850	7,213
Total		r 21,672	25,375	28,413
Metal:				
Primary:				
Blister		r 34,462	33,903	33,285
Refined		r 27,719	26,449	25,806
Secondary		6,448	r e 6,500	e 7,000
Iron and steel:				
Iron ore and concentrate	thousand tons	4,056	3,922	3,908
Roasted pyrite	do	154	r e 170	e 170
Pig iron	do	r 619	648	700
Ferroalloys:				
Ferrochrome	do	35	30	29
Ferromanganese	do	227	223	232
Ferrosilicon (75% basis)	do	243	213	279
Ferrosilicomanganese	do	141	162	169
Other	do	11	11	11
Total	do	r 657	639	720
Crude steel	do	r 882	916	963
Semimanufactures:				
Rolled	do	618	647	e 670
Finished castings	do	20	17	e 10
Lead, mine output, metal content		r 3,675	3,820	3,630

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS—Continued			
Magnesium metal, primary	36,105	36,491	37,521
Molybdenum, mine output, metal content	r 306	174	122
Nickel:			
Concentrate, metal content	360	386	e 400
Metal, primary	r 41,770	43,308	42,706
Platinum-group metals (exports) troy ounces	28,068	44,915	e 45,000
Selenium, elemental	28	r e 25	e 25
Silicon, elemental (exports)	r 26,648	44,984	55,742
Titanium:			
Ilmenite concentrate	r 641,604	608,614	752,632
Dioxide e	17,000	17,000	18,000
Vanadium, mine output, metal content e	r 1,010	r 960	730
Zinc:			
Mine output, metal content	r 10,717	15,932	19,350
Metal, primary	r 62,562	73,347	80,505
NONMETALS			
Cement, hydraulic thousand tons	r 2,740	2,648	2,709
Feldspar, lump	202,783	r e 200,000	e 200,000
Fertilizer materials, manufactured:			
Nitrogenous:			
Elemental nitrogen (total) thousand tons	534	585	627
Ammonia do	617	NA	NA
Fertilizer, gross weight do	894	NA	NA
Phosphatic do	6	NA	NA
Compound and other do	914	NA	NA
Graphite	r 8,288	8,655	6,676
Lime (quicklime and hydrated lime)	100,089	r e 105,000	e 110,000
Mica (exports)	3,478	5,112	e 5,500
Olivine	r 136,000	147,800	148,000
Pyrite and pyrrhotite:			
Gross weight	r 777,931	794,548	792,204
Sulfur content	r 356,752	364,373	363,298
Stone:			
Dimension stone:			
Syenite (labrador)	55,716	NA	NA
Slate thousand square meters	383	NA	NA
Crushed and broken stone:			
Dolomite	r 351,056	r e 375,000	400,000
Limestone thousand tons	r 5,221	r e 5,300	e 5,300
Nepheline syenite	160,091	161,064	200,300
Quartz and quartzite	505,503	e 505,000	e 510,000
Sulfur, sulfuric acid (100%)	r 313,949	352,815	382,306
Talc, soapstone, and steatite:			
Unground	64,463	e 76,000	e 76,000
Other	77,194	r e 77,000	e 77,000
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades thousand tons	455	455	415
Coke, all grades do	329	310	320
Gas, manufactured million cubic feet	1,051	1,021	1,003
Peat:			
For agricultural use	11,263	r e 11,500	e 12,000
For fuel use e	5,000	5,000	5,000
Petroleum:			
Crude oil thousand 42-gallon barrels	2,081	12,126	11,166
Refinery products:			
Gasoline do	5,406	5,602	6,069
Jet fuel do	856	1,568	1,616
Kerosine do	1,155	1,225	1,372
Distillate fuel oil do	12,913	14,152	14,532
Residual fuel oil do	17,789	16,257	17,036
Lubricants do	231	273	266
Other do	2,378	3,481	2,723
Refinery fuel and losses do	1,977	2,638	NA
Total do	42,705	45,196	43,614

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

TRADE

Norway's balance of trade in mineral commodities in 1973 showed a small deficit of about $50 million compared with a surplus of about $10 million in 1972. Mineral commodity exports were valued at $1.45 billion, while imports were valued at $1.5 billion.[2] Mineral commodities in 1973 accounted for 38% of the total value of Norwegian exports (excluding ships) and for 29% of the total value of imports. Nonferrous metals (principally aluminum and nickel), ferroalloys, and rolled steel continued to be the major export items, while the principal imported commodities were crude oil and petroleum products, rolled steel, and copper-nickel matte.

Norway's trade relationships with the United Kingdom and Denmark changed in 1973, as the latter two countries, formerly members of the European Free Trade Association (EFTA), became members of the EC. By special arrangement, free trade in industrial products was maintained during 1973, but after January 1, 1974, EC tariffs will apply to British and Danish imports from Norway.

By agreements with various EFTA countries, many EC tariffs will be gradually dismantled over a period of years. If Norway had joined the EC, the transition period for "sensitive products" (which include aluminum, ferroalloys, and magnesium, each of which is a major export product of Norway) would have been about 4½ years. Under the agreement signed between Norway and the EC in May 1973, the transition period for most products will be 7 years, and 9 years for aluminum, effective July 1, 1973.

Norway's trade in mineral commodities in 1971 and 1972 is detailed in tables 2 and 3.

[2] Values in Norwegian kroner (NKr) were converted to U.S. dollars at the rate of NKr 5.76 = US$1.00 for 1973 and NKr 6.59 = $1.00 for 1972. Source: Statistisk Månedshefte, v. 92, No. 2, (1974), p. 72.

Table 2.—Norway: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destination, 1972
METALS			
Aluminum metal, including alloys:			
Scrap	4,820	6,645	West Germany 4,277; Sweden 1,243; Netherlands 606.
Unwrought	415,328	536,840	United Kingdom 129,431; West Germany 133,340; United States 65,226.
Semimanufactures	37,070	46,326	United Kingdom 16,702; Sweden 9,635; Denmark 6,697.
Cadmium	78	78	NA.
Cobalt	762	492	NA.
Copper:			
Ore and concentrate	40,300	39,754	West Germany 18,145; Sweden 15,222; Spain 6,387.
Metal, including alloys:			
Scrap	702	1,027	West Germany 517; Belgium-Luxembourg 371; United Kingdom 41.
Unwrought			
Unrefined	6,382	7,325	West Germany 6,825; Poland 500.
Refined	25,956	26,166	West Germany 13,913; United Kingdom 3,195; Sweden 3,063.
Semimanufactures	2,160	2,952	Sweden 1,643; Denmark 585.
Gold metal unworked or partly worked troy ounces	2,058	3,247	United Kingdom 1,125; Denmark 997.
Iron and steel:			
Ore and concentrate except roasted pyrite thousand tons	2,742	2,919	West Germany 1,657; United Kingdom 686.
Roasted pyrite	160,040	164,658	West Germany 148,381; Denmark 12,125.
Metal:			
Scrap	18,421	15,518	West Germany 7,677; Sweden 4,045; Spain 3,783.
Pig iron including cast iron	126,983	103,960	United Kingdom 39,052; West Germany 16,252; Sweden 6,933.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destination, 1972
METALS—Continued			
Iron and steel—Continued			
Ferroalloys:			
Ferromanganese	187,542	210,284	United Kingdom 60,717; West Germany 44,604; United States 22,409.
Other	346,911	392,675	West Germany 97,823; United Kingdom 91,458; Belgium-Luxembourg 30,186.
Steel, primary forms	180,965	185,649	Netherlands 86,137; Denmark 54,374; West Germany 20,227.
Semimanufactures:			
Bars, rods, angles, shapes, sections	197,066	225,680	United Kingdom 84,303; Sweden 35,008; West Germany 31,333.
Universal plates and sheets	92,365	101,932	Sweden 48,393; United Kingdom 20,973; Denmark 20,502.
Hoop and strip	1,253	1,447	Sweden 926; Brazil 322.
Rails and accessories	184	35	Sweden 17.
Wire	7,702	9,245	United Kingdom 2,435; Iraq 1,837; Greece 744.
Tubes, pipes, fittings	25,707	30,491	Sweden 14,586; Denmark 7,776; United Kingdom 1,961.
Castings and forgings rough	13,727	12,039	Sweden 8,484; Denmark 1,774; Liberia 1,138.
Total	338,004	380,869	
Lead:			
Ore and concentrate	5,380	6,015	Belgium-Luxembourg 4,829; West Germany 1,186.
Metal, including alloys:			
Scrap	4,276	5,501	Denmark 3,060; Sweden 2,115; West Germany 326.
Unwrought	218	663	United Kingdom 336; Denmark 141.
Semimanufauctures	69	112	Sweden 96; Denmark 10.
Magnesium metal, including alloys, all forms value, thousands	$20,008	$25,103	NA.
Manganese ore and concentrate	100	657	Sweden 400; United Kingdom 200.
Molybdenum ore and concentrate	550	584	NA.
Nickel:			
Ore and concentrate	8,212	7,946	Finland 7,928.
Metal including alloys:			
Scrap	158	297	West Germany 162; United Kingdom 55; Belgium-Luxembourg 52.
Unwrought	40,092	40,218	United States 12,938; West Germany 5,633; Sweden 4,852.
Semimanufactures	120	46	Italy 18; Netherlands 13.
Platinum-group metals and silver:			
Waste and sweeping ——kilograms	30,165	38,034	West Germany 24,274; United Kingdom 8,850.
Metal, including alloys:			
Platinum-group metals——troy ounces	28,100	44,915	United States 27,392; United Kingdom 12,089.
Silver ——do	321,603	345,459	Denmark 237,015; Sweden 95,359.
Silicon elemental	26,648	44,984	U.S.S.R. 9,881; United States 9,739; West Germany 9,628.
Tin metal, including alloys:			
Scrap ——long tons	34	28	Denmark 13, West Germany 9.
Unwrought ——do	200	187	Sweden 163; Finland 21.
Titanium ore and concentrate (ilmenite)	513,835	598,729	NA.
Zinc:			
Ore and concentrate	11,249	13,392	Poland 11,312; West Germany 2,080.
Oxide	489	742	Sweden 389; West Germany 92; Portugal 90.
Metal, including alloys:			
Scrap	92	18	NA.
Unwrought	48,547	58,455	Sweden 24,295; United Kingdom 17,704; West Germany 8,920.
Semimanufactures	748	854	Sweden 479; Denmark 78; Hong Kong 52.
Other:			
Ash and residues containing nonferrous metals	19,164	8,209	United Kingdom 2,414; Netherlands 2,357; West Germany 1,712.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destination, 1972
METALS—Continued			
Other—Continued			
Oxides, hydroxides and peroxides of metals n.e.s	2,935	2,191	NA.
Base metals, including alloys, all forms	845	603	NA.
NONMETALS			
Abrasive (grinding and polishing wheels and stones)	1,068	1,028	Poland 246; Sweden 192; Finland 133.
Cement	1,217,277	1,064,423	United States 607,622; Ghana 344,521; Liberia 56,617.
Clay products:			
Refractory including nonclay bricks	6,570	7,326	West Germany 5,247; Netherlands 668; Sweden 308.
Nonrefractory —value, thousands	$679	$670	West Germany $540; United Kingdom $27; France $17.
Feldspar and fluorspar	236,511	241,393	West Germany 59,580; United Kingdom 54,908; Netherlands 37,130.
Fertilizer materials:			
Manufactured:			
Nitrogenous	759,090	819,904	NA.
Phosphatic	15	20	NA.
Potassic	13	4	NA.
Other	480,001	589,605	NA.
Graphite, natural	8,566	8,667	NA.
Mica all forms	3,478	4,126	France 1,005; West Germany 758; Spain 442.
Pyrite (gross weight)	545,236	572,035	West Germany 441,277; Sweden 105,048.
Salt	1,976	3,347	Sweden 1,948; Canada 992; Ireland 265.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly refined:			
Marble and other calcareous	2,744	4,086	West Germany 1,802; Italy 1,073; Sweden 434.
Slate	44,552	48,274	Netherlands 21,011; Denmark 8,185; West Germany 7,372.
Other	68,069	73,675	France 22,183; Italy 17,242; West Germany 16,575.
Worked all types	264	201	Sweden 110; Netherlands 46; Belgium-Luxembourg 40.
Dolomite	66,916	82,674	NA.
Gravel and crushed rock	1,014,755	1,069,073	West Germany 796,582; United Kingdom 181,527; Denmark 37,835.
Limestone	11,344	11,998	Sweden 8,400; Denmark 2,824.
Quartz and quartzite	7,663	5,112	Poland 2,024; Denmark 1,595; West Germany 315.
Sand, excluding metal bearing	3,790	2,842	Ivory Coast 489.
Sulfur:			
Sulfur dioxide	1,592	1,698	Sweden 1,546; Denmark 152.
Talc, steatite, soapstone and pyrophyllite	71,849	71,764	United Kingdom 18,102; Sweden 12,280; West Germany 10,449.
Other nonmetals, n.e.s.:			
Slag dross and similar waste not metal bearing	4,900	18,629	East Germany 14,707; West Germany 3,890.
Other	801	580	West Germany 232.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen	52	52	NA.
Coal and coke, including briquets:			
Anthracite and bituminous coal	85,343	88,500	West Germany 82,201; Netherlands 4,509; United Kingdom 988.
Coke and semicoke	60,511	90,404	Venezuela 52,170; Romania 22,000; Denmark 13,026.
Peat, including peat briquets and litter	8	1	NA.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	r 1,798	12,585	United Kingdom 4,883; West Germany 3,788; Denmark 2,137.
Refinery products:			
Gasoline, including natural —do	1,593	2,642	Sweden 2,344; United Kingdom 298.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destination, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Kerosine and jet fuel thousand 42-gallon-barrels	63	989	Denmark 492; Netherlands 250; Sweden 142.
Distillate fuel oil ---do---	1,239	2,653	Sweden 1,703; Denmark 780; United Kingdom 170.
Residual fuel oil ---do---	8,754	9,753	Sweden 5,484; Finland 1,473; Denmark 887.
Lubricants ---do---	112	176	Belgium-Luxembourg 52; Turkey 38; Denmark 30.
Mineral jelly and wax ---do---	1	1	Mainly to Sweden.
Other:			
Nonlubricating oils, n.e.s ---do---	1	1	Do.
Liquefied petroleum gas ---do---	164	289	United Kingdom 154; Denmark 78.
Pitch and pitch coke ---do---	(1)	(1)	NA.
Bituminous mixtures n.e.s.---do---	1	(1)	NA.
Mineral tar and other coal- petroleum- or gas- derived crude chemicals	18,491	37,227	Netherlands 21,797; West Germany 7,157.

NA Not available.
[1] Less than ½ unit.

Table 3.—Norway: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite	5,767	--	
Oxide and hydroxide	1,156,970	1,035,602	Jamaica 484,348; United States-Virgin Islands 144,252; Guinea 103,800; United States 103,731.
Metals including alloys:			
Scrap	64	400	All from Netherlands.
Unwrought	33,663	35,586	U.S.S.R. 17,277; Sweden 10,971; Poland 2,398.
Semimanufactures	18,370	19,763	Sweden 6,048; Finland 3,931; Belgium-Luxembourg 3,551.
Antimony metal including alloys	19	44	People's Republic of China 35; Netherlands 7.
Arsenic trioxide, pentoxide and acid	128	118	Sweden 78; United Kingdom 20.
Chromium:			
Chromite	82,072	52,697	Turkey 29,242; U.S.S.R. 14,489; Greece 8,639.
Oxide	164	170	West Germany 137; Poland 19.
Cobalt:			
Oxide and hydroxide	2	8	Belgium-Luxembourg 7.
Metal including alloys, all forms	5	7	Belgium-Luxembourg 7.
Copper metal, including alloys:			
Scrap	247	70	United States 38; Singapore 30.
Unwrought	1,052	795	United Kingdom 538; Netherlands 74; Finland 69.
Semimanufactures	26,096	24,891	Sweden 11,377; United Kingdom 4,022; Canada 2,781.
Gold metal worked or partly worked troy ounces	60,475	49,319	United Kingdom 38,806; West Germany 7,652.
Iron and steel:			
Ore and concentrate	10,186	13,435	Sweden 13,307; Finland 125.
Scrap	51,963	59,643	United Kingdom 30,090; Denmark 16,876.
Pig iron, ferroalloy and similar materials	18,409	14,452	West Germany 6,652; Sweden 2,910; United Kingdom 2,194.
Steel primary forms	90,964	132,839	Netherlands 101,704; Belgium-Luxembourg 23,016; Sweden 3,747.
Semimanufactures:			
Bars, rods, angles, shapes and sections	292,809	281,580	West Germany 68,234; France 40,473; Belgium-Luxembourg 38,553.
Universals, plates, and sheets	563,126	601,844	Japan 120,680; Sweden 107,597; United Kingdom 94,559.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Iron and steel—Continued			
Semimanufactures—Continued			
Hoop and strip	59,699	39,385	Belgium-Luxembourg 16,278; West Germany 7,658; France 6,873.
Rails and accessories	16,684	13,490	Sweden 9,673; Austria 1,451; West Germany 1,102.
Wire	8,818	10,670	Belgium-Luxembourg 3,961; Sweden 2,978; United Kingdom 1,433.
Tubes, pipes and fittings	82,530	87,785	West Germany 30,018; United Kingdom 16,671; Sweden 11,881.
Castings and forgings, rough	1,711	1,247	United Kingdom 439; West Germany 247; Denmark 236.
Total	1,025,377	1,036,001	
Lead:			
Oxides	1,955	1,259	Sweden 616; West Germany 313; United Kingdom 302.
Metal, including alloys:			
Scrap	149	380	Denmark 348; Sweden 31.
Unwrought	11,050	11,704	United Kingdom 7,169; Sweden 2,316; Republic of South Africa 950.
Semimanufactures	1,112	1,113	Netherlands 610; Belgium-Luxembourg 171; West Germany 158.
Magnesium metal, including alloys all forms	18	31	United Kingdom 23; Italy 3; West Germany 3.
Manganese:			
Ore and concentrate	735,699	721,194	Brazil 240,667; Ghana 173,349; Republic of South Africa 122,318.
Oxides	580	427	Netherlands 324; Belgium-Luxembourg 68.
Mercury ——76-pound flasks	232	87	Spain 29; Sweden 29.
Molybdenum metal, including alloys all forms	2	3	Austria 2.
Nickel:			
Matte, speiss and similar materials	100,036	85,492	Canada 82,853; Republic of South Africa 2,639.
Metal, including alloys:			
Scrap	163	--	
Unwrought	155	99	United Kingdom 80; Canada 13.
Semimanufactures	317	294	United Kingdom 136; West Germany 129.
Platinum-group metals and silver:			
Waste and sweeping ——kilograms	21,184	4,155	Switzerland 2,182; Denmark 1,576.
Metal, including alloys:			
Platinum group ——troy ounces	6,494	3,569	United Kingdom 1,608; Switzerland 643.
Silver ——thousand troy ounces	3,070	3,418	United Kingdom 1,763; West Germany 1,392.
Tin metal, including alloys:			
Scrap ——long tons;	53	26	All to Sweden.
Unwrought ——do	665	578	United Kingdom 336; Netherlands 156.
Semimanufactures ——do	529	624	United Kingdom 508; Netherlands 65.
Titanium:			
Ore and concentrate	283	297	All to Australia-Samoa.
Dioxide	333	1,522	West Germany 1,350; Spain 64.
Tungsten metal, including alloys, all forms	1	6	Sweden 2; United Kingdom 2.
Zinc:			
Ore and concentrate	82,471	120,381	Sweden 72,600; Australia-Samoa 27,021; Canada 16,883.
Oxide	1,917	1,550	East Germany 555; Poland 500; West Germany 262.
Metal including alloys:			
Scrap	3,115	2,753	Sweden 2,025; Denmark 501; France 200.
Unwrought	1,131	751	Poland 689.
Semimanufactures	1,220	1,258	Poland 307; France 306; Netherlands 211.
Other:			
Ore and concentrate	649	288	Australia-Samoa 205.
Ash and residue containing nonferrous metals	137	43	Sweden 37.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Other—Continued			
Oxides, hydroxides and peroxides of metals, n.e.s	487	438	Finland 170; United Kingdom 111; West Germany 92.
Metals, including alloys, all forms:			
Metalloids	36	19	Sweden 18.
Alkali akaline-earth, and rare-earth metals	51	107	Austria 50; United Kingdom 50.
Pyrophoric alloys	4	8	United Kingdom 6.
Base metals, including alloys all forms n.e.s	565	976	Republic of South Africa 787; Sweden 82.
NONMETALS			
Abrasives:			
Pumice, emery, natural corundum	2,435	6,350	Iceland 4,918; Italy 1,098; West Germany 113.
Grinding and polishing wheels and stone	811	715	Sweden 175; Austria 169; United States 105.
Asbestos	5,753	5,114	U.S.S.R. 2,350; Canada 2,075.
Barite and witherite	21,830	27,673	United Kingdom 4,792; Ireland 5,510; Italy 5,463.
Boron materials:			
Crude natural borates	1,732	3,485	United States 2,610; Netherlands 575; United Kingdom 300.
Oxide and acid	192	338	France 258; Netherlands 50.
Cement	15,576	12,588	West Germany 4,967; Denmark 3,008; United Kingdom 2,035.
Chalk	10,475	8,833	Denmark 4,183; France 2,213; Sweden 1,660.
Clays and clay products:			
Crude clays:			
Fuller's earth dinas, chamotte	793	640	United Kingdom 359; United States 133; West Germany 123.
Kaolin	83,507	73,946	United Kingdom 71,188; Denmark 806; Finland 617.
Other	56,056	43,253	United Kingdom 27,719; Czechoslavakia 3,380; Sweden 2,591.
Products:			
Refractory	30,788	21,461	Sweden 6,532; United Kingdom 3,222; Denmark 2,973.
Nonrefractory ----value, thousands	$3,400	$3,828	West Germany $805; Netherlands $744; Japan $592.
Cryolite and chiolite	2,500	2,304	All from Denmark.
Diamond:			
Gem, not set or strung--thousand carats	10	10	Belgium-Luxembourg 5.
Industrial ----------do----	25	--	
Diatomite and other infusorial earth	2,097	1,197	United States 519; Iceland 279; Denmark 157.
Feldspar	11	6	NA.
Fertilizer materials:			
Crude:			
Phosphatic	347,813	370,517	U.S.S.R. 249,824; Morocco 59,734; United States 47,109.
Manufactured:			
Nitrogen	1,238	1,280	West Germany 858; Austria 346.
Phosphatic	8,795	14,559	Sweden 11,372; Belgium-Luxembourg 2,429.
Potassic	237,225	235,223	Spain 102,193; France 84,034; West Germany 33,063.
Other	11,830	4,413	Sweden 4,326.
Ammonia	3	4,593	United States 4,590.
Fluorspar	41,132	34,071	United Kingdom 16,401; Italy 6,650; Spain 6,650.
Graphite, natural	417	328	United Kingdom 167; Sweden 109.
Gypsum and plasters	209,340	237,156	France 120,121; Poland 114,900; West Germany 1,464.
Lime	20,576	16,864	Denmark 14,026; Sweden 2,507.
Magnesite	3,699	4,058	Austria 1,516; North Korea 1,480; People's Republic of China 800.
Mica all forms	3,778	5,830	India 3,767; Brazil 1,190; Republic of South Africa 507.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Pigments mineral:			
Natural crude	490	211	West Germany 60.
Iron oxides, processed	2,118	2,543	West Germany 2,253; Sweden 195.
Precious and semiprecious stone, except diamond including synthetic stone dust and powder kilograms	8,898	6,130	United States 5,572; West Germany 309.
Salt and brine	370,574	331,534	Netherlands 118,330; Tunisia 59,301; Italy 46,258.
Sodium and potassium compounds:			
Caustic soda	20,608	43,544	Belgium-Luxembourg 23,949; Netherlands 17,449; France 912.
Caustic potash, sodic and potassic peroxides	875	726	Sweden 337; West Germany 274.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	562	685	Italy 429; People's Republic of China 43.
Slate	4,658	2,705	Sweden 2,426; East Germany 279.
Other	2,123	2,349	Sweden 1,692; East Germany 402.
Worked, all types	2,485	1,617	Portugal 589; Sweden 453; Italy 91.
Dolomite	3,562	2,911	West Germany 1,192; Sweden 1,072.
Flint	1,246	1,285	Denmark 833; France 450.
Gravel and crushed rock	48,996	64,264	Sweden 63,067; Netherlands 403; West Germany 400.
Limestone	296,843	230,551	United Kingdom 216,419; Denmark 12,308.
Quartz and quartzite	196,306	193,326	Spain 110,233; Portugal 45,287; Sweden 29,641.
Sand, excluding metal bearing	153,012	159,064	Belgium-Luxembourg 91,700; Sweden 37,288; United Kingdom 12,044.
Sulfur:			
Elemental	21,225	17,535	Poland 13,596; France 3,375.
Sulfuric acid	41,384	34,276	Sweden 34,217; Netherlands 22.
Talc, steatite, soapstone, and pyrophyllite	2,922	3,029	India 816; Finland 574; United States 506.
Other, n.e.s.:			
Crude	63,531	63,472	West Germany 56,466; East Germany 3,200; Sweden 2,995.
Slag, dross and similar waste, not metal bearing	56,002	48,815	Sweden 43,542; Denmark 3,470.
Oxides and hydroxides of magnesium, strontium, and barium	336	264	East Germany 100; United Kingdom 42; France 35.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	394	371	United States 366.
Carbon black and gas carbon	4,842	4,508	Sweden 1,896; Netherlands 938; United Kingdom 566.
Coal, all grades, including briquets thousand tons	466	418	United States 152; Poland 140; United Kingdom 76.
Coke, all types ——do	615	516	United Kingdom 318; West Germany 96; France 60.
Gas, hydrocarbon	7,948	8,858	Sweden 6,344; Denmark 1,447; United Kingdom 771.
Peat, including peat briquets and litter	4,849	3,539	Sweden 3,453; Finland 61.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	41,247	47,168	Iran 19,144; Muscat-Oman 9,473; Saudi Arabia 6,562.
Refinery products:			
Gasoline (including natural) ——do	5,155	6,527	Belgium-Luxembourg 1,480; United Kingdom 1,422; U.S.S.R. 1,208.
Kerosine and jet fuel ——do	3,378	4,029	United Kingdom 2,285; Belgium-Luxembourg 1,037; Netherlands 400.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
Petroleum—Continued			
Refinery products—Continued			
Distillate fuel oil thousand 42-gallon barrels	11,076	10,787	United Kingdom 3,574; Belgium-Luxembourg 2,290; Netherlands 1,884.
Residual fuel oil ---do---	6,172	6,666	United Kingdom 2,551; U.S.S.R. 1,054; Sweden 860.
Lubricants ---do---	452	441	United Kingdom 150; Sweden 122; Denmark 95.
Mineral jelly and wax ---do---	50	47	West Germany 26; U.S.S.R. 7.
Other:			
Nonlubricating oils, n.e.s ---do---	196	172	Netherlands 81; France 54; United Kingdom 24.
Pitch and pitch coke ---do---	462	421	West Germany 213; United Kingdom 183.
Petroleum coke ---do---	1,543	1,488	United States 1,076; United Kingdom 291.
Bitumen and other residues do---	884	1,068	Denmark 409; Netherlands-Antilles 284; Netherlands 121.
Bituminous mixtures, n.e.s.-do---	17	17	Denmark 6; United Kingdom 4.
Total ---do---	29,385	31,463	

NA Not available.

COMMODITY REVIEW

METALS

Aluminum.—With a strong recovery of export demand in 1973, Norway's production of primary aluminum rose to a record level of 620,000 tons, 14% more than in 1972. Output in 1973 was equivalent to about 90% of productive capacity compared with 80% of that of 1972. Production of aluminum semimanufactures rose nearly 18% to about 100,000 tons. Exports increased by about 8% and included 576,000 tons of ingot and 54,000 tons of semimanufactures valued at approximately $365 million. Export prices were relatively low; the average f.o.b. value for exports of ingot in 1973 was only 0.2% higher than in 1972. Imports of alumina and aluminum hydroxide (no bauxite was imported in 1973) increased by 21% to 1,256,000 tons valued at about $100 million.

Production capacity for primary aluminum was not increased during 1973, but Mosjøen Aluminum A/S announced plans to raise capacity at the Lista smelter by 50%, to 80,000 tons per year by late 1975. The Mosjøen company, jointly owned by Elkem-Spigerverket A/S and Aluminum Co. of America, also operates a 90,000-ton smelter in north Norway. Plans were also announced by A/S Årdal og Sunndal Verk (ASV), the largest Norwegian producer, to increase the combined production capacity of its three smelters to at least 400,000 tons per year by 1980. ASV, which produced about 290,000 tons of aluminum in 1973, is owned jointly by the Norwegian Government and Alcan Aluminium Ltd. Alcan also announced that the 15,000-ton smelter operated at Eydehavn by Det Norske Nitrid Aluminium A/S (DNN) would be phased out by the end of 1974. Reasons for the closure were stated to be obsolescence and high operating costs. DNN is owned jointly by Alcan and British Aluminium Co. Ltd.

A new sheet-rolling mill for aluminum was completed in September 1973 by A/S Nordisk Aluminiumindustri, a subsidiary of ASV. The company now has a production capacity for flat-rolled products of about 50,000 tons per year.

In July, Norsk Hydro A/S acquired full ownership of Alnor Aluminium Norway A/S, by purchasing the 49% share held by Martin Marietta Aluminum Corp. for a reported $20 million. The Alnor facilities, which include a production capacity of about 115,000 tons of primary aluminum and 50,000 tons of aluminum semimanufactures, are now known as Norsk Hydro A/S Karmøy Fabrikker. Norsk Hydro also had tentative plans to build an alumina plant at Mongstad.

The trade agreement signed in 1973 between Norway and the EC was not as favorable to the aluminum industry as Norwegian producers had hoped. The agreement established a transitional period of 9 years for eliminating customs duties on EC imports of primary aluminum and 7 years for aluminum semimanufactures.

Copper and Zinc.—Production and exports of copper and zinc concentrates continued to increase in 1973. Compared with 1972, output of concentrates of both metals was up 20%. Exports of copper concentrate rose by 60% to 64,000 tons valued at approximately $18 million, while exports of zinc concentrate rose 11% to about 15,000 tons valued at $2.3 million. Most of the additional zinc concentrate produced in 1973 was apparently consumed in Norway at the Eitrheim smelter of Det Norske Zinkkompani A/S.

The rise in output of copper concentrate was due to the first full year of production at the Grong and Repparfjord mines in north Norway. The Grong mine produced 22,000 tons of concentrate containing about 22% Cu, while 9,800 tons of 37% Cu concentrate were produced at Repparfjord. The Grong mine also accounted for about one-third of the increase in output of mine zinc, while most of the increase was produced from the new Lergruvbakken mine of A/S Røros Kobberverk. Crude ore at Lergruvbakken averages about 7.8% Zn and 0.7% Cu. Output of copper and zinc concentrates from most other mines, including those of A/S Sulitjelma and Folldal Verk A/S, was slightly below 1972 levels.

A/S Sulitjelma remained the leading producer of copper concentrate (22,600 tons in 1973) and the only producer of blister copper from domestically mined ores. The company produced 7,475 tons of blister copper in 1973 and exported 7,633 tons to West Germany. Plans to increase smelter capacity at Sulitjelma to 30,000 tons of blister copper per year were also announced. The company expected to begin development of a new mine in 1974, in the Mons-Peter Area at Sulitjelma, where drilling has outlined about 850,000 tons of relatively rich copper ore. The new mine was expected to begin production of ore at the rate of 150,000 tons annually, sometime in 1975.

A 5-year, $6.5-million development program was begun in 1973 at the Tverrfjellet mine of Folldal Verk A/S, near Hjerkinn. Sinking of a 16-square-meter ventilation shaft to the 300-meter level was begun. A trackless mining system was planned for mining below the 300-meter level. A spiral truck-haulage drift, 30 square meters in cross section, will be driven at a 10% grade to the 700- or 800-meter level. The ventilation plant to be constructed will deliver about 175,000 cubic feet of fresh air per minute. The development program also includes automation of flotation equipment in the concentrator. The Tverrfjellet operation produced 21,992 tons of copper concentrate and 8,277 tons of zinc concentrate in 1973.

At Løkken, Orkla Grube-Aktiebolag was completing an $8 million flotation plant designed to recover concentrates of copper and zinc from fine-grained pyrite ore. The plant was scheduled to begin production late in 1974 and was expected to produce about 25,000 tons of copper concentrate and 7,500 tons of zinc concentrate per year from about 430,000 tons of crude ore. Pyrite concentrate will be stored underwater for possible future use. The company, which is the leading Norwegian producer and exporter of cupriferous pyrite, has experienced low prices for its pyrite during the past few years and believes that the West German market for pyrite may disappear in the near future.

Refined copper continued to be produced at Kristiansand by Falconbridge Nikkelverk A/S from imported matte. Exports of refined, unalloyed copper in 1973 totaled 23,887 tons, while imports of copper (unwrought and semimanufactures, including alloys) totaled 28,584 tons.

Exports of unwrought zinc increased to 68,000 tons, up 14% from 1972, while imports of zinc concentrate (11,000 tons) were practically unchanged from the 1972 level.

Gold and Silver.—Although mine production of gold and silver was not available from government statistics, small quantities of both metals were being recovered from Norwegian base-metal concentrates at foreign or domestic smelters. Copper concentrate from the Tverrfjellet mine, smelted in Sweden and West Germany, reportedly yielded about 4,500 kilograms of silver and 45 kilograms of gold in 1972. The mine produced about 23,000 tons of copper concentrate containing 24% Cu in that year. Concentrates produced at the Bleikvassli lead-zinc mine in 1973 were

expected to contain about 5,000 kilograms of silver and a small unspecified quantity of gold. Expected production of crude ore at Bleikvassli in 1973 was about 130,000 tons, averaging 2.5% Pb, 4.35% Zn, 0.22% Cu, and 18% S.

Iron Ore.—Production and exports of iron ore in 1973 were about the same as in 1972. Exports of iron ore agglomerates (mostly pellets) in 1973 increased by 120,000 tons and made up 44% of total exports (2,988,000 metric tons) compared with 41% in 1972. Pellets were expected to make up the bulk of Norwegian exports of iron ore in 1974, after a second pelletizing line is completed at Kirkenes by A/S Sydvaranger. An increase of 10% to 13% in 1974 kroner prices for Norwegian ores was also expected. The average value of all iron ore exported in 1973 (including 175,000 tons of roasted pyrite) was about 75 kroner per metric ton, f.o.b. Norwegian ports; this was equivalent to approximately US$13.00 per ton at the 1973 average rate of exchange.

Production of iron ore by company in 1972 and 1973 was as follows, in thousand metric tons:

Company	1972 [1]	1973 [2]	Average Fe content (dry) [1] in 1972
A/S Sydvaranger	2,377	2,360	65%
A/S Norsk Jernverk	829	947	63%–66%
Fosdalens Bergverks A/S	500	508	65.6%
Elkem-Spigerdverket A/S	138	106	60%–67%
Titania A/S [3]	35	41	59.8% (3.2% TiO_2)
Orkla Grube-Aktiebolag [3]	2	2	64%
Total	3,881	3,964	

[1] Statistisk Sentralbyrå (Oslo). Industristatistikk 1972.
[2] Bergverks-Nytt (Trondheim). V. 21, No. 2, 1974; pp. 6–11.
[3] Byproduct magnetite.

Pellets comprised 51% of total output by A/S Sydvaranger and the remainder was unagglomerated concentrate. At the Rana mine of A/S Norsk Jernverk, about one-third of production was magnetite concentrate (66% Fe) used for pellet feed and the remainder was hematite concentrate (63% Fe) used mostly for sinter feed. Production from the Rana mine has been supplemented to some extent by pellet feed supplied by A/S Sydvaranger, and by magnetite sinter feed supplied by Fosdalens Bergverks A/S. Output of iron ore by Elkem-Spigerverket A/S in 1973 included 95,000 tons of vanadium-bearing magnetite from the Rødsand mine, and 11,000 tons of lump ore and concentrate from the Bråstad mine.

The quantity of waste rock and crude ore scheduled to be mined in 1974 was substantially greater than 1972–73 levels at the Sydvaranger and Rana mines. Total rock and ore to be mined by A/S Sydvaranger was 18 million tons, up 4 million tons from 1973. At the Rana operation, which includes three open pits, the scheduled quantity was 10.7 million tons, up 3.2 million tons from 1973. New equipment purchased for the Rana operation in 1973 included three 150-ton diesel-electric (Unit Rig) trucks and a Harnischfeger (P & H 2100-BL) electric shovel with 15-cubic-yard bucket. Five 150-ton trucks were scheduled to be delivered to A/S Sydvaranger in mid-1974.

Total planned output of iron ore products by A/S Sydvaranger through 1978 has been sold under contracts. Long-range plans of the company include facilities for production of prereduced pellets.

Iron and Steel.—Production and exports of iron, steel, and ferroalloys set new records in 1973. Compared with 1972, exports of pig iron increased 34% to 140,000 tons; exports of steel (crude forms and semimanufactures) rose 13% to 643,000 tons; and exports of ferroalloys increased by 16% to 697,000 tons; the corresponding gains in total value (in kroner) were 28%, 21% and 17.5%, respectively. Total exports of iron, steel and ferroalloys in 1973 were valued at about $300 million. Imports of steel also increased 12%, to a record 1,337,000 tons valued at about $330 million.

The state-owned company, A/S Norsk Jernverk, continued to account for about 85% of the pig iron and 80% of the raw steel produced in Norway. The company's works at Mo-i-Rana included six electric ironmaking furnaces, two 40-ton Linz-Donawitz (LD) converters, and three electric steel furnaces. Under an expansion program approved by the Government in 1973, steelmaking capacity will be in-

creased to 800,000 tons per year, production of shipbuilding sections at Mo will be increased 50% to 200,000 tons per year, and production of tinplate at Bergen will be increased 50% to 120,000 tons annually. Cost of the program, which is to be completed in 1976, was estimated at about $75 million of which about 20% will be spent on pollution control.

The steelmaking division of Elkem-Spigerverket A/S accounted for the rest of the iron and steel produced in 1973. Pig iron and ferrovanadium were produced at Svelgen from vanadium-bearing magnetite concentrates produced at the Rødsand mine. Steel was produced mainly at the Nydalen works near Oslo, mostly from local scrap although about 10% of the charge was pig iron from Svelgen. A wide range of products was produced at Nydalen, with the main product being high-tensile reinforcing bars. Steelmaking capacity was reported to be 185,000 tons annually.

Concerning ferroalloys, little information was available on production or new plant developments in 1973. A plant for production of refined ferromangenese was expected to come onstream in February 1973 at the Porsgrunn ferromanganese plant of K/S A/S Fesil-Nord & Co. Norwegian producer prices for ferrosilicon and ferrochrome were reported to have increased sharply during 1973, with the price of ferrosilicon rising nearly 60%.

Exports of ferroalloys in 1972 and 1973 were reported as follows, in metric tons:

	1972	1973
Ferrosilicon	212,366	278,363
Ferromanganese	210,284	225,254
Ferrosilicomanganese	145,613	162,848
Ferrochrome	32,516	28,402
Ferrosilicochrome	1,197	1,414
Ferrovanadium	543	694
Other ferroalloys	471	448
Total	602,990	697,423

Source: Statistisk Sentralbyrå (Oslo). Månedsstatistikk over Utenrikshandelen. December 1972 and 1973.

Imports of manganese ore and chromite in 1973 were 832,000 tons and 87,000 tons, respectively.

Magnesium.—Norsk Hydro reported that the market for magnesium improved considerably during the year ended June 30, 1973; stocks of metal were reduced, and total sales by the Magnesium Division increased by 20% compared with the previous year. Sales for the year ended June 30 were valued at approximately $35 million. Of the 37,500 tons of magnesium produced during calendar 1973, an estimated 35,000 tons was slated for export, mainly to West Germany and other European countries.

Molybdenum.—The Knaben molybdenum mine at Kvinesdal was closed May 1, 1973. The operating company, A/S Knaben Molybdaengruber, cited rising costs of production, the decline of world prices for molybdenum, and the greater productivity of North American producers as principal reasons for the closure. The mine, which produced approximately 937,000 pounds of MoS_2 in 1972, had operated almost continuously since 1885 and in recent years was the only operating molybdenum mine in West Europe. It was owned by the (Swedish) Axel Johnson Group, and all concentrate was exported to Sweden. An estimated 108 employees were affected by the closure.

Exports of molybdenum concentrate totaled 218 tons in 1973, compared with 584 tons in 1972.

Nickel, Cobalt, and Platinum-Group Metals.—The only domestic production of mine nickel continued to be a sulfide concentrate produced as a byproduct of processing ilmenite ore at Tellnes. Output of concentrate (containing 4% to 5% nickel) has increased each year for several years; 10,500 tons were produced in 1973 and 12,000 tons were expected to be produced in 1974. Exports of concentrate in 1973 totaled 11,535 tons.

In the Ballangen Area south of Narvik, exploration for nickel near Rana was reported by Stavanger Staal A/S to have yielded encouraging results. A decision on whether to begin mining was expected in 1975.

Production of refined nickel, cobalt, and platinum-group metals was continued at Kristiansand by Falconbridge Nikkelverk A/S, from nickel-copper matte imported mostly from Canada. The cobalt refinery, which was severely damaged by fire on May 4, 1972, was rebuilt by March 1973 and deliveries of refined cobalt were resumed at that time. The stockpile of cobalt-bearing residues, which had accumulated during the shutdown of the refinery, was expected to be exhausted by the end of 1974. Exports during 1973 included 43,250 tons of refined nickel, 723 tons of refined cobalt, and 38,740 troy ounces of platinum-group metals. Imports of nickel-copper matte totaled 89,646 tons.

Silicon.—Production and exports of elemental silicon continued to increase in 1973. The output of 60,000 tons was about 13% greater than reported capacity at the end of 1972. Exports of silicon in 1973 totaled 55,742 tons, compared with 44,984 tons in 1972.

Titanium.—Titania A/S, a subsidiary of N.L. Industries, Inc., continued to increase output of ilmenite concentrate at Tellnes in 1973. Compared with 1972, production increased by 24%. Exports increased by 14% to 685,000 tons valued at approximately $9.6 million. Production capacity was being increased to 1 million tons of concentrate per year. Net exports of titanium dioxide and titanium pigment in 1973 were valued at about $6.5 million.

NONMETALS

Cement and Other Construction Materials.—The volume of building construction in 1973 appeared to be somewhat less than in 1972. Residential completions increased about 3% during the year, but the number of units under construction declined about 4%. The volume of building construction in the mining and industrial sector was generally lower than in 1972.

Production and exports of cement in 1973 were about the same as in 1972. Exports totaled 1,042,000 tons, including an estimated 600,000 tons of finished cement to the United States and about 300,000 tons of clinker to Ghana. Domestic consumption was estimated at about 1.7 million tons. No new cement kilns were installed in 1971 or 1972, but Norcem A/S announced plans to build a new plant with a production capacity of 1 million tons per year. The plant was expected to cost about $90 million and was to be completed by 1978.

Exports of building stone, consisting mainly of slate from north Norway and an attractive variety of syenite ("labrador") from the southern part of the country, continued to increase in 1973. Exports included 50,600 tons of slate, 83,000 tons of "labrador," and 7,500 tons of marble and other stone, with a combined f.o.b. value of about $16 million.

In 1973 the Norwegian building-stone industry included about 250 firms with a total employment of approximately 2,200. Only 20% of the firms employed more than 20 persons each; 40% employed between 5 and 20 persons; and the remainder employed less than 5 persons each.

Early in 1973, A/S Sydvaranger was reported to have negotiated a long-term contract with a German importer, for delivery of 500,000 tons of crushed stone from Kirkenes in north Norway. By shipping the stone in vessels of 30,000 to 50,000 tons cargo capacity from the deep-water harbor at Kirkenes, the freight cost to Germany was expected to be less than 10 kroner per ton, compared with present costs of about 15 kroner per ton for shipments of 3,000 to 4,000 tons from ports in south Norway.

Exports of crushed stone and gravel in 1973 again exceeded 1 million tons, with the major share destined for West Germany. The principal exporter was believed to be Fjordstein A/S at Hauge-i-Dalane. The latter company produced 735,000 tons of crushed stone in 1973.

Statistics released late in 1973 indicated that the total volume of rock blasted in construction of tunnels in Norway in 1972 (excluding mines) was 4.7 million cubic yards, and the aggregate length of tunnels was 112 miles. Hydroelectric power projects accounted for 72% of the total volume, followed by highway tunnels (14%) and sewers (4%). Plans for 1973 included 100 miles of tunnel with an aggregate volume of 4.8 million cubic yards.[3]

Feldspar.—Production and exports of nepheline syenite increased for the 12th consecutive year. Exports in 1973 totaled 192,000 tons, 20% more than in 1972. The sole producer was Norsk Nefelin division of Elkem-Spigerverket A/S. Scheduled production in 1974 was 212,000 tons. Exports of other feldspar also increased in 1973, to 94,600 tons.

Fertilizer Materials.—An estimated 750,000 tons of ammonia were produced in 1973. Most if not all of the output was produced by Norsk Hydro, which reported production of 700,000 tons for the year ended June 30. About one-third of the company's output was produced by electrolysis at Glomfjord in north Norway, and the remainder was produced at Herøya by a steam-reforming process based on naphtha. Most of the ammonia was used in Norway for production of calcium nitrate, urea, and compound fertilizers but about 175,000 tons was exported. In 1973, Norsk Hydro announced plans to build an ammonia plant with a production capacity of 600,000 tons per year, in cooperation

[3] Bergverks-Nytt (Trondheim). V. 20, No. 11, 1973, p. 21.

with Swedish and Danish partners. The location of the proposed plant was not specified.

Imports of raw materials for production of fertilizer in 1973 included 390,000 tons of crude phosphate and 248,000 tons of potassium compounds. Exports of nitrogenous and compound fertilizers increased 15% to 1.63 million tons, valued at about $90 million. Production capacity for compound fertilizers was increased by 150,000 tons each at the Glomfjord and Herøya plants of Norsk Hydro during 1973.

Consumption of fertilizer nutrients in Norway during the 1972–73 agricultural year was estimated at 80,200 tons of nitrogen, 61,100 tons of potassium, and 25,300 tons of phosphorus.

Pyrites and Sulfur.—Production of pyrites (including cupriferous pyrite) in 1973 was slightly less than in 1972, but exports declined 16% to 483,000 tons. The main factors in the decline appeared to be low prices for sulfur and decreased production at Løkken by Orkla Grube-Aktiebolag. A further decline was expected in 1974, as Orkla will begin flotation of copper and zinc concentrates from its pyrite ore, but reduced output at Løkken may be offset by increased production scheduled at the Tverrfjellet and Sulitjelma mines.

Production of sulfuric acid in 1973 was the highest on record. About 300,000 tons were produced from pyrite at Sarpsborg by A/S Borregaard, and most of the remainder was produced from zinc smelter gases at Eitrheim by Det Norske Zinkkompani A/S. The output at Eitrheim was used in the manufacture of phosphoric acid for export to Sweden, and aluminum fluoride for consumption in Norway. Part of the sulfuric acid produced at Sarpsborg was exported to the Brazilian affiliate of Borregaard for the manufacture of cellulose.

MINERAL FUELS

Coal and Coke.—Production of coal on Svalbard was the lowest since 1969. Shipments totaled 407,000 tons. Most of the coal was used at the state-owned steelworks at Mo-i-Rana, where it was mixed with coal imported from the United States and made into metallurgical coke. About 80,000 tons were exported, mainly to West Germany. Imports of coal in 1973 totaled 403,000 tons. Imports of coke were 577,000 tons, plus 324,000 tons of petroleum coke.

Store Norske Spitsbergen Kulkompani A/S (SNSK), the only Norwegian producer of coal, was given substantial financial support by the Government in 1973, in the form of grants and loan guarantees, in order to continue mining operations at Longyearbyen and to develop the Svea coal deposits. Production of 500,000 tons annually from the Svea deposits was possible by 1976. SNSK is now owned one-third by the Government.

Petroleum and Natural Gas.—*Exploration.*—In the summer of 1973, bids were requested by the Government for a number of exploration concessions in the Norwegian sector of the North Sea, but no awards were made and none was expected until 1974. Areas north of 62° latitude continued to be reserved by the State. Only about half of the commercially interesting areas south of 62° latitude was under license in 1973.

Drilling by the Phillips Group in 1973 was stated to have confirmed the presence of a major oilfield in the Eldfisk structure, about 9 miles south of the Ekofisk Field. Tests on the first extension well, 5 miles south of the center of Ekofisk, indicated a flow of 13,500 barrels of oil per day; the second, 4 miles south of the first, indicated a flow of 10,200 barrels per day of high-gravity, low-sulfur oil from four pay zones with an aggregate thickness of 508 feet; and a third, at an unspecified location indicated up to 3,600 barrels per day.

Eight miles northwest of the Ekofisk Field, a well drilled by the Phillips Group on the Albuskjell structure indicated a daily flow of 2,900 barrels of oil and 16 million cubic feet of gas. A previous well drilled farther west on the same structure by A/S Norske Shell had tested 2,700 barrels of oil per day.

The oil deposits in the Ekofisk Area, including the Eldfisk, Edda, Albuskjell, and Tor structures, are typically found in limestone of Danian/Maastrichtian (Cretaceous) age at a depth of about 10,000 feet.

Production.—The four wells in the Ekofisk Field produced 11.8 million barrels of oil in 1973 according to the Phillips Petroleum Co. The wells were shutdown for a total of 65 days by bad weather conditions. Drilling of 30 production wells and 8 injection wells from 3 platforms was underway and scheduled for completion early in 1975. The new facilities

are expected to produce about 300,000 barrels of oil per day. A million-barrel-capacity concrete storage tank was towed to the production site in June 1973 and set in place in 230 feet of water. The tank was to come into service in mid-1974, storing crude oil that cannot be loaded into tankers during bad weather.

The 220-mile, 34-inch crude oil pipeline being built from the Ekofisk Field to Teeside, was nearly completed at yearend although its construction was not authorized by the Norwegian Parliament until late in April. The pipeline and terminal facilities were expected to be completed by the spring of 1975. Contracts were also let for the construction of a 270-mile, 36- to 42-inch gas pipeline from Ekofisk to Emden, West Germany. Construction of the latter pipeline was expected to start in the spring of 1974, with completion by late 1975. Installed annual throughput capacity of the two pipelines was expected to be 50 million tons of crude oil and 16 billion cubic meters of gas, respectively. The gas contract covers delivery of 164 billion cubic meters over a 20-year period; 50% of the volume will be used by Ruhrgas A. G. of West Germany, and the remainder will be equally divided by N. V. Nederlands Gasunie, Gaz de France, and Distrigaz of Belgium. The pipeline companies for both oil and gas will be owned jointly by the Norwegian State Oil Co. (Statoil) and the Phillips Group, with the Phillips Group being sole operator.

Plans to produce natural gas from the Frigg Field, about 250 miles north of Ekofisk, were being studied by Norsk Hydro. Plans include a 240-mile pipeline to Peterhead, Scotland, and development of the field for production in 1976. Norsk Hydro has a 32.87% interest in the field. The field straddles the boundary between the British and Norwegian sectors and is estimated to contain reserves of about 200 billion cubic meters of gas.

Trade, Refining, and Consumption.—Exports of crude oil in 1973 totaled 1,532,000 tons and were mostly destined for the United Kingdom and West Germany. The oil came from the Ekofisk Field, where it was pumped into tankers via mooring buoys in the open sea. Gas separated from the oil was flared.

Imports of crude oil in 1973 totaled 7.05 million tons, about 10% more than in 1972. The principal supplying country was Iran. Total throughput of crude oil at Norwegian refineries was about 6.4 million tons. Exports of refined products in 1973, mostly to the United Kingdom and Sweden, totaled 2.1 million tons; imports totaled 4.5 million tons, mostly from the United Kingdom. Fuel oils made up 82% of exports and 55% of imports.

Construction of the refinery at Mongstad, near Bergen, was continued. Completion was expected early in 1975. The refinery will have a refining capacity of 4 million tons of crude oil per year. About half of the output of refined products will be available to Norsk Hydro, including about 600,000 tons for the company's own needs and 1.5 million tons for sale. A 49% interest is held by a subsidiary of British Petroleum.

One of the concessions obtained by the Government from the Phillips Group, prior to approval of the latter's plans to pipe oil and gas produced at Ekofisk to the United Kingdom and West Germany, was an option to purchase sufficient liquefied natural gas, landed in Norway free of freight charges, to produce 250,000 tons of ethylene per year for the establishment of a petrochemical industry in Norway. Two groups of Norwegian companies applied to take over the Government's option but no decision was announced by yearend. The two groups were Norsk Hydro, A/S Borregaard, and Saga Petroleum A/S with five other major concerns.

Inland consumption of petroleum products in 1972 and 1973 was as follows, in thousand metric tons:

Product	1972	1973
Aviation fuels	287	281
Gasoline	1,068	1,068
Kerosine	422	466
Gas/diesel oil	2,946	3,131
Residual fuel oil	1,933	1,927
Other	853	1,062
Total	7,509	7,935

Source: Organization for Economic Cooperation and Development (OECD; Paris). Provisional Oil Statistics by Quarters, 4th Quarter 1973. 1974, 21 pp.

The Mineral Industry of Pakistan

By George E. Fish, Jr. [1]

The mineral-based industries of Pakistan provided less than 1% of the country's gross national product (GNP). Natural gas from the Mari and Sui natural gasfields and the Dhulian oilfield continued to be the major component of Pakistan's mineral industry. Reserves of natural gas in the Dhulian, Mari, and Sui Fields are sufficient to supply the nation's requirements in the foreseeable future. Significant quantities of chromite, clays, gypsum, rock and marine salt, sand and gravel, stone, and a few other metallic and nonmetallic minerals were produced in Pakistan. Some of the commodities were exported in sufficient quantities to earn vitally needed foreign exchange. Although the overall foreign exchange situation for Pakistan has improved somewhat, the income received from exportation of mineral commodities is more than offset by the necessity of importing iron and steel, crude petroleum, and partially or completely refined petroleum products.

Statistical sources indicated that the mining and quarrying of crude minerals provided $26.7 million [2] in current dollars to Pakistan's GNP of $4,874 million for the fiscal year ending June 30, 1972. For the fiscal period ending June 30, 1973, the contribution of mining and quarrying to the GNP increased 32% to $35.3 million, but the total GNP increased only 15% to $5,640 million. These data are not comparable with data presented in previous editions of the Bureau of Mines Minerals Yearbooks because of the devaluation of the Pakistani rupee and the removal of the contribution of the former east wing of Pakistan (now Bangladesh). It is assumed that the processing of crude minerals adds significantly to the value, although available data do not provide information concerning the value added through processing of either native or imported mineral raw materials. A large amount of revenue is provided to the Government by the petroleum and natural gas industry from the levy of duties and other special taxes on raw and processed fuels. Also, the consumption of petroleum and natural gas from domestic sources permits the Pakistani Government to retain large amounts of foreign exchange that would otherwise be required to import these commodities for domestic use.

PRODUCTION

The four provinces of Pakistan produced natural gas, stone, sand and gravel, rock and marine salt, clay, magnesite, chromite, marble, and sulfur in appreciable quantities. Pakistan continued to produce finished products such as chemical fertilizers, chemicals, and cement, the manufacture of which consumed, to some extent, domestically produced raw minerals. Mineral raw materials and mineral-based production not required for domestic consumption was exported for consumption in other countries.

[1] Physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

[2] Where necessary, values have been converted from Pakistani Rupees (PRs) to U.S. dollars at a rate of PRs 10.05=$1.00.

Table 1.—Pakistan: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Aluminum, bauxite, gross weight	283	533	424
Antimony ore:			
Gross weight	157	223	70
Metal content e	31	45	14
Chromium, chromite, gross weight	24,163	32,207	21,929
Iron and steel, mild steel products [1] ---thousand tons	p 180	p 186	205
Lead ore:			
Gross weight	12	(2)	--
Metal content e	6	(2)	--
Manganese ore, gross weight	91	127	172
NONMETALS			
Abrasives, natural, emery stone	566	2,246	599
Barite	2,962	2,402	1,725
Cement, hydraulic ---thousand tons	2,621	2,694	2,879
Chalk	925	1,089	556
Clays:			
Bentonite	108	481	407
Fire clay	27,608	26,566	22,179
Fuller's earth	10,737	11,246	11,334
Kaolin (china clay)	2,732	4,260	729
Other [3]	e 50,000	24,625	104,690
Feldspar	305	237	1,209
Fertilizer materials, manufactured:			
Nitrogenous: [4]			
Gross weight	265,442	571,624	664,251
Nitrogen content	107,425	251,849	290,504
Phosphatic, gross weight	27,676	32,126	38,147
Fluorspar	4,770	2,383	1,595
Gypsum, crude	133,513	154,138	92,387
Magnesite, crude	220	294	2,410
Natron, manufactured (soda ash)	80,575	68,451	76,128
Pigments, natural mineral, ocher	1,546	4,455	5,900
Salt:			
Rock ---thousand tons	345	362	378
Marine ---do	266	234	102
Total ---do	611	596	480
Sand and gravel:			
Gravel	e 71,000	69,052	58,153
Sand:			
Bajri [5]	e 8,600	7,550	15,977
Common [6]	27,000	14,152	
Glass [7]	35,312	47,732	37,965
Stone:			
Aragonite	11,703	17,430	17,738
Dolomite	2,019	330	156
Limestone ---thousand tons	2,523	2,754	2,855
Marble	2,217	1,252	(8)
Crushed [6 9]	214,951	67,145	506,451
Strontium minerals, celestite	399	343	13
Sulfur [10]	2,534	3,036	3,193
Talc and related materials, soapstone	e 4,700	4,396	3,983
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades ---thousand tons	800	e 800	e 800
Gas, natural, sales ---million cubic feet	107,680	118,680	132,100
Natural gas liquids e ---thousand 42-gallon barrels	60	65	70

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity		1971	1972	1973 p
MINERAL FUELS AND RELATED MATERIALS—Continued				
Petroleum:				
Crude oil	thousand 42-gallon barrels	r 3,000	3,294	e 3,300
Refinery products:				
Gasoline	do	2,774	4,173	e 4,300
Jet fuel	do	3,358	2,409	e 2,500
Kerosine	do	2,482	3,596	e 3,700
Distillate fuel oil	do	6,169	6,772	e 7,000
Residual fuel oil	do	8,030	9,736	e 10,100
Lubricants	do	621	343	e 350
Other	do	1,571	1,499	e 1,550
Refinery fuel and losses	do	1,241	1,426	e 1,500
Total	do	26,246	29,954	e 31,000

e Estimate. p Preliminary. r Revised.
[1] As reported in source, types of products not specified.
[2] Revised to none.
[3] Sind Province only; additional quantities may be produced in other provinces, but are not reported.
[4] Data are for urea and ammonium sulfate only; ammonium nitrate presumably is still produced, but recent data are not available owing to Pakistan Government restrictions. In the year ending June 30, 1965 (latest data available), ammonium nitrate output totaled 76,086 tons (gross weight) with an indicated nitrogen content of 26,630 tons.
[5] As reported by North-West Frontier Province only; no details on the nature of this sand are available.
[6] Punjab and Sind Provinces only; additional quantities may be produced in other provinces.
[7] Punjab, Sind, and North-West Frontier Provinces only; additional quantities may be produced in other provinces.
[8] Aragonite and marble are reported inseparably, and the combined figure has been entered under aragonite.
[9] Reported in source as ordinary stone.
[1] Less than $50,000.

TRADE

Pakistan sources indicated that overall export performance during 1972–73 was much improved over that of the 1971–72 fiscal year. Overall, exports of all commodities showed tendencies to overheat the economy and, prompted the Government, to place some restrictions on exports. Cement, petroleum, and petroleum refinery products continued to make up the bulk of the nation's mineral and mineral-based exports.

The major Pakistan imports of mineral and mineral-based commodities consisted of iron, steel, scrap metal, crude petroleum, and petroleum refinery products. The remainder consisted of fossil fuels, various metals, and other mineral materials.

Table 2, based on official trade information, supplies the best available quantitative export data.

The following tabulations show the value of recorded mineral commodity exports and reexports, and imports, respectively.

Commodity or commodity group	Value of exports and reexports (million dollars)	
	1971–72	1972–73
Chromite	0.8	0.9
Other metallic ores	.4	(1)
Metals, including scrap	.1	.1
Cement	8.9	8.9
Gem stones except diamond	.3	.7
Salt	.4	.2
Stone, sand and gravel	1.1	1.3
Petroleum and petroleum refinery products	8.6	11.7
Other	2.1	.7
Total	22.7	24.5

[1] Less than $50,000.

Commodity or commodity group	Value of imports (million dollars)	
	1971–72	1972–73
Iron and steel, including ores and scrap	79.3	74.9
Other metals, including ores and scrap	14.4	18.1
Fertilizer materials	11.3	37.2
Coal and coke	7.9	3.1
Crude and partly refined petroleum	35.9	42.1
Petroleum refinery products	17.7	16.9
Other	4.1	7.1
Total	170.6	199.4

Table 2.—Pakistan (excluding Bangladesh): Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971–72	1972–73
METALS		
Aluminum metal, including alloys, semimanufactures	4	--
Chromium ores and concentrates	22,357	27,118
Copper metal, including alloys, all forms	13	3
Iron and steel:		
Scrap	--	5
Semimanufactures	51	103
Lead metal, including alloys, all forms	1	--
Platinum ---troy ounces	r 6,052	4,200
Tin ---long tons	r 1	1
Other ores and concentrates, n.e.s	12,955	9
NONMETALS		
Abrasives, natural:		
Dust and powder of precious and semiprecious stones ---value	$390	--
Grinding and polishing wheels and stones ---do	r $12,112	$4,185
Barite	--	1,016
Cement	569,759	697,857
Chalk, crude	9	2
Clays and clay products:		
Crude clays, n.e.s.:		
Fire clay	125	2
Other	557	--
Products:		
Refractory	1,779	137
Nonrefractory	--	5
Feldspar and fluorspar	--	1
Fertilizer and fertilizer materials, manufactured	10,584	5,332
Gem stones other than diamond ---kilograms	16,024	53,476
Mica, crude and worked	--	20
Salt	61,977	17,177
Stone, sand and gravel:		
Dimension stone	8,848	12,397
Crushed and broken stone	r 5	56
Talc, steatite, soapstone, pyrophyllite	--	2,700
Other nonmetals, n.e.s	204	--
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	7,588	4,525
Coal and coke	686	300
Gas, hydrocarbon:		
Natural ---value	--	$28
Manufactured ---do	--	$202
Petroleum:		
Partly refined ---thousand 42-gallon barrels	--	(1)
Topped crude [2] ---do	345	949
Refinery products:		
Gasoline ---do	r 11	(1)
Kerosine and jet fuel ---do	6	2
Distillate fuel oil ---do	962	1,070
Residual fuel oil ---do	2,441	3,522
Lubricants ---do	178	122
Other:		
Asphalt ---do	--	12,131
Unspecified ---do	(1)	--
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	--	4

r Revised.
[1] Less than ½ unit.
[2] Reported in source as "topped crude—naphtha."

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—Pakistan produced small quantities of bauxite for domestic consumption in nonaluminum-producing uses. Bauxite production for this purpose declined 20% from 533 tons in 1972 to 424 tons in 1973. All of the 1973 production originated in the Province of Punjab.

Chromite.—Production declined 32% to 21,929 tons in 1973, the lowest reported output since 1969. Estimated reserves of chromite are 2 to 3 million tons, located in the Muslimbāgh Area of Baluchistan. The bulk of the chromite produced (about 90%) was exported to the United States.

Copper.—A crash program was initiated for a comprehensive investigation of porphyry copper deposits at Saindak in Chagai District, Baluchistan. Preliminary estimates indicated that the deposits may contain 250 million tons of copper ore with an average copper content of 0.5% to 0.6%. Drilling operations have been hampered by a lack of water, which has prompted the Geological Survey of Pakistan to search for underground water sources.

Iron and Steel.—Production of various manufactured and semimanufactured iron and steel items in 1973 increased 10% over that of the previous year. Pakistan is totally dependent on imports of crude iron and steel.

In an attempt to establish a domestic iron and steel industry, the Pakistani Government plans to set up a pig iron plant that would utilize sizable iron ore deposits discovered in Chilghazi and Durbin Chab Areas of Chagai District. Iron ore reserves in the area are estimated to be 5 million tons, with further exploration continuing to more precisely evaluate the deposits. The 100,000-ton-capacity pig iron plant will be built with the assistance of the People's Republic of China at a cost of $27 million.

An iron and steel plant capable of producing 1 million tons annually will be erected east of Karachi at Pipri with extensive Soviet assistance. This plant, which will rely exclusively on imported iron ore, is expected to be operational by 1978.

Uranium.—The United Nations Development Program Governing Council has approved a request to extend an ongoing uranium research project for 3 additional years to expand and accelerate exploration and training. The assistance approved will be in the form of expert advisory services, fellowships, and equipment, worth $892,800. The Pakistan Government is interested in assessing domestic uranium resources as a source of fuel for the existing and planned nuclear powerplants.

NONMETALS

Barite.—Barite production declined 28% from 2,402 tons in 1972 to 1,725 tons in 1973. This is the second consecutive year in which production declined.

The Pakistan Executing Committee of the National Economic Council approved the proposed Khuzdar barite mining project, which is a joint venture between the Baluchistan State Government and Pakistan Petroleum Ltd. Plans for the project envisioned a first-year production of 15,000 tons, which would reach 60,000 tons in 1979. The project is basically export-oriented and is expected to generate a substantial amount of foreign exchange.

Cement.—Production from the nine cement plants in Pakistan increased 7% in 1973. Exports of cement to Middle East countries in the fiscal year 1972–73 increased 67% in value over those of the previous fiscal year. The Government plans to set up two new cement factories, one in Baluchistan and the other either in Sind or Punjab. The Baluchistan plant was planned after Iran agreed to purchase 80% of its production.

Fertilizer Materials.—Various chemical fertilizers such as urea, ammonium nitrate, ammonium sulfate, and superphosphate were produced in Pakistan. Production increased 16% in 1973, but was still 30% short of domestic requirements.

Contracts were awarded for a major expansion of the fertilizer plant at Multan. The $100 million project is a joint venture of the Pakistan Government and Abu Dhabi's National Oil Co. The plant will have a designed daily capacity of 1,200 tons of nitric acid, 1,015 tons of nitrophosphate, 1,500 tons of calcium ammonium nitrate, and 1,000 tons of ammonia.

Gypsum.—Crude gypsum production decreased sharply from 154,138 tons in 1972 to 92,387 tons in 1973. About 60% of the

domestic consumption is used by Pak-American Fertilizers Ltd., with the remainder used in the manufacture of cement. The D. G. Khan quarry in Punjab produced more than 90% of all gypsum mined in Pakistan.

Salt.—Pakistan has large reserves of rock salt. The Khewra mines in the Salt Range of Punjab were reputed to be the second largest in the world. Production of rock salt increased slightly in 1973, but marine salt production in 1973 was less than half that produced in 1972. Overall salt production decreased 19% in 1973 when compared with data for 1972.

MINERAL FUELS

Pakistan's energy consumption in 1973 from all forms of available commercial fuels was estimated to be the equivalent of 8.0 million tons of fuel oil. During 1973, the composition of the national energy requirement was estimated as follows: petroleum, 41%; natural gas, 36%; coal 9%; and hydroelectric/nuclear, 14%.

Coal.—Production has remained virtually unchanged for the past 3 years. During 1973, no coal was exported from Pakistan, and approximately 30,000 tons was imported. Major new industries, such as fertilizer plants, rely exclusively on natural gas, and numerous existing industries have switched from coal to gas as a source of energy.

Natural Gas.—During 1973, Pakistan's output of natural gas from the Dhulian oilfield and the Mari and Sui gasfields increased 11% over the 1972 production. For the first time in 19 years, during December 1973, Sui gas production exceeded 400 million cubic feet per day. Karachi Gas, Indus Gas, and Sui Northern Gas Pipelines added 31,816 new customers to their distribution system of which 250 were industrial, 1,865 were commercial, and 29,701 were domestic customers. Industrial customers consumed more than 95% of all natural gas produced. The fertilizer industry consumed 29,473 million cubic feet of gas in 1973.

Petroleum.—Estimated crude oil production in Pakistan remained essentially the same in 1973 when compared with similar data for 1972. Domestic petroleum production satisfied only 12% of the nation's requirements. The high dependency on imported petroleum, coupled with large increases in the price of oil in the latter part of 1973, has had, and is continuing to have, serious effects on Pakistan's foreign exchange posture.

In March 1973, Marathon Oil Co. of the United States concluded a concession agreement for a 10,000-square-mile area on the coast of Baluchistan and offshore. In April 1973, Amoco Pakistan Exploration Co. signed an agreement for a new concession of almost 20,000 square miles near its 1969 concession in the Punjab and the Sind. On December 2, 1973 Amoco spudded in its first well at Sarai Sadher. Two refineries at Karachi and one at Morgah currently process approximately 3.5 million tons of petroleum annually, and the Government is attempting to increase that capacity.

The Mineral Industry of Peru

By F. W. Wessel [1]

Based on preliminary data, Peru's gross domestic product (GDP) in 1973 was $7.2 billion,[2] an increase of 5.8% over that of 1972. Mineral production accounted for $549 million, or 7.6%, of the GDP; the value of mineral production was 3.3% higher than in 1972. Peru's exports in 1973 amounted to $1.12 billion, an increase of 18.4%. The value of mineral exports in 1973 was $643.9 million, or 57.5% of the total export value, and represented a 34.1% increase over the 1972 level. However, a 29% increase in imports for the year reduced the favorable trade balance from $148 million in 1972 to $24 million in 1973.

On August 16, Supreme Decree 034-73-EM/DGM was issued, implementing Mining Law 18880 by setting forth welfare and security regulations. Essentially these regulations were concerned with the health and safety of mining labor, although some attention was given to the security of installations and properties to ensure continued employment.

On March 14, by Supreme Resolution 849-73-ED, a mining school was established in Ancash, with the dual purpose of providing professional technical education and also functioning as a trade school for mining labor. In addition, Decree Law 2023, enacted December 4, set forth the purpose and operational methods of the Scientific and Technological Mining Institute (STMI) created by Mining Law 18880; the STMI will apparently be research oriented.

Almost identical in form, Decree Laws 20035 and 20036 (May 29) were issued as new organic acts for Empresa Minera del Perú (Minero Perú) and Empresa Petróleos del Perú (Petroperú), respectively. Major differences from the previous organic acts were the doubling of capitalization to $517 million in each case, and establishment of boards of directors.

On September 6 Peru's Minister of Energy and Mines outlined official plans for the mining and petroleum industries in Peru. A policy of development and state operation of large mineral deposits will be pursued. In parallel action, a major prospecting and exploration effort will be undertaken, in the hope of diversifying the mix of Peru's mineral exports and thus reducing dependence on copper. Annual copper production is to be increased to 1 million tons by 1980; new production from Cerro Verde, Cuajone, and Tintaya and expanded output from Casapalca, Cobriza, and others will make up the first stage of the increase, with five other major copper deposits coming into production at subsequent intervals. Refineries will be built to enable Peru to export a higher value product. Coal and phosphate development projects were underway, and development partners were being sought for two major iron deposits.

No further operating contracts will be concluded for petroleum production; present contracts were considered sufficient to supply domestic demand and permit modest exports.

Peru planned an expenditure of $1 billion to develop its steel industry between 1974 and 1990. Emprésa Siderúrgica del Perú (SIDERPERÚ) is to modernize and rationalize its Chimbote works. In later stages, production is to be increased from the present 300,000 tons per year to 500,000 tons and finally to 2 million tons. A new mill, to be built at Nazca near the Marcona mine, will have a nominal annual capacity of 2 million tons, and will include a blast furnace, basic oxygen furnaces, and continuous-casting facilities.

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[1] Physical scientist, Division of Nonferrous Metals—Mineral Supply.

[2] Where necessary, values have been converted from Peru soles (S/) to U.S. dollars at the rate of S/38.7 = US$1.00.

Minero Perú issued the following list of priority projects, in which it intends to engage:

Priority	*Project*
1	Cerro Verde copper mine development.
2	Ilo copper refinery.
3	Cajamarquilla zinc refinery.
4	Tintaya copper mine development.
5	Santa Rosa copper mine development.
6	Lead smelter and refinery (site not selected).
7	Chalcobamba-Ferrobamba copper mine development.
8	Antamina copper-zinc mine development.
9	Quellaveco copper mine development.
10	Michiquillay copper mine development.
11	Bayovar phosphate mine development, including treatment plant.
12	Berenguela copper-silver mine development.
13	Oyon coal mine development.
14	Alto Chicama coal mine development.

Total cost was estimated at $1.2 billion from external financing.

Banco Minero del Perú borrowed $60 million from the Inter-American Development Bank to aid small- and intermediate-size nonferrous metal mines. Of 58 projects, 47 were base-metal mines and 6 were gold and silver mines; tungsten and antimony were also represented. As existing contracts expire, Minero Perú will handle all sales from mines under governmental control.

Peru nationalized its railways in 1972. Early in 1973 it was announced that $40 million will be spent over a 5-year period for right-of-way repair, additional motive power and rolling stock, construction of shops, redesign of classification yards, and some centralized traffic control.

Peruvian mining policy calls for state control of all large mining operations. Events during 1973, in accordance with this policy, led to the acquisition of the Peruvian assets of Cerro de Pasco Corp., a wholly owned subsidiary of Cerro Corp., and repatriation of its concessions. As a result of proposals made by Cerro Corp. to Peru in 1972, the Government, advised the company in July 1973, that it was ready to begin negotiating for the sale of part or all of Cerro de Pasco Corp. Cerro Corp.'s 22% share in Southern Peru Copper Corp. (SPCC) was not involved.

In negotiations which began September 13, Peru offered Cerro Corp. between $12 and $16 million for Cerro de Pasco, following a valuation formula which considered only physical assets; ore reserves were assumed to belong to Peru in any event. The company's valuation of its subsidiary was about $150 million; in 1972, Cerro de Pasco's sales reached $129 million and accounted for one-fifth of Peru's total export value. Government negotiators, however, insisted that the amount of compensation be determined solely by the Government. Cerro Corp. withdrew its offer to sell Cerro de Pasco Corp. to Peru on September 24. However, the Peruvian Government, invoking recently enacted laws, was officially to take possession of Cerro de Pasco Corp. on January 1, 1974, renaming the operation "Centromin-Perú."

Workers at the Marcona Mining Co. iron property were on strike from February 23 to mid-June. Steel production was interrupted on May 25 at Chimbote when 3,000 workers struck the plant, already suffering from the effects of a sabotaged rolling mill. A strike of a few days' duration in June stopped production at the Toquepala mine and Ilo smelter of SPCC. A sitdown strike in that company's mill began July 4 and in a few days caused the Ilo smelter to shut down because of lack of feed. White-collar workers employed by SPCC struck on September 6 and remained out until October 1. On November 27 miners at Toquepala and Ilo went on strike, an action which remained unsettled at yearend. Workers at five smaller mines (Atacocha, Chicrin, Condestable, Huaron, and Metalurgia Peruana) went out on strike on September 4; Atacocha, Huaron, and Metalurgia Peruana, resumed production on September 24, and the other two mines somewhat later. On December 6, 4,000 mine workers at smaller mines staged a 2-week strike in sympathy with workers at Toquepala and Ilo. Estimated daily cost to Peru of production loss by SPCC was $500,000 in foreign exchange and $200,000 in taxes. The strike was settled December 18 with government recognition of the Miners' Federation.

PRODUCTION

In terms of mine output, Peru's production of lead, zinc, gold, and silver increased 8%, 10%, 21%, and 3%, respectively; copper production remained at its 1972 level. Refined copper, lead, and zinc production were respectively 1%, 3%, and

0.2% less than in the previous year. Production of iron ore declined 5%, but production of steel doubled. Production of manganese ore and mercury showed sharp decreases.

Cement production increased 7%, continuing a rising trend. Barite production maintained its strong performance of the previous year.

Crude petroleum production and refining throughput both increased 9% during 1973. Of total refinery feed, a net 31% was imported.

Table 1.—Peru: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Antimony:			
Mine output, metal content	687	749	770
Metal (content of antimonial lead bars)	311	370	324
Arsenic, white	656	1,019	e 1,100
Bismuth:			
Mine output, metal content	642	725	572
Metal	600	665	512
Cadmium:			
Mine output, metal content	449	517	562
Metal	171	210	212
Copper:			
Mine output, metal content	207,346	219,126	219,000
Copper sulfate	687	867	e 850
Metal:			
Blister	133,792	137,040	134,009
Refined	32,561	39,213	38,976
Gold:			
Mine output, metal content ---troy ounces	83,752	86,421	104,490
Metal ---do	35,697	51,827	52,727
Indium ---kilograms	1,868	2,398	3,459
Iron and steel:			
Iron ore and concentrate ---thousand tons	8,849	9,414	8,964
Pig iron (excluding blast furnace ferroalloys) ---do	143	163	259
Steel, ingot and casting ---do	179	181	360
Lead:			
Mine output, metal content	165,814	184,381	199,000
Metal	67,515	86,009	83,269
Manganese:			
Ore and concentrate, gross weight	9,753	11,024	7,778
Metal content	2,926	3,066	2,333
Mercury ---76-pound flasks	3,462	4,550	3,582
Molybdenum, mine output, metal content	802	766	647
Selenium ---kilograms	7,069	8,021	7,689
Silver:			
Mine output, metal content ---thousand troy ounces	39,952	40,370	41,654
Metal ---do	19,367	24,152	20,917
Tellurium metal ---kilograms	23,885	1,789	26,251
Tin, mine output, metal content ---long tons	167	124	218
Tungsten, mine output, metal content	760	954	860
Zinc:			
Mine output, metal content	318,073	376,129	412,000
Metal, refined	59,143	69,810	69,645
NONMETALS			
Barite	102,516	r e 205,000	e 215,000
Cement, hydraulic ---thousand tons	1,466	1,627	1,742
Chalk	465	e 470	e 470
Clays:			
Bentonite	29,478	e 36,000	e 36,000
Fire	10,555	e 10,000	e 11,000
Kaolin	395	e 400	e 400
Common	147,082	e 150,000	e 150,000
Diatomite	3,776	e 4,000	e 4,000
Feldspar	1,435	r e 1,500	e 1,500
Gypsum:			
Crude	45,427	e 90,000	NA
Calcined	e 57,000	e 57,000	
Lime e	r 10,000	10,000	10,000
Phosphate, guano	22,541	e 23,000	e 23,000
Salt, all types	185,170	r e 190,000	e 190,000

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
NONMETALS—Continued			
Stone:			
Dimension:			
Marble [1]	1,132	e 1,200	NA
Slate	12	10	
Crushed and broken:			
Dolomite	4,015	e 4,000	
Gravel and sand ---thousand tons	2,158	e 2,200	
Limestone ---do	1,341	e 1,400	NA
Quartzite	4,319	e 5,000	
Silica	52,670	e 55,000	
Talc and related materials, pyrophyllite	5,487	e 5,500	e 5,500
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Bituminous	92,000	r e 75,000	e 75,000
Anthracite	10,718	r e 10,000	e 10,000
Coke, all types	33,433	e 11,000	e 11,000
Gas, natural:			
Gross production ---million cubic feet	r 67,915	64,440	64,020
Marketed ---do	16,937	17,164	2 15,720
Natural gas liquids:			
Natural gasoline [3] ---thousand 42-gallon barrels	509	447	449
Propane ---do	320	308	296
Butane ---do	7	2	3
Total ---do	836	757	748
Petroleum:			
Crude ---do	22,589	23,644	25,767
Refinery products:			
Aviation gasoline ---do	1	4	2
Motor gasoline ---do	r 10,434	10,897	11,743
Jet fuel ---do	1,419	1,513	1,743
Kerosine ---do	4,314	4,427	4,493
Distillate fuel oil ---do	r 7,007	6,680	7,123
Residual fuel oil ---do	9,329	9,528	10,923
Lubricants ---do	64	92	97
Other:			
Liquefied petroleum gas ---do	380	469	516
Asphalt ---do	r 256	206	230
Unspecified ---do	r 130	156	124
Refinery fuel and losses ---do	395	442	455
Total ---do	33,729	34,414	37,449

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

[1] Includes crushed marble.

[2] Excludes sales to consumers.

[3] Includes hexane.

TRADE

The value of Peru's exports reached $1,039 million in 1973, a 10.2% increase over 1972. Of this total, copper exports, valued at $284 million, accounted for 27%, and lead, zinc, iron ore, and silver an additional 25%. Corresponding 1972 figures were 20% and 21%. The increase in copper revenue was due to increased world copper prices, as total copper exports were 13% less than in 1972. Exports of lead, zinc, gold, and silver, increased by 9%, 30%, 6%, and 18%, respectively; iron ore exports declined 7%, and exports of crude oil were down 3%.

Minero Perú began deliveries of copper to Czechoslovakia and of copper and zinc to the People's Republic of China, under the terms of 1972 agreements. Similar agreements concluded in 1973 specify future shipment of zinc concentrate to Finland, and crude oil to Brazil. Petroleum shipments will be made to Manaus, beginning in January 1974, at the rate of 4,000 barrels daily.

Peruvian imports were estimated at $1,026 million, a 30% increase over 1972 levels. Imports of equipment for petroleum prospecting and exploration were, by Decree Law 19939 of February 20, exempted from payment of certain surtaxes and surcharges; the total reduction in payment was 12.5% ad valorem. Imports of steel increased during 1973, primarily because of sabotage at the Chimbote steelworks.

Servício Nacional de Fertilizantes (SENAFER), a government agency importing and marketing agricultural fertilizers, was given exclusive rights to these activities under Supreme Decree 008–73–IC/DS, effective April 17, 1973. During the last 6 months of the year, Mexico delivered 10,000 tons of urea to Peru's fertilizer plants.

Minero Perú raised the export price of bismuth from $4.50 to $4.75 per pound early in June. Effective September 3, Minero Perú raised the price of Special High Grade zinc from 29¼ to 34 cents per pound, and on November 1 raised the price a further 8 cents to 42 cents per pound.

Table 2.—Peru: Quantity and value of selected major mineral commodity exports, 1971–73 [1]

Commodity	Quantity (metric tons)			Value, f.o.b. (millions)		
	1971	1972	1973	1971	1972	1973
Copper content of ores, concentrates, and smelter products	193,519	218,467	190,319	170	r 183	284
Iron ore, gross weight	9,010,000	8,618,000	[2] 8,708,000	62	65	61
Lead content of ores, concentrates, and smelter products	145,698	165,743	165,900	27	33	42
Silver content of ores, concentrates, and smelter products	1,025	1,289	1,059	47	62	68
Zinc content of ores, concentrates, and smelter products	344,531	398,986	403,600	47	69	93

r Revised.

[1] Source: 1971—American Embassy, Lima, Peru. State Dept. Airgram A–115, Apr. 6, 1972; 1972—American Embassy, Lima, Peru. State Dept. Airgram A–62, Mar. 14, 1973; 1973—American Embassy, Lima, Peru. State Dept. Airgram A–155, July 18, 1974.

[2] Calculated from reported iron content of 5,582,000 metric tons on the basis of the grade of exported material in 1972.

Table 3.—Peru: Exports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1971 [2]	1972 [3]	Principal destinations, 1972 [3]
METALS			
Antimony ore and concentrate [4]	711	784	France 527; Brazil 118; Japan 99; United Kingdom 40.
Arsenic trioxide	62	NA	
Copper:			
Ore and concentrate (excluding matte) [5]	r 146,258	100,037	Japan 83,110; United States 8,605; West Germany 4,578.
Scrap—value, thousands	$41	--	
Matte and cement	2,749	2,535	Spain 1,760; Japan 775.
Metal, including alloys: [5 6]			
Blister	r 124,724	134,049	United States 89,756; Belgium-Luxembourg 13,924; West Germany 13,478.
Refined	r 28,549	27,384	People's Republic of China 12,398; Netherlands 5,630; Argentina 4,115; West Germany 2,583.
Gold: [5]			
Ore and concentrate—troy ounces	43,237	46,013	NA.
Metal, content of mixed bars—do	6,056	6,139	NA.
Iron and steel:			
Ore and concentrate (excluding pyrite) [5]—thousand tons	9,120	8,471	Japan 6,940; United States 1,340.
Pig iron, including cast iron	180	NA	
Semimanufactures, tubes, seamless	235	NA	
Lead:			
Ore and concentrate	123,884	130,231	West Germany 37,878; Japan 25,702; United States 25,238; Belgium-Luxembourg 24,479.
Metal, including alloys, all forms [5 6]	r 64,092	75,025	United States 45,469; Italy 9,391; People's Republic of China 5,619; Netherlands 4,025.
Mercury—76-pound flasks	r 1,334	3,742	United States 2,205; Japan 957; West Germany 290; Finland 290.
Molybdenum ore and concentrate [7 8]	1,038	613	France 314; United States 177; Italy 122.

See footnotes at end of table.

Table 3.—Peru: Exports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971 [2]	1972 [3]	Principal destinations, 1972 [3]
METALS—Continued			
Silver:			
Ore and concentrate [5] thousand troy ounces	17,329	19,323	NA.
Waste and sweepings value, thousands	$34	--	
Metal, including alloys: [5]			
Refined and electrolytic thousand troy ounces	14,341	18,707	NA.
Blister and mixed bars ----do----	3,432	3,484	NA.
Tin:			
Ore and concentrate ------long tons--	4,671	2,093	United Kingdom 1,971; Netherlands 122.
Metal alloys, unwrought [8] ------do----	191	489	Netherlands 301; United States 128; West Germany 25.
Tungsten ore and concentrate ----------	1,387	1,251	Japan 397; United Kingdom 382; United States 304.
Zinc:			
Ore and concentrate ----------	506,231	673,406	Japan 399,876; France 115,072; West Germany 61,571.
Scrap ----------value, thousands--	$26	--	
Metal, including alloys, all forms [5 6] --	r 52,312	55,375	United States 29,248; Brazil 16,190; People's Republic of China 4,778.
Other:			
Ore and concentrate of base metals, n.e.s.[9] ----------value, thousand--	$1,800	$5,193	Canada $4,413; Netherlands $401; France $194.
Scrap and waste, nonferrous, n.e.s. do----	$7	$252	All to Spain.
Metal, including alloys, all forms:			
Metalloids ----------do----	$232	$657	United States $575; Spain $82.
Base metals, n.e.s ---------do----	$6,301	$6,097	France $3,157; United States $2,521; Spain $179.
NONMETALS			
Barite and witherite [8] ----------	98,818	191,429	United States 169,044; Netherlands 22,385.
Cement, hydraulic ----------	[10] 19,951	[11] 3,493	All to United States.
Fertilizer materials, crude ----------	2,175	2,428	All to West Germany.
Salt ----------	183	297	All to Italy.
Other, crude minerals, n.e.s. value, thousands	$9	$8	Do.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum: [12]			
Crude ----thousand 42-gallon barrels--	1,111	1,074	NA.
Refinery products:			
Distillate fuel oil ---------do----	86	161	NA.
Residual fuel oil ----------do----	140	793	NA.
Lubricants ----------do----	(13)	(13)	NA.
Other:			
Liquefied petroleum gas do----	25	36	NA.
Unspecified ----------do----	4	3	NA.
Total ----------do----	255	993	

r Revised. NA Not available.

[1] Due to the unavailability of official Peruvian trade returns at the time this table was compiled, exports of a number of mineral commodities are not included.

[2] Source: Unless otherwise noted, Statistical Office of the United Nations. Supplement to the World Trade Annual, 1971. V. 2, New York, 1974, pp. 342–344.

[3] Source: Unless otherwise noted, Statistical Office of the United Nations. World Trade Annual, 1972. V's. 1, 2, and 3, New York, 1974.

[4] Partial figure derived from official trade publications of major trading partners.

[5] Source: Ministerio de Energia y Mineas, Dirección General de Mineria. Anuario de la Mineria del Peru, 1972. Lima, 1972, 155 pp.

[6] Listed distribution is taken from Metallgesellschaft A.G. Metal Statistics, 1963–73, 61st Edition, Frankfurt-am-Main, 1974, 332 pp.

[7] Includes ores of vanadium, zirconium, tantalum, and titanium, if any.

[8] Since primary sources (see footnotes 2 and 3) give value only from the United States in this category, the quantity exported to the United States is taken from U.S. official imports.

[9] Includes the value of a portion of the antimony ore and concentrate shown elsewhere in this table.

[10] Source: 1971 edition of the publication cited in footnote 5.

[11] Partial figure taken from official U.S. imports.

[12] Source: Ministerio de Energia y Mineas, Dirección General de Hidrocarburos. Estadistica Petrolera, 1971 and 1972 eds. V's. 22 and 23, Lima, 1972 and 1973, 132 pp. and 138 pp.

[13] Less than ½ unit.

Table 4.—Peru: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1971[2]	1972[3]	Principal sources, 1972[3]
METALS			
Aluminum:			
Oxide and hydroxide	r 1,644	1,582	All from West Germany.
Metal, including alloys, all forms:			
Scrap	854	725	All from United States.
Unwrought and semimanufactures	4,887	[4] 1,853	West Germany 390; France 325; Belgium-Luxembourg 301; Switzerland 262; United States 218.
Copper:			
Ore and concentrate	231	148	All from Canada.
Metal, including alloys, all forms	r 458	524	Canada 116; United States 108; West Germany 88; Netherlands 62; Sweden 62; Italy 50.
Iron and steel:			
Scrap	--	12,024	All from United States.
Pig iron, ferroalloys, similar materials	977	673	France 401; United States 272.
Steel, primary forms	4,662	55,060	Netherlands 35,707; Japan 13,801; United States 5,552.
Semimanufactures:			
Bars, rods, angles, shapes, sections	23,617	[5] 37,258	Japan 26,835; Belgium-Luxembourg 4,001; United States 2,261.
Universals, plates, sheets	[6] 131,368	[7] 82,487	Japan 45,747; Canada 16,203; United States 10,590; France 6,536.
Hoop and strip	18,297	3,237	Japan 1,798; West Germany 1,071; United States 368.
Rails and accessories	1,904	1,005	Belgium-Luxembourg 534; United States 471.
Wire (excluding wire rod)	3,567	4,552	Japan 2,167; Belgium-Luxembourg 1,267; Italy 471.
Tubes, pipes, fittings	18,794	13,502	Japan 5,219; United States 4,845; Italy 2,808.
Castings and forgings, rough	1,436	2,962	All from Italy.
Unspecified ----value, thousands	$218	$3,106	NA.
Manganese:			
Ore and concentrate	687	359	All from United States.
Oxide	211	426	All from Japan.
Nickel metal, including alloys, all forms	r 70	55	Canada 29; West Germany 26.
Platinum-group metals and silver:			
Ore and concentrate value, thousands	$347	$391	All from Canada.
Metal, including alloys:			
Platinum group ----------do	$77	$62	All from Switzerland.
Silver ----------do	$11	--	
Titanium oxides	102	--	
Other:			
Ore and concentrate, n.e.s	[8] 54	578	Mainly from Netherlands.
Metals, nonferrous, including scrap, n.e.s ----------value, thousands	$348	$505	NA.
Oxides and hydroxides of metals n.e.s ----------do	$86	$94	United States $64; West Germany $30.
NONMETALS			
Abrasives, natural, n.e.s.:			
Grinding and polishing wheels and stones	[9] 115	--	
Other, including industrial diamond ----value, thousands	$261	$163	All from United States.
Asbestos, unworked and worked	[9] r 5,559	7,027	All from Canada.
Cement, hydraulic	[10] r 1,860	NA	
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	r 4,520	6,737	United States 4,296; United Kingdom 2,441.
Products ----------value, thousands	$1,551	$1,323	United States $613; Italy $211; Austria $159; West Germany $147; France $134.
Diamond, gem, not set or strung --do	$564	$549	NA.
Feldspar and fluorspar	r 300	511	All from United Kingdom.
Fertilizer materials:			
Crude, phosphatic	15,197	8,117	All from United States.
Manufactured:			
Nitrogenous	50,600	35,299	West Germany 15,895; Netherlands 10,834; Belgium-Luxembourg 7,156.
Phosphatic	1,818	NA	
Potassic	r 8,503	12,232	West Germany 6,933; United States 5,299.
Other, including mixed	6,774	2,175	All from United States.
Unspecified ----value, thousands	$28	$794	Norway $698; United States $50; France $24.

See footnotes at end of table.

Table 4.—Peru: Imports of selected mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971 [2]	1972 [3]	Principal sources, 1972 [3]
NONMETALS—Continued			
Graphite, natural ____ value, thousands	$26	--	
Gypsum and plasters ____ do____	$42	--	
Magnesite	1,516	--	
Mica, unworked ____ value, thousands	$34	--	
Pigments, mineral, processed iron oxides	368	395	All from West Germany.
Salt ____ value, thousands	$25	NA	
Sodium and potassium compounds, n.e.s., caustic soda	9,634	4,850	United States 4,518; West Germany 332.
Stone, sand and gravel:			
Dimension stone, crude and partly worked	710	576	All from Italy.
Dolomite, chiefly refractory grade	--	1,365	All from Spain.
Sand, excluding metal bearing	3,892	3,222	All from United States.
Unspecified ____ value, thousands	$19	$21	Do.
Talc and related materials	--	396	All from Italy.
Other nonmetals, n.e.s.:			
Crude ____ value, thousands	$207	$228	United States $172; Italy $31; Spain $10.
Oxides and hydroxides of strontium, barium, magnesium	r 296	133	All from United States.
Inorganic bases, n.e.s.[11] value, thousands	$399	$203	United States $65; Norway $64; Belgium-Luxembourg $59.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s ____ do____	$35	NA	
Mineral manufactures, n.e.s.[12] ____ do____	$369	$294	United States $134; Japan $87; United Kingdom $73.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	r 228	NA	
Coal, all grades, including briquets	23,331	61,544	All from United States.
Coke and semicoke	[10] r 120,600	1,255	Do.
Petroleum: [13]			
Crude and partly refined thousand 42-gallon barrels	r 11,762	11,953	NA.
Refinery products:			
Gasoline:			
Aviation ____ do____	279	253	NA.
Motor ____ do____	--	112	NA.
Jet fuel ____ do____	159	43	NA.
Distillate fuel oil ____ do____	198	13	NA.
Residual fuel oil ____ do____	1,748	1,399	NA.
Lubricants ____ do____	211	314	NA.
Other:			
Liquefied petroleum gas do____	26	58	NA.
Naphtha, unfinished ____ do____	1,084	285	NA.
Unspecified ____ do____	59	34	NA.
Total ____ do____	3,764	2,511	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals value, thousands	$168	NA	
Mineral fuels, unspecified ____ do____	$17	--	

r Revised. NA Not available.

[1] Due to the unavailability of official Peruvian trade returns at the time this table was compiled, imports of some mineral commodities are possibly not included.

[2] Source: Unless otherwise noted, Statistical Office of the United Nations. Supplement to the World Trade Annual, 1971. V. 2, New York, 1974, pp. 348–356.

[3] Source: Unless otherwise noted, Statistical Office of the United Nations. World Trade Annual, 1972. V's. 1, 2, and 3, New York, 1974.

[4] Of this total quantity, the portion imported from France is taken from French official exports.

[5] In addition to the listed quantity, Australia and Denmark exported to Peru semimanufactures in this class valued at $932,000 and $96,000, respectively.

[6] Since primary sources (see footnotes 2 and 3) give value only for Japan and Austria in this category, the quantities imported from those countries are taken from their official exports.

[7] Of this total quantity, the portion imported from Japan is taken from Japanese official exports.

[8] Source: Statistical Office of the United Nations. World Trade Annual, 1971. V. 1, New York, 1973, p. 372.

[9] Of this total quantity, the portion imported from the United States is taken from U.S. official exports.

[10] Source: Ministerio de Energia y Minas, Dirección General de Mineria. Anuario de la Mineria del Peru, 1971. Lima, 1971, 138 pp.

[11] May include artificial corundum.

[12] Composed mainly of nonfriction asbestos manufactures.

[13] Source: Ministerio de Energia y Minas, Dirección General de Hidrocarburos. Estadistica Petrolera, 1971 and 1972 eds. V's. 22 and 23, Lima, 1972 and 1973, 132 pp. and 138 pp.

COMMODITY REVIEW

METALS

Copper.—A large porphyry-type deposit of copper ore was discovered in Lambayeque early in the year. First estimates indicated 50 million to 300 million tons of ore. Discovery of a second deposit, near Tintaya in Cuzco, was announced in December, and extensive copper mineralization was reported in Ancash in March.

Completion of the drilling program at Tintaya resulted in a reserve estimate of 40 million tons of sulfide ore containing 2.2% copper and 10 million tons of oxide ore containing 2.5% copper. The treatment method under consideration was leaching and electrowinning, on a scale of 27,000 tons of product annually. Production was expected by the end of 1976 from a plant estimated to cost $48.4 million. Minero Perú was seeking a World Bank loan for 60% of this amount.

World Bank financing was also sought for developing the deposit at Santa Rosa, estimated to cost $93 million. The deposit, which adjoins and in part underlies the Cerro Verde deposit, contains 800 million tons of measured and indicated ore at a grade of 0.7% copper. Target date for the first stage of development was 1976, with output set at 124,000 tons per year; capacity for an additional 30,000 tons per year will be added in 1977.

The Antamina Special Mining Co. was officially organized in September as a joint Peruvian-Romanian company. The Antamina copper-zinc deposit, a Cerro de Pasco concession until rescinded by the Peruvian Government, is in Ancash, and contains 60 million to 80 million tons of ore containing 1.3% copper and 1.5% zinc. The deposit will be worked on a scale of 10,000 tons of ore daily, with resultant annual production of 40,000 tons each of copper and zinc. Feasibility and engineering studies were essentially complete, and production is expected by 1977. Development cost was estimated at $70 million, most of which will be contributed by the Romanian company Geomin. The Antamina company was the first mixed company to be organized under the terms of Decree Law 18880, the general mining law of 1971.

Planning by Minero Perú indicated that mining at the Quellaveco deposit would begin in 1977, with an output of 60,000 tons per year. Ore reserves were estimated at 200 million tons containing 0.94% copper. Quellaveco was a concession of the American Smelting and Refining Company (Asarco) until rescinded in January 1971. At some date beyond 1978, Minero Perú plans to produce 30,000 tons of copper annually from the Berenguela deposit, but no steps in this direction were reported.

Minero Perú and a consortium of five Japanese copper smelters agreed to conduct a drilling program and feasibility study for the Michiquillay deposit near Cajamarca. Another former Asarco concession, the deposit contains 570 million tons of ore at 0.72% copper. Infrastructure to serve a mining operation at Michiquillay was conspicuously absent, but consideration was being given to piping the concentrates to Pacasmayo, 230 kilometers distant on the coast. Productive capacity of 100,000 tons per year was tentatively planned, and a small molybdenite byproduct was thought possible. If a favorable report emerges from the preliminary study, and the Japanese interests wish to continue, a mixed company similar to that formed to mine Antamina may be organized.

The December 1969 contract between the Peruvian Government and SPCC provided that operations at Cuajone must begin by mid-1976 under penalty of loss of the concession. The necessary financing was estimated at $450 million to $550 million. SPCC has invested about $83 million in Cuajone's development, using the profits from its Toquepala operation. A loan of $200 million was arranged with an international consortium of 29 banks, and another loan of a similar amount was made by the Export-Import Bank. Both loans were made contingent on SPCC obtaining a final amount of $130 million from equipment manufacturers and other sources, and upon conclusion of satisfactory sales contracts. The Cuajone deposit contains 46.8 million tons of ore containing 1% copper and 0.02% to 0.025% molybdenum.[3] Mine production is expected to be 200,000 tons daily. Peruvian authorities in November indicated expectation that production

[3] Argall, G. O., Jr. Cuajone—Developing World's Next Big Copper Porphyry Mine. World Mining, v. 26, No. 12, November 1973, pp. 44–47.

would begin in December 1975 or early in 1976.

Cia. Minera Cerros Negros, a Homestake Mining Co. subsidiary, and Japan's Mitsubishi Mining Co. will jointly conduct exploration and feasibility studies on the Pashpap deposit in Ancash. Reserves were estimated, before this additional exploratory drilling, at 48 million tons of ore containing 0.86% copper and 0.03% molybdenum. A 5,000-ton-per-day mill that will produce concentrates containing 12,000 tons of copper annually was planned. If the participants proceed to exploit the deposit, a company will be formed in which Homestake Mining will hold 70% of the shares and Mitsubishi the remainder.

Mitsui Mining & Smelting Co. Ltd., through its subsidiary Cia. Minera Katanga, obtained approval of its contract to exploit the small but high-grade Katanga deposit in Cuzco. Reported ore reserves were 500,000 tons containing 5.6% copper, 1.36 troy ounces of silver per ton, and small amounts of byproducts. A 150-ton-per-day mill was nearing completion; concentrates will be shipped to Japan for smelting. A concentration process has been devised for particular application to the oxide ores. Mitsui Mining & Smelting expected its total investment to be about $4.6 million.

Another Homestake Mining subsidiary, Cia. Minera del Madrigal, completed its first full year of operation of the Madrigal deposit, 45 miles north of Arequipa. One of the three veins contains 1 million tons of ore at 2.2% copper, 4% lead, 6% zinc, and 4 troy ounces of silver per ton. The mill processed 500 tons of ore daily. Concentrates at the overall rate of 100 tons daily were trucked to Sumbay, transshipped by rail to Matarani, and loaded on small freighters for delivery to Toho Zinc Co. Ltd., Japan. The scale of operations is to be doubled by 1976.

Plans to construct a copper-processing complex were officially announced. Concentrates from the Toquepala, Cuajone, and Cerro Verde mines will be smelted at Ilo. Blister from Ilo will be cast into anodes for refining at a new plant to be built nearby. The $40 million plant will have an ultimate capacity for producing 150,000 tons of electrolytic copper per year, and is expected to be onstream in 1975. Mitsui Mining & Smelting and Furukawa Mining Co., Ltd., will provide the financing and undertake construction; the loan is to be repaid by 1985. Included in the project are a number of copper-fabricating plants, costing an additional $20 million.

Peru has agreed to provide expert technical and financial assistance to the Government of Papua New Guinea in its evaluation of proposals by Kennecott Copper Corp. for exploitation of the Ok Tedi copper deposit. The ore body was estimated to contain 200 million tons of ore at 0.8% copper, and development costs were estimated at $500 million.

Gold.—Banco Minero del Perú continued its campaign to promote placer gold mining on the eastern slopes of the Andes. As a result, placer gold production reached 17,500 troy ounces, more than 4 times the quantity mined in 1972. In the Department of Madre de Dios, which adjoins Brazil and Bolivia, production reached 1,900 troy ounces per month at yearend, and further expansion was expected.

Iron Ore.—Principally because of labor troubles, production of iron ore by the Marcona Mining Co., Peru's sole producer, decreased by 4.8% in 1973. The company increased the capacity of its conveyor-belt system from the mine to San Nicolás from 2,000 to 2,200 tons per hour. Expansion of pelletizing capacity from 4 million to 7.5 million tons was deferred because the company and Peruvian officials failed to agree on terms.

Marcona's production was principally for export; about 61% went to Japan and 17% to the United States. The Chimbote steel plant in Peru used 4% of the total production.

Marcona's mine and equipment will be taken over by Minero Perú in 1982. The processing and port installations at San Nicolás will remain with Marcona. The unmined La Justa deposit of 32 million tons containing 56% iron remained a Marcona concession at last report.

Iron and Steel.—Plans for a 100,000-ton-per-year steel mill in the Arequipa-Matarani area were being formulated. Preliminary agreement for financing was concluded with Czechoslovakia, and sites were being examined.

Expansion of steel capacity at Chimbote continued during the year; the major portion of the first expansion stage (additional basic oxygen capacity, soaking pits, and shops) is to be on line in 1974.

Lead and Zinc.—Cerro de Pasco produced 43% of Peru's lead production, 25% from purchased ores, and 41% of the zinc output. Other mining companies contributing important quantities were Cia. Minerales Santander (a St. Joe Minerals Corp. subsidiary), which produced 81,000 tons of concentrate, and Cia. Minera del Madrigal, which produced 28,000 tons, including some copper. Eight other medium-size mines produced lead and zinc concentrates during the year.

Minero Perú exported 12,000 tons of zincite, produced by Cerro de Pasco, to Cia. Asturiana de Zinc in Spain.

Ministerial Resolution 670–73 EM/OSP of July 16 gave governmental approval to a feasibility study of a proposed 87,000-ton zinc refinery at Cajamarquilla, near Lima. Minero Perú was thereby authorized to obtain financing. The total cost was estimated at $70 million, and the refinery will come onstream in 1977.

MINERAL FUELS

Petroleum.—Petroperú concluded 9 new operating contracts with foreign oil companies, bringing the total to 18. Two of the areas covered by the contracts are on the Continental Shelf, and the remainder are east of the Andes. One of the two contracts for offshore drilling was concluded with Belco Petroleum Corp. del Peru; previously Belco had operated under a concession arrangement. Contracts for exploring the jungle fields were made with Signal Petroleum Co. of Peru, Amerada Hess Corp. of Peru, Andes Petroleum Co., Peru Cities Service Corp., Oceanic Exploration Co., Hispanoil, Dominex, and Total-Peru.

In the northwest, Belco drilled 20 wells for development and 16 wells for exploration in its offshore areas. Tenneco Corp. drilled three exploratory wells offshore and then recessed its drilling program. Of the seven exploratory onshore wells drilled by Petroperú, two were in the Tumbes area and showed oil in Miocene strata.

Petroperú and Occidental del Perú, Inc., were the only active drillers in the jungle areas. Petroperú drilled three confirmatory wells: Corrientes 14–XC–D, abandoned at nearly 10,000 feet; Corrientes 12–XC, which tested at 6,500 barrels per day; and Pavayacu, which tested at 1,000 barrels per day. Petroperú also drilled five exploratory wells, all nonproductive. Occidental drilled four exploratory wells, all productive: Capahuary Sur 43–X1 at 7,488 barrels per day, Forestal 51–X1 at 9,000 barrels per day, Shiviyacu 52–X1 at 5,184 barrels per day, and Tambo 44–1 at 2,650 barrels per day. Three additional wells were being drilled at yearend. Occidental may be in production in 1975, well ahead of schedule.

Seven contractors were preparing to drill during 1974: Amoco Peru Petroleum Co., Arco Peru Co., British Petroleum Co., Getty Oil (Peru), Phillips Petroleum Co., Peruvian Sun Oil Co., and Union Oil Co. Reserve estimates for the jungle area reached 400 million barrels at yearend.

Petroperú purchased the holdings of Cia. Petrolera Lobítos, S.A., in September. This action left Cia. Peruana de Petróleo, Ltda. (El Oriente) the only company still operating under the old concessions system, although all its concessions not in active production were rescinded by the Government. Negotiations for the sale of El Oriente to Petroperú were conducted during the year, but were inconclusive.

Production of crude in 1973 was 9% greater than in 1972, and came from coastal areas (49.5%), the Continental Shelf (48.1%), and eastern fields (2.4%). The increase in the total was due entirely to a 23% increase in production from offshore wells.

Refining capacity became 100% owned by Petroperú during the year; the Conchan-Chevron refinery in Lima was taken over in May and the Ganso Azul refinery at Pucallpa in October. Total production of refinery products was 37.34 million barrels, an increase of 8.5% above 1972 production. Refined product output was as follows, in thousand 42-gallon barrels:

Refinery	Motor gasoline		Kerosine		Diesel		Residual fuel		Other	
	1972	1973	1972	1973	1972	1973	1972	1973	1972	1973
Talara	6,558	7,144	3,864	3,837	4,687	5,184	4,870	6,039	907	928
La Pampilla	3,673	3,963	154	194	1,251	1,255	3,293	3,606	1,803	1,944
Iquistos	50	40	92	96	161	157	141	105	[1] 1	[1] 1
Conchan-Chevron	546	554	257	331	453	456	1,138	1,115	142	179
Pucallpa	70	42	61	36	128	72	86	58	27	8

[1] Processing gain.
Source: U.S. Embassy, Lima, Peru. State Dept. Airgram A-76, Apr. 9, 1974.

Petroperú issued invitations to bid on the construction of a 65,000-barrel-per-day primary distillation unit at the Pampilla refinery, to bring that plant's capacity to 95,000 barrels per day. The new unit is expected onstream by mid-1976.

Construction of the trans-Andean pipeline is to begin in May 1974. Financing of the $340 million project was obtained from Japanese sources, to be repaid largely with crude petroleum. Bechtel Corp. was preparing final engineering plans. The pipeline will run from Concordia through Borja, Bogua, and Olmos to Bayovar on the coast, a distance of 897 kilometers, crossing the Andes at about 8,000 feet, and will require seven pumping stations. The 30-inch pipeline will carry 211,000 barrels per day when it is completed in 1976.

Petrochemicals.—Working from a resource base of 22 billion barrels of crude oil and 50,000 billion cubic feet of natural gas, a proposal was prepared, for approval by the Andean Pact nations concerned, for sectoral industrial development of petrochemical production. Basic chemicals requiring large-scale production and wide export markets, and products already produced in many of the oil-producing countries, will not be assigned or allocated, but a number of plastics, resins, and synthetic fibers and rubbers such as polyethylene, polypropylene, styrene, vinyl chloride monomer, methanol, carbon black, and cyanides will be allocated, and phenol, isoprene, xanthates, and methyl isobutyl ketone were being considered for allocation.

A joint Bolivian-Peruvian petrochemical complex, possibly to be built on the Peruvian coast, was the subject of discussions extending through yearend.

The Mineral Industry of the Philippines

By Robert A. Clifton [1]

In 1973 the Philippine mining industry again established record mineral production value of $525.8 million,[2] an increase of 60%. Record prices for copper, copra, sugar, and timber in world markets were responsible for the sharp rise of the gross national product (GNP) growth rate to 10% compared with 4.3% (revised) in 1972. Mineral production continued to make an increasing contribution to the overall economy of the country.

PRODUCTION

Metallic minerals were dominant in the industry, comprising four out of the five top valued products. The four (copper, gold, iron ore, and chromite) generated 80% of the total mineral value in 1973. Copper producers continued to lead, by a great margin, the rest of the mineral industry in both volume and value. The rising price of gold on the world market was a significant factor in the Philippine economy. The Philippines continued as the leading vendor of chromite to the United States.

Portland cement, the leading nonmetallic mineral, rebounded to a production of about two-thirds capacity in 1973 but was extremely sensitive to the energy crisis. At yearend a suspension of all cement exports was in effect. The ban, effective December 13, 1973, was announced to conserve as much as possible of the bunker fuel oil consumed in the Philippines. Cement producers used 16% of the oil consumed in 1972 and exported about 25% of their product. Under Presidential Decree No. 230 some export tariffs due for downward revision were made permanent at current levels. The mineral products and the tariff on each follow: Copper concentrate, 6%; iron ore, 4%; chromite concentrate, 4%; gold, 4%; cement clinker and portland cement, 4%; bunker fuel oil, 4%; and petroleum pitch, 4%.

The Philippines was particularly hard hit by the energy crisis of 1973. The three main reasons for this were the lack of domestic oil production, almost total dependence on fuels originating on the Arabian Peninsula, and the very large share of refining and distribution facilities in U.S. hands. By yearend the Government had created the Philippine National Oil Co. (PNOC), patterned on Indonesia's P.N. Pertamina, and gives it sweeping powers to intervene in the fuel industry; had placed severe restrictions on fueling foreign ships and planes; and had bought Esso's distribution system and a 57% share of Bataan Refinery Corp.

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[1] Physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

[2] Where necessary, values have been converted from Philippine pesos (PP) to U.S. dollars at the rate of PP6.72=US$1.00.

Table 1.—Philippines: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Cadmium mine output, metal content—kilograms	9,843	7,983	--
Chromium, chromite, gross weight:			
Metallurgical grade	88,790	81,370	95,659
Refractory grade	340,804	268,230	484,609
Total	429,594	349,600	580,268
Copper mine output, metal content	197,573	213,695	187,400
Gold—troy ounces	637,048	606,730	572,319
Iron and steel:			
Iron ore and concentrate—thousand tons	2,331	2,205	2,255
Ferroalloys	1,484	1,819	NA
Lead mine output, metal content	e 20	--	--
Manganese ore and concentrate, gross weight	5,133	2,491	3,973
Mercury mine output, metal content—76-pound flasks	5,020	3,341	2,160
Molybdenum mine output, metal content	4	--	--
Nickel mine output, metal content	222	384	399
Platinum-group metals:			
Palladium—troy ounces	1,756	4,810	4,205
Platinum—do	703	2,712	2,464
Silver mine output, metal content—thousand troy ounces	1,940	1,848	1,892
Zinc mine output, metal content	3,875	4,603	5,371
NONMETALS			
Asbestos	e 1,200	--	--
Barite	--	--	3,261
Cement, hydraulic—thousand tons	3,117	2,903	4,059
Clays:			
Bentonite	133	61	e 70
White	14,384	11,655	e 13,000
Rock	4,436	4,202	e 4,700
Other	289,768	280,482	256,345
Diatomite	e 50	--	--
Feldspar	39,358	46,061	24,998
Fertilizer materials:			
Crude phosphatic:			
Guano	1,135	2,012	10
Phosphate rock	4,729	2,618	12,228
Manufactured:			
Nitrogenous [1]	48,000	54,000	e 60,000
Mixed and unspecified	55,864	56,975	56,896
Gypsum and anhydrite, crude [2]	42,796	84,882	101,782
Lime	222,580	282,665	150,740
Perlite	415	435	825
Pyrite and pyrrhotite (including cupreous):			
Gross weight	238,334	255,785	125,738
Sulfur content	110,944	118,787	e 58,000
Salt, marine	235,000	219,500	220,000
Sand and gravel:			
Sand, glass—thousand tons	498	412	504
Sand and gravel n.e.s. [3]—thousand cubic meters	4,628	5,598	5,691
Stone:			
Coral, crushed—do	335	334	e 370
Dolomite	11,488	8,871	10,455
Limestone—thousand tons	3,948	4,015	4,534
Marble (dimension), unfinished	3,700	e 11,000	9,053
Tuff	59,206	49,387	35,667
Cobbles and boulders n.e.s.—thousand cubic meters	215	216	612
Sulfur, elemental	39	10	--
Talc	1,317	1,007	1,634
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades	40,024	38,900	39,004
Petroleum refinery products:			
Gasoline—thousand 42-gallon barrels	15,771	16,004	
Jet fuel—do	2,116	2,589	
Kerosine—do	3,382	3,601	
Distillate fuel oil—do	14,946	13,663	NA
Residual fuel oil—do	24,528	21,562	
Other—do	2,421	2,549	
Refinery fuel and losses—do	3,949	4,153	
Total—do	67,113	64,121	NA

e Estimate. NA Not available. p Preliminary.

[1] Data are for year ending June 30 of that stated.

[2] Including synthetic.

[3] Including unspecified earths.

TRADE

Exporting companies in the Philippines realized $1,700 million for their merchandise, but importers spent only $1,050 million. The $650 million favorable balance of trade set a country record.

Table 2.—Philippines: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum metal, including alloys, all forms	1,080	1,299	Hong Kong 573; Singapore 303; Thailand 229.
Chromite ore and concentrate	403,887	382,807	United States 159,005; Japan 112,609; Netherlands 24,973.
Copper:			
Ore and concentrate	720,186	780,438	Japan 670,634.
Waste and scrap, including alloys	1,686	3,366	Japan 2,675; Spain 430.
Matte	--	7	All to United States.
Metal and alloys, unwrought and semimanufactures	r 2,391	4	All to Hong Kong.
Gold bullion—thousand troy ounces	327	180	All to United Kingdom.
Iron and steel:			
Ore and concentrate, including roasted pyrite	2,213,290	2,306,180	Japan 2,290,613.
Steel:			
Primary forms	2,419	--	
Semimanufactures	64,427	4,015	Arab Republic of Egypt 2,457; Brunei 787; Guam 718.
Lead metal and alloys, unwrought and semimanufactures	1	--	
Magnesium metal and alloys, unwrought	3	--	
Manganese ore and concentrate	8,877	3,965	Taiwan 1,800; Republic of Korea 1,485; Japan 680.
Mercury—76-pound flasks	4,496	2,914	Japan 2,489.
Molybdenum concentrate	11	--	
Nickel ore and concentrate	769	2,513	All to Japan.
Silver metal—thousand troy ounces	492	954	United Kingdom 547; Japan 407.
Zinc:			
Concentrate	9,630	8,708	All to Japan.
Scrap	1,018	1,102	Do.
Other metals:			
Ores and concentrates containing more than one metal:			
Copper, gold, and silver concentrates	7,115	5,487	All to United States.
Lead and copper concentrates containing gold and silver	2,610	13,716	Do.
Ores and concentrates n.e.s.	103,456	45,907	United States 35,205; Greece 9,900.
Ash, slag, and other residues containing nonferrous metals	51	27	All to Japan.
Refinery matte n.e.s.	29	28	All to United Kingdom.
Metals and alloys n.e.s., unwrought and semimanufactures	--	10	All to Indonesia.
NONMETALS			
Asbestos	2	--	
Cement, hydraulic	635,903	519,386	Singapore 181,225; Indonesia 137,783; South Vietnam 119,276.
Chalk	--	50	All to Thailand.
Feldspar and fluorspar	4	50	All to Singapore.
Fertilizer materials, manufactured	8,000	--	
Salt	3	(1)	All to Hong Kong.
Stone, sand and gravel:			
Quartz and quartzite	2,900	--	
Sand	r 3,931	138	United Kingdom 35; Netherlands 21; Italy 20.
Gravel and crushed stone	13	10	Hong Kong 9; United Kingdom 1.
Stone, dimension, not worked	r 62	83	Guam 70; Singapore 13.
Other crude minerals n.e.s.	--	167	Thailand 157; Japan 10.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	142	115	Guam 81; United States Trust Territories in the Pacific 34.
Kerosine—do	151	52	Hong Kong 51.
Jet fuel—do	310	566	Taiwan 224; United States 129; Thailand 100.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Distillate fuel oil ---do---	3,944	1,568	Singapore 914; Hong Kong 511.
Residual fuel oil ---do---	343	563	Singapore 523.
Lubricants ---do---	5	15	Hong Kong 12.
Other ---do---	r 2,868	523	Japan 274; Singapore 201.
Total ---do---	7,763	3,402	

r Revised.
1 Less than ½ unit.

Table 3.—Philippines: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite	3,000	3,301	All from Malaysia.
Oxide	2	(1)	All from United States.
Scrap	r 28	30	United States 27.
Alloys, unwrought and semimanufactures	11,520	12,688	United States 5,810; Japan 2,077; Australia 1,610.
Copper:			
Ore and concentrates	(1)	(1)	All from Japan.
Metal, including alloys, all forms	r 6,135	5,499	Japan 3,007; United States 1,660.
Iron and steel:			
Iron ore and concentrate	10	2	All from Japan.
Scrap	5,717	44,607	United States 30,878; Japan 7,652; Australia 5,212.
Pig iron, cast iron, powder and shot	18,888	32,986	Japan 31,687; Australia 1,054.
Ferroalloys	5,190	3,856	Taiwan 1,751; Japan 1,495.
Steel, primary forms	204,578	253,751	Australia 119,773; Japan 108,214.
Semimanufactures:			
Bars, rods, angles, shapes, sections	51,525	36,756	Japan 19,693; Australia 8,678.
Universals, plates, sheets	143,930	538,564	Japan 520,630.
Hoop and strip	12,695	22,391	Japan 21,134.
Rails and accessories	5,243	1,070	Australia 617; Japan 178; Luxembourg 147.
Wire	10,057	8,524	Japan 6,873.
Tubes, pipes, fittings	29,927	30,000	Japan 23,489.
Castings and forgings	297	614	United States 341; Australia 200; Japan 64.
Lead:			
Oxide	237	127	United Kingdom 63; Australia 36; Netherlands 20.
Metal, including alloys, all forms	7,141	5,858	Australia 5,018.
Magnesium metal and alloys, all forms	5	4	United States 2; United Kingdom 1.
Manganese ore and concentrates	4,481	5	All from Netherlands.
Molybdenum metal and alloys, unwrought and semimanufactures	3	45	United States 25; Canada 13; Japan 7.
Nickel metal, including alloys, all forms	1,202	242	Japan 141; United States 32; France 14.
Silver and platinum metals including alloys troy ounces	96	1	All from West Germany.
Titanium oxide	45	1	All from United States.
Tin metal, including alloys, all forms	837	1,629	Malaysia 922; Japan 279; Australia 202.
Tungsten metal and alloys, unwrought and semimanufactures	1	1	Mainly from Netherlands.
Zinc metal, including alloys, all forms	15,353	13,858	Japan 8,772; Australia 4,221.
Other:			
Ore and concentrate:			
Of molybdenum, tantalum, titanium, vanadium, zirconium	376	918	Australia 649; United Kingdom 260.
Of nonferrous base metals	r 10	--	
Nonferrous metals and alloys n.e.s., unwrought and semimanufactures	58	34	Japan 14; United Kingdom 11; Netherlands 5.
NONMETALS			
Abrasives:			
Crude, natural	608	435	Netherlands 225; United States 89; Japan 59.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Abrasives—Continued			
Dust and powder of precious and semi-precious stones	7	8	All from United States.
Grinding and polishing wheels and stones	634	604	Taiwan 152; United Kingdom 128; Japan 115.
Asbestos:			
Crude, washed or ground	1,903	2,235	Canada 1,979; Mozambique 165.
Manufactures of asbestos	2,992	3,688	Japan 938; Taiwan 708; United States 684.
Barite and witherite	4,393	4,069	Singapore 2,151; United States 1,390; Japan 350.
Borates and boric acid, crude natural	--	30	All from United States.
Cement	20,781	12,383	Japan 11,030.
Chalk	1	--	
Clays and clay products:			
Crude clays	29,545	36,031	Japan 17,623; United States 13,593.
Products, value, thousands	$3,977	$5,017	United States $2,583; Japan $1,154; Austria $355.
Diamond, industrial, do	$207	$270	Congo $198; United Kingdom $45.
Diatomaceous earth	1,157	645	United States 523; Japan 88; West Germany 22.
Feldspar and fluorspar	2,789	2,509	Italy 950; Republic of Korea 610; India 491.
Fertilizer materials:			
Crude:			
Nitrogenous	50	--	
Phosphatic	123,321	164,024	United States 162,874.
Manufactured:			
Nitrogenous	238,775	145,876	Japan 105,509; Republic of Korea 19,900; Australia 11,351.
Phosphatic	12,253	4,731	Republic of Korea 4,000.
Potassic	52,435	83,897	United States 58,158; Israel 11,971.
Mixed	16	307	West Germany 204; Japan 100.
Graphite	85	209	Japan 110; United States 33; Republic of Korea 25.
Gypsum	16,845	20,239	Australia 18,532.
Magnesite	928	1,046	Austria 500; Japan 388; United States 137.
Pigments, mineral:			
Crude natural	3,257	2,023	United Kingdom 944; India 889; Belgium 84.
Iron oxide, processed	341	246	Japan 123; West Germany 72.
Salt	27,163	104,692	India 38,924; Australia 32,104; Pakistan 7,500.
Stone, sand and gravel:			
Dimension stone, crude and worked	183	102	Taiwan 92; Italy 9.
Dolomite	3,977	7,010	Japan 5,329; Taiwan 569; West Germany 542.
Limestone	1,963	1,468	Japan 1,438.
Sand	7,049	15,063	South Vietnam 6,700; Australia 6,333; Japan 1,918.
Gravel	212	188	Belgium 101; France 83.
Sulfur	19,225	21,314	Iran 20,437.
Talc	3,669	3,797	Republic of Korea 3,290.
Other nonmetals, crude, n.e.s	3	171	Republic of Korea 150; Japan 20.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural	1,081	1,490	Japan 1,350.
Coal, coke, briquets	14,809	14,322	Japan 12,675.
Petroleum:			
Crude, thousand 42-gallon barrels	66,217	67,516	Saudi Arabia 26,118; Iran 12,967; Kuwait 9,704.
Refinery products:			
Gasoline:			
Aviation, do	107	103	Bahrain 59; Iran 38.
Motor, do	(1)	82	Singapore 66; Saudi Arabia 16.
Kerosine and jet fuel, do	90	22	Saudi Arabia 20.
Distillate fuel oil, do	151	64	All from Saudi Arabia.
Residual fuel oil, do	r (1)	(1)	All from United States.
Lubricants including grease, do	821	704	Japan 248; United States 239; Netherlands Antilles 151.
Other, do	240	252	Taiwan 131; United States 50; Indonesia 44.
Total, do	r 1,409	1,227	
Crude chemicals from the distillation of coal, gas, and petroleum	2,145	1,850	Japan 1,279; Norway 459.

r Revised.

1 Less than ½ unit.

COMMODITY REVIEW

METALS

Chromite.—Philippine chromite production ranked sixth in the world in 1972. Production in 1973 rebounded to a total of 580,268 dry metric tons, an increase of 65% over 1972. Metallurgical-grade material was 18% higher in volume but 1% lower in price. Refractory-grade production increased 79% in volume and realized 73% higher prices. Chromite contributed 2% to the value of mineral production.

Copper.—The Philippines was eighth in world production of mine copper in 1972. Long the pace setter in the minerals industry, copper again was the 1973 leader in volume, with a combined total of 833,277 tons of direct-shipping-grade ore and concentrates produced. The value was 65% of the country's total mineral value.

Atlas Consolidated Mining & Development Corp. announced discovery of an indicated 200 million tons of new ore between its Biga and Lutopan ore bodies.

Lepanto Consolidated Mining Co. is to invest nearly $12 million in a new mine in Negros Occidental that has an indicated 98 million short tons of ore averaging 0.50% copper, 0.004 ounce per ton gold, and 0.01 ounce per ton silver.

Gold.—World gold prices continued to bolster the gradual decline in Philippine production. The 6% decline in production was offset by a 60% increase in value. The average value of an ounce was $93.59. The gold production provided 10% of total mineral value.

Iron Ore.—Iron ore production again reached a record high, exceeding 1972 production by 2%. The 11% hike in value provided enough return for the iron ore to comprise 3% of the total mineral value.

Manganese.—Manganese ore output increased 59% over that of 1972 with a corresponding 56% increase in value.

Mercury.—Mercury production decreased 36% in volume and 9% in value during 1973.

Nickel.—Although there was little change in nickel production and profits in 1973, this should change considerably with the opening of the Marinduque Mining and Industrial Corp. $220 million mine and smelter on Nonoc Island in July 1974.

Silver.—Silver production increased 2% to 1,891,643 ounces in 1973 and had a 47% increase in value.

NONMETALS

Barite.—Barite production reappeared for the first time since 1966, with 3,261 tons worth about $73,000.

Cement.—Cement production rose 39% and value 52%, but production was still at only 67% of capacity. The long-range effects of the energy crisis are difficult to predict, with exports of cement (25% of production) banned at yearend. The continuing Philippinization of the petroleum industry may assist the cement industry as more Arabian oil becomes available.

Clays.—Clay production decreased 8% in quantity and increased 23% in value as compared with 1972.

Feldspar.—Feldspar production dropped a sharp 46% from 1972.

Lime.—Lime production suffered a 47% decrease in volume to 150,740 tons, with a corresponding 46% decrease in value.

MINERAL FUELS

Coal.—Coal production was the same as in 1972, but the value increased 8%.

Petroleum.—The end of 1973 saw some sweeping changes in the petroleum industry of the Philippines and its relation to the Government.

The PNOC was created and given broad powers of intervention in the fuel industry. The energy crisis had affected the Philippine economy directly and harshly, as the country was included with the United States on the list of embargoed nations by the Arabian consortium. With no domestic production, allocations and severe restrictions on the use of petroleum products were necessary. The Philippines was exempt from the last 5% price rise, but U.S. companies were not, which negated any advantage therefrom.

PNOC was the possessor—by purchase, not nationalization—of the assets of Esso Oil Co. in the country. This included the distribution system, which was the nation's seventh largest company in sales and twenty-first in net worth, and 57% of the Esso subsidiary Bataan Refinery Corp., which was fifth in sales and eight in net worth in 1972. Esso was reportedly glad to sell its share of the money-losing subsidiary. Court decisions and government decrees had kept gasoline prices at a level ("regular" was 18 cents (U.S.) per gallon and "premium" was

22 cents on July 31) where profit was impossible. President Marcos announced that the Government's shares would soon be sold to private investors. Negotiations were underway with Mobil Oil Co. about a division of the Bataan Refinery shares that would satisfy the needs of the company and the Government and keep Mobil as the operator.

The explorers service contracts remained popular and many foreign companies were interested in the oil potential in the Philippines archipelago, particularly the Sulu Sea Area.

The Mineral Industry of Poland

By Boteo Tachkov[1]

The mineral industry of Poland paced the advance of the economy during 1973. Because Poland is one of the world's largest producers of coal, and an important producer of copper and sulfur, the mining industry is among the country's most important. Poland is the world's 4th largest producer of anthracite and bituminous coal, the 12th largest producer of mine copper, the 13th and 8th largest producer, respectively, of mine lead and mine zinc ores, and the 3d largest producer of elemental sulfur. In 1973, the extractive industry accounted for about 11% of the total national output and employed 10.5% of the total labor force in industry.

Of a total industrial production valued at $70.5 billion[2] in 1973, the 600 mining and minerals processing operations accounted for $22.9 billion or 30.8%.[3] In 1972, the total minerals output was reported at 430 million tons, a gain of 7.5% over the 400 million tons produced in 1970.

Poland is a significant exporter of minerals and fuels. Exports of mineral commodities were encouraged as a matter of policy and were increasingly being directed toward countries from which Poland had been importing high-technology goods. In 1973, Poland's total imports were valued at $8,157 million (for foreign trade purposes 3.2 zloty=US$1.00) and showed a gain of 81% over those of 1970. Imports of high-technology goods, industrial equipment, and machinery accounted for 45% of the total. The total value of Poland's exports in 1973 was only $6,673 million. This resulted in a deficit of $1,484 million in the country's international balance of payments.

Although the value of total Polish exports increased about 50% over that of 1970 and included a substantial increase in sales of chemical and electromechanical goods, the largest (52%) increase was comprised of the traditional exports of fuels and energy. Fuel and energy exports in 1973 were valued at $844 million and accounted for 12.7% of the total export value and 14% of the value of all exports to non-Communist countries. By comparison, exports of the same commodities were valued at $553 million in 1970 and accounted for 12.5% of the total export value and 15% of the value of exports to the non-Communist countries.

Major trends and policies in the Polish mineral industries in 1973 included a departure from the traditional emphasis on the raw material base of coal, salt, pyrites, and limestone, to a more diversified base which includes petroleum, natural gas, and sulfur. Further, central planning, the hallmark of state-managed economies, was being diffused to some degree as more decisionmaking responsibilities were assumed by the management of individual enterprises.

PRODUCTION

The Polish mining and electric power industry increased production by 7% over that of 1972. Unlike other coal-producing countries, Poland continued to develop its coal industry and reached a record output level in 1973 as production rose to 157 million tons of hard coal (anthracite and bi-

[1] Foreign mineral specialist, Division of Fossil Fuels—Mineral Supply.

[2] Where necessary, values have been converted from Polish zloty (Zl) to U.S. dollars at the official exchange rate of Zl 19.99=US$1.00.

[3] Maly Rocznik Statisticzny, 1974 (Concise Statistical Yearbook). Central Statistical Office, Warsaw, 1974, p. 89.

tuminous) and 39 million tons of lignite. The expansion is to continue in the future as new coal mining capacity is added. The production of coking coal increased from 17.2 million tons in 1972 to 17.7 million tons in 1973.

The copper industry is also to be expanded significantly and is to provide for export a significant share of its output. Massive investment has been concentrated in the low Silesian Basin, which is fast becoming the main copper center in Europe. It produced 130,000 tons of metal in 1973. Along with the development of new mines, several new copper smelters are under construction.

Output of 3.6 million tons of elemental sulfur in 1973 placed Poland third among the world's sulfur producers. It ranks 12th in the production of sulfuric acid. Facilities for reloading Polish liquid sulfur exported to the United Kingdom were completed at the British port of Runcorn. Special towers will operate on the "sulfur sealine" between Poland and the United Kingdom.

With 14 million tons of steel production, Poland ranked 10th among steel producers of the world. However, production was below the needs of the internal market and, despite the construction of several new plants, Poland is expected to remain a net importer in the near future. This is particularly true of requirements for quality steels. Most of the rolling equipment has been in operation for over 20 years, and some has been in use for 50 years. Only 15% to 20% can be considered to be modern. In 1973, Poland had 26 steel plants with a total of 85 open-hearth furnaces and 21 blast furnaces. The yearly average employment in the steel industry was 155,800.[4] The value of crude steel production reached $7,519 million in 1973 compared with $6,758 million in 1972.

[4] Work cited in footnote 3.

Table 1.—Poland: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Aluminum metal, primary	100,000	102,000	102,000
Cadmium metal, primary [e]	[r] 400	350	350
Copper:			
Mine output, metal content [e]	90,000	122,500	132,600
Metal:			
Smelter	92,700	150,000	155,000
Refined, including secondary	92,700	131,000	156,000
Iron and steel:			
Iron ore and concentrate, gross weight--thousand tons	2,078	1,656	1,413
Pig iron ---do	7,043	7,291	[e] 7,680
Ferroalloys:			
Blast furnace ---do	143	132	[e] 124
Electric furnace ---do	133	175	[e] 157
Steel, crude ---do	12,738	13,476	14,058
Steel semimanufactures:			
Rolled, excluding pipe ---do	8,722	9,215	9,867
Pipe ---do	847	933	1,012
Lead:			
Mine output, metal content	[r] 65,000	68,000	70,000
Metal, refined, including secondary	60,200	65,300	68,400
Nickel, mine output, metal content [e]	[r] 2,000	1,500	1,500
Silver, mine output, metal content [e] --thousand troy ounces	[r] 2,600	[r] 4,000	4,800
Zinc:			
Mine output, metal content	193,600	195,000	[e] 210,000
Metal, refined, including secondary	220,000	228,000	235,000
NONMETALS			
Barite [e]	55,000	50,000	50,000
Cement, hydraulic ---thousand tons	13,082	13,986	15,548
Clays, bentonite [e]	50,000	50,000	50,000
Feldspar [e]	30,000	30,000	30,000
Fertilizer materials, manufactured:			
Nitrogenous:			
Gross weight ---thousand tons	3,217	3,367	3,910
Nitrogen content [2] ---do	1,081	1,147	1,364
Phosphatic:			
Gross weight ---do	3,016	2,934	2,890
P_2O_5 content [2] ---do	706	763	814

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
NONMETALS—Continued			
Gypsum and anhydrite:			
Crude [e] ——thousand tons	850	850	850
Calcined ——do	[r] 261	314	297
Lime (quicklime and hydrated lime) ——do	3,819	4,193	4,441
Magnesite, crude	[r] 22,000	35,700	22,100
Salt:			
Rock ——thousand tons	1,222	1,209	1,260
Other ——do	1,740	1,801	1,819
Sulfur:			
Elemental: [e]			
Frasch process ——do	2,200	2,377	2,975
Other native ——do	513	550	570
Byproduct ——do	14	15	17
Total [3] ——do	[r] 2,727	2,942	3,562
Sulfuric acid ——do	2,252	2,568	2,914
MINERAL FUELS AND RELATED MATERIALS			
Coal:			
Bituminous ——do	145,493	150,697	156,629
Lignite and brown ——do	34,517	38,221	39,217
Total ——do	180,010	188,918	195,846
Coke:			
Coke oven ——do	15,504	15,878	16,496
Gashouse ——do	1,329	1,322	1,204
Total ——do	16,833	17,200	17,700
Fuel briquets, all grades ——do	1,945	1,984	1,796
Gas:			
Manufactured:			
Town gas ——million cubic feet	[r] 29,134	29,594	26,627
Coke oven gas ——do	210,368	215,560	225,696
Natural, marketed ——do	190,098	205,637	212,841
Natural gas liquids, natural gasoline ——thousand 42-gallon barrels	257	257	[e] 260
Peat	15,200	8,900	4,400
Petroleum:			
Crude:			
As reported ——thousand tons	395	347	392
Converted ——thousand 42-gallon barrels	2,931	2,574	2,908
Refinery products:			
Gasoline ——do	15,827	18,071	18,624
Kerosine (presumably including jet fuel) ——do	550	1,240	1,403
Distillate fuel oil ——do	19,568	22,567	24,685
Residual fuel oil ——do	15,058	19,900	22,511
Lubricating oil ——do	2,380	2,597	2,744
Grease ——do	101	[e] 120	106
Paraffin ——do	126	118	188
Bitumen ——do	[r] 3,581	3,903	[e] 4,000
Total [4] ——do	[r] 57,191	68,516	[e] 74,261

[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 multiingredient fertilizers.

[3] Sum of reported total of Frasch sulfur and other native mined sulfur plus an estimate for byproduct sulfur, chiefly from the Plock petroleum refinery. Reported totals for Frasch and other native mined sulfur was as follows, in metric tons: 1971—2,713,000; 1972—2,927,000; and 1973—3,545,000.

[4] Total of listed commodities only, excluding products not reported individually in official sources, as well as refinery fuel and losses.

TRADE

The mineral industry made a substantial contribution to Polish trade with Western markets. In 1973, Poland exported 36 million tons of hard coals; it ranked second among the world's exporters. Liquid sulfur exports rose sharply, reaching 600,000 tons or 252,000 tons more than in 1972. Nearly 96,000 tons of zinc was exported, 40,300 tons of copper, and a small amount of silver. During 1973, Poland became an exporter of electrical energy, about 1,754 million kilowatt-hours.

Poland's imports from the European Communities (EC) were valued at $2,187

million, equal to 26.8% of the total value, and for the first time, surpassed the value of imports from U.S.S.R. Imports from the Soviet Union were valued at $1,969 million or 24.4% of the total. However, the U.S.S.R. is still Poland's most important supplier of raw materials, crude oil, oil products, iron ore, celulose, and cotton. Imports of fuel and power, mainly crude oil, were valued at $468 million, up from $373 million in 1972.

Table 2.—Poland: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Cadmium metal, all forms	225	215	Mainly to U.S.S.R.
Chromium trioxide	718	826	Italy 230; Spain 173; Netherlands 120.
Copper:			
Ore and concentrate	56,556	2,302	All to West Germany.
Metal, unwrought and wire	29,087	49,767	West Germany 19,793; United Kingdom 15,297; Czechoslovakia 3,491.
Iron and steel:			
Iron ore and concentrate	2,000	1,000	NA.
Scrap	180,468	435,106	Switzerland 192,337; West Germany 144,447; Italy 49,583.
Pig iron [1]	90,459	24,028	Netherlands 18,987; Albania 4,041.
Ferroalloys [2]	1,002	4,174	West Germany 1,964; Austria 1,152; Switzerland 956.
Steel ingots	4,088	62,127	East Germany 37,643; Hungary 24,484.
Semimanufactures, including iron and steel castings, thousand tons	1,473	1,409	Yugoslavia 145; United States 127; Romania 124.
Lead:			
Ore and concentrate	10,304	5,138	Romania 4,081; Switzerland 1,057.
Metal, including alloys, unwrought	118	312	All to Romania.
Zinc metal, including alloys, unwrought and semimanufactures	91,179	98,636	U.S.S.R. 41,549; United Kingdom 13,960; Czechoslovakia 8,347.
Other metal, nonferrous semimanufactures, including alloys	9,685	12,859	U.S.S.R. 3,953; West Germany 3,337; Italy 1,914.
NONMETALS			
Cement	145,558	26,752	West Germany 12,722; Czechoslovakia 7,552; Sweden 3,781.
Clays, crude, refractory	29,229	31,130	Hungary 19,176; East Germany 5,036; Italy 4,466.
Fertilizer materials, manufactured, nitrogenous, thousand tons	848	917	East Germany 338; India 118; Pakistan 85.
Gypsum and plasters:			
Gypsum, do	572	532	Sweden 203; Denmark 131; Norway 108.
Plasters, do	33	56	Finland 22; Austria 16; West Germany 12.
Lime	131,499	76,212	Czechoslovakia 65,940; Hungary 5,140.
Salt:			
Brine, thousand tons	51	53	France 23; Czechoslovakia 11.
Rock	159	191	Hungary 46; Czechoslovakia 40; Sweden 32.
Stone, dolomite	22,431	19,431	West Germany 13,850; Denmark 3,391.
Sulfur:			
Elemental, thousand tons	2,064	2,487	India 322; United Kingdom 276; France 208; West Germany 188.
Sulfuric acid	197,373	348,228	Switzerland 83,749; Austria 67,354; East Germany 49,429.

See footnotes at end of table.

Table 2.—Poland: Exports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
MINERAL FUELS AND RELATED MATERIALS			
Coal and briquets:			
Anthracite and bituminous thousand tons	30,301	32,687	U.S.S.R. 9,695; Italy 3,041; Czechoslovakia 2,625.
Lignite and lignite briquets ——do	3,561	4,103	All to East Germany.
Coke ——do	2,398	2,269	East Germany 783; U.S.S.R. 611; Hungary 295.
Gas, manufactured coke oven million cubic feet	301	138	All to East Germany.
Petroleum refinery products thousand tons	1,069	1,723	U.S.S.R. 494; Denmark 262; Austria 230; West Germany 206.

NA Not available.
[1] Includes blast furnace ferroalloys.
[2] Includes electric furnace ferroalloys only.

Table 3.—Poland: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite and concentrate	122,168	116,370	Hungary 109,311; West Germany 7,059.
Oxide and hydroxide	224,983	230,934	Hungary 142,182; United States 36,991; Yugoslavia 26,559.
Metal, including alloys, all forms	21,375	24,828	U.S.S.R. 7,317; Yugoslavia 5,828.
Chromium, ore and concentrate	152,536	169,324	U.S.SR 118,243; Albania 35,305.
Copper metal, including alloys, unwrought and wire	34,629	34,101	United Kingdom 17,061; U.S.S.R. 6,218.
Iron and steel:			
Ore and concentrate ——thousand tons	12,430	12,548	Mainly from U.S.S.R.
Scrap ——do	262	302	Czechoslovakia 271.
Pig iron [1] ——do	1,552	1,471	Mainly from U.S.S.R.
Ferroalloys [2] ——do	9	8	U.S.S.R. 5; Austria 1.
Semimanufactures, including iron and steel castings ——do	1,328	1,833	U.S.S.R. 589; West Germany 271; Czechoslovakia 225.
Lead metal, including alloys, unwrought	18,590	16,504	United Kingdom 6,031; Romania 3,785; U.S.S.R. 3,597.
Magnesium metal, including alloys, all forms	1,001	854	All from U.S.S.R
Manganese:			
Ore and concentrate	401,120	505,463	U.S.S.R. 422,666; France 39,335; Belgium-Luxembourg 24,062.
Metal, all forms	1,069	1,967	West Germany 964; Italy 407; U.S.S.R. 342.
Mercury ——76-pound flasks	934	589	U.S.S.R 325; United States 75.
Molybdenum ore and concentrate	489	354	Canada 274; United Kingdom 50.
Tin metal, including alloys, all forms long tons	4,878	4,705	United Kingdom 1,520; Switzerland 1,109; Malaysia 813.
Zinc, ore and concentrate	109,820	160,889	United States 67,738; Canada 19,842; Iran 13,016.
Other, nonferrous semimanufactures, n.e.s	2,805	5,665	Italy 1,399; West Germany 1,322; Czechoslovakia 1,107.
NONMETALS			
Asbestos	67,252	70,520	U.S.S.R. 54,843; United Kingdom 9,986.
Barite	14,045	26,224	East Germany 9,979; Belgium-Luxembourg 7,003; People's Republic of China 5,937.
Cement	614,176	1,240,014	U.S.S.R. 338,942; Romania 176,023; Austria 167,439; Finland 158,219.
Clays and clay products, crude:			
Fuller's earth	11,348	15,441	Yugoslavia 5,085; West Germany 4,151; Czechoslovakia 4,075.
Kaolin (china clay)	127,633	119,592	Czechoslovakia 59,555; U.S.S.R. 26,781; United Kingdom 15,521.
Refractory clays and burnt slate	14,071	10,267	U.S.S.R. 9,611.
Diatomite	1,765	2,298	Belgium-Luxembourg 1,261; United States 865.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Fertilizer materials:			
Crude, phosphatic, apatite concentrate thousand tons	953	1,232	Mainly from U.S.S.R.
Manufactured:			
Phosphatic ---do---	1,567	1,660	Morocco 1,173; Tunisia 470.
Potassic ---do---	2,191	2,108	U.S.S.R. 1,219; East Germany 751; West Germany 135.
Fluorspar	29,985	39,849	East Germany 22,557; People's Republic of China 9,964; North Korea 7,068.
Graphite, natural	11,818	13,030	Austria 6,826; U.S.S.R. 4,510.
Magnesite, crude	160,551	170,382	North Korea 83,720; Czechoslovakia 69,285; Yugoslavia 11,657.
Mica	1,658	1,666	Mainly from India.
Stone:			
Quartzite	10,353	19,885	Mainly from U.S.S.R.
Other	14,696	14,783	Norway 10,176; Finland 4,006.
Talc	19,868	19,119	North Korea 10,644; Czechoslovakia 3,812; Norway 1,989.
MINERAL FUELS AND RELATED MATERIALS			
Coal and briquets:			
Anthracite and bituminous coal thousand tons	1,302	1,194	U.S.S.R. 841; East Germany 348.
Lignite and lignite briquets ---do---	6	2	All from East Germany.
Gas, hydrocarbon:			
Natural ---million cubic feet---	52,548	52,972	All from U.S.S.R.
Manufactured ---do---	167	176	Do.
Petroleum:			
Crude ---thousand tons---	7,894	9,703	Do.
Refinery products ---do---	2,267	2,332	U.S.S.R. 1,286; West Germany 192.

[1] Includes blast furnace ferroalloys.
[2] Includes electric furnace ferroalloys only.

COMMODITY REVIEW

METALS

Aluminum.—The Polish aluminum industry is relatively underdeveloped. Domestic consumption of aluminum is only 3.1 kilograms per capita annually compared with 17 kilograms in the United States. Poland lacks bauxite ore, and the production of about 100,000 tons of aluminum per year depends on imports of raw materials from Australia, Hungary, and Yugoslavia. The signing of a new 10-year contract with Yugoslavia for 120,000 tons per year of alumina to start in 1976 was announced recently.

A new, thin-sheet rolling mill was added to the aluminum works at Konin, according to announcements. A plant will be erected at Nowiny to produce 100,000 tons aluminum oxide in 1977–78 by a new method from low-grade ores.

Copper.—The development of the Polish copper industry, now underway, was planned to meet not only indigenous demand, but also to provide a large surplus for export. Much of the investment was directed to the Lubin and Sierszowice Regions, which contain the sixth largest proved reserve of copper in the world. The copper ore also is reported to contain cobalt, lead, molybdenum, nickel, selenium, silver, vanadium, and other valuable associated minerals. Two mines, Lubin and Polkowice, with a 4.5-million-ton annual capacity, work the deposit at 600- to 850-meter depths. Work continued on the development of a third mine (Rudna), which has a planned annual production for 1978 of 9 million tons. Work started on a second copper plant in Glogow.[5] It is expected to be completed by 1976 and will produce sulfuric acid, nickel, and anode slime in addition to electrolytic copper. The ore dressing plant at the new Rudna mine was expected to start production in 1974. At full capacity, the plant was planned to process 7,000 tons of ore per day into copper concentrate.[6]

A copper processing department was put in operation at the Utmen plant in Wroclaw. There, the copper foundry has been

[5] Mining Industry in Poland. Main Office for Mining Research, Katowice, 1974, p. 50.
[6] Peoples Tribune. Mar. 25, 1974, p. 1.

rebuilt, raising the annual capacity to 160,000 tons. A second foundry under construction will have a capacity of 150,000 tons of copper per year. A modern strip-rolling mill was being built at Szopienice. The copper rolling mill now in operation is important for the cable industry.[7] Construction began also on a large copper and brass strip-rolling mill, the output of which is to be used by the Polish motor vehicle industry and for export.

Offers of assistance to improve the technical level of Poland's copper rolling mills have come from Canada and Sweden; Japan offered $600 miilion financing in return for copper.

In 1973, Poland produced 156,000 tons of refined copper. With a production of 12.6 million tons, Poland claims to rank 12th among world copper ore producers in terms of gross weight of ore. Targets have been set that would make Poland the third or fourth ranked producer. The production of electrolytic copper is to reach 200,000 tons by 1975.

Iron and Steel.—In 1973, Poland produced 14 million tons of steel, up from 13.5 million tons in 1972. Among the several current metallurgical projects, the Katowice plant is the largest. By 1976, the following facilities are expected to be completed: an ore preparation department of 9 million-ton-per-year capacity; two blast furnaces with a combined annual capacity of 4.4 million tons of pig iron; an oxygen converter with an annual capacity of 4.5 million tons of steel; and a semifinished product rolling mill, a blooming mill, and a continuous mill producing 6 million tons of billets and blooms annually.[8]

In June, production began at the plate mill and at the wire rod mill of the Cedar metallurgical plant. The Cedar plant will produce 350,000 tons of high-grade steel per year. At the Novotko and Zawiercie plants installation of equipment was being expedited. At Zawiercie, installation of the rolling mill has been completed, and for the foundry, four electric arc furnaces of over 1.2-million-ton annual capacity have been ordered from Crevsot Loire Enterprises. The coke ovens at Zawiercie will produce 1 million tons of coke annually. At the Lenin steelworks, sheet metal production started for food-can production. Output will increase when the cold-rolling mill is completed. Its annual capacity will be 1 million tons.

Lead and Zinc.—Ore output increased in 1973 and approximately 5 million tons (gross weight) ranked Poland 13th and 8th, respectively, among the lead and zinc ore producers of the world on a gross weight basis according to Polish sources. About 70% of ore reserves is in the form of sulfides and 30% is in the form of oxides. During 1973, six mines were in operation, and a new (Pomorzany) was being developed in Upper Silesia, which will more than offset declining production at Bytom. Tests of the ore-dressing plant were scheduled to start in 1974. Two mills would process 2,500,000 tons of ore annually.

Most of the zinc-lead facilities in Poland are antiquated. The recovery of metal is by two basic processes: horizontal retort furnaces and recently by electrolysis, which provides 47% of the total production of zinc. Although production of zinc was sufficient to supply some quantities for export (96,000 tons in 1973), production of lead meets only 75% of annual demand.

MINERAL FUELS

Coal is the principal source of energy in Poland, which has potential resources of about 100 billion tons. Poland also has an estimated 10 billion tons of lignite resources. Together with hydroelectric and natural gas resources, total Polish energy resources are estimated at about 135 billion tons of standard fuel equivalent.[9].

Total energy consumption in 1973 amounted to an estimated 131 million tons in standard fuel equivalent. Of the total 72.1% was supplied by hard coal, 7.6% by lignite, 18.4% by liquid and gaseous fuels, and 1.9% by other kinds of primary energy.[10]

The average growth in energy demand for the 5-year period 1965–70 was 4.8%; for 1970–75 it was about 4.9%; and for 1975–80 it is projected to be 5.2%.

The increased demand for energy from the 1973 131-million-ton standard fuel equivalent to 400 million tons in the year 2000 is expected to be supplied by the following:

1. An increase in hard coal output to about 300 million tons annually, includ-

[7] Freedom Guardian. Apr. 18, 1973, p. 2.
[8] Polish Journal. Jan. 3, 1974, pp. 1–2.
[9] One kilogram standard fuel=7,000 kilocalories (roughly 13,000 Btu per pound).
[10] Mitrega, Jan. Fuel and Energy Resources in our Country. Mining News. June 1973, pp. 145–147.

Table 4.—Polish energy balance 1970–80[1]

	1970	1975	1980
Demand for energy, standard fuel equivalent (thousand tons)	121.0	152.0	199.0
Growth index	100.0	126.0	164.0

DISTRIBUTION OF PRIMARY ENERGY SUPPLY

	1970		1975		1980	
	Standard fuel equivalent (thousand tons)	Percent	Standard fuel equivalent (thousand tons)	Percent	Standard fuel equivalent (thousand tons)	Percent
Hard coal	92.3	76.3	106.2	69.9	126.8	63.7
Brown coal	7.3	6.0	10.0	6.6	11.1	5.6
Oil	12.2	10.1	21.6	14.2	41.0	20.6
Natural gas	7.3	6.0	11.8	7.8	17.9	9.0
Hydropower	.7	.6	.6	.4	.6	.3
Others	1.2	1.0	1.8	1.1	1.6	.8
Total	121.0	100.0	152.0	100.0	199.0	100.0

[1] Computed by the author from data published in Polish Coal Review. V. 12, 1973, pp. 3–4.

ing anticipated annual exports of 40 to 50 million tons.

2. A threefold increase in lignite output and construction of power combines with an aggregate generating capacity of 10,000 to 12,000 megawatts.

3. An increase in the use of liquid and gaseous fuels in supplying energy from the present 18% to 35%.

4. Introduction of nuclear power generation to supply for 12% to 14% of the energy production.

Coal.—Polish coal production reached a new high in 1973 of 157 million tons of hard coal and 39 million tons of lignite. About 20% of the output was exported and accounted for about 11% of the total export value. About 88% of the production was steam coal and 12% was coking coal. Of the total 73 mines, 3 mines were producing over 10,000 tons daily, and 20 mines over 8,000 tons daily. The average daily production per mine was 6,200 tons.[11]

Stimulated by an increased demand for coal, the industry spent about $675 million for expansion and modernization of existing mines and the development of new mines. The expansion of the Moszczenica mine was completed, reaching a daily capacity of 10,000 tons. The Janowice mine was being enlarged and modernized to produce 24,000 tons daily. Work continued on the newly developed Borynia, Zofiowka, and Pniowek mines in the Rybnik coal district. By 1978, the Rybnik mines are expected to produce about 40 million tons annually. The Slask mine near Katowice is expected to start production in 1974. The development of the large Piast mine at Bierun continued in 1973. Preparations have been made to start developing a lignite mine at Belchatow. About 16,000 people are expected to be employed in the development of the mine and the electric power station, which will have a capacity of 5,000 megawatts.

Two important policy decisions, affecting development of the Polish coal industry in the future, were announced in 1973:

1. Development of brown coal deposits to supply thermal electric powerplants. The utilization of brown coal is expected to free larger quantities of hard coal for export.

2. Increased research to develop methods of coal gasification and production of liquid fuels from coal. A special government program was established in September 1973.

Natural Gas.—Most of the natural gas consumed in Poland at present was derived from the Lubaczow Field (5,500,000 cubic meters per year) or imported from the U.S.S.R. (2,500,000 cubic meters per year). Deposits of natural gas were found in Odolanow, near Ostrow, Dosnau Province. The gas contains 0.4% helium and 35% to 70% nitrogen. Production is expected to reach over 1,000 million cubic meters annually of 95% methane gas in addition to significant quantities of pure nitrogen and helium.

In 1973, Polish plants produced about 1,000 million cubic meters of gas and 1.5 million tons of coke through gasification of coal.

[11] Page 41 of work cited in footnote 5.

Petroleum.—The small deposits of petroleum in Poland are scattered in the south and west, and the output is transported by rail to the small refineries in southern Poland. However, a large amount of petroleum is brought into Poland by pipeline from the U.S.S.R. and by ships across the Baltic Sea. A proposed pipeline from the Adriatic Sea is to terminate in Poland.

In view of the increasing needs for oil products, Poland has signed long-term agreements for delivery with Iraq and Libya. A similar agreement with Peru is under consideration.

According to Polish estimates, 1 ton of crude oil costs 40% less to purchase than gasoline. This is one of the reasons why the Government has assigned importance to refinery construction. Of the refineries under construction, the Gdansk refinery is the largest. After completion of its first stage by 1975, it will process 3 million tons of petroleum annually. Another major refinery is planned for Blachownia. The first stage, with an annual capacity of 3 million tons is due for completion in 1977. Expansion is underway at the small refineries in South–Jaslo, Jedlicze, Glinik, Trzebina, and Czechowice. These refineries are expected to add an annual capacity of 2 million tons by 1975. Trial runs of a fourth refinery at the Plock combine were to begin in 1974. This plant is expected to add a further 4 million tons to annual refinery capacity and allow increased delivery of Soviet oil. The expansion of refineries should bring Poland's annual capacity to 30 million tons by 1980.

The second branch of the Friendship line supplying oil from the U.S.S.R. started operation in May 1973. The network of pipelines for petroleum and petroleum products is planned to reach about 5,500 kilometers in 1990 from about 1,500 kilometers in 1973. Petroleum deliveries are expected to rise to 160 million tons from about 15 million tons in 1973.

The Mineral Industry of Portugal

By Norman A. Matthews [1]

The Portuguese mineral and metal industries produced, in general, lower tonnages in 1973 than in 1972, although the value was slightly higher owing to higher prices. An overall index of the minerals industry showed a 4% increase in value in 1973, with a modest decline in tonnage. Most categories of agricultural products showed an increase in volume; the fish catch showed a 15% increase in 1973 compared with that of 1972. The overall volume of construction increased 4% however, the volume of industrial building construction declined. Tourism increased 7% in 1973 compared with that of 1972.

Money supply increased 15% during 1973, and the liquidity reserve increased 10% over that of 1972. Overall wholesale and retail prices increased about 10% during the year, whereas consumer prices increased 10% in the first 9 months of the year. Government revenues and expenditures were essentially in balance during 1973 at $1.96 billion.[2]

Exports and imports increased 23% and 27%, respectively, compared with that of 1972, but the deficit in international trade continued to increase. Offshore oil exploration concessions were granted during 1973 to several United States and European companies or consortia. The locations were primarily off the northern and southern Atlantic coasts. At yearend, the three following major public works construction projects were underway:

1. New Lisbon airport.—A master plan was completed during the year and called for construction to begin in 1974, with completion in 1979. Airport cost was projected at $150 million with capacity projected at 10 million passengers per year.

2. Deepwater port at Sines.—A deepwater port will be necessary to serve the new oil refinery and petrochemical complex at Sines, 100 miles south of Lisbon. The first phase of the project, to cost $100 million, will open the port to medium-size tankers by 1975. The facility will accomodate large tankers by 1976.

3. Expansion of port of Leixoes.—This port area, serving Oporto, will be expanded in four stages beginning in 1973, with completion scheduled for 1978. A total of 2,000 yards of new dock space and modern equipment will be provided. Projected cost of the expansion was estimated at $22 million.

PRODUCTION

The overall value of metals and minerals production in Portugal was slightly higher in 1973 than in 1972; the index figure for minerals was 4% higher in value, but slightly lower in quantity. Copper metal and tungsten mine output increased, whereas lead, zinc, and silver output declined substantially.

Iron ore production was at a very low level, and manganiferous ore output declined 16% compared with 1972 production. Coke, pig iron, and raw steel production increased only moderately, owing to the expansion program of Siderúrgia Nacional S.A.R.L. at its Seixal plant.

Nonmetallic mineral output showed little change compared with that of 1972. The one exception was cement production, where the output of new facilities combined with capacity operations raised production 28% over 1972 levels.

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[1] Physical scientist, Division of Ferrous Metals—Mineral Supply.

[2] Where necessary, values have been converted from Escudo (Esc) to U.S. dollars at the rate of Esc25.50 = US$1.00.

Table 1.—Portugal: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity		1971	1972	1973 p
METALS				
Antimony, mine output, metal content		--	14	20
Arsenic, white		186	261	239
Beryl concentrate, gross weight		15	17	3
Columbite-tantalite concentrate, gross weight		11	12	12
Copper:				
Mine output, metal content:				
In cupreous pyrite		3,328	5,528	5,324
In other ore and concentrate		586	528	443
In precipitate		43	30	28
Total		3,957	6,086	5,795
Metal, refined primary		4,500	3,800	4,000
Gold, mine output, metal content	troy ounces	13,696	16,718	15,258
Iron and steel:				
Iron ore and concentrate, gross weight:				
Hematite and magnetite	thousand tons	51	1	1
Manganiferous	do	48	42	35
Total	do	99	43	36
Pig iron	do	355	357	e 440
Ferroalloys:				
Ferromanganese and ferrosilicon		6,727	8,664	e 9,650
Ferrotungsten		273	336	331
Total		7,000	9,000	9,981
Steel, crude	thousand tons	412	425	460
Steel semimanufactures	do	353	e 450	e 450
Lead:				
Mine output, metal content		1,383	1,157	452
Metal, refined		1,200	1,200	1,200
Manganese ore and concentrate, gross weight		4,734	5,348	181
Molybdenum ore and concentrate, metal content		3	2	e 2
Silver, mine output, metal content	troy ounces	262,510	230,263	108,394
Tin:				
Mine output, metal content	long tons	546	520	525
Metal	do	476	596	516
Titanium, ilmenite concentrate, gross weight		890	752	e 500
Tungsten, mine output, metal content		1,344	1,403	1,512
Uranium oxide (U_3O_8) e		95	95	95
Zinc, mine output, metal content		2,046	1,788	698
NONMETALS				
Asbestos		127	8	--
Barite		1,150	825	1,030
Cement, hydraulic [1]	thousand tons	2,458	2,840	e 3,660
Clays:				
Kaolin		44,950	44,636	44,554
Other		60,920	72,917	NA
Diatomite		4,671	1,651	1,153
Feldspar		18,771	18,011	20,793
Fertilizer materials, manufactured:				
Nitrogenous, gross weight	thousand tons	559	504	484
Phosphatic, gross weight	do	275	261	216
Mixed and unspecified	do	175	241	203
Total	do	1,009	1,006	903
Gypsum and anhydrite		177,522	135,496	e 170,000
Kyanite and related materials: Andalusite		181	103	NA
Lime (quicklime and hydrated lime)	thousand tons	205	320	e 283
Lithium minerals, lepidolite		750	1,200	1,000
Mica, all grades		810	1,656	e 1,700
Pyrite and pyrrhotite (including cupreous):				
Gross weight	thousand tons	559	553	532
Sulfur content	do	249	243	234
Salt:				
Rock	do	235	286	301
Marine	do	161	212	e 210
Total	do	396	498	511
Sand and gravel:				
Gravel	do	96	314	NA
Sand	do	2,560	2,647	NA

See footnotes at end of table.

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

Commodity	1971	1972	1973 p
NONMETALS—Continued			
Stone:			
Calcareous:			
Dolomite ---thousand tons--	23	34	NA
Limestone, marl and calcite ---do---	6,283	6,939	NA
Marble ---do---	229	236	NA
Other:			
Basalt ---do---	62	54	NA
Diorite ---do---	54	51	NA
Gabbro ---do---	19	22	NA
Granite ---do---	1,654	2,756	NA
Graywacke ---do---	2	30	NA
Ophite ---do---	39	40	NA
Porphyry ---do---	100	91	NA
Quartz ---do---	158	170	149
Quartzite ---do---	116	115	NA
Sandstone ---do---	1	NA	NA
Schist ---do---	69	177	NA
Serpentine	300	445	NA
Slate ---thousand tons--	44	45	NA
Syenite ---do---	3	4	NA
Sulfur, elemental, including sublimed	2,284	2,906	3,147
Talc	1,275	1,204	1,110
MINERAL FUELS AND RELATED MATERIALS			
Coal, anthracite ---thousand tons--	253	252	273
Fuel briquets, all grades ---do---	35	34	e 33
Gas, manufactured ---million cubic feet--	13,702	13,914	e 14,000
Petroleum refinery products:			
Gasoline ---thousand 42-gallon barrels--	4,556	4,616	4,660
Jet fuel ---do---	1,668	2,048	2,017
Kerosine ---do---	1,268	1,240	1,097
Distillate fuel oil ---do---	6,251	7,080	6,825
Residual fuel oil ---do---	9,757	10,410	10,550
Lubricants ---do---	553	644	625
Other ---do---	3,525	3,316	3,199
Refinery fuel and losses ---do---	1,959	2,474	2,533
Total ---do---	29,537	31,828	31,506

e Estimate. p Preliminary. NA Not available.
[1] Includes production from the Azores and Madiera Islands as follows, in thousand tons: 1971—None; 1972: Azores—15; Madiera—30; 1973: Azores—22 (estimated): Madiera—34 (estimated). The balance of output in each year was from continental Portugal.

TRADE

The Portuguese trade deficit continued to increase in 1973, with the value of exports approximating $1.75 billion, and imports, $2.87 billion, a differential of $1.12 billion in 1973, compared with $950 million and $617 million in 1971. Exports and imports increased 23% and 27% in value, respectively, compared with 1972 totals.

The pattern of foreign trade did not change significantly in 1973, but relative values of mineral exports continued to decline compared with that of textiles, clothing, and other manufactured articles. Some of the largest categories in value of imports in 1972 included (1) chemicals, $216 million, (2) crude oil and petroleum products, $125 million, (3) iron and steel products, $85 million, (4) nonferrous metals, $55 million, and (5) fertilizers and intermediates, $18 million. Value of the principal export categories in 1972 were (1) textile yarn and fabrics, $231 million, (2) food products, including live animals, $135 million (of which fish involved $49 million), (3) beverages and tobacco, $93 million (of which wines were valued at $88 million), (4) chemicals, $84 million, (5) pulp and waste paper, $66 million, (6) electrical machinery, $81 million, and (7) cork products, $64 million.

Exports from Portugal went to (1) Europe, accounting for 67% of the total, of which the principal countries were the United Kingdom, West Germany, and the Netherlands, and (2) the United States, with 10.8% of the total export value. Portugal's imports were principally from (1) West Germany, (2) the United Kingdom, (3) the United States, (4) Angola, (5) France, and (6) Spain.

The balance of payments was expected to improve substantially with an increase in domestic production of steel in 1974 and 1975, and self-sufficiency in petroleum products after 1976.

Table 2.—Portugal: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum metal, including alloys, all forms	82	--	
Arsenic trioxide, pentoxide, acids	--	170	Argentina 130.
Copper metal, including alloys, all forms	714	998	United States 317; Sweden 202; Italy 140.
Gold metal ---troy ounces	--	64	All to Canada.
Iron and steel:			
Ore and concentrate, including roasted pyrite:			
Roasted pyrite	5,475	3	Mainly to Finland.
Other	26	28	United Kingdom 17; Netherlands 10.
Metal:			
Scrap	5,457	19,256	Spain 13,300; Thailand 2,000.
Pig iron, ferroalloys, similar materials	5,633	9,332	West Germany 6,506; United Kingdom 948.
Steel, primary forms	--	2,890	Spain 2,089.
Semimanufactures:			
Bars, rods, angles, shapes, sections	9,924	14,654	Angola 6,930; Indonesia 3,000; Mozambique 2,330.
Universals, plates, sheets	9,348	7,086	France 2,323; Portuguese Guinea 1,676; Brazil 1,476.
Rails and accessories	211	38	All to Angola.
Wire	1,711	--	
Tubes, pipes, fittings	10,163	4,163	Spain 800; Angola 770; Norway 677; Mozambique 621.
Castings and forgings, rough	2,792	3,613	United Kingdom 937; Sweden 565; Angola 415; Switzerland 359.
Lead:			
Ore and concentrate	2,205	1,735	All to France.
Oxides	103	57	Angola 38; Mozambique 19.
Metal, including alloys, all forms	479	591	Angola 266; Mozambique 234.
Magnesium metal, including alloys	3	7	All to United Kingdom.
Manganese ore and concentrate	1,004	7,360	Spain 5,380; France 1,980.
Nickel metal, including alloys, all forms	48	26	United Kingdom 22.
Platinum-group metals and silver:			
Waste and sweepings thousand troy ounces	734	1,590	Belgium-Luxembourg 1,083; United Kingdom 490.
Platinum group ---troy ounces	3,768	2,549	France 1,241; West Germany 890.
Silver ---do	943	6,406	Mozambique 5,466; Angola 675.
Tin metal, including alloys, all forms long tons	88	109	Angola 28; United States 21; West Germany 16.
Tungsten ore and concentrate	1,473	687	Netherlands 325; United Kingdom 234.
Zinc:			
Ore and concentrate	3,876	2,762	All to France.
Oxide	129	167	Angola 85; Mozambique 40; Brazil 40.
Metal, including alloys, all forms	111	324	Angola 191; Netherlands 71.
Other:			
Ore and concentrate of molybdenum, titanium, vanadium, zirconium	11	24	Brazil 23.
Ash and residues containing nonferrous metals	1,013	788	Belgium-Luxembourg 633; Netherlands 110.
NONMETALS			
Asbestos	(1)	(1)	All to Angola and Mozambique.
Cement	52,281	69,152	Cape Verde 25,635; Israel 19,404; Portuguese Guinea 11,517.
Chalk	88	146	Angola 122; Mozambique 15.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Kaolin	1,260	2,094	Netherlands 1,880.
Other	593	458	United States 135; Angola 91; Mozambique 75.
Products:			
Refractory	2,448	1,630	Angola 1,005; Portuguese Guinea 343.
Nonrefractory	23,604	22,228	Gibraltar 5,170; Spain 4,430; United Kingdom 3,913.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Diamond:			
Gem, not set or strung--thousand carats	1,559	1,465	United Kingdom 1,432; Belgium-Luxembourg 33.
Industrial ---do	865	858	All to United Kingdom.
Diatomite and other infusorial earth	174	86	Netherlands 30; Mozambique 22.
Feldspar, leucite, nepheline, etc	10,407	6,718	Italy 3,130; France 2,681.
Fertilizer materials, natural and manufactured:			
Nitrogenous	70,385	116,799	West Germany 59,805; Morocco 9,920; France 7,926.
Phosphatic	108,640	65,474	United Kingdom 25,728; Nigeria 11,330; Iceland 4,920.
Potassic	1,853	2,026	Angola 1,289.
Other, including mixed	23,736	40,937	Angola 17,943; United Kingdom 12,321; Cyprus 3,192.
Gypsum and plasters	244	241	Mozambique 117; Angola 73.
Lime	1,600	1,022	Mozambique 536; Portuguese Guinea 248.
Mica, crude, including splittings and waste	290	377	France 220; United Kingdom 135.
Pigments, mineral:			
Natural crude	51	79	Angola 25; Mozambique 22; Portuguese Guinea 20.
Iron oxides, processed	100	56	Mozambique 19; Angola 17; Cape Verde 15.
Pyrite (gross weight)	186,738	114,109	Belgium-Luxembourg 81,309; Denmark 32,800.
Salt	254	459	Finland 425; Portuguese Guinea 16.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Marble and other calcareous	104,923	113,595	Italy 43,081; West Germany 25,852; Spain 18,610.
Slate	6,408	7,679	Belgium-Luxembourg 2,971; West Germany 1,926.
Granite and other	23,090	9,458	Italy 5,423; West Germany 1,514; Japan 1,005.
Worked:			
Slate	4,364	4,920	United States 1,263; Netherlands 1,191; West Germany 647.
Paving and flagstone	96,480	101,365	West Germany 56,393; Denmark 16,611; United Kingdom 11,891.
Marble and other	33,011	45,535	West Germany 24,703; United Kingdom 6,607; Denmark 5,414.
Gravel and crushed rock	6,975	6,962	Gilbraltar 5,061; Mozambique 1,398.
Quartz and quartzite	128,475	130,914	Norway 55,966; Italy 39,612; Switzerland 29,237.
Sand, not metal bearing	39,106	45,924	Gibraltar 22,700; Italy 19,600.
Sodium compounds	1,164	1,579	Angola 1,082; Brazil 250.
Sulfur:			
Elemental, all forms	807	44	France 20; Angola 15.
Sulfuric acid	18,389	44,962	Spain 31,387; Turkey 10,860.
Talc and steatite	97	124	Angola 89; Mozambique 18.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	66	144	Portuguese Guinea 119; Cape Verde 15.
Coal and coke, including briquets	143	3,913	Netherlands 3,767.
Petroleum refinery products:			
Bunker deliveries:			
Distillate fuel oil thousand 42-gallon barrels	151	133	All to foreign flag vessels and aircraft.
Residual fuel oil ---do	449	581	
Gasoline ---do	56	18	
Jet fuel ---do	655	687	
Lubricants ---do	52	13	
Gasoline ---do	60	85	Portuguese Guinea 63; Cape Verde 11.
Kerosine ---do	595	511	United Kingdom 283; Netherlands 121; Denmark 63.
Distillate fuel oil ---do	631	545	Netherlands 264; Spain 134; Portuguese Guinea 61.
Residual fuel oil ---do	1,142	539	Denmark 365; United Kingdom 102; Italy 71.
Lubricants ---do	395	357	Republic of South Africa 119; United Kingdom 62; Spain 60.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum refinery products—Continued			
Other:			
Liquefied petroleum gas thousand 42-gallon barrels	12	19	Cape Verde 9; Portuguese Guinea 9.
Unspecified ——do——	6	25	Spain 7; United Kingdom 5; Cape Verde 3; Italy 2.
Total ——do——	4,204	3,513	

[1] Less than ½ unit.

Table 3.—Portugal: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Oxide and hydroxide	3,802	2,863	France 953; West Germany 948; United Kingdom 690.
Metal, including alloys:			
Scrap	187	101	France 25; West Germany 25; United States 24.
Unwrought	1,578	1,586	Norway 600; United Kingdom 454; France 148.
Semimanufactures	17,257	22,904	Canada 8,361; West Germany 2,626; Belgium-Luxembourg 1,392.
Chromium:			
Chromite	--	379	Finland 261.
Oxide and hydroxide	150	170	West Germany 82; Belgium-Luxembourg 50.
Copper metal, including alloys:			
Scrap	544	352	Guinea 68; Mozambique 63; United States 56.
Unwrought:			
Blister	1,547	999	Zambia 750; Angola 150.
Refined, unalloyed	6,552	6,509	Canada 2,594; Belgium-Luxembourg 2,503.
Master alloys	78	146	United Kingdom 129.
Semimanufactures	8,946	7,672	United Kingdom 3,020; France 1,450.
Gold metal, unworked and partly worked troy ounces	918	115	United States 66; West Germany 37.
Iron and steel:			
Ore and concentrate, including roasted pyrite	340,172	365,593	Angola 288,000; Brazil 63,981.
Scrap	10,278	24,045	NA.
Pig iron, ferroalloys, similar materials	23,392	22,898	Spain 18,454.
Steel, primary forms	150,679	206,805	Japan 84,161; United States 64,491; Netherlands 27,221.
Semimanufactures:			
Bars, rods, angles, shapes, sections	92,433	66,226	West Germany 15,176; Sweden 11,825; Belgium-Luxembourg 10,354.
Universals, plates, and sheets	180,748	141,511	West Germany 42,822; Japan 30,909; Sweden 29,268.
Hoop and strip	24,936	21,942	Belgium-Luxembourg 13,163.
Rails and accessories	42,924	5,166	Belgium-Luxembourg 3,406.
Wire	14,896	12,629	France 2,506; Belgium-Luxembourg 2,326; United Kingdom 2,129.
Tubes, pipes, fittings	17,545	16,204	United Kingdom 4,194; West Germany 4,184; France 1,253.
Castings and forgings, rough	625	619	Sweden 204; West Germany 127.
Lead:			
Oxides	48	72	United Kingdom 71.
Metal, including alloys:			
Scrap	162	261	Malta 105; United Kingdom 50; Angola 43.
Unwrought and semimanufactures	12,117	10,680	United Kingdom 5,598; Mexico 2,760.
Magnesium metal, including alloys, all forms	5	10	United Kingdom 5.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Manganese:			
Ore and concentrate	213	362	Japan 135; Netherlands 115.
Oxides	221	357	United Kingdom 134; Netherlands 60.
Mercury ----76-pound flasks--	957	725	Yugoslavia 531.
Molybdenum metal, including alloys, all forms ----kilograms--	r 2,900	1,200	United Kingdom 600; West Germany 200.
Nickel metal, including alloys, all forms	537	513	West Germany 193; United Kingdom 168.
Platinum-group metals and silver, including alloys:			
Platinum group ----troy ounces--	477,440	2,747	United Kingdom 1,218; France 886.
Silver ----thousand troy ounces--	1,253	1,466	United Kingdom 819; West Germany 492.
Tin:			
Oxides ----long tons--	9	12	Austria 6; West Germany 5.
Metal, including alloys, all forms --do--	95	392	Belgium-Luxembourg 374.
Titanium:			
Rutile concentrates	257	149	Australia 98; Austria 51.
Oxides	4,107	4,712	United Kingdom 1,595; Finland 1,213; West Germany 875.
Zinc:			
Oxides	195	262	Norway 90; West Germany 61; Sweden 40.
Metal, including alloys:			
Scrap	95	153	United Kingdom 80.
Unwrought	9,334	10,828	Spain 3,420; Belgium-Luxembourg 2,243; West Germany 1,371.
Semimanufactures	863	1,129	West Germany 810.
Other ores and concentrates:			
Of vanadium, zirconium, titanium (except rutile)	505	578	Australia 444; United Kingdom 105.
Unspecified nonferrous	16	(1)	All from Netherlands.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	403	594	Italy 386; Netherlands 156.
Dust and powder of precious and semiprecious stones (including diamond) ----kilograms--	68	63	United Kingdom 58.
Grinding and polishing wheels and stone	390	443	United Kingdom 103; West Germany 76.
Asbestos	5,780	5,515	Canada 3,066; Republic of South Africa 1,255.
Barite and witherite	362	290	West Germany 139; United Kingdom 76.
Cement	100,835	5,115	NA.
Chalk	4,296	4,973	France 3,236; Belgium-Luxembourg 1,179.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Bentonite	5,014	5,214	West Germany 1,347; Spain 1,203.
Kaolin	3,658	5,335	United Kingdom 4,224; France 860.
Other	3,039	2,038	United Kingdom 1,518.
Products:			
Refractory	19,195	14,630	France 6,916; West Germany 2,266; Austria 1,412.
Nonrefractory	2,613	2,653	Spain 1,797; Italy 546.
Cryolite and chiolite	63	75	Denmark 70.
Diamond, except powder and dust:			
Gem, not set or strung --thousand carats--	1,915	15	Switzerland 5; Belgium-Luxembourg 4; Netherlands 3.
Industrial ----carats--	--	17,545	West Germany 10,750; Belgium-Luxembourg 5,370.
Not classified ----thousand carats--	2,279	2,190	All from Angola.
Diatomite and other infusorial earth	1,784	2,425	Spain 1,098; West Germany 332.
Feldspar, leucite, nepheline, etc	2,662	2,194	United Kingdom 1,461; Spain 414.
Fertilizer materials:			
Crude:			
Nitrogenous	r 1,692	1,756	Chile 1,600.
Phosphatic	285,960	297,829	Morocco 245,392; Senegal 42,561.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Fertilizer materials—Continued			
Manufactured:			
Nitrogenous	3,901	12,718	Netherlands 6,050; France 1,520.
Phosphatic	11,419	9,183	Belgium-Luxembourg 7,082; France 2,050.
Potassic	39,588	47,212	Spain 47,200.
Other, including mixed	34,129	41,840	United Kingdom 18,242; Belgium-Luxembourg 9,575; West Germany 5,749; Italy 5,278.
Graphite, natural	179	436	United Kingdom 250; West Germany 76.
Gypsum and plasters	25,303	30,629	Morocco 30,070.
Lime, hydraulic	79	1	All from West Germany.
Magnesite	388	478	Austria 242; Netherlands 223.
Mica, crude and worked	230	274	Norway 135; United Kingdom 125.
Pigments, mineral:			
Natural, crude	67	70	Austria 46; France 11.
Iron oxides, processed	1,681	1,679	West Germany 707; Spain 573.
Salt and brine	27,015	88,095	Italy 30,270; Tunisia 19,607; Cape Verde 19,000.
Stone, sand and gravel:			
Dimension stone:			
Crude	r 292	1,685	Angola 1,147; Iraq 500.
Worked	r 31	--	
Dolomite, chiefly refractory grade	4,760	5,884	Italy 4,483.
Flint and crushed rock	152	135	Denmark 93; Spain 10; West Germany 10.
Quartz and quartzite	149	161	Sweden 78; Belgium-Luxembourg 45; Spain 24.
Sand, excluding metal bearing	6,985	5,783	Belgium-Luxembourg 4,977.
Sulfur:			
Elemental, all forms	25,751	30,515	France 24,926; Finland 2,180.
Sulfur dioxide	241	208	West Germany 130; France 55.
Sulfuric acid	54	5,306	Norway 2,658; Poland 2,596.
Talc, steatite, soapstone, pyrophyllite	2,905	3,263	France 1,656; Norway 504.
Other nonmetals, crude, n.e.s	9,940	8,972	Cape Verde 5,600; Spain 2,711.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	330	1,414	Netherlands 680; Spain 384.
Carbon black	7,843	8,481	Spain 4,280; West Germany 1,551.
Coal, all grades, including briquets thousand tons	156	367	United States 274; Poland 77.
Coke and semicoke do.	311	177	West Germany 65; France 33; Belgium-Luxembourg 33.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	25,535	31,372	Iraq 12,335; Saudi Arabia 10,063.
Refinery products:			
Gasoline do.	362	801	Spain 475; Belgium-Luxembourg 230.
Kerosine do.	r 4	1	Mainly from Netherlands Antilles.
Jet fuel do.	r 228	444	Italy 177; Netherlands 123; Spain 61.
Distillate fuel oil do.	2,140	1,346	Italy 431; Netherlands 392; United Kingdom 140.
Residual fuel oil do.	2,137	1,443	Netherlands 466; Mozambique 341; Italy 263; Iraq 266.
Lubricants do.	422	171	United Kingdom 51; France 50; Netherlands 28.
Other:			
Liquefied petroleum gas do.	2,620	2,774	France 1,088; Spain 758; Netherlands 435.
Unspecified do.	260	362	Spain 128; Netherlands Antilles 82; Netherlands 79.
Total do.	r 8,173	7,566	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	12,917	12,526	United Kingdom 5,546; Spain 3,055; Netherlands 2,195.

r Revised. NA Not available.
1 Less than ½ unit.

COMMODITY REVIEW

METALS

The overall value of selected products of the extractive minerals industry, constituting an index incorporating nonferrous, ferrous, and nonmetallic minerals, increased 4% in 1973 compared with 1972 value. This increase in value occurred, despite a slight reduction in volume as a result of higher unit prices. Output of refined copper increased slightly compared with 1972 production. Production of lead and zinc minerals in 1973 declined substantially compared with previous years because the Terramonte mine closed; value of coproduct silver in the concentrates decreased similarly. Tungsten mine output exceeded the 1972 output by 7%.

Beralt Tin & Wolfram Ltd., the major tungsten mining company in Portugal, refinanced its operations and created a Portuguese subsidiary company, Beralt Tin & Wolfram (Portugal) S.A.R.L. in which the Government of Portugal has a 45% interest. Financial losses were minimal in 1973 and, with higher selling prices for tungsten, prospects improved for developing newly delineated ore bodies.

Scrimenex Ltd. of Canada continued a drilling program on a massive copper sufide ore body in eastern Portugal. The property was previously owned by Intermine Ltd. Nine thousand feet of drilling had revealed reserves of about 500,000 tons of ore grading 2.2% copper. Further surveying of the area was planned before considering mine development.

Broken Hill Pty. Co. Ltd., of Australia incorporated the firm Sociedade Mineira S.A.R.L. in Lisbon to explore over 2,500 square kilometers of the Portuguese Province of Timor in Indonesia for manganese, chromium, and copper.

Iron and Steel.—Production of iron ore has declined steadily since 1971 and was at 1,000 tons in 1973. The quantity of manganiferrous ore shipped also declined from 42,000 tons in 1972 to 35,000 tons in 1973. Steel production increased 8% compared with that of 1972, and reached 460,000 tons. Nevertheless, little increase was realized from the expansion program underway at the Siderúrgia Nacional mill at Sexial, the first phase of which was scheduled to be completed in 1974.

Details of the steel mini-mill being constructed at Folgosa, 60 miles east of Oporto, were announced at midyear. The Davy International group of the United Kingdom is the overall contractor, and Demag of West Germany will furnish and install the electric furnaces and continuous-casting facility. The plant, to be operated by Siderúrgia Nacional, S.A.R.L., will start melting operations by midyear 1975 with an initial capacity of 200,000 tons per year in cast billets. The continuously cast billets will supply a merchant mill producing wire rods, bars, and small sections. Facility cost was projected at $24 million.

NONMETALS

Overall production of fertilizer intermediates declined 10% compared with 1972. Production of cement increased from 2.8 million tons in 1972 to 3.7 million tons in 1973, reflecting capacity operations and the output of two new kilns installed by Companhia Cimento Tejo at Alhandra. Production of most other nonmetallic minerals continued at rates approximating those of the previous year. Political unrest caused reporting to be delayed on many items, such as quarry products.

Construction of a new cement plant by Cia. Cementos do Norte at Souselas was announced. When completed in 1974, the plant, incorporating one kiln of 15-foot diameter and 230-foot length, was expected to produce 1,760 tons per day of clinker.

Plans for additional ammonia and urea production as a part of the petrochemical complex on the Sines Peninsula were being formulated, but details had not been announced at yearend.

MINERAL FUELS

Production of anthracite increased from 252,000 tons in 1972 to 273,000 tons in 1973, reversing the gradual decline of recent years. Domestic production of petroleum products continued at capacity with little change from that of 1972; domestic consumption declined slightly in 1973 compared with that of 1972.

Construction began on the new petroleum refinery on the Sines Peninsula to be operated by Sociedade Portuguesa de Refinacão de Petróleos (Petrosul). Procon France and Compagnie Française d'Études

et de Construction Technip of France were prime contractors, with basic engineering provided by Universal Oil Products Co. The designed capacity of the plant was 224,000 barrels per day; the plant was expected to cost $250 million. Completion is anticipated in 1976. Associated with the refinery will be several petrochemical projects that had not been finalized at yearend. An ethylene plant of 200,000-tons-per-year capacity and ammonia and urea plants of 1,000 tons per day each were being considered. Sumitomo Chemical Co., Ltd. of Japan was also negotiating for construction of a polyvinyl chloride plant of 50,000- to 100,000-tons-per-day capacity.

Two groups of offshore petroleum exploration concessions were granted by the Government in 1973. The October contracts included the folowing:

1. The Shell Prospex Portuguese S.A.R.L.-Sacorex (Portugal) group will drill 11 offshore wells in two zones near Oporto and four zones northwest of Lisbon.

2. The Sun Oil-Amerada (Hess)-Phillips Petroleum group will drill in two zones 100–150 miles north of Lisbon.

3. Esso Exploration Inc. will drill in three zones 100 miles south of Oporto.

Preliminary negotiations for the second group of concessions were made during 1973, but contracts were finalized after yearend. These included the following:

1. Shell Prospex-Sacorex will drill in three zones off the west coast, west of Oporto and 60–70 miles north of Lisbon.

2. Texaco Exploration will drill in one zone off the west coast, south of Lisbon.

3. Chevron-Petrosul of Portugal and Sonap of Portugal will drill in two shallow- and three deepwater zones off Algarve, the southern coast.

4. Challenger-Energy Resources, Inc., will drill in one shallow- and two deepwater zones off Algarve.

Generally all contracts are based upon a 6-year exploration period, with commitments to drill exploration wells within the first year.

Congestion at the Port of Leixoes, which serves Oporto in the north, was particuarly heavy during December 1972–January 1973, and has led to the formulation of a port-expansion plan to be completed by 1978. Proposed by Adminitracão dos Portos de Douro e Leixoes (APDL—Port Adminstration), the plan includes the following.

(1) A pier extension 370 meters long, in operation by yearend 1973; (2) a pier extension 500 meters long for containers and roll-on/roll-off vessels, to be completed by mid-1975; (3) dock 4, 500 meters in length, to be completed in 1975; and (4) an additional 500 meters of dock length, to be completed in 1978.

The total cost of the port extension is estimated at $22 million, with $10.6 million for civil construction and $5.5 million for cranes, forklifts, and other handling equipment.

The Mineral Industry of Romania

By Joseph B. Huvos [1]

In 1973, Romania's most important mineral products were crude oil, coal, natural gas, bauxite, aluminum, iron ore, iron and steel, manganese ore, cement, barite, pyrites, salt, and petrochemicals. By world standards, only crude oil had some importance with an annual output approximating 0.5% of world production.

During 1973, as in previous years, the Romanian Government continued its vigorous investment program for economic development, with total investments in all sectors of the economy reaching 91.2 billion lei,[2] an increase of 7.4 billion lei over the 1972 level (corresponding to a plan fulfillment of 97.3%). Of this, industry as a whole received 54.6 billion lei, an increase of 13.3% over that of 1972. Major investments in the mineral industries were in the metallurgy area, where new productive capacities were brought onstream, such as the Tîrgovişte alloy steel enterprise, the coke-chemical plant at the Galaţi Siderurgical Combine, the Hunedoară Siderurgical Combine, the Slatina Aluminum Enterprise, the Baia-Mare Metallurgical and Nonferrous Metals Enterprise, the Buzău Wire and Wire Products Enterprise, the Roman Pipe Enterprise, and the Bucharest Republic Pipe Enterprise.

In the area of fuel and power, units commissioned included: the first 210-megawatt thermoelectric group at Brailă; the 210-megawatt heating plant at Brazi; the 170-megawatt Lotru hydroelectric project; and the Piteşti-Sud 120-ton-per-hour steam heating plant. In the chemical industry, the tripolyphosphate and phosphate compound plant at the Valea Călugărească Chemical Fertilizer Combine, a synthetic fiber plant at the Synthetic Fiber Combine of Savineşti, and a plasticizer plant at the Solvent Enterprise of Timişoară were commissioned. In the field of construction materials, facilities commissioned included: the Ceramic Products Enterprise of Cluj; the cement products plants of Calaraşi and Constanţa; three new 320,000-ton-per-year cement lines at the Cîmpulung Cement Combine; and two new asbestos-cement lines at the Aleşd Cement and Asbestcement Combine and one at the Medgidia Asbestcement Combine.[3]

Romania's supply-demand balance for the more important minerals did not change much in 1973. In 1972, by world trade standards, the significant export was that of 5.1 million tons of petroleum products; 59,000 tons of nonferrous metals and alloys, including aluminum; 1,331,400 tons of steel semiproducts; 813,500 tons of chemical fertilizer; and 1,084,300 tons of cement.

Of Romania's total commodity trade, 24.5% was with the U.S.S.R.; trade with centrally controlled economies including the U.S.S.R. amounted to 51.4% of total trade.

PRODUCTION

In 1973 Romania's industrial production was valued at 429.6 billion lei. This was an increase of 15.0% over 1972 production figures and corresponds to a 100.2% plan fulfiliment.

During 1973, growth in the major sectors of the minerals and related industries was as follows:

[1] Foreign mineral specialist, Division of Fossil Fuels—Mineral Supply.

[2] Values have not been converted from Romanian currency units (lei) to U.S. dollars, because of the wide variation between the official exchange rate (lei 4.97=US$1.00) and the rate actually used for transactions.

[3] Scînteia (Bucharest). (Release on Plan Fulfillment in 1973). V. 43, No. 9773, Feb. 6, 1974, p. 3.

Industry sectors	Percent growth
Building materials industry	6.7
Chemical industry	18.3
Electric and thermal energy	8.2
Ferrous metallurgy, including mining	12.2
Fuels	6.8
Nonferrous metallurgy, including mining	9.6

Significant increases were registered in the production of phosphatic fertilizers, electric power, crude steel, aluminum and alloys, cement, lignite, and natural gas.

Table 1.—Romania: Production of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Aluminum:			
Bauxite, gross weight [e]	305,000	305,000	345,000
Alumina, gross weight [e]	210,000	210,000	282,000
Ingot (including alloys)	[r] 110,814	121,533	141,241
Bismuth, mine output, metal content [e]	80	80	80
Cadmium, smelter output [e]	80	80	80
Copper: [e]			
Mine output, metal content, recoverable	14,200	35,000	42,000
Smelter	11,000	35,000	42,000
Refined	11,000	35,000	42,000
Gold, mine output, metal content [e] troy ounces	60,000	60,000	60,000
Iron and steel:			
Iron ore thousand tons	3,467	3,361	3,234
Pig iron and blast furnace ferroalloys do	4,382	4,890	5,713
Crude steel do	6,803	7,401	8,161
Semimanufactures:			
Castings and forgings, finished do	569	618	669
Pipes and tubes do	825	880	902
Rolled products do	4,763	5,230	5,833
Lead: [e]			
Mine output, metal content, recoverable	38,000	38,000	41,000
Smelter	36,000	36,000	39,000
Manganese ore: [e]			
Gross weight	127,000	130,000	140,000
Manganese content	28,000	30,000	34,000
Silver, mine output, metal content [e] thousand troy ounces	1,000	1,000	1,100
Zinc: [e]			
Mine output, metal content, recoverable	39,800	40,000	42,000
Smelter	39,800	40,000	42,000
NONMETALS			
Barite [e]	116,000	116,000	116,000
Cement, hydraulic thousand tons	8,523	9,212	9,848
Clays: [e]			
Bentonite	120,000	120,000	120,000
Kaolin	50,000	50,000	50,000
Fertilizer materials, manufactured:			
Nitrogenous, N content thousand tons	827	874	854
Phosphatic, P_2O_5 content do	245	313	361
Fluorspar [e]	15,000	15,000	15,000
Graphite [e]	6,000	6,000	6,000
Lime thousand tons	[r] 2,253	2,435	2,593
Pyrite: [e]			
Gross weight do	840	840	870
Sulfur content do	360	360	375
Salt do	2,948	3,147	3,296
Sodium carbonate, manufactured, 100% Na_2CO_3 basis	601,000	665,000	677,000
Sulfuric acid (monohydrate) thousand tons	1,047	1,162	1,311
Talc [e]	57,000	57,000	60,000
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	74,634	73,763	77,367
Coal:			
Run-of-mine:			
Anthracite and bituminous thousand tons	8,505	8,073	8,294
Brown do	654	641	654
Lignite do	13,792	16,557	17,716
Total do	22,951	25,271	26,664
Washed (produced from above):			
For coke and semicoke production do	1,329	1,205	1,344
Lignite do	13,187	15,938	17,057
Other (unspecified) do	6,085	6,016	6,450
Total do	20,601	23,159	24,851

See footnotes at end of table.

Table 1.—Romania: Production of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued			
Coke, metallurgical ---------- thousand tons	1,108	1,134	1,321
Gas:			
Manufactured (coke oven and blast furnace) million cubic feet	18,953	[e] 19,390	[e] 19,420
Natural:			
Gross production:			
Associated ---------- do	189,074	191,616	197,725
Nonassociated ---------- do	754,494	787,054	834,799
Total ---------- do	943,568	978,670	1,032,524
Marketed production ---------- do	891,620	925,522	975,548
Petroleum:			
Crude:			
As reported ---------- thousand tons	13,793	14,128	14,287
Converted [e] ---------- thousand 42-gallon barrels	102,799	105,296	106,481
Refinery products: [2]			
Gasoline ---------- do	25,645	26,648	28,568
Jet fuel and kerosine ---------- do	[r] 8,138	8,471	7,936
Distillate fuel oil ---------- do	39,366	38,165	41,754
Residual fuel oil ---------- do	29,111	31,695	36,170
Lubricants ---------- do	4,200	4,494	4,536
Other:			
Liquefied petroleum gas ---------- do	2,587	2,645	2,865
Asphalt ---------- do	3,424	3,515	3,660
Petroleum coke ---------- do	671	--	--
Total ---------- do	[r] 113,142	115,633	125,489

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

[1] In addition to the commodities listed, antimony, asbestos, feldspar, 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 1972, reference year for this chapter's trade tables, Romania's exports of all goods amounted to 14.4 billion lei; imports, 14.5 billion. In 1973, exports increased 29.2%, to 18.6 billion lei; imports increased 20.4%, to 17.5 billion lei. In 1972, trade by major mineral and related commodity groups was as follows:

	Value (million lei)	Percent of total
Exports:		
Building materials ------	418.0	2.9
Chemicals, fertilizers and rubber ----------	1,181.8	8.2
Fuels, minerals and metals ----------	2,368.0	16.5
Petroleum, products only	762.1	5.3
Imports:		
Building materials ------	162.8	1.1
Chemicals, fertilizers and rubber ----------	806.6	5.6
Fuels, minerals and metals ----------	3,843.0	26.6

Romania does not publish detailed trade figures showing commodities by country of origin or destination; only the total value of all goods traded was reported. In 1971, on the basis of this total value, Romania's principal trading partners were as follows:

Country	Percent of total trade
U.S.S.R ----------	24.5
West Germany ----------	9.5
East Germany ----------	6.9
Czechoslovakia ----------	6.2
Italy ----------	5.8
France ----------	4.6
China, People's Republic of ------	4.2

Trade with centrally planned countries was 14.8 billion lei, or 51.4% of Romania's total trade.

Table 2.—Romania: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971 [1]	1972 [2]	Principal destinations, 1972
METALS			
Aluminum and alloys:			
Scrap	3,297	3,683	West Germany 2,287; Italy 1,207.
Unwrought and semimanufactures [3]	53,000	51,500	Japan 21,800; People's Republic of China 8,900.
Copper and alloys, unwrought and semimanufacures [3]	3,300	5,100	All to West Germany.
Iron and steel:			
Pig iron and ferroalloys	636	621	West Germany 336; Sweden 285.
Steel, primary forms [4]	253,000	34,000	NA.
Semimanufactures:			
Bars, rods, angles, shapes, sections [4]	266,000	248,000	NA.
Plates and sheets [3 5]	618,300	575,500	U.S.S.R. 235,400; West Germany 70,200; East Germany 62,400; People's Republic of China 61,300.
Hoop and strip	13,351	7,422	All to Yugoslavia.
Wire [4]	22,000	21,000	NA.
Pipes, tubes, fittings [3 6]	r 242,500	255,000	U.S.S.R. 132,500; People's Republic of China 41,300; West Germany 25,700.
Castings and forgings	12,490	15,194	All to West Germany.
Total	1,174,641	1,122,116	
Lead:			
Oxides	NA	NA	
Metal and alloys, unwrought and semimanufactures [3]	2,100	1,200	Italy 500; West Germany 300; Netherlands 200.
Manganese ore [3]	49,200	37,000	All to Japan.
Silver:			
Waste and sweepings value, thousands	$1,062	$1,383	Italy $808; France $523.
Metal, crude and worked ——do——	$434	$1,198	All to Italy.
Zinc metal and alloys, unwrought and semimanufactures [3]	2,900	1,800	United Kingdom 900; West Germany 600.
Other, nonferrous scrap, n.e.s	59	36	All to Italy.
NONMETALS			
Barite [3]	r 49,500	25,000	U.S.S.R. 18,000; Belgium-Luxembourg 7,000.
Cement, hydraulic [3]	r 934,600	1,084,300	Austria 228,600; Poland 169,000; Yugoslavia 150,700; Hungary 140,100.
Clays and products:			
Crude, bleaching [7]	1,900	2,111	All to Poland.
Products, nonrefractory	139,871	102,345	Mainly to Yugoslavia.
Fertilizer materials, manufactured:			
Nitrogenous	236,214	311,591	West Germany 140,869; France 100,553.
Phosphatic	2,140	26,620	Spain 14,581; Belgium-Luxembourg 4,897; France 3,554.
Mixed	54,690	55,395	Spain 41,123; France 10,709.
Pyrite, unroasted	NA	NA	
Salt [3]	633,600	652,100	Hungary 264,700; Bulgaria 123,500; Czechoslovakia 76,000.
Sodium and potassium compounds, n.e.s.: [3]			
Caustic soda	r 93,900	115,200	U.S.S.R. 63,000; Hungary 30,400.
Soda ash	r 306,400	371,900	U.S.S.R. 184,100; Hungary 46,000; Argentina 35,900.
Stone, sand and gravel:			
Dimension stone, worked	12,141	19,918	West Germany 16,546; Austria 3,372.
Other	9,608	7,846	West Germany 6,314; Japan 1,099.
Talc	NA	NA	
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural	[8] 46,500	1,504	All to Yugoslavia.
Carbon black [3]	36,300	38,100	People's Republic of China 9,200; Czechoslovakia 8,900; East Germany 6,200.
Coal, bituminous	--	15,382	All to Italy.
Gas, natural and manufactured [3] million cubic feet	7,063	7,063	All to Hungary.
Peat and briquets	2,707	3,014	All to Austria.

See footnotes at end of table.

Table 2.—Romania: Exports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971 [1]	1972 [2]	Principal destinations, 1972
MINERAL FUELS AND RELATED MATERIALS —Continued			
Petroleum:			
Crude [9] --thousand 42-gallon barrels--	698	393	Austria 377.
Refinery products: [3]			
Gasoline ----------do----	5,304	5,120	Greece 1,285; U.S.S.R. 986; France 789; Poland 760.
Kerosine ----------do----	253	326	Greece 209; U.S.S.R. 84.
Distillate fuel oil ----------do----	19,548	17,712	West Germany 3,166; France 2,950; United States 2,033; Greece 1,889.
Residual fuel oil ----------do----	10,260	10,753	Italy 3,253; United States 1,301; Greece 1,081; Czechoslovakia 1,000.
Lubricants ----------do----	r 2,617	2,554	U.S.S.R. 763; People's Republic of China 571; Italy 240.
Other:			
Mineral jelly and wax -do----	128	106	U.S.S.R. 42; Italy 22.
Petroleum coke ----------do----	606	262	Japan 141; Poland 83.
Unspecified ----------do----	340	246	NA.
Total ----------do----	r 39,056	37,079	
Crude chemicals from coal, gas, and oil distillation ----------	28,577	21,781	West Germany 16,159; Spain 4,018.

r Revised. NA Not available.

[1] Compiled from 1971 edition of Supplement to the World Trade Annual, v. 1 (Eastern Europe), Walker and Company, New York, 1974 (prepared by the Statistical Office of the United Nations) unless otherwise noted. These data represent imports from Romania as reported by selected trading partner countries.

[2] Compiled from United Nations Statistical Office, World Trade Annual, 1972 ed., v. 1-3, 1974, unless otherwise noted.

[3] Official export statistics of Romania.

[4] United Nations Economic Commission for Europe, Annual Bulletin of Steel Statistics for Europe, v. 1, 1973, New York, 1974.

[5] Includes strip.

[6] Excludes fittings.

[7] Official import statistics of Poland.

[8] Includes petroleum refinery asphalt.

[9] Official import statistics of Austria.

Table 3.—Romania: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971 [1]	1972 [2]	Principal sources, 1972
METALS			
Aluminum: [3]			
Bauxite	r 206,800	226,300	Yugoslavia 196,600; Greece 22,500.
Alumina	40,000	62,800	Switzerland 21,600; United Kingdom 21,300; Guinea 12,100.
Metal, including alloys, unwrought and semimanufactures	r 9,000	12,900	U.S.S.R. 3,300; Yugoslavia 2,700; Hungary 2,500; Italy 2,100.
Chromium, chromite [3]	35,600	33,900	Mainly from Albania.
Copper metal, including alloys, unwrought and semimanufactures [3]	r 27,100	34,700	United Kingdom 9,300; U.S.S.R. 7,800; United States 6,900.
Iron and steel:			
Iron ore [3] thousand tons	6,939	7,615	U.S.S.R. 4,529; Algeria 1,616; India 1,318.
Pig iron, sponge iron, powder and shot [3] do	r 608	528	U.S.S.R. 504.
Ferroalloys [3] do	121	118	Mainly from U.S.S.R. and the People's Republic of China.
Steel, primary forms [4] do	216	280	NA.
Semimanufactures: [4]			
Bars, rods, angles, shapes, sections do	414	481	NA.
Plates and sheets do	589	348	NA.
Hoop and strip do	36	33	NA.
Rails and accessories do	74	72	NA.
Wire do	28	35	NA.
Pipes, tubes, fittings do	r 84	125	NA.
Total [5] do	1,225	1,094	
Lead:			
Ore and concentrate [6]	7,098	4,081	All from Poland.
Oxides	2,000	NA	
Metal, including alloys, all forms [6]	--	312	All from Poland.
Manganese:			
Ore and concentrate [3]	1,800	2,000	All from U.S.S.R.
Oxide	887	1,372	All from Japan.
Mercury 76-pound flasks	2,062	1,886	Spain 986; Italy 899.
Nickel metal, including alloys, unwrought and semimanufactures [3]	2,300	2,900	U.S.S.R. 1,900; United Kingdom 600.
Platinum-group metals, unwrought and semimanufactures value, thousands	$681	$351	France $161; Italy $138.
Silver metal, unwrought and semimanufactures do	$91	$63	All from France.
Tin metal, including alloys, unwrought and semimanufactures [3] long tons	2,460	2,953	People's Republic of China 1,083; Switzerland 787; Netherlands 787.
Titanium oxides	1,190	364	All from West Germany.
Tungsten metal, all forms	6	NA	
Zinc:			
Powder (blue dust)	1,298	1,652	Belgium-Luxembourg 1,267; West Germany 385.
Metal, including alloys, all forms [3]	1,400	5,700	Bulgaria 3,700; United Kingdom 1,000.
Oxides	NA	NA	
Other metals, including alloys, all forms	67	134	United Kingdom 74; Belgium-Luxembourg 36.
NONMETALS			
Abrasives, manufactured [7 8]	50	44	All from U.S.S.R.
Asbestos [3]	r 38,400	42,700	U.S.S.R. 19,600; Canada 12,400; United Kingdom 8,300.
Barite and witherite	3,661	5,134	Italy 2,151; West Germany 1,783; France 1,200.
Borates, crude natural	NA	NA	
Chalk	673	NA	
Clays and products:			
Crude clays, n.e.s	18,816	31,218	United Kingdom 12,937; Yugoslavia 9,679; Greece 8,602.
Products:			
Refractory	r 38,014	41,538	Yugoslavia 15,626; U.S.S.R. 7,100; Italy 4,799.
Nonrefractory	388	2,002	All from Italy.

See footnotes at end of table.

Table 3.—Romania: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971 [1]	1972 [2]	Principal sources, 1972
NONMETALS—Continued			
Cryolite [3]	r 4,200	4,800	People's Republic of China 2,000; Yugoslavia 900; Netherlands 900.
Diamond:			
Gem ---value, thousands	NA	NA	
Industrial ---do	$511	$899	France $707; Belgium-Luxembourg $192.
Feldspar and fluorspar	1,852	1,086	All from Italy.
Fertilizer materials:			
Crude:			
Nitrogenous, nitrogen content [3]	--	NA	
Phosphatic, apatite concentrate, P_2O_5 content [3]	340,600	404,400	Mainly from U.S.S.R.
Potassic, K_2O equivalent	[3] 34,200	[7] 70,700	All from U.S.S.R.
Manufactured, phosphatic	24,877	5,000	All from Israel.
Graphite	119	NA	
Magnesite, products [3]	21,700	19,000	Czechoslovakia 9,700; U.S.S.R. 7,100; North Korea 700.
Mica, worked	24	20	France 13; Switzerland 7.
Pigments, mineral, iron oxides	271	542	All from West Germany.
Pyrites, unroasted [7]	133,000	54,000	All from U.S.S.R.
Stone, quartz and quartzite	NA	NA	
Sulfur, elemental (including colloidal) [3]	r 29,900	39,800	Poland 34,400.
Sulfuric acid [7 9]	r 51,333	[6] 44,107	U.S.S.R. 27,700; Bulgaria 15,509.
Talc	NA	NA	
Other crude nonmetals	965	828	All from Netherlands.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	204	257	All from France.
Coal [3] ---thousand tons	r 743	754	U.S.S.R. 405; Czechoslovakia 293.
Coke [3] ---do	2,435	2,496	U.S.S.R. 1,200; Czechoslovakia 518; People's Republic of China 178.
Petroleum:			
Crude [3] --thousand 42-gallon barrels	21,078	21,352	Iran 12,459; Algeria 2,220.
Refinery products:			
Gasoline ---do	17	NA	
Distillate fuel oil ---do	18	NA	
Lubricants ---do	9	7	West Germany 3; United Kingdom 3.
Other ---do	45	58	Italy 59; West Germany 19.
Crude chemicals from coal, gas, or oil distillation [7]	17,521	18,737	All from U.S.S.R.

r Revised. NA Not available.

[1] Compiled from 1971 edition of Supplement to the World Trade Annual, v. 1 (Eastern Europe), Walker and Company, New York, 1974 (prepared by Statistical Office of the United Nations) unless otherwise noted. These data represent exports to Romania as reported by selected trading partner countries.

[2] Compiled from United Nations Statistical Office, World Trade Annual, 1972 ed., v. 1–3, 1974, unless otherwise noted.

[3] Official import statistics of Romania.

[4] United Nations Economic Commission for Europe, Annual Bulletin of Steel Statistics for Europe, v. 1, 1973, New York, 1974.

[5] Official Romanian import statistics report a total of 1,412,000 tons for 1971 and 1,200,000 tons for 1972. Principal sources and quantity imported of total semimanufactures for 1972 are as follows: U.S.S.R. 565,000; Poland 106,000; East Germany 77,000.

[6] Official export statistics of Poland.

[7] Official export statistics of U.S.S.R.

[8] Reported in source as hard alloys.

[9] Official export statistics of Bulgaria.

COMMODITY REVIEW

METALS

Aluminum.—In 1973, Romania's primary aluminum production (including alloys) was 27.5% above that of 1971 and 16.2% above that of 1972. This continued the spectacular growth of Romania's aluminum industry during the current 1971–75 5-year plan which is scheduled to evolve as follows, for the rest of the plan period—1974, 198,700 tons; 1975, 200,000 to 208,000 tons.

To sustain the planned increase in primary metal production, Romania's only aluminum smelter located at Slatina is scheduled to reach the necessary capacity by 1975.

In 1973, Romania's estimated bauxite production increased 13.1% to 345,000 tons, representing 45.4% of the estimated supply of 760,000 tons for the year. The rest of the bauxite supply came, as in the past, mainly from Yugoslavia (200,613 tons)[4] and Greece (20,000 tons)[5] the quota for the year.

Romania's bauxite is mined by open pit methods from an ore body near Dobreşti, in the general area of Oradea.

Alumina production increased in 1973 by 34% to an estimated 282,000 tons. In June, a new 250,000-ton-per-year alumina plant went onstream at Tulcea in the Danube Delta.[6] Design and technology for the plant were by Aluterv, the engineering company of the Hungarian Aluminum Trust; equipment was built by Hungarian and Romanian companies. At this plant a slightly modified Bayer process is used. Previously, Romania had only one 200,000-ton-per-year alumina plant located at Oradea, not far from the bauxite deposits.

Copper.—In 1973, Romania's estimated copper production amounted to 42,000 tons, an increase of 20% over that of 1972. The current 1971–75 5-year plan provides for a major expansion of copper production leading to an output of about 50,000 tons by 1975.

Romania has several mining areas, some of which have been known for over 2,000 years and which are generally the complex sulfide ore type. The copper is often associated with gold, silver, and other nonferrous base metals. The most important of these mining areas are the Baia Mare region, including Baia Sprie and Cavnic; the areas of Roşia Montana, Moldova Nouă, Borşa, Bălan, and Leşul Ursului

Production trends led toward utilization of ores of decreasing grade, processed in quantities in excess of 6 million tons per year, such as the Moldova Nouă banatites with 0.23% copper, appreciable molybdenum and magnetite, and the Roşia Poienii deposit with 0.3% copper, both poorer than most known commercial ore deposits.[7]

In 1973, Romania was a net importer of copper. The Soviet Union provided 7,423 tons. Chile was to deliver 7,500 tons during the same period, on the basis of a former contract, and cooperation with Peru progressed further. Negotiations were continued with Zambia for creating a joint company for developing the Makambo copper deposits near Mufulira.[8]

Iron and Steel.—Romanian steel production amounted to 8.2 million tons in 1973 exceeding 1972 by 10.3% and 1971 by 20.0%. Thus, the 1973 production plan of 7.7 to 7.8 million tons was exceeded by a comfortable margin. For the year 1974, production plan figures were revised upwards to 8.6 million tons of steel.[9] Expansion of the steel industry's productive capacity is one of the major goals of the current 1971–75 5-year plan, with steel production targeted to reach or exceed 10 million tons per year by 1975.

In 1972, the iron ore supply for the iron and steel industry came from the following sources, in thousand metric tons:

Countries	1971	1972 p
Romania	3,467	3,361
U.S.S.R	4,300	4,528
India	1,390	1,430
Algeria	760	[1] 1,100
Yugoslavia	120	--
Total	10,037	10,419

p Preliminary. [1] Planned.

Iron ore is mined in Romania mainly in the following areas: Teliuc, Chelar, Capuş, Lucta, and Ocna de Fier. Because of the limited extent of available resources, it is expected that production of iron ore will remain about constant during the coming decade.[10]

Major units commissioned during 1973 in the iron and steel industry were the Tîrgovişte steel alloy plant, the 1.3-million-ton-per year, two-battery[11] coke-chemicals plant at the Siderurgical Combine in Galaţi, and some new productive capacity at the Siderurgical Combine in Hunedoară.[12]

Romania's iron and steel industry is concentrated in three main areas, Galaţi, Hunedoară, and Reşiţa.

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[4] Socialist Federal Institute for Statistics, Belgrade, Yugoslavia. Statistics of Foreign Trade of the SFR Yugoslavia, Year 1972. 1973, p. 52.
[5] Metal Bulletin (London). No. 5793, Apr. 17, 1973, p. 14.
[6] Oancea, T. (The First Alumina Charge at Tulcea). Scînteia (Bucharest), v. 42, No. 9554, June 29, 1973, p. 1.
[7] Almaşan, B. (The Mining Industry of the SRRomania). Neue Bergbautechnik (Leipzig), v. 3, No. 6, June 1973, pp. 409–412.
[8] Metals Week. Romania Promotes Zambian Venture. V. 44, No. 18, Apr. 20, 1973, p. 6.
[9] Scînteia (Bucharest). (Law for Implementing the National Plan). V. 43, No. 9709, Dec. 2, 1973, p. 2.
[10] Probleme Economice (Bucharest). No. 6, 1971.
[11] Metal Bulletin. No. 5809, June 19, 1973, p. 31.
[12] Work cited in footnote 9.

Lead and Zinc.—In Romania, lead and zinc are associated generally with each other and copper in complex sulfide ores. Efforts directed during the current 5-year plan to boost copper production will also increase lead and zinc production in the major mining areas.

NONMETALS

Asbestos.—Romania signed a bilateral agreement with the U.S.S.R., under the terms of which Romania will participate in developing the Kijembajew Asbestos Combine located in the Ural Mountains. In exchange Romania will secure a supply of asbestos. Other participants in similar bilateral agreements with the U.S.S.R. for the same combine were Bulgaria, Czechoslovakia, East Germany and Hungary.[13]

Cement.—In 1973, cement production increased 6.9% over that of 1972. Plans call for a further increase to 12.05 million tons in 1974,[14] a downward revision of the original 1971–75 5-year plan which called for 13 to 14 million tons of production in 1974 and 15.0 to 16.5 million tons in 1975.[15]

Cryolite.—A 1,100-ton-per-year cryolite facility went onstream at the Chemical Combine of Năvodari. The process is of domestic origin.

Fertilizer Materials.—In 1973, as during the previous year, production of fertilizer materials, in terms of total active substance (nitrogen, phosphorus pentoxide, and potassium oxide) fell short of the plan target by 1.65 to 1.78 million tons, but it exceeded 1972 production by 3.5%.[16] Rapid growth of the fertilizer industry's production capacity continued according to the 1971–75 5-year plan.

Nitrogenous fertilizer production (in 100% active substance) decreased 2.3% in 1973. Several new units went onstream in the nitrogenous sector of the industry. At Piatra Neamţ, Azotul 4, a new ammonia unit was commissioned,[17] which will increase existing capacity ultimately by 140,000 tons per year of granulated urea.[18] The new coking plant at Galaţi which came onstream during the year will produce more than 60,000 tons per year of byproduct ammonium sulfate, 300,000 tons of ammoniacal liquor, and 15,000 tons of byproduct sulfur.[19]

Romania has been a net exporter of nitrogenous fertilizer, exporting in 1972 813,300 tons of fertilizer (100% active substance), most of it nitrogenous.

In 1973, Romanian phosphate fertilizer production increased 15.3%. In spite of a spectacular rise in overall fertilizer materials production, phosphatic fertilizer has lagged behind the targets set by the current 1971–75 5-year plan. The plan prescribed 2.1 to 2.3 million tons per year of total active substance (for all fertilizer) in 1974 and 2.6 to 2.8 million tons per year in 1975.[20]

Romania's phosphatic fertilizer industry has moved towards the production of nitrophosphate based complex products, which are most adapted to domestic and international trade requirements.[21] The types of fertilizers most suitable for Romanian soils are of the 2:1:1 and 2:1:0 type. New products will be of the 22:11:11 and 27:13.5:0 type. The process selected for new plants is that of Norsk Hydro, based on the Odda process.[22]

Romania's phosphorous fertilizer industry is at three main locations as follows: Valea Călugărească; Năvodari; and Turnu Magurele.[23]

New production capacity scheduled for the remainder of the 1971–75 5-year plan includes four nitrophosphate plants at 891,000 tons each to be located at Arad, Tirgu Mureş, Craiova, and Turnu Magurele. This will make Romania the world's largest producer of nitrophosphates.[24] For the 1976–80 5-year plan, Romania has scheduled new capacities of 510,000 tons per year of P_2O_5, consisting of three more 100,000 ton per year P_2O_5 units associated with 225,000 tons per year of nitrogen ammonia capacity to

[13] Neues Deutschland (East Berlin). (Seven Countries of SEMA Build in the Ural, the Kijembajew Combine). V. 28, No. 319, Nov. 18, 1973, p. 1.
[14] Work cited in footnote 9.
[15] Scînteia (Bucharest). (Law for Implementing the 5-Year Plan for the 1971–75 Period). V. 41, No. 9335, Oct. 22, 1971, p. 3.
[16] Page 1 of work cited in footnote 3.
[17] Revista de Chimie (Bucharest). January 1973, pp. 47–48.
[18] Chemical Age International. New Romanian Plants. V. 107, No. 2835, Nov. 16, 1973, p. 21.
[19] Nitrogen (British Sulphur Corp. Ltd., London). Romania. No. 87, January–February, 1974, p. 9.
[20] Work cited in footnote 15.
Phosphorus and Potassium (British Sulphur Corp. Ltd., London). Roumania's Phosphate Industry. No. 66, July–August, 1973, pp. 31–34.
[21] Phosphorus and Potassium (British Sulphur Corp. Ltd., London). Complex Fertilizers—the Roumanian View. No. 61, September–October, 1972, pp. 28–32.
[22] Work cited in footnote 21.
[23] Work cited in footnote 21.
[24] Work cited in footnote 21.

be located at Arad, Braşov, and Galaţi, and 150,000 tons per year of P_2O_5 at Slobozia, and 60,000 tons of P_2O_5 per year at Piatra Neamţ.

Romania imports all of its phosphate rock requirements. From 1969 to 1972 imports in thousand metric tons, were as follows:

Country	1969	1970	1971	1972
U.S.S.R.	507	565	578	568
North Vietnam	--	--	--	--
Israel	272	171	102	30
United States	--	--	--	382
Tunisia	29	53	89	--
Jordan	--	6	10	--
Algeria	20	52	95	51
Morocco	--	--	46	91
Total	828	847	920	1,122

Consumption of fertilizers has lagged behind target figures, which was set to reach 720,000 tons of P_2O_5 per year in 1975, almost triple the 1971 consumption. It has been estimated[25] that it will reach only 350,000 tons of P_2O_5 per year, leaving substantial amounts for export.

Romania has no indigenous potassic raw material sources and imported 34,000 tons of potassium oxide in 1971–72, 30,000 tons in 1970–71, and 29,000 tons in 1969–70.

Salt.—In 1973 Romania's salt production increased 40% over that of 1972. Total salt reserves are estimated officially at 20 billion tons.[26]

Romania's salt deposits consist almost entirely of rock salt found mainly in massifs. There are more than 270 salt massifs, with over 2,000 deposits of other types of salt, divided among the inner and outer Carpathian regions. Principal massifs exploited at present are as follows: Bukovina peaks (Cacica); Trotus area (Tîrgu Ocna); the area between Teleajen and Prahova (Slănic, Telega, and Doftana); the area of Slatioarele in the Getic Depression, west of the Olt (Ocnele Mari). In the Transylvanian basin massifs are strung out along the marginal anticlines. Of these deposits, only those at Ocna Mureş, Ocna Dejului, and Praid are mined.

Mining of salt is by room and pillar methods utilizing either trapezoidal chambers with centerpillars or rectangular pillars up to 60 meters in height and 30 to 35 meters in width at the base; or chambers of 8 to 16 meters in length, and square pillars of 14 meters in diameter, and intermediate floors of 8 meters. Equipment used includes 1.2 cubic meter bucket excavators, and 12-cubic-meter dumptrucks.

Consumption of salt is as follows, in percent:

Sodium chloride industry	50
Domestic market (food)	25
Exports (industry and food)	25
	100

Romania has a well-developed sodium industry, the most important products of which are calcined soda, caustic soda and chlorine, sodium sulfate, and hydrochloric acid. Romania's output of sodium products has grown rapidly from 583,000 tons in 1965 to more than 900,000 tons in 1971. The five most important sodium enterprises are:

1. Sodium products plant at Govora:
   Capacity: 180,000 tons per year of soda.
   40,000 tons per year of caustic.
   5,000 tons per year of sodium silicate.
2. Borzesti Chemical Enterprise Group (within the Gheorghe Gheorgiu-Dej complex):
   Products: Caustic and chlorine from brine.
3. Sodium products plant at Ocna Mureş:
   Products: Soda, caustic.
4. Turda chemical plant:
   Products: Caustic, liquid chlorine, hydrochloric acid.
5. Tirnaveni Chemical Enterprise Group:
   Products: Sodium bichromate, sodium sulfide, barium chloride.

Sulfuric Acid.—Trial operations started at a new 100,000-ton-per-year sulfuric acid plant at the Savineşti petrochemical (caprolactam) plant. The plant is equipped with

[25] Work cited in footnote 21.
[26] Bogdan, A., and N. Hasnas. (Salt Deposits, Mining, and Industrial Use of Salt in Romania). Terra (Bucharest), July–August, 1973, pp. 17–25.

a liquid SO_2 unit and a 35,000-ton-per-year oleum unit. Another 200,000-ton-per-year sulfuric acid plant was commissioned at Valea Călugărească. This complements a 200,000-ton-per-year sulfuric acid plant at the same location, designed by the Lurgi companies, Frankfurt, West Germany.[27]

MINERAL FUELS

Romania's total estimated energy production in 1973 amounted to 65.8 million tons in standard coal equivalent (SCE) and was comprised of lignite (8.18%); anthracite, bituminous, and brown coals (11.77%); natural gas (50.78%); crude oil (28.21%); and other sources which include hydroelectric energy (1.06%).

Total energy production of Romania in 1971, the last year for which detailed data were available,[28] amounted to 62.784 million tons in SCE showing a gain of 5.8% over the output of 1970. Of the total 1971 national energy production, 18.6% was derived from coal and lignite, 29.4% from crude petroleum, 51.1% from natural gas, and 0.9% from other sources including hydroelectric power.

Romania's primary energy consumption in 1971 and estimates for 1975 on the basis of published plan figures were as follows, in million tons of SCE unless otherwise specified:[29]

Commodity	1971			1975 (plan)		
	Quantity	SCE [1]	Percent	Quantity [2]	SCE [1]	Percent
Solid fuels	20.601	14.620	24.0	37.75	26.790	33.3
Liquid fuels	13.793	14.270	23.4	14.30	18.590	23.1
Natural gas (billion cubic meters)	21.365	31.839	52.3	26.15	34.832	43.3
Other (hydroelectric, etc.)	XX	.168	.3	XX	.210	.3
Total energy	XX	60.897	100.0	XX	80.422	100.0

XX Not applicable.
[1] Standard coal equivalent.
[2] Values used for 1975 are the arithmetic median of limits given in the 5-year plan for the year.

The projection of Romania's energy needs shows an increase of 5% per year in the near future, and a substantial effort has to be made to develop indigenous energy resources, in order to keep up with the demand.[30] The percentage of reserves and production of the principal energy sources in 1970 was as follows:[31]

	Reserves	Production
Coal (lignite)	61.1	14.6
Petroleum	9.6	33.8
Natural gas	26.3	51.0

Romania will make efforts to increase fuel imports through foreign economic cooperation; increase its hydrocarbon and coal reserves; promote new sources of energy such as bituminous shale, thermal water, and nuclear fuels; raise the percentage of coal in the power balance; utilize the entire hydroelectric potential; develop further geologic prospecting for fuels; and increase efficiency in the use of energy by improved technology and organization.[32]

Romania's electric energy production from primary energy sources, and including hydroelectric energy was 46.7 billion kilowatt-hours in 1973, an increase of 7.6% over that of 1972. Industry used, 54.9%; transportation 1.4%; construction 1.6%; agriculture, 2.1%; communities, 1.6%; public lighting, 0.9%; general lighting, 4.1%; domestic use, 6.6%; power generating plants, 8.1%; losses, 10.2%; and exports, 8.5%.

Electrical energy production and plans for future development was as follows, in percent:[33]

	1970	1975	1980
Hydroelectric	8.0	13.7	13.5
Nuclear	--	--	1.0
Thermoelectric	92.0	86.3	85.5
Breakdown of thermoelectric:			
Lignite	17.1	18.6	25.0
Bituminous and brown	10.8	9.6	9.5
Oil and gas	61.4	53.3	45.3
Secondary resources	2.7	4.8	5.7

One of the goals of the current 1971–75 5-year plan is utilization of available hydro-

[27] Sulphur (British Sulphur Corp. Ltd., London). Roumania. No. 106, May–June, 1973, p. 12.
[28] United Nations (New York). World Energy Supplies, 1968–1971. Statistical Papers, Series J, No. 16, 1973.
[29] Work cited in footnote 28.
[30] Almason, B. (Development of Power Resources of the Socialist Republic of Romania). Era Socialista (Bucharest), No. 24, December 1973, pp. 7–10.
[31] Work cited in footnote 30.
[32] Work cited in footnote 30.
[33] Baciu, A. Improved Use of Energy Resources Urged. Viata Economica (Bucharest), Sept. 14, 1973, pp. 3–5.

electric potential. Accordingly, the hydroelectric potential will be 40% used by 1975 when 10 billion kilowatt-hours will be produced.[34] Major hydroelectric projects in operation in 1973 were the Iron Gates (1,056 megawatt), Lotru (500 megawatt), Argeş (220 megawatt).

Work will start during the current 1971–75 5-year plan on Romania's first nuclear generating plant of 440 megawatts.

Coal.—In 1973 there was a 7.3% increase in the production of coal, which consisted of: washed bituminous and brown coal (5.2%); lignite (68.8%); and some nonspecified coal, probably untreated brown and bituminous coal (26.0%). Total run-of-mine production fell short of the 1971–75 5-year plan of 29.5 million to 30.5 million tons for 1973.[35]

About 31% of Romania's coal production is bituminous. The most important bituminous coalfield is in the Valea Jiului, where 96% of the total bituminous coal output is mined. The rest comes from the Anina coalfield, which is much smaller in size.[36]

In the Valea Jiului there are 14 coal seams which are large enough to be worked. Thickness of the seams ranges from 0.5 meter to 30 meters and inclinations vary greatly from mine to mine. Mining in some mines is now at depths of more than 1,500 feet. Workings are in general of the long-wall type, except for some parts (seam No. 3), which due to their irregularities have to be mined by room and pillar methods.

In 1973, 66.4% of the coal produced was lignite. Reserves are located mainly south of the Carpathian Mountains in the area of Oltenia (Tirgu Jiu) and minor deposits are located in the eastern part of Transylvania (Braşov) where production is only 300,000 tons per year (1.5% of total).[37]

Oltenia's lignite deposits are divided into seven basins, of which only the Rovinari, Motru, and Jilt Basins have deposits suitable for strip mining. Exploration between the Danube and the Olteţ rivers shows total reserves of 3 billion tons, of which more than 2 billion are estimated to be economically exploitable. Of this 1.24 billion tons are suitable for strip mining, having an overburden ratio of less than 8 to 1. The reserves may be divided into two areas:[38] in the plains 320 million tons and in the hills 920 million tons.

The Rovinari, Motru, and Jilt Basins have 11 strip mines of which 4 are in the plains and 7 are in the hilly area. The lignites are of Pliocene age, and are covered with poorly consolidated quaternary age overburden of the following materials, in percent:

Top soil	5–20
Alluvial gravel	15–20
Clay, marl	50–70
Sand	5–20

Hydrological conditions in the area present problems and necessitate early construction of irrigation ditches and the drilling of water diversion wells with submerged centrifugal pumps. New riverbeds had to be created to divert the Jiul river from the working areas.

Some data on the Rovinari Basin strip mines are in table 4.

[34] Ricu, L. (Development of Energy Economy of the Socialist Republic of Romania). Die Technik (Leipzig), v. 29, No. 4, April 1972, pp. 245–248.

[35] Work cited in footnote 15.

[36] Vlad, P. Romanian Mining Industry Plans Comprehensive Expansion. World Mining, v. 26, No. 9, August 1973, pp. 46–49.

[37] Popa, A. (Lignite Strip Mining in the Romanian Socialist Republic). Neue Bergbautechnik (Leipzig), v. 3, No. 10, October 1973, pp. 752–755.

[38] Work cited in footnote 37.

Table 4.—Strip mine data, Rovinari Basin

	Name of mine			
	Cicani	Gîrla	Betergea Nord	Tismana
Area, square kilometers	2.1	5.0	2.9	15.0
Industrial reserves, million tons	11.1	31.4	14.2	106.0
Overburden ratio, cubic meters per ton	2.2	3.1	2.9	2.4
Planned capacity, million tons per year	1.35	2.2	1.35	3.2
Lifespan, years	9	16	12	32
Year of commissioning	1964	1968	1967	1968
Year when capacity was reached	1967	1973	1973	1975
Productivity in tons, per work shift	20.7	32.2	23.7	13.7
Production costs, lei per ton	39.1	34.5	46.6	44.2
Specific investment, lei per ton per year	242	260	345	255

Much of the coal produced in the Rovinari basin is used locally. The country's largest thermal powerplant with a 1,720-megawatt capacity is located at Rogojelu in the center of the basin. It is being fed by conveyor from the mines, and there is a 200,000-ton, fully mechanized storage facility for lignite.

Natural Gas.—Romania's gross natural gas production, which included associated gas and natural gas liquids, increased by 5.5% in 1973. The current Romanian 1971–75 5-year plan for natural gas production, excluding associated gas and natural gas liquids, is as follows, in billion cubic feet:

Year	Quantity
1971	749
1972	784
1973	795–823
1974	848–890
1975	901–946

Romania has important reserves of natural gas which form the basis for its highly developed petrochemical industry. It is used to make ammonia, nitrogenous fertilizer, acetylene, methanol, and hydrocyanic acid.

Reserves of natural gas were estimated at 10 trillion cubic feet in mid-1972, the last year for which data were available.[39]

Romania's natural gas deposits are located in a large kidney-shaped area near the center of the Transylvanian Basin around Tîrgu-Mureş, Turda, Copşa Mică, and Făgăraş.

Investments for developing the country's gas resources continued at a high rate.

There has been no reported production of gasworks gas in Romania since 1971. For other types of manufactured gas see table 1.

Petroleum.—In 1973, Romanian crude oil production increased by 1.1%. According to the 1974 production plan, which is an upward revised version of the original 1971–75 5-year plan, the production of crude oil is scheduled to reach 14.4 million tons in 1974.[40]

Romania's petroleum deposits are located in three regions:

1. The region around Ploieşti, Piteşti, Tîrgovişte, and Teleajen in the Prahova District are the oldest and largest producing areas.

2. The Bacău region on the Moldavian slopes of the Carpathian Mountains.

3. The West Carpathian region, southeast of the Carpathian chain.

In spite of intense exploration for oil, production has leveled off during the last few years, and new fields are at increasingly greater depths than older fields. At present, all new deposits are deeper than 3,500 meters and deposits are becoming smaller.[41]

Exploratory drilling according to the latest available data, in meters was as follows: [42]

1965	1,648,749
1970	1,632,000
1971	1,679,739

In 1972, 66 drill holes were deeper than 4,000 meters; 13 were deeper than 5,000 meters; and 5 were in excess of 6,000 meters. The deepest hole was Ghergeasa No. 922 with 6,204 meters (18,922 feet).

In production, hydraulic fissuring was used more than 450 times in the Moineşti region. There were also more than 2,000 uses of solvent treatment, and about 300 uses of acid treatment.[43]

Romania's refining capacity has been developed considerably during the last years, and it is estimated that it exceeds present productive capacity for domestic crude oil by 30% to 40%, reaching about 18 to 20 million tons per year.

During the last few years, Romania imported increasing amounts of crude oil, mostly from the Middle East, with quantities estimated to be in the area of 3.8 million tons in 1973. Lybia was thought to have delivered 1.75 million tons; Iran, about 1 million tons; Algeria, one-half million ton; and the rest from other sources.

Romania continued vigorous efforts to develop its petrochemicals industry.

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[39] World Oil. V. 177, No. 3, Aug. 15, 1973, p. 118.
[40] Work cited in footnote 9.
[41] Petrol si Gaze (Bucharest). (Progress Reached in the Petroleum Industry). V. 24, No. 3, March 1973, pp. 135–136.
[42] Work cited in footnote 41.
[43] Petrol si Gaze (Bucharest). V. 24, No. 4, April 1973, p. 253.

The Mineral Industry of Sierra Leone

By Henry E. Stipp [1]

Sierra Leone's mineral industry in 1973 contributed significant value to the nation's economy. Diamond continued to be the principal mineral export; being valued at an estimated $93.7 million [2] in 1973, compared with a value of $68.1 (revised) million in 1972. An increase in diamond prices on the world market was mainly responsible for the substantial $25.6 million rise in 1973. Significant quantities of iron ore and bauxite also were mined and exported in 1973.

A new mining agreement was signed by the Government and the iron mining firm Sierra Leone Development Co. Ltd. According to the agreement the Government will be represented on the company board by two directors. Also the firm will pay royalties of 6 cents per ton of ore mined and an increased income tax of 60% of the company's taxable income. Mining rent paid to local officials will be increased from $12,000 to $24,000 per year. The new agreement was scheduled for submission to Parliament for ratification early in 1973.

Although government mining policy is designed to acquire 51% of the equity in individual mining companies, negotiations with each mining company reportedly will depend upon individual circumstances and foreign investors interests will receive adequate protection.

Mineral deposits in the Northern Province of Sierra Leone were being explored by geologists from the Institute of Geological Sciences of Great Britain.[3] An 8,106-square-mile-area was covered in order to prepare maps and identify mineral samples. The Federal Republic of Germany also has provided mineral specialists and equipment to aid the Government of Sierra Leone in the 1971–74 period.

The marketing of diamond under the Alluvial Diamond Mining Act was being studied by the Government.[4] Reportedly plans were made to introduce a new program incorporating a number of international diamond firms that will be licensed to purchase diamonds in competition with the Diamond Corporation of West Africa Ltd. (DICORWAF).

The Government and Bayer-Preussag Group of West Germany signed a new agreement covering rutile mining operations in the Moyamba and Bonthe Districts.[5] Bayer-Preussag has been conducting mineral surveys in these areas since October 1970.

Indications of gold, molybdenum, nickel, asbestos, talc, chromium, platinum, and iron were discovered as the result of a 6-month preliminary mineral survey conducted by the United Nations Development Programme (UNDP). A large-scale mineral survey has been recommended for adoption by the UNDP because of this preliminary work. The Government of Sierra Leone has recommended a program for strenthening the Geological Survey Department with the help of the UNDP. A deputy director for the Geological Survey of Sierra Leone has been provided by the UNDP for a period of 2 years to assist with administrative work. A program for investigating and developing multipurpose water resources also was carried out by

[1] Physical scientist, Division of Ferrous Metals—Mineral Supply.
[2] Where necessary, values have been converted from Leones (Le) to U.S. dollars at the rate of Le1 = US$1.20.
[3] Standard Bank Review (London). Sierra Leone. March 1973, p. 13.
[4] Standard Bank Review (London). Sierra Leone. March 1974, p. 19.
[5] Barclays International Review (London). Sierra Leone. February 1973, p. 23.

the Government with the assistance of the UNDP.

The Romanian Government offered to assist the Sierra Leone Government to explore for petroleum deposits. A geologist and a drilling engineer were preparing to travel to Sierra Leone in accord with the trade agreement between the two countries signed early in 1973.

Sierra Leone's Government joined the International Bauxite Association, a group of countries whose purpose is to explore the potential for obtaining high prices for aluminum raw materials. Headquarters of the association reportedly will be in Jamaica.

PRODUCTION

Mineral commodities produced by Sierra Leone in 1973 were valued at an estimated $109.6 million (not including petroleum refinery products) compared with an estimated $87.7 million in 1972. The quantity of diamond produced in 1973 decreased 7% from the output in 1972; however, the value increased about 43% because of the higher unit price for diamond on the world market.

Quantity figures for the production of mineral commodities are shown in table 1.

Table 1.—Sierra Leone: Production of mineral commodities

Commodity [1]	1971	1972	1973 [p]
Aluminum, bauxite, gross weight ---thousand metric tons--	590	720	603
Diamond:			
Gem ---thousand carats--	[r] 778	720	[2] 670
Industrial ---do---	[r] 1,168	1,080	[2] 1,000
Total ---do---	[r] 1,946	1,800	[2] 1,670
Iron ore, gross weight ---thousand metric tons--	2,548	2,321	2,405
Petroleum refinery products:			
Gasoline ---thousand 42-gallon barrels--	337	405	350
Jet fuel ---do---	223	137	119
Kerosine ---do---	49	140	144
Distillate fuel oil ---do---	517	503	496
Residual fuel oil ---do---	883	804	846
Other ---do---	182	{ 13	291
Refinery fuel and losses ---do---		{192	
Total ---do---	2,191	2,194	2,246
Titanium minerals, rutile ---metric tons--	11,932	--	--

[p] Preliminary. [r] Revised.

[1] In addition to the commodities listed, a variety of crude construction materials (clays, sand, gravel, and stone) is produced but production data are not reported and available general information is inadequate for the formulation of reliable estimates of output levels. Also, Sierra Leone annually refines some 8,000 to 10,000 tons of salt from imported crude marine salt, but this is not included in the body of the table as salt production because it would then represent a double counting of this material which is credited as a part of France's salt production.

[2] Actual production data not available; figures represent exports, which closely approximate output in most years.

TRADE

Data on the trade of mineral commodities by Sierra Leone are shown in tables 2 and 3.

Table 2.—Sierra Leone: Exports and reexports of selected mineral commodities

Commodity	1971	1972
Abrasives, natural, n.e.s., dust and powder of precious and semiprecious stones, including diamond dust ---value	--	$1,287
Aluminum, bauxite ---thousand metric tons	561	694
Stone, sand and gravel ---metric tons	--	12
Cement, hydraulic ---do	30	20
Diamond:		
Uncut and unworked ---thousand carats	1,924	1,838
Cut and polished ---do	9	8
Iron and steel:		
Ore and concentrates ---thousand metric tons	2,610	2,321
Semimanufactures ---metric tons	5	34
Other ferrous and nonferrous metal scrap ---do	13,056	11,469
Petroleum refinery products:		
Gasoline ---thousand 42-gallon barrels	45	34
Kerosine and jet fuel ---do	142	83
Distillate fuel oil ---do	1,232	1,037
Lubricants ---do	1	2
Rutile ---metric tons	16,378	--
Salt and brine ---do	(1)	--

[1] Less than ½ unit.

Table 3.—Sierra Leone: Imports of selected mineral commodities

Commodity	1971	1972
METALS		
Aluminum metal and alloys, all forms	161	151
Copper metal and alloys, all forms	36	30
Iron and steel:		
Ore and concentrate	515	61
Scrap	1	--
Primary forms and semimanufactures	r 14,747	13,363
Lead metal and alloys, all forms	50	42
Nickel metal and alloys, all forms	376	--
Silver, unworked or partly worked ---value	$2,505	$573
Tin metal and alloys, all forms ---long tons	(1)	9
Zinc metal and alloys, all forms	4	15
NONMETALS		
Abrasives:		
Natural, n.e.s., dust and powder of precious and semiprecious stones, including diamond ---value	--	$332
Grinding and polishing wheels and stones ---do	$3,178	$5,865
Asbestos, crude, including waste	66	--
Cement, hydraulic	60,721	70,842
Clays, products:		
Refractory (including nonclay bricks)	92	16
Nonrefractory	136	35
Fertilizer materials, crude and manufactured	34	--
Gypsum and plaster	3	(1)
Lime	288	201
Salt	r 7,662	8,617
Sodium compounds, n.e.s., caustic soda	214	130
Stone, sand and gravel	425	313
Sulfuric acid	41	67
Other crude nonmetallic minerals	56	26
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	35	6
Coal, coke, briquets	10	9
Petroleum:		
Crude and partly refined ---thousand 42-gallons barrels	2,194	2,196
Refinery products:		
Gasoline ---do	63	107
Kerosine and jet fuel ---do	10	(1)
Distillate fuel oil ---do	520	70
Liquefied petroleum gas ---do	5	5
Lubricants ---do	25	4
Mineral jelly and wax ---do	2	4
Other ---do	20	(2)
Total ---do	645	190
Crude chemicals from distillation of coal, gas, and petroleum	1,630	463

r Revised.
[1] Less than ½ unit.
[2] Quantity not reported; value of import was $5,000.

COMMODITY REVIEW

METALS

Bauxite.—Sierra Leone Ore and Metal Co. Ltd. (SIEROMCO), a wholly owned subsidiary of Suisse Aluminum Industries A.G. of Switzerland, was conducting detailed exploratory work in the Port Loko District. The company was studying the feasibility of opening a bauxite mine in this area.

Gold.—Reportedly the Government would like to see a rebirth of the alluvial gold mining industry, which died out after the discovery of diamonds. Investment in the mining industry, especially gold mining, was encouraged.

Iron Ore.—In October a team of geologists and mining specialists from Bethlehem Steel Corp. began a survey for iron, copper, manganese, nickel, molybdenum, and gold.[6] Reportedly the group located a promising iron ore deposit at the village of Bagla in the Eastern Province, near the border with Liberia. Detailed exploration of the Bagla Area has been initiated. The quantity and quality of iron ore in the Bagla deposit will be determined after the mineral survey of the area has been completed. If the Bagla deposit is found to be economically exploitable, known deposits of chrome ore in the area could be developed using the infrastructure constructed for development of iron ore.

Titanium Minerals (Rutile).—Sierra Rutile Ltd. has been making progress in exploring and prospecting for rutile deposits is the Bonthe and Moyamba Districts.[7] The company was prospecting a 520-square-mile area west of the Jong River and about 20 miles south of the Mokanji Hills. Sizable deposits of rutile have been located in this area. Sierra Rutile was evaluating the potential of the deposits, studying the technical mining problems, developing a suitable mining method for the deposits, designing processing plants, and developing appropriate processing techniques. In addition the geology of the deposit was being studied thoroughly in order to arrive at a cost for mining the deposit. Sierra Rutile had about 300 workers, under the supervision of geologists, drilling and pitting down to the water table. Samples taken from pits and drill holes were analyzed for rutile by wet chemical and by dry methods. A 100-ton-per-day pilot plant was being built and full-scale production at 20,000 tons of feed per day was expected by mid-1975.

A total of 12 Sierra Leoneans and 13 foreign nationals comprise the company's staff, many of whom had been employed by the former Sherbro Minerals Co. Ltd. When production is resumed within the next few years up to 900 persons are expected to be employed on the project.

NONMETALS

Cement.—A severe shortage of cement resulted in the temporary suspension of construction activities throughout most of the year. At yearend a large shipment of cement arrived in Freetown and the price dropped from $5.04 to $3.24 per bag.

Diamond.—Diamonds are recovered in Sierra Leone by the National Diamond Mining Co. (Sierra Leone) Ltd. (DIMINCO), a government-controlled firm. Diamonds also are recovered by individual diggers or teams licensed by the Government to dig for diamonds. Individuals sell their stones to the Government Diamond Office (GDO), which is managed by DICORWAF. DICORWAF is a part of the De Beers Central Selling Organization, which handles the sale of about 80% of the world's diamonds. DIMINCO sells its stones through the GDO to buyers who are licensed by the Government.[8]

Production of diamond by DIMINCO in 1973 was estimated at 1,100,192 carats valued at about $60.7 million compared with an estimated 999,778 carats valued at $35.4 million in 1972. Purchases of rough and uncut diamonds by the Government Diamond Office (GDO) in 1973 totaled 569,808 carats valued at $36.8 million compared with 800,523 carats valued at $25.6 million in 1972. Although the total quantity of diamond produced in 1973 was less than that in 1972, the value of production increased substantially owing to the sale of better quality stones and higher prices on world markets. There was greater demand for diamond on world markets, especially for investment purposes. In

[6] Sierra Leone Trade Journal. Search for Copper, Nickel, and Gold. V. 13, No. 4, October–December 1973, p. 109.

[7] Sierra Leone Trade Journal. Progress at Sierra Rutile. V. 13, No. 4, October–December 1973. pp. 102–103.

[8] Sierra Leone Trade Journal. Mining. V. 13, No. 4, October–December 1973, p. 95.

February, De Beers raised the value of diamond by 11%. DICORWAF, in April, increased the price of rough gem diamonds marketed by the De Beers Central Selling Organization by about 7% varying with the quality and size of the stone.

Early in 1973, the dry season facilitated alluvial mining; however, heavy rains during September flooded mine workings bringing alluvial diamond mining to a halt. Alluvial mining reached a peak in March with 1,497 mining licenses being issued, and by the end of September, 1,291 licenses were current.

The smuggling problem and illicit mining practices became more intense because of the rise in prices. Various estimates of the diamond resources have indicated that they are becoming depleted and could be exhausted in as little as 2 years.

MINERAL FUELS

Petroleum.—Sierra Leone Petroleum Refining Co. Ltd., jointly owned by the Government and five oil companies, began operating May 6, 1970. The refinery has a capacity of 450,000 tons per year; however, its present throughput of crude is less than 300,000 tons per year.[9] Sierra Leone consumes about 150,000 tons of petroleum products per annum. Crude oil is supplied by Nigeria and Gabon, usually in lots of 18,000 to 20,000 tons. Employment totaled 116 persons, many of whom are skilled technical workers of Sierra Leone nationality. There are two major oil storage depots at Kissy and several minor depots in the interior. The country has more than 200 gasoline service stations, marine bunkering facilities at Freetown, and aviation fueling services at Yungi, Hastings, and Bo. In 1973 the petroleum refining firm entered into a 3-year technical service agreement with British Petroleum Corp.

In June the price of all grades of gasoline increased 5 cents per gallon, owing to the higher price for crude oil on world markets. At yearend the Government approved a series of price increases for petroleum products; however, to offset their effect part of the increase was subsidized by the Government. It was estimated that subsidies would cost about $3 million in 1974.

Oil exploration licenses have been granted to several companies including Clinton International Oil Co., Inter-Ocean Co. (subsidiary of Oceanic Exploration Co.), and Occidental Petroleum Corp., and several firms have conducted offshore seismic surveys during the last 3 years; however, no commercial oilfields have been found. Reportedly the survey results were not encouraging and the companies did not conduct exploratory drilling.

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[9] Chamber of Commerce of Sierra Leone Journal (Freetown). Oil and Sierra Leone. 1973, pp. 42–43.

The Mineral Industry of the Republic of South Africa

By James H. Jolly [1]

The mineral industry of the Republic of South Africa achieved a record high in mineral output value in 1973. The value of total mineral production, including gold and diamond sales, was $4.1 billion,[2] almost $1.6 billion more than the record amount set in 1972. Soaring gold prices, continued strong demand for diamond and platinum, and increased world demand for industrial minerals and metals were the main factors in setting the new high.

The South African economy grew considerably in 1973. The rate of increase for the real gross domestic product rose from 3% in 1972 to approximately 4% in 1973 despite a poor agricultural year. The gross national product increased 19.4% (in terms of rand) to an estimated $27 billion in 1973. The balance of payments was in surplus for the first 3 quarters of the year, mainly because of higher prices received for gold, but showed a deficit in the last quarter, reflecting the accelerated rate of expansion in domestic economic activities. The economy was not appreciably affected by reduced crude oil imports late in the year because domestic coal supplied about 80% of South Africa's energy requirements.

The mining industry experienced inflationary costs because of large wage increases, lower productivity of workers, and rising prices for stores and equipment. Mineral exports were subjected to higher rail freight rates and harbor and shipping costs.

The high rate of economic growth caused an extremely tight labor market and serious shortages of skilled and semiskilled workers were experienced in the mineral industry. To alleviate shortages of white workers, work rules were adjusted so nonwhite workers could advance to more skilled positions in mining operations.

The Government continued major programs to increase the Republic's ability to export larger quantities of raw and semifinished mineral products and to encourage development of domestic industry. In April, the Government approved the $1.6 billion Sishen-Saldanha Bay iron ore and steel semimanufactured products export project of the South African Iron and Steel Industrial Corp. Ltd. (ISCOR). The development of Richards Bay continued as the rail line to Vryheid was completed and industrial development, including expansion of the aluminum smelter and construction of a petrochemical complex, was underway. Development of the Richards Bay harbor facilities was on schedule and was expected to be ready for large-scale exports of coal in 1976.

Development of a new and, reportedly, cheaper uranium enrichment process continued. A $115 million pilot plant for testing the process was scheduled for completion in June 1974.

In the metals sector, the country's only aluminum smelter planned a 40% expansion. Two commercially viable copper-zinc deposits in northwest Cape Province were being extensively drilled to determine reserves. A new electrolytic copper refinery to process South African and the Territory of South-West African blister copper was planned near Cape Town. Gold production continued to decline but output value rose dramatically, accounting for about 63% of South Africa's mine production value in 1973. ISCOR revised expansion plans at the Vanderbijlpark and Newcastle works and planned a new steel semimanufactured

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[2] Where necessary, values have been converted from South African Rand (R) to U.S. dollars at a rate of R1=$1.445 (average of monthly averages as given in volumes 26 and 27 of International Financial Statistics). The rate for 1972 was R1=$1.293.

products plant at Saldanha Bay. Palabora Mining Co. planned to ship 4 to 6 million tons of magnetite by pipeline to the coast for export to Japan. Platinum producers continued with expansion plans based on firm commitments from automotive manufacturers. Uranium output declined due to weak market conditions but, as a result of the vastly improved uranium outlook brought about by the oil crisis, a closed uranium plant was to be reactivated. A major zinc discovery near Gamsberg, in northwestern Cape Province, was announced by Newmont Mining Corp. and O'okiep Copper Co. Ltd.

In the nonmetals sector, the world's first commercially successful production of sulfuric acid and clinker cement from by-product gypsum began operations in 1973 at Phalaborwa, Transvaal. Production and value of diamond increased as demand and prices rose during the year. The Central Selling Organization's diamond sales exceeded the 1972 record high by 57%. Total fluorspar production continued to decline but production and sales of acid-grade material increased significantly.

In the fuels sector, coal mining operations were expanding to meet increasing domestic and export requirements. Several new mines were planned, and others merged to improve operations and profitability. The industry continued to seek additional export contracts and benefited from the world energy crisis late in the year. Although some new export contracts for coal deliveries in 1974 and 1975 were signed, significant increases in coal exports were not expected until the Richards Bay project was completed in 1976. The search for domestic petroleum supplies continued both onshore and offshore with negative results. The country's petroleum refinery capacity increased and more expansion was planned.

PRODUCTION

The uptrend in mineral production that started late in 1972 continued throughout 1973. This, together with price increases, resulted in a 46.4% increase (in terms of rand) in mineral output value. The value of production and/or sales, including uranium and platinum listed under "ores and minerals" in official statistics, follow:

Commodity	Value (thousands) 1972	1973
Gold	1,499,771	2,585,524
Silver	5,320	10,594
Diamond	116,407	234,620
Ores and minerals:		
Local sales	365,704	[1] 518,860
Exports	524,249	760,697
Total	2,511,451	4,110,295

[1] Figure differs from that shown on table 5 due to source.

In terms of quantity, output of most mineral commodities showed increases during the year, particularly copper, manganese, nickel, tin, acid-grade fluorspar, and coal. Significant tonnages of lead, zinc concentrate, and zirconium concentrate were registered for the first time, reflecting new mining and recovery operations. Gold production continued to decline as lower grade ores were mined to take advantage of high gold prices. Uranium output was also significantly less because of continuing low prices.

Table 1.—Republic of South Africa: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Aluminum, smelter	r 29,400	52,900	52,800
Antimony concentrates:			
Gross weight	23,996	24,109	25,870
Metal content	14,246	14,571	15,700
Beryllium, beryl concentrates, 11% to 12% BeO	491	250	52
Bismuth concentrate:			
Gross weight, kilograms	22	--	--
Metal content, do	13	--	--
Chromium, chromite, gross weight:			
More than 48% Cr_2O_3	100,835	48,404	30,120
44% to 48% Cr_2O_3	1,031,295	977,812	957,783
Less than 44% Cr_2O_3	512,066	456,943	661,727
Total	1,644,196	1,483,159	1,649,630
Columbium-tantalum concentrate, kilograms	1,000	240	--
Copper:			
Mine output, metal content	157,470	161,927	175,797
Metal:			
Smelter	152,300	167,800	150,000
Refined	79,220	79,307	90,000
Gold, primary, thousand troy ounces	31,389	29,245	27,495
Iron and steel:			
Iron ore and concentrate, thousand tons	10,496	11,223	10,955
Pig iron, do	r 4,004	4,406	4,884
Ferroalloys, do	448	490	
Crude steel, do			
Iron and steel semimanufactures:	4,920	5,340	5,628
Cast iron and steel, do	400	380	NA
Rolled products, do	3,269	NA	NA
Lead, mine output, metal content	--	137	1,623
Manganese ore and concentrate, gross weight:			
Metallurgical:			
Over 48% Mn	689,009	743,467	934,983
Over 45% to 48% Mn	86,688	116,509	278,193
Over 40% to 45% Mn	239,288	174,607	246,443
Over 30% to 40% Mn	2,140,752	2,142,653	2,629,137
Total metallurgical	3,155,737	3,177,236	4,088,756
Chemical:			
Over 65% MnO_2	6,784	7,999	8,203
Over 35% to 65% MnO_2	74,015	86,263	78,671
Total chemical	80,799	94,262	86,874
Grand total	3,236,536	3,271,498	4,175,630
Manganiferous iron ore, 15% to 30% Mn, 20% to 35% Fe	181,637	101,657	66,527
Nickel:			
Mine output, metal content [1]	12,757	11,656	19,426
Electroyltic metal	r 10,000	10,000	10,000
Plantinum-group metals:			
Platinum group content of concentrates, matte and refinery products [e], thousand troy ounces	1,250	1,450	2,360
Osmiridium from gold ore, troy ounces	3,200	3,000	2,800
Silver metal, primary, thousand troy ounces	3,378	3,294	3,652
Tin:			
Concentrate:			
Gross weight, long tons	3,364	3,624	4,976
Metal content, do	1,997	2,125	2,634
Metal, primary, do	702	767	860
Tungsten concentrate, 60% WO_3:			
Gross weight, kilograms	12,000	1,000	1,000
Tungsten content, do	7,000	550	550
Uranium oxide (U_3O_8)	3,800	3,629	3,094
Vanadium:			
Vanadiferous slag, gross weight	26,286	31,519	35,870
Vanadium content of:			
Vanadiferous slag produced [e]	3,680	r 4,410	5,020
Vanadium pentoxide and ammonium vanadate [e]	2,240	r 2,908	3,187
Total	5,920	7,318	8,207
Zinc:			
Concentrate:			
Gross weight	315	4,017	34,031
Metal content	158	2,009	17,016
Smelter	r 43,400	47,200	58,100
Zirconium concentrate (baddellite)	--	--	4,956

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
NONMETALS			
Asbestos:			
Amosite	98,464	102,278	106,477
Chrysotile	61,161	154,908	153,867
Crocidolite [2]	159,671	65,959	73,895
Total	319,296	323,145	334,239
Barite	2,962	2,517	2,014
Cement, hydraulic thousand tons	5,856	6,108	6,864
Clays:			
Bentonite	20,634	24,312	25,080
Fire clay	269,396	306,229	291,503
Flint clay	364,413	281,671	261,264
Fuller's earth	1,222	1,897	916
Kaolin	39,184	38,218	38,615
Corundum, natural	241	294	269
Diamond:			
Gem [e] thousand carats	3,169	3,370	3,448
Industrial [e] do	3,862	4,025	4,117
Total do	7,031	7,395	7,565
Diatomite	325	314	528
Feldspar	12,240	25,322	31,692
Fertilizer materials, crude, natural, phosphate rock thousand tons	1,729	1,966	2,063
Fluorspar:			
Acid grade	141,022	142,883	185,304
Ceramic grade	13,848	17,861	4,475
Metallurgical grade	84,171	50,062	20,545
Total	239,041	210,806	210,324
Gem stones, semiprecious:			
Emerald crystals kilograms	1,986	1,089	1,272
Tiger's eye	223	72	75
Graphite	1,145	847	1,029
Gypsum, crude	408,236	419,392	483,239
Kyanite and related materials:			
Andalusite	44,471	45,857	60,702
Sillimanite	17,460	9,476	19,317
Lime [3] thousand tons	1,093	1,194	1,399
Lithium minerals (spodumene)	1	--	--
Magnesite, crude	78,663	68,792	80,189
Mica:			
Sheet kilograms	2,966	1,733	219
Waste	7,160	4,245	6,009
Pigments, natural mineral:			
Ochers	2,314	1,620	1,738
Oxides	783	6,827	583
Pyrite:			
Gross weight:			
Cupriferous	220,797	--	--
Noncupriferous	528,836	438,577	551,113
Total	749,633	438,577	551,113
Sulfur content:			
Cupriferous	88,300	--	--
Noncupriferous	211,600	175,400	220,400
Total	299,900	175,400	220,400
Quartz, quartzite and glass sand (silica)	576,909	682,513	792,009
Salt	352,466	370,423	391,249
Silcrete	25,955	22,456	24,861
Stone, sand and gravel, n.e.s.:			
Dimension stone:			
Granite:			
Sawn slabs [3]	34,891	23,278	19,407
Rough blocks [3]	239,970	270,140	316,805
Marble	11,969	3,237	3,147
Crushed and broken:			
Limestone [3] thousand tons	12,177	13,363	14,102
Shale do	453	572	358
Sulfur, elemental byproduct [e]	r 25,000	r 24,000	25,000
Talc and related materials:			
Pyrophyllite (wonderstone)	3,333	2,059	4,743
Talc	8,438	8,760	7,100
Vermiculite	132,070	147,903	156,461

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
MINERAL FUELS AND RELATED MATERIALS			
Carbon black e	28,000	r 30,000	30,000
Coal:			
Anthracite ---thousand tons	1,841	1,336	1,408
Bituminous ---do	56,825	57,104	60,944
Total ---do	58,666	58,440	62,352
Coke:			
Oven and beehive ---do	r 3,592	3,583	e 3,600
Gashouse, low and medium temperature ---do	e 100	101	99
Petroleum refinery products: e			
Gasoline ---thousand 42-gallon barrels	r 24,786	24,589	
Jet fuel ---do	r 734	1,002	
Kerosine ---do	r 3,548	3,315	
Distillate fuel oil ---do	r 17,612	20,493	NA
Residual fuel oil ---do	r 20,860	21,727	
Lubricants ---do	r 820	1,292	
Other ---do	r 4,440	4,810	
Refinery fuel and losses ---do	r 6,854	7,606	
Total ---do	r 79,654	84,834	NA

e Estimate. p Preliminary. r Revised. NA Not available.
1 Previously reported incorrectly as electroyltic nickel.
2 Includes asbestos reported in source as anthophyllite, cape blue, and transvaal blue.
3 Local sales plus exports (actual production not reported).

TRADE

In 1973, the Republic of South Africa's balance of payments position was aided significantly by export sales of mineral commodities, principally those of gold, platinum, diamonds, and copper. The export value of all mineral products increased dramatically over that of 1972 mainly because of high free market gold prices and substantial increases in the prices of most other metals and minerals. Export tonnages of most mineral commodities, notably chrome, iron ore, managanese ore, nickel, asbestos, dimension stone, coal, and platinum-group metals, also increased. Exports of copper, antimony, metallurgical-grade fluorspar, and crude phosphate were lower.

The export value (in terms of rand) of certain base minerals and metals was adversely affected by the U.S. dollar devaluation in February because the dollar prices were fixed by contract.

During 1973, there were shortages of certain materials particularly steel and petroleum. Imports of crude oil were severely curtailed following the October Arab-Israeli War, but the mining industry was little affected by the embargo. Despite increased domestic steel output, imports of steel products increased during the year due to strong economic activity particularly in the last half of the year.

Table 2.—Republic of South Africa: Mineral products trade

(Million dollars)

Products	Exports		Imports	
	1972	1973	1972	1973
Mineral products	301	e 406	289	e 368
Chemicals and allied products	92	125	258	374
Articles of stone, etc., ceramic products, glass, and glassware	13	15	43	66
Precious and semiprecious stones, jewelry	417	692	32	46
Base metals and products	370	524	210	354
Total	1,193	1,762	832	1,208

e Estimate.

Source: Commerce and Industry. V. 32, No. 10, May 1974, pp. 313–316.

Table 3.—Republic of South Africa: Exports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Oxide and hydroxide	2	2	NA.
Metal, including alloys:			
Scrap	962	1,648	Japan 1,228; West Germany 201; Italy 108.
Unwrought and semimanufactures	2,317	2,324	NA.
Antimony, ore and concentrate	10,704	35,267	United Kingdom 16,545; United States 15,004.
Arsenic:			
Trioxide, pentoxide and acids	1,783	2,376	United Kingdom 1,737; United States 420.
Metal	--	3	NA.
Chromium:			
Chromite—thousand tons	1,210	871	United States 284; Japan 253; West Germany 128.
Oxide and hydroxide	16	21	NA.
Copper:			
Ore and concentrate	10,743	1,974	Belgium 1,640; Japan 248.
Metal, including alloys:			
Scrap	116	15	NA.
Unwrought:			
Blister and other unrefined [2]	61,211	51,174	United States 20,219; Belgium 13,066; Japan 10,688.
Refined [2]	67,195	78,758	West Germany 34,045; United Kingdom 27,883; Italy 5,169.
Master alloys	2	1	NA.
Semimanufactures	3,267	14,909	Belgium 6,654; United States 2,735; Japan 1,579.
Gold metal, unworked or partly worked [3] troy ounces	1,597	670	NA.
Iron and steel:			
Ore and concentrate [2] —thousand tons	5,545	5,120	Japan 5,011.
Metal:			
Scrap	6,511	5,442	Spain 1,358.
Pig iron	371,868	495,176	Japan 459,765.
Sponge iron, powder and shot	234	315	NA.
Ferroalloys:			
Ferromanganese	170,082	230,106	United States 132,798; United Kingdom 29,600; Italy 12,937; West Germany 12,483.
Ferrochrome	88,911	151,862	United States 64,458; Netherlands 29,919; Canada 16,375.
Ferrosilicon	8,536	25,104	Australia 5,377; Japan 3,067; West Germany 2,444.
Other	5,993	12,095	West Germany 2,854; United States 2,224; United Kingdom 1,755.
Ingots and other primary forms	801	8,087	Greece 5,126.
Semimanufactures:			
Bars and rods	19,781	59,071	NA.
Angles, shapes, sections	40,270	127,263	NA.
Plate and sheet	159,001	281,089	NA.
Hoop and strip	5,068	8,833	NA.
Rails and accessories	27,061	22,167	NA.
Wire	9,289	5,682	NA.
Tubes, pipes, fittings	19,060	12,430	NA.
Castings and forgings	492	NA	NA.
Total	280,022	516,535	
Lead: [2]			
Concentrate:			
Lead	2,540	5,504	Netherlands 2,925; West Germany 2,579.
Lead, vanadium	5,765	--	
Oxide	100	194	NA.
Metal, including alloys:			
Unwrought	60,782	40,332	Italy 16,085; United States 9,258; United Kingdom 5,474.
Semimanufactures	94	104	NA.
Magnesium, metal, scrap	134	200	United States 196.
Manganese:			
Ore and concentrate —thousand tons	2,623	2,504	Japan 1,053; Netherlands 444; France 426.
Oxides	16	476	United Kingdom 407.
Metal, electrolytic	9,782	11,896	Canada 2,835; Sweden 2,435; Belgium 1,706.
Mercury—76-pound flasks	28	3	NA.

See footnotes at end of table.

Table 3.—Republic of South Africa: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Nickel:			
Matte, speiss, and similar materials	349	207	United States 167.
Metal, including alloys:			
Scrap	12	157	NA.
Unwrought	4,801	10,193	Norway 2,976; United States 2,716; Netherlands 1,143.
Semimanufactures	187	245	United States 183; Italy 26; West Germany 16.
Platinum-groups metals, including alloys, all forms—thousand troy ounces	1	481	United States 194; Japan 132; United Kingdom 68.
Silver:			
Waste and sweepings [4]—troy ounces	592,799	403,326	All to West Germany.
Metal, including alloys [4]—thousand troy ounces	r 3,979	2,749	United Kingdom 2,683.
Tin:			
Ore and concentrate—long tons	3,141	3,009	United Kingdom 2,499.
Metal including alloys:			
Scrap—do	32	--	
Unwrought and semimanufactures—do	51	42	NA.
Titanium oxide	848	451	NA.
Tungsten:			
Ore and concentrate	192	20	All to West Germany.
Metal, including alloys, all forms	15	1	All to Ireland.
Vanadium, pentoxide (fused) [5]	3,619	4,692	Japan 1,590; Austria 624; Netherlands 534; United Kingdom 469.
Zinc:			
Ore and concentrate [2]	22,721	16,679	Belgium 11,439.
Oxide	365	476	NA.
Metal, including alloys:			
Scrap, dust, powder	736	1,318	West Germany 975; Belgium 145.
Unwrought and semimanufactures	r 76	150	NA.
Other:			
Ore and concentrate:			
Of base and precious metals, n.e.s.	1,208	830	United States 566.
Of molybdenum, tantalum, titanium, vanadium, zirconium	2,260	613	NA.
Ash and residue containing nonferrous metals	1,597	4,998	West Germany 1,949; Austria 1,078; Italy 745.
Waste and sweepings of precious metals—troy ounces	--	882	All to United Kingdom.
Metal including alloys:			
Alkali and alkaline earth—kilograms	522,047	800	NA.
Base metals, n.e.s	232	342	West Germany 117; United Kingdom 94; Norway 60.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	20	12	NA.
Grinding and polishing wheels and stones	278	311	NA.
Asbestos	299,802	295,846	Japan 63,152; United Kingdom 55,080; United States 17,797; Italy 17,072.
Barite	84	56	NA.
Boron materials, boric acid	--	11	NA.
Cement	54,942	59,285	NA.
Chalk	1,466	2,453	NA.
Clays and clay products:			
Crude clays, n.e.s.:			
Andalusite, kyanite, sillimanite	50,807	22,837	Belgium 9,630; Japan 8,297; Netherlands 2,164.
Other	268,535	160,999	Japan 75,870; West Germany 28,424; Netherlands 25,526.
Products:			
Refractory	36,608	29,696	NA.
Nonrefractory [6]	787	618	NA.
Diamond:			
Gem, unworked and worked—thousand carats	2,968	3,065	United Kingdom 2,396.
Industrial:			
Natural—do	5,608	10,049	United Kingdom 6,164.
Manufactured—do	5,732	7,796	Ireland 7,664.
Diatomite	46	133	NA.

See footnotes at end of table.

Table 3.—Republic of South Africa: Exports of mineral commodities[1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Feldspar	13,972	13,884	West Germany 4,111; Australia 2,688; United States 2,419; Spain 2,022.
Fertilizer materials:			
Crude:			
Natural nitrate	5	--	
Phosphatic rock	2,208	3,684	NA.
Other	3,576	2,258	Belgium 501; United Kingdom 394; Netherlands 250.
Manufactured:			
Nitrogenous	57,283	21,146	NA.
Phosphatic	76,855	28,462	NA.
Potassic	920	719	NA.
Other	1,321	1,333	United Kingdom 742.
Ammonia	2,751	1,390	NA.
Fluorspar	180,301	125,051	Japan 67,441; Australia 21,092; United States 13,878.
Graphite, natural	388	225	NA.
Gypsum and plasters	14,543	15,760	NA.
Lime	5,877	11,241	NA.
Lithium minerals	--	1,286	Japan 686; West Germany 500.
Magnesite	2,222	1,444	NA.
Mica:			
Crude, including splittings and waste	7,549	8,555	United Kingdom 3,905; France 1,086; West Germany 766.
Worked, including agglomerated splittings value, thousands	$12	$10	NA.
Pigments, mineral:			
Natural, crude	859	1,040	United Kingdom 840.
Iron oxides, processed	156	162	NA.
Precious and semiprecious stones, except diamond:			
Precious thousand carats	580	(7)	
Semiprecious kilograms	771,580		
Salt	44,555	48,956	NA.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	120	568	NA.
Caustic potash	49	5	NA.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	700	856	NA.
Granite	213,496	238,618	Japan 52,890; France 45,138; West Germany 37,717.
Slate	753	969	Netherlands 331; Belgium 204; West Germany 118.
Worked, including slate	809	866	Netherlands 305; France 138; United Kingdom 133.
Dolomite, chiefly refractory grade	2,259	2,889	NA.
Gravel and crushed rock	293	389	United Kingdom 335.
Limestone, except dimension	13,924	12,286	NA.
Quartz and quartzite	1,979	766	Netherlands 320; United States 222.
Sand, excluding metal bearing	1,882	2,283	NA.
Sulfur:			
Elemental:			
Other than colloidal	115	127	NA.
Colloidal	(8)	8	NA.
Sulfuric acid	1,741	6,705	NA.
Talc and steatite	351	360	NA.
Vermiculite	123,640	128,935	United Kingdom 28,541; United States 23,993; Italy 18,992.
Other nonmetals, n.e.s.:			
Crude	r 10,321	10,447	United Kingdom 3,650; West Germany 2,454; Netherlands 1,657.
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture	44,324	60,060	West Germany 11,860; Austria 5,446; United States 4,164.
Slag and ash, n.e.s	--	171	NA.
Building materials of asphalt, asbestos, fiber cement, and unfired nonmetals, n.e.s value	$831,061	$548,527	NA.

See footnotes at end of table.

Table 3.—Republic of South Africa: Exports of mineral commodities[1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	13,322	7,265	NA.
Carbon black and gas carbon	4,215	4,480	NA.
Coal and briquets:			
Anthracite	1,167,065	1,167,500	France 312,588; West Germany 269,074; Netherlands 144,918.
Other	764,350	342,491	NA.
Coke and semicoke	50,895	12,629	Belgium 11,517.
Gas, hydrocarbon, natural and manufactured	1,575	2,026	NA.
Petroleum refinery products:			
Gasoline, motor thousand 42-gallon barrels	161	631	Ship and aircraft stores 261; Australia 204.
Kerosine and jet fuel ---do---	612	236	Ship and aircraft stores 186.
Distillate fuel oil ---do---	1,494	3,715	Ship and aircraft stores 3,413.
Residual fuel oil ---do---	21,886	19,070	All to ship and aircraft stores.
Lubricants (including grease) ---do---	466	452	NA.
Mineral jelly and wax ---do---	104	107	United States 41; West Germany 30; United Kingdom 8; Japan 8.
Nonlubricating oils ---do---	9	5	NA.
Pitch ---42-gallon barrels---	1,084	2,105	NA.
Bitumin and other residues thousand 42-gallon barrels	73	68	NA.
Bituminous mixtures, n.e.s ---do---	27	14	NA.
Tar distilled from coal, from lignite or from peat, and other mineral tar	859	37	NA.

r Revised. NA Not available.

[1] Source: Foreign Trade Statistics. V. 1, 1972, compiled by the Department of Customs and Excise, and includes Botswana, Lesotho, Swaziland, and the Territory of South-West Africa.

[2] Partially or wholly from Botswana, Lesotho, Swaziland, or the Territory of South-West Africa.

[3] Industrial gold only, excluding large quantities of monetary gold not reported officially in trade statistics.

[4] Includes platinum.

[5] See lead for concentrate.

[6] Excluding material reported in original source in units of area.

[7] Quantity not reported. Total value of precious and semiprecious stones (except diamond) was $2,380,844 in 1971 and $1,345,888 in 1972.

[8] Less than ½ unit.

Table 4.—Republic of South Africa: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite	24,254	13,275	Australia 9,940.
Oxide and hydroxide	77,677	103,495	West Germany 51,012; Greece 26,399; Australia 24,719.
Metal, including alloys:			
Scrap	107	339	Canada 120; Australia 108.
Unwrought	22,500	1,136	Australia 256; France 175; Romania 171; United Kingdom 161.
Semimanufactures	11,406	6,951	United States 2,409; France 825; United Kingdom 709.
Arsenic:			
Oxides and acids	74	73	United Kingdom 60.
Metal	71	--	
Chromium:			
Chromite	21,423	124,465	NA.
Oxide and hydroxide	32	20	NA.
Cobalt, oxide and hydroxide	13	15	United Kingdom 6; Australia 5; Canada 3.
Copper:			
Ore and concentrate	2,319	34,792	NA.
Metal, including alloys:			
Scrap	41	80	NA.
Unwrought	5,231	6,509	NA.
Semimanufactures	3,675	2,630	United Kingdom 1,101; West Germany 298.
Gold metal, unworked or partly worked troy ounces	10,223	7,229	United Kingdom 3,643.

See footnotes at end of table.

Table 4.—Republic of South Africa: Imports of mineral commodities[1]—Continued
(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Iron and steel:			
Metal:			
Scrap	29,146	50,371	NA.
Pig iron, ferroalloys and similar materials	13,470	32,864	Sweden 15,096; United Kingdom 5,468.
Steel ingots and other primary forms	74,477	60,179	NA.
Semimanufactures:			
Bars and rods	291,104	323,997	United Kingdom 138,852; Japan 26,001; France 7,553.
Angles, shapes, sections	71,875	120,837	United Kingdom 46,857; Belgium 30,583; United States 5,793.
Plate and sheet	318,570	66,803	Japan 48,027; United Kingdom 5,297; Australia 3,344.
Hoop and strip	23,844	68,013	United Kingdom 17,868; West Germany 15,363; Japan 14,189.
Rails and accessories	37,421	23,040	France 10,262; United Kingdom 3,969; West Germany 2,454.
Wire and wire rod	19,480	8,764	Belgium 1,961; United Kingdom 1,161; Japan 1,008.
Tubes, pipes, fittings	68,156	29,695	Japan 16,099; United Kingdom 5,716; West Germany 2,358.
Castings and forgings, rough	3,384	5,108	France 1,242; Australia 767; West Germany 629.
Total	833,834	646,257	
Lead:			
Ore and concentrate	--	11,025	All from Canada.
Oxides	157	38	NA.
Metal, including alloys:			
Scrap	2,047	1,928	NA.
Unwrought	10,628	10,046	NA.
Semimanufactures	192	52	NA.
Magnesium metal, including alloys, all forms	331	412	Norway 200; United States 143; United Kingdom 42.
Manganese:			
Ore and concentrate	277	738	United Kingdom 402.
Oxides	412	437	United States 164; Japan 150; United Kingdom 57.
Mercury ----76-pound flasks	1,486	1,830	Spain 760; Mexico 348; United Kingdom 331.
Molybdenum metal, including alloys, all forms	17	29	United States 17.
Nickel:			
Ore and concentrate	41	--	
Metal, including alloys, all forms	620	698	United Kingdom 258; West Germany 110; Japan 95.
Platinum-group metals, including alloys, all forms ----troy ounces	10,086	3,991	United Kingdom 3,664.
Silicon and tellurium	469	307	NA.
Silver:			
Waste and sweepings ----troy ounces	5,518	4,138	United Kingdom 2,773.
Metal, including alloys, all forms--do	746,007	565,608	Australia 276,451; United Kingdom 83,650; West Germany 38,873.
Tin:			
Ore and concentrate ----long tons	217	173	NA.
Oxides ----do	18	22	United Kingdom 17; West Germany 5.
Metal:			
Scrap ----do	8	55	NA.
Unwrought and semimanufactures do	507	470	NA.
Titanium (ilmenite):			
Ore and concentrate	297	292	Australia 284.
Oxides	991	413	West Germany 139; Norway 96; United Kingdom 85.
Tungsten:			
Ore and concentrate	481	543	NA.
Metal, including alloys, all forms	70	45	Portugal 20.
Zinc:			
Ore and concentrate	34,851	21,599	Australia 14,099; Canada 7,500.
Oxides	144	173	West Germany 116; United Kingdom 47.
Metal, including alloys:			
Scrap, including powder and dust	1,106	813	Australia 420; United States 96; West Germany 50.
Unwrought	17,598	6,683	Australia 1,377.
Semimanufactures	94	85	Australia 43; West Germany 18.
Zirconium, ore and concentrate	530	340	All from Australia.

See footnotes at end of table.

Table 4.—Republic of South Africa: Imports of mineral commodities[1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Other:			
Ore and concentrate of:			
Molybdenum, tantalum, vanadium	107	132	Chile 67; United States 33; Canada 29.
Other base metals, n.e.s	1,739	1,795	Australia 1,612.
Ash and residue containing nonferrous metals	6,236	10,388	Australia 2,177; West Germany 1,061.
Oxides, hydroxides and peroxides of metals, n.e.s	280	342	United States 109; West Germany 26.
Elemental boron, phosphorus and/or selenium	132	99	United Kingdom 33; U.S.S.R. 29; United States 24.
Metals, including alloys, all forms:			
Alkali, alkaline earth and rare-earth metals	28	3	NA.
Pyrophoric alloys	9	6	United Kingdom 2.
Base metals, including alloys, all forms, n.e.s.[2]	394	358	United Kingdom 173.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	1,313	2,374	NA.
Grinding and polishing wheels and stones	613	451	West Germany 213; Italy 74; United States 73.
Asbestos	11,792	16,162	NA.
Barite	2,510	1,859	United States 324; West Germany 51; Japan 36.
Boron materials:			
Crude, natural borates	1,250	1,865	United States 1,400.
Acid	751	674	France 543; United States 111.
Bromine	17	21	Mainly from Israel.
Cement	224,957	60,258	United Kingdom 12,646; Japan 6,507; West Germany 1,717.
Chalk	5,818	5,193	France 4,274.
Clays and clay products:			
Crude clays and refractory minerals	22,608	16,755	United Kingdom 7,513; United States 5,754.
Products:			
Refractory	20,413	29,546	United Kingdom 7,276; Japan 6,661; West Germany 4,355; Austria 4,316.
Nonrefractory	13,857	12,658	NA.
Cryolite and chiolite	982	82	Denmark 67.
Diamond:			
Gem ——carats	114,202	98,500	United Kingdom 76,500.
Industrial ——thousand carats	2,560	4,794	United Kingdom 2,254; Ireland 1,191.
Diatomite and other infusorial earth	4,728	3,794	United States 3,242; Japan 360.
Feldspar, leucite and nepheline syenite	62	210	NA.
Fertilizer materials:			
Crude:			
Nitrogenous	599	168	NA.
Phosphatic	4	3	NA.
Potassic	209,413	181,456	West Germany 46,043; Israel 29,267 (103,238 unreported).
Other	234	1,050	NA.
Manufactured:			
Nitrogenous	r 35,294	104,758	Netherlands 58,637.
Phosphatic:			
Thomas slag	14,303	10,908	All from Belgium.
Other	34	8,392	NA.
Potassic	45,197	26,870	West Germany 15,655.
Other, including mixed	15	505	United States 285; West Germany 109.
Graphite, natural	420	333	Norway 214.
Gypsum and plaster	5,911	5,949	West Germany 3,982; Spain 979; United Kingdom 945.
Lithium minerals, not further described	2,523	10,110	NA.
Lime	407	395	NA.
Magnesite	142,838	98,053	Japan 5,780 (91,479 unreported).
Mica:			
Crude, including splittings and waste	1,209	420	NA.
Worked, including agglomerated splittings	48	60	United Kingdom 43.
Pigments, mineral:			
Natural, crude	726	695	Austria 321; United Kingdom 294.
Iron oxides, processed	3,574	2,712	West Germany 2,344.

See footnotes at end of table.

Table 4.—Republic of South Africa: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Precious and semiprecious stones, except diamond ——value, thousands	r $987	$960	Ireland $370; United Kingdom $85; West Germany $80.
Pyrite	14	9	NA.
Salt	2,629	2,002	United Kingdom 1,042.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	38,883	6,400	United States 3,479; Netherlands 1,378; West Germany 851.
Caustic potash	836	896	West Germany 593; Czechoslovakia 141; Belgium 55.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	583	759	Italy 734.
Other	193	1,363	NA.
Worked	2,574	1,676	Italy 1,061; Portugal 236.
Dolomite	517	114	All from Japan.
Gravel and crushed stone	51,570	69,313	NA.
Limestone	100	19	NA.
Quartz and quartzite	183	49	NA.
Sand, excluding metal bearing	931	2,038	NA.
Sulfur:			
Elemental:			
Other than colloidal	210,866	222,178	France 78,909; United States 12,364; Canada 7,009 (123,561 unreported).
Colloidal	421	359	West Germany 296.
Sulfur dioxide	5	2	NA.
Sulfuric acid	19	108	NA.
Talc and steatite	2,785	2,131	Italy 709; Republic of Korea 312; France 173.
Other nonmetals, n.e.s.:			
Crude	1,577	1,312	Australia 495; United Kingdom 188; Japan 112.
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture	32,084	28,875	Canada 27,695.
Slag and ash, n.e.s	75	24	NA.
Oxides and hydroxides of magnesium, strontium, and barium	208	243	United States 99; United Kingdom 49.
Iodine and fluorine	14	5	Japan 4.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	7,669	4,281	NA.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumin, natural	7,785	3,802	United States 1,007.
Carbon and carbon black	5,291	3,575	United States 2,126; Canada 616; West Germany 397; United Kingdom 305.
Coal, all grades, including briquets	86,872	15,353	NA.
Coke and semicoke	2,362	1	NA.
Gas, hydrocarbon, natural	67	796	NA.
Hydrogen and rare gases	36	23	United States 9; United Kingdom 7.
Peat	283	595	West Germany 475.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	90,978	85,841	NA.
Refinery products:			
Gasoline, motor ——do	3,833	1,675	NA.
Kerosine (including jet fuel) and white spirit ——do	2,463	1,292	NA.
Distillate fuel oil ——do	6,191	3,744	NA.
Residual fuel oil ——do	11,162	8,264	Netherlands 446; United States 395.
Lubricants (including grease) ——do	1,290	1,044	United States 361; United Kingdom 207; Netherlands Antilles 156.
Jelly and wax ——do	251	182	West Germany 46; Japan 42; United States 35.
Other:			
Nonlubricating oils, n.e.s ——do	3,643	6,704	NA.
Pitch ——42-gallon barrels	4,466	2,221	United Kingdom 1,492.
Petroleum coke ——do	23,788	38,815	United Kingdom 22,009; United States 16,806.

See footnotes at end of table.

Table 4.—Republic of South Africa: Imports of mineral commodities[1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Other—Continued			
Bitumen and other residues --42-gallon barrels--	16,344	16,086	Netherlands 8,072; United States 2,967.
Bituminous mixtures, n.e.s ----------do----	3,715	4,733	United States 2,803; United Kingdom 945.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals thousand 42-gallon barrels--	232	298	Netherlands 132; United Kingdom 82.

r Revised. NA Not available.
[1] Source: Foreign Trade Statistics. V. 1, 1972, compiled by the Department of Customs and Excise, and includes Botswana, Lesotho, Swaziland, and the Territory of South-West Africa.
[2] Includes some manufactures, not separable from unwrought and semimanufactures in source.

Table 5.—Republic of South Africa: Major domestic mineral sales[1]

(Thousand dollars)

Commodity	1972	1973
METALS		
Chromite	2,919	4,967
Copper	44,943	92,210
Iron ore	18,200	20,562
Manganese ore	8,626	9,446
Nickel	7,721	13,559
Tin	2,425	3,960
Zinc concentrate	161	2,029
NONMETALS		
Andalusite and sillimanite	714	1,105
Asbestos	3,721	3,355
Clays	2,909	4,024
Feldspar	757	856
Fluorspar	746	828
Gypsum	1,423	1,866
Limestone	15,158	19,232
Lime products, burnt	12,387	16,756
Magnesite	886	1,020
Phosphate rock	15,954	20,670
Pyrite (for sulfur)	3,605	5,616
Salt	4,800	6,268
Silica[2]	3,162	4,754
Slate	1,314	1,845
Stone, dimension	1,035	1,054
MINERAL FUELS AND RELATED MATERIALS		
Coal	153,559	199,640
MISCELLANEOUS		
Other minerals	r 58,579	83,218
Total	365,704	518,840

r Revised.
[1] Does not include gold, silver, and diamond, data on which are not available.
[2] Includes silcrete.

Source: Republic of South Africa, Department of Mines. Quarterly Information Circular. October–December 1973, pp. 29–30.

Table 6.—Republic of South Africa: Major mineral exports

(Thousand dollars)

Commodity	1972	1973
METALS		
Antimony concentrate	14,303	17,985
Chromite	13,527	19,513
Copper	105,809	155,140
Gold [1]	r 1,499,771	2,585,524
Iron ore	20,996	30,489
Manganese ore	39,599	67,125
Nickel	25,751	30,769
Silver [1]	r 5,320	10,594
Tin concentrate	4,433	6,537
Vanadium [2]	27,523	33,139
Zinc	--	2,197
Zirconium concentrate	--	2,801
NONMETALS		
Andalusite and sillimanite	1,041	2,070
Asbestos	45,453	64,506
Clays	4,067	4,065
Diamond	r 116,407	234,620
Feldspar	595	314
Fluorspar	5,003	5,937
Gem stones, semiprecious	360	507
Limestone	627	869
Mica	381	650
Salt	471	508
Stone, dimension	9,695	14,971
Vermiculite	3,380	4,946
MINERAL FUELS AND RELATED MATERIALS		
Coal	10,370	20,153
MISCELLANEOUS		
Other minerals [3]	189,965	275,505
Total	r 2,144,847	3,591,434

r Revised.
[1] Total value, including domestic sales, if any.
[2] Includes slag, polyvanadate and metavanadate, fused pentoxide, ferrovanadium, and Carvan.
[3] Mainly platinum and uranium.

Source: Republic of South Africa, Department of Mines. Quarterly Information Circular. October–December 1973, pp. 31–32.

COMMODITY REVIEW

METALS

Aluminum.—Alusaf (Pty.) Ltd., the Republic of South Africa's only producer of primary aluminum, supplied almost all of the country's total domestic demand for aluminum metal in 1973. Production was 52,800 tons, down slightly from that of 1972. Alusaf planned to boost aluminum capacity by 40% to 75,000 tons per year by the first half of 1974. A total of 66 new aluminum reduction cells were being added to the smelter at a cost of about $26 million.[3] Shipments of alumina from the Gove, Australia, operation of Swiss Aluminium Ltd. (Alusuisse) began in 1973. Alusuisse, which has a 22% interest in Alusaf, has a $280 million, 20-year contract to supply the smelter with alumina.

In November Alcan Aluminium Ltd. (Alcan) sold its majority interest in Alcan Aluminium of South Africa Ltd., a 40,000-ton-per-year aluminum fabricating company, to Huletts Corp.[4] Government policy that required the subsidiary to purchase the bulk of its primary aluminum requirements from Alusaf was a major factor in the sale. Alcan's holdings in the fabricating company were reduced to 24%. Huletts held 36% and the South African public 40%.

Antimony.—Consolidated Murchison Ltd. (CM), the free world's largest and South Africa's only antimony producer, operated at capacity in 1973. According to the CM annual report production of concentrate increased about 7% to 26,081 tons from 619,000 tons of ore milled. Shipments

[3] Engineering and Mining Journal. V. 174, No. 1, January 1973, p. 147.
[4] Mining Journal (London). Alcan Reduces S.A. Holding. V. 281, No. 7216, Dec. 7, 1973, p. 478.

(30,186 tons) although declining 14% from those of 1972, exceeded production, resulting in a further decline in concentrate stocks. At yearend, remaining stocks amounted to 2,858 tons, down from 7,403 tons held at the first of the year. Higher sales prices for antimony more than offset a 34% increase in production cost per ton of concentrate.

In 1973 the company increased exploration and made additional reserves available. Two shafts, the Athens and Beta, were being sunk to exploit deeper extensions of presently mined ore bodies. Sinking of the $6.7 million Athens shaft began in June. The shaft, scheduled for completion in 1975, is planned to be 1,000 meters deep and to have a rated capacity of 50,000 tons per month of antimony ore.[5]

Antimony Products (Pty.) Ltd., a joint venture of Chemetron Corp., Consolidated Murchison, and Johannesburg Consolidated Investment Co. Ltd., was constructing a 7.2-million-pound crude antimony oxide plant near Gravelotte, Transvaal. The plant was scheduled to begin production in April 1974.

Chrome and Chromite.—Output of the South African chromite and ferrochrome industries improved in line with the recovery in world steel production. Local consumption of chromite by ferroalloy producers continued to increase and exports of both chromite and ferrochrome increased significantly over those of 1972. Many chromite mines were expanding operations and developing additional reserves. Chromite production was 1,649,630 tons, only slightly higher than that of 1971 but 11.2% more than that of 1972. During 1973, 40% of production was lower grade material (less than 44% Cr_2O_3), as compared with 31% in 1971 and 1972.

Marble Lime and Associated Industries Ltd. planned to increase the annual production at the Kroondal chromite mine from 250,000 to 300,000 tons of various grades in 1974. About 150,000 tons of concentrate and 100,000 tons of lumpy ore were produced in 1973. More than 90% of output was exported. Kroondal's ore reserves were about 200 million tons at the end of the year.

Copper.—In 1973, copper output was a record 175,797 tons, due largely to added production from the new copper-zinc mine of Prieska Copper Mines (Pty.) Ltd. (PCM). Exports declined but the value soared to a record $155 million owing to high copper prices on world markets. Local sales increased 55%, reflecting increased domestic processing, fabrication, and consumption. Two large, commercially viable copper deposits in northern Cape Province were being extensively drilled to determine reserves. A new electrolytic copper refinery to process blister copper was planned near Cape Town.

PCM, a joint venture of Anglovaal Consolidated Investment Co. Ltd., United States Steel Corp., and Middle Witwatersrand (Western Areas) Ltd., continued to expand operations and production in 1973. The second half of the concentrator was commissioned in April and the plant was almost completed at yearend. Production was below planned levels for the year due to concentrator and stoping problems but these problems were almost entirely overcome by the end of December. The company planned to attain full production of 220,000 tons milled monthly by mid-1974, yielding approximately 9,500 tons of copper concentrate (26% Cu) and 8,000 tons of zinc concentrate (50% Zn). All of the concentrate produced have been sold for the first 10 years of the mine's operations to South African and European companies. The sales contract with Azienda Minerali Metallici Italiane, S.p.A. (AMMI), of Italy for part of the copper concentrate was cancelled by mutual consent but was replaced by a similar contract with O'okiep Copper Co.[6]

Palabora Mining Co. Ltd., the country's largest copper producer, increased copper concentrate production as a result of improved mill recoveries on less tons of ore milled than in 1972. Smelter production declined 4% owing to reduced concentrate purchases from outside sources. Copper sales also decreased but revenues, owing to high copper price, were up substantially. Production statistics for Palabora's operation in 1972 and 1973 follow:

	1972	1973
Ore milled		
million metric tons	19.3	19.2
Grade of ore ----percent Cu	.56	.57
Copper produced [1] --metric tons	99,972	95,889
Copper sales ----------do----	102,965	98,248
Average cost per ton of copper produced ----------	$443	[e] $554

[e] Estimate.
[1] Includes 9,720 tons of copper from outside sources in 1972 compared with 2,251 tons in 1973.

[5] Metals Sourcebook. V. 1, No. 21, Dec. 29, 1973, p. 4.
[6] Mining Journal (London). New Copper Contract. V. 280, No. 7184, Apr. 27, 1973, p. 351.

Palabora planned to construct several scrubbing towers to reduce emissions of sulfurous gases and a new flotation plant to recover the copper sulfide mineral, valerite, which until now was lost to tailings.[7]

Production statistics for O'okiep Copper Co., operator of 12 mines, 3 mills, and 1 smelter in northwestern Cape Province follow:

	1972	1973
Ore milled thousand metric tons	3,147	2,992
Grade of ore percent Cu	1.28	1.34
Blister copper produced[1] metric tons	36,937	34,263
Blister copper sales do	35,765	34,432
Cost per ton of blister copper produced	$611	$836

[1] Includes 763 tons of blister copper produced from custom concentrates in 1972 and 462 tons in 1973.

Ore reserves at O'okiep mines were 24,393,000 tons averaging 1.58% copper at the end of 1973 as compared with 25,436,000 tons averaging 1.56% copper at the end of 1972. The 80-mile water pipeline from the Orange River to the town of O'okiep was completed in October. The additional water supplies relieved the constant threat to mill and smelter operations due to lack of processing water.

O'okiep and Tsumeb Corp. Ltd. decided late in 1973 to commission an engineering and feasibility study for an electrolytic copper refinery with a capacity of about 140,000 tons of cathode copper annually to be erected near Cape Town. The refinery would treat all of the blister copper production from the two companies.

Production of copper at the Messina mine, of the Messina (Transvaal) Development Co. Ltd., for the year ending September 30 was 10,820 tons, 180 tons less than in 1971 and 1972. Ore production decreased 9% as underground operations were adversely affected by work required to improve ventilation conditions. During 1973, underground development and drilling proved 1,070,000 tons of ore assaying 1.22% copper. Total proved ore reserves at the end of the fiscal year were 5,365,000 tons averaging 1.45% copper.

According to the Phelps Dodge Corp. annual report, two large copper-lead-zinc-silver deposits within 3.5 miles of each other, near Pofadder in Cape Province, are exploitable by open pit methods. By the end of 1973, a total of 139 and 84 diamond drill holes were completed at the Black Mountain and Broken Hill deposits, respectively. Ore reserves were estimated as follows:

	Reserves (million tons)	Grade, percent			Silver, ounce per ton
		Copper	Lead	Zinc	
Black Mountain:					
Open pit ore	30	0.6	2.3	0.5	0.8
Underground ore	48	.8	2.9	.6	.8
Broken Hill:					
Open pit ore	37	.4	4.5	2.3	1.7
Underground ore	25	.4	3.0	2.2	1.0

In both deposits, no attempt was made to determine the ultimate extension of ore at depth. Extensive pilot plant testing was scheduled during 1974. Preliminary metallurgical testing of ore from both deposits indicated no serious milling and concentrating problems.

Gold.—The gold mining industry enjoyed record profits in 1973 due to soaring gold prices that ranged from $65 to $127 per ounce on world markets. Strong demand for gold for speculative and investment purposes resulted from the instability of world currency markets, rampant inflation, and the international oil crisis. The two-tier system of gold sales introduced in 1968 was abandoned in November, and South Africa's obligation to sell current gold production to the International Monetary Fund (IMF) in the event of a balance of payment deficit was terminated in December. Both of these actions increased South Africa's flexibility in marketing its gold. Durng the year more than 96% of South Africa's newly mined gold was sold on the open market.

Gold production was 27.5 million ounces, 1.8 million ounces or 6% less than that of

[7] Mining Journal (London). New Plant at Palabora. V. 280, No. 7186, May 11, 1973, p. 391.

1972. The tonnage of ore milled increased but the grade of ore fell 9% to 0.36 ounce of gold per ton. The decline in ore grade was the result of mining marginal ores made economic by high gold prices. In some cases as much as 40% of mill feed was ore previously not considered in reserves. Also as a result of higher gold prices, ore reserves increased substantially and the lives of most mines were extended. Eighteen mines received state assistance in 1973 but only two mines were receiving subsidies at yearend. The continuing demand for gold at high prices stimulated exploration and reevaluation of marginal gold properties. Several new mines were proposed and additional deep level shafts were planned. Sunday milling to increase productivity was proposed.[8]

Working costs per ton of ore milled rose 20% (in terms of rand) to $15.19 in 1973 because of substantial wage and salary increases and higher costs for stores and services. Despite these increases, working profit per ton of ore milled rose $9.74 to $19.39. The average price received by producers for gold output was $94.14 per ounce in 1973 as compared with $51.50 in 1972.

Improvements in mining methods continued. Rock cutting machines were tested on production scale at a number of mines to improve safety and increase efficiency by eliminating the use of explosives.[9] A raise boring machine, the largest and most powerful of its type in use underground, was commissioned at the Vaal Reefs South Mine of Anglo-American Corp. of South Africa Ltd. (AAC). The machine was designed to excavate ventilation and short hoist shafts of up to 12 feet in diameter and 2,000 feet in depth. Promising new methods were under investigation to increase gold recovery from final plant tailings and effluents. Coatings of thucholite and hydrated iron oxides on gold particles were discovered to cause most gold losses in tailings.[10]

Union Corp. planned to establish a new gold mine south of the President Brand and President Steyn lease areas in the Orange Free State goldfield. An estimated $60 million will be required to bring the mine into operation. Production was expected to start by the end of 1977 at a rate of about 900,000 tons of ore per year. Mining and milling was to be done by St. Helena Gold Mine Ltd. on a royalty basis.[11]

Gold Fields of South Africa Ltd. (GFSA) and AAC were carrying out an extensive drilling program on the Deelkraal and Buffelsdoorn farms south of Western Deep Levels Ltd. in the Transvaal. Preliminary data indicated that a viable mine could be supported at prevailing gold prices.

Loraine Gold Mines Ltd., a subsidiary of Anglo-Transvaal Consolidated Investment Co. Ltd. (Anglovaal), planned a $10.5 million expansion program spread over the next 3 years. The program included sinking of a new 5,250-foot shaft (No. 4), near the present No. 3 shaft, and plant improvements to raise the milling rate from 100,000 tons per month to 200,000 tons.[12]

Harmony Gold Mines Ltd., which merged with Merriespruit (Orange Free State) Gold Mining Co. Ltd. and Virginia Orange Free State Gold Mining Co. Ltd. early in 1973, became one of the largest gold mining operations in the world. Harmony's combined mill capacity was 480,000 tons per month and was scheduled to be increased to 540,000 tons per month by 1976. The total reserves of the expanded property were estimated at 20 million tons averaging 0.30 ounce per ton of gold.

East Driefontein Gold Mining Co. Ltd. planned to increase mill production from 960,000 tons per year to 2,172,000 tons by 1976. Although proven reserves were less than 1 million tons at yearend, the development of zones A and B were expected to provide the necessary reserves to maintain operations at the expanded level.

The lives of AAC's East Daggafontein and Free State Saaiplaas mines, both of which were to cease underground operations in 1973, were extended to mid-1974 and 1977, respectively, because of higher gold prices. The Brakpan mine, which closed 12 years ago, was to be reactivated by Government GM Areas. Production was planned by the end of 1974 at a rate of 20,000 tons per month. A 15-year operation was envisioned.

Iron and Steel.—The decision by the Government in April to approve the Sishen-

[8] Mining Journal (London). Sunday Milling on the Cards. V. 280, No. 7188, May 25, 1973, p. 425.

[9] Mining Magazine. Rock Cutting Machines for Production Trials in South Africa. V. 129, No. 2, August 1973, pp. 125–127.

[10] Engineering and Mining Journal. Anglo Finds Cause of Gold Loss in Tailing, Works on Improved Recovery. V. 174, No. 9, September 1973, p. 32.

[11] Metals Sourcebook. No. 20, Oct. 8, 1973, p. 2.

[12] Mining Journal (London). Loraine Sinks New Shaft. V. 281, No. 7212, Nov. 9. 1973, p. 387.

Table 7.—Republic of South Africa: Gold output, by major producers, in 1973

(Troy ounces)

Company or mine	Production
Barberton	45,300
Blyvooruitzicht	1,032,272
Bracken	325,966
Buffelsfontein	1,105,000
City Deep	60,955
Consolidated Main Reef	25,775
Crown Mines	94,501
Doornfontein	613,188
Durban Deep	323,494
East Daggafontein	129,214
East Driefontein	528,046
East Rand Proprietary Mine Ltd	521,144
Elsburg	301,262
Freddies Consolidated	410,992
Free State Geduld	1,363,890
Free State Saaiplaas	242,461
Grootvlei	200,685
Harmony	1,175,102
Hartebeestfontein	1,164,463
Kinross	394,119
Kloof	934,161
Leslie	295,262
Libanon	530,188
Loraine	347,234
Marievale	189,516
President Brand	1,423,299
President Steyn	1,013,104
St. Helena	944,060
South African Land and Exploration Co. Ltd	226,637
Stilfontein	658,311
Vaals Reefs	2,191,411
Venterspost	329,580
Vlakfontein	144,646
Welkom	643,101
West Driefontein	2,427,735
Western Areas	522,963
Western Deep Levels	1,886,889
Western Holdings	1,596,793
West Rand Consolidated	218,480
Winkelhaak	526,310
Witwatersrand Nigel Ltd	34,581
Miscellaneous	260,765
Total	27,402,855

Source: Chamber of Mines of South Africa. January–December 1973.

Saldanha Bay iron ore, and steel semimanufactured product export project of the Government-sponsored ISCOR was the major event in the iron and steel industry in 1973. The project was selected over development of the St. Croix ore terminal, favored by the private sector, because the port facilities of nearby Port Elizabeth were underutilized.[13] The overall project which includes mine expansion at Sishen, construction of a 850-kilometer electrified railroad, development of harbor facilities at Saldanha Bay, and construction of a steelworks with semifinished product capacity of 3 million tons per year, was expected to cost about $1.6 million. Iron ore exports were scheduled to begin late in 1976, expanding to 15 million tons annually in the early 1980's. Provisions were made to ultimately increase iron ore exports to 35 million tons annually. ISCOR and Vereinigte Österreichische Eisen und Stahlwerke A. G. (VÖEST) of Austria agreed in principle to construct a 3-million-ton-per-year steel bloom and billet plant at Saldanha.[14] Cost of the facility was estimated at $1 billion. ISCOR will hold 51% of the shares VÖEST, 26% and other participants, 23%.

Iron Ore and Concentrate.—Production of iron ore decreased slightly in 1973. Local sales declined but exports increased 28%

[13] Metal Bulletin, No. St. Croix Ore Terminal. No. 5827, Aug. 21, 1973, p. 31.

[14] Metal Bulletin. Semis Plant for Saldanha. No. 5847, Nov. 2, 1973, pp. 28–29.

Table 8.—Republic of South Africa: Salient statistics of gold and uranium production by members of the Chamber of Mines, Transvaal and Orange Free State

		1972	1973
Number of operating gold mines		43	41
Ore milled	thousand tons	72,046	75,154
Production of gold:			
Gross weight	thousand troy ounces	28,910	27,142
Per ton of ore milled	troy ounces	.401	.361
Number of uranium-producing mines		10	8
Ore treated for uranium recovery	thousand tons	14,609	12,828
Production of uranium oxide (U_3O_8):			
Gross weight	thousand pounds	8,001	6,821
Per ton of ore milled	pounds	.55	.53
Average realized gold price, per ounce [1]		$51.50	$94.14
Working profit, gold and uranium	thousands	$708,668	$1,484,766
Taxes and lease fees payable to government	do	$310,320	$722,211
Net dividens	do	$239,166	$453,434
Average number of employees in service:			
Whites		37,120	37,017
Nonwhites		367,982	385,557
Mine development, including shaft sinking	meters	835,967	899,438
Ore reserves, payable	thousand tons	145,810	182,365
Average grade of reserves	troy ounces per ton	.516	.465

[1] Includes premiums from private sales.

Source: Chamber of Mines of South Africa. Published by Union Corp., Ltd. Reports and Accounts 1973, p. 44.

to 3.4 million tons combined hematite and magnetite concentrate. ISCOR was the major producer, shipping a total of 5.9 million tons of iron ore products from its three mining operations. Mine production was as follows: the Sishen mine, almost 3 million tons; the Thabazimbi mine, 2.3 million tons; and the Lylyveld mine, 0.6 million tons. The capacity of the Sishen mine was being expanded to 9 million tons annually to meet the increasing demands of ISCOR's three steelworks. A new open pit mine was under development at Sishen to provide the iron ore requirements for export and the steelworks at Saldanha Bay.

ISCOR began negotiations with several countries regarding exports of iron ore from Saldanha Bay. The Tang Eng Iron Works in Taiwan contracted to import 1 million tons of high-grade ore annually after 1976.[15] Producers in Japan, the United States, and Western Europe, including VÖEST, have expressed interest. In July, Japanese steel producers signed a 2-year agreement with ISCOR to purchase 400,000 tons per year of Sishen iron ore in 1973 and 1974.[16] The price per ton f.o.b. for lump ore was reported to be $9.40.

Palabora Mining Co. Ltd. produced slightly more than 3 million tons of magnetite concentrate, of which 1.1 million tons were sold locally and 800,000 tons were exported to Japan. Palabora was considering the construction of a 4-to-6-million-ton-per-year magnetite pelletizing plant on the east coast of Africa if negotiations with Japanese steel companies were successful. The company planned to ship the magnetite in slurry form to the coast via a 160-kilometer pipeline. It was envisoned that the entire operation could begin late in 1977 or early in 1978.

Iron and Steel Products.—Demand for steel products accelerated as the year progressed. Although steel output increased, imports of steel products, particularly cold- and hot-rolled sheet, rose. ISCOR revised the expansion programs at the Vanderbijlpark and Newcastle works to reduce immediate capital requirements and to better utilize equipment. Scheduled production at the Vanderbijlpark works was revised upward to 6 million tons (annually) of molten steel by 1983, as compared with the previous target of 4 million tons. At the Newcastle works, planned production was scaled downward from 5 million to 3 million tons per year. ISCOR conitnued planned expansion of its profile product lines to reduce the country's dependence on imported materials. With the commissioning of the wide-tandem cold mill and a new wide hot-strip mill at Vanderbijlpark by 1975, imports of hot-and cold-rolled sheet were expected to end.

According to ISCOR's annual report for the year ending June 30, 1973 total production of ingot steel increased 6.2% over the previous year to 4,052,735 tons. The Vanderbijlpark works contributed 2,702,608 tons and the Pretoria works, 1,350,127 tons. The Newcastle works produced 943,673 tons of hot metal, of which 876,514 tons was for production of pig iron and 67,159 tons for the production of ferromanganese.

An estimated 3,962,100 tons of rolled, drawn, and forged steel products were consumed in the Republic of South Africa, the Territory of South-West Africa, and neighboring African States during the fiscal year 1973. ISCOR supplied 72.2% of the total, other South African producers 22.5%, and 5.3% was imported. For fiscal 1972, the percentages were 68.4, 22.0, and 9.6, respectively.

Highveld Steel and Vanadium Corp. Ltd. (HSV) operated its iron plant at capacity for the first time, achieving a 21.5% increase in hot metal production. Production of continuous-cast blocks was 2% higher, totaling a record 433,490 tons. HSV planned a $20 million expansion program to increase steel and vanadium slag output by 25%. The new facilities plus expansion of the Mapochs mine were expected to be completed early in 1975.

Manganese.—Production and sales of managanese ore increased significantly in 1973. Prices were firm but, as a result of increased costs for labor and stores, the working costs of manganese production rose by 28%. High shipping charges and increased rail charges also adversely affected company earnings. South African Manganese Ltd. (SAM) continued as the principal producer of manganese ore with a record output of 2,603,853 tons, or 62% of the Republic's production. During 1973, the other major manganese producer, the Associated Manganese Mines of South Africa Ltd. (AMM), shipped 1,629,000 tons of manganese ore, 41% more than in 1972.

[15] American Metal Market. Taiwan Contracts for South African Iron Ore. V. 80, No. 249, Dec. 26, 1973, p. 2.

[16] Mining Journal (London). Iscor Signs New Contracts. V. 281, No. 7194, July 6, 1973, p. 3.

SAM's Wessels mine, the largest underground manganese operation in the world, started initial ore production during 1973. The Wessels mine was established to supplement declining production of the nearby Hotazel mine. As the Hotazel ore reserves are exhausted, Wessels production was scheduled to progressively increase to about 500,000 tons per year as new facilities were completed. The combined capacity of these two mines was about 1.1 million tons in 1973. SAM's other operations at Mamatwan and Lohathla have a combined capacity of 1.7 million tons of ore per year.

Delta Managenese (Pty.) Ltd. a joint venture of Delta Metal Co. Ltd. and Alcan, was constructing a $21 million electrolytic manganese plant at Nelspruit in eastern Transvaal. Production was scheduled to start early in 1974 with an initial capacity of 14,500 tons per year. The plant was expected to double this capacity by late 1975. Foote Mineral Co. will be the distributor of Delta's products in the United States and Mexico.[17]

Nickel.—Nickel production, a byproduct of platinum mining, increased 67% to 19,426 tons in 1973. Exports were only 316 tons higher than last year's 9,984 tons but the value of exported nickel rose $5 million to $30.8 million. Local sales increased significantly, rising 49% to 4,639 tons in 1973.

Platinum.—Although platinum-group metal production statistics are not reported, output was estimated at 2.4 million ounces in 1973, including 1.5 million ounces of platinum. Sales exceeded those of 1972 and profits were higher. The strong demand was due mainly to economic recovery in the United States and Europe and to increased jewelry demand in Japan. The platinum industry continued with expansion programs based on commitments, made by major automobile manufacturers in the United States and Japan, to buy large quantities of platinum and palladium for use in catalytic converters to control automobile exhausts.

Rustenburg Platinum Mines Ltd. was expanding platinum capacity from 1.1 million to 1.525 million ounces per year. The expansion program, which is expected to be completed by 1976 at a cost of about $140 million, included doubling the Union section output by the second quarter of 1974 and development of a new platinum mine at Amandelbult, about 20 miles northeast of the Union section. The Amandelbult mine was planned to have an initial capacity of 225,000 ounces of platinum annually with provision for expansion to 675,000 ounces, if necessary.[18] Rustenburg and Ford Motor Co. modified their existing contract to include palladium as well as platinum and to extend the contract period from 3 to 5 years. Annual deliveries of 380,000 ounces of platinum and 120,000 ounces of palladium were to begin in 1975.[19]

Impala Platinum Ltd. planned to increase platinum production capacity to 950,000 ounces by the end of 1974. Expansion of mine and refinery facilities was expected to cost about $115 million. Atok Platinum Mines (Pty.) Ltd., a subsidiary of Anglovaal, planned to boost platinum production to 35,000 ounces annually. The expansion, which will cost about $3 million, is scheduled for completion early in 1975.[20]

Western Platinum Ltd. was constructing a $3 million platinum refinery at Brakpan to process its own production. The refinery, which has a planned annual capacity of 150,000 ounces, was scheduled to come onstream in April 1974. For the year ending September 30, Western Platinum reported production of 109,000 ounces of platinum-group metals in matte.

Tin.—Rooiberg Minerals Development Co., a member of the GFSA group of companies, increased output of tin-in-concentrate about 28%, producing a record 1,921 long tons in the fiscal year ended June 30. The increase was attributable to the mining of higher ore grades and better flotation recovery. A newly commissioned shaft, at the "C" mine, with a capacity to hoist 25,000 long tons of ore per month was expected to further increase tin production. Production of tin-in-concentrate by Union Tin Mines Ltd., also a GFSA company, continued to decline in fiscal 1973 due to lower ore grades and decreased ore output. During the year more than 70% of total production, 248 long tons, was reclaimed tin from old tailings. Increased ore output, mainly from the newly developed western section of the mine, was expected in 1974.

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[17] Engineering and Mining Journal. V. 174, No. 7, July 1973, p. 121.

[18] World Mining. Rustenburg to Open New Mine at Amandelbult. V. 26, No. 3, March 1973, p. 95.

[19] Mining Magazine. Platinum Contract. V. 129, No. 1, July 1973, p. 61.

[20] American Metal Market. Atok Expansion Gets Green Light. V. 80, No. 216, Nov. 7, 1973, p. 6.

Uranium.—The production of uranium at South African gold mines declined again in 1973, reflecting the policy of mining lower grade ores due to higher gold prices. Production was 3,094 tons, 535 tons less than in 1972. Early in the year AAC closed one of the two uranium plants at the Vaal Reefs mine because of weak market demand and low uranium prices.[21] However, with the advent of the energy crisis late in the year and improvement in the medium-term outlook for uranium, AAC decided to reactivate the closed plant early in 1974. Production of uranium at West Rand Consolidated Mines Ltd. (WRC), the only primary uranium producer in the Republic, was down slightly because the company mined areas of higher gold values to take advantage of the high gold prices. WRC was considering ceasing all uranium production at the end of the year because stocks were sufficient to meet existing sales commitments through 1976.[22] The uranium plant at AAC's President Brand mine continued on a care-and-maintenance basis and uranium-bearing slimes were continuing to be stockpiled.

The Government announced that a $115 million pilot uranium enrichment plant using South African-developed technology would be operating before June 1974.[23] The process for which details are not available, was expected to produce enriched uranium significantly cheaper than by any other means. A full-sized plant, capable of producing 2,400 tons of enriched uranium annually, was envisioned by 1980 at a cost of about $800 million.

Vanadium.—The demand for vanadium rose steadily throughout 1973, in parallel with the general improvement in world steel production. The Republic's vanadium output was a record 8,207 tons, 12% higher than in 1972. During 1973 HSV, the principal producer, produced a record 35,870 tons of vanadium slag and operated its vanadium pentoxide roasting furnaces at full capacity. For the first time, the vanadium-bearing iron ore mined at Mapochs exceeded 1 million tons, which was sufficient to meet the demands of both the steelworks and the Vantra plant. HSV planned to increase vanadium slag and steel production by 25% at its Witbank plant by the first quarter of 1975.[24] The expansion, which will cost about $20 million, involved improvements at the Mapochs mine and additional production facilities at the steelworks. Most of the additional output was expected to be exported.

Transvaal Alloys Ltd. (TAL), a HSV subsidiary, was mining a vanadium ore body near Uitvtugt, Transvaal, under a lease from Bushveld Development (Pty.) Ltd. The company expected to mine 1.2 million tons of ore before the lease expires in February 1974. TAL planned to have its vanadium pentoxide plant near Staffberg onstream early in 1974.

Zinc.—The Republic of South Africa's only zinc producer, PCM, completed its first full year's operation, producing 34,031 tons of zinc concentrate in 1973, compared with only 4,017 tons in 1972. The company planned to attain full production of 220,000 milled tons monthly by mid-1974, yielding

[21] Metal Bulletin. No. 5783, Mar. 13, 1973, p. 18.
[22] South African Mining and Engineering Journal. W.R.C.M.—An Old-Timer Which Could Surprise. V. 85, No. 4083, August 1973, pp. 43–59.
[23] Metal Bulletin. SA Enrichment. No. 5846, Oct. 30, 1973, p. 22.
[24] Engineering and Mining Journal. V. 174, No. 9, September 1973, p. 224.

Table 9.—Republic of South Africa: Uranium production, by producer, in 1973

Gold-uranium producer	Gold ore treated (thousand metric tons)	Production U_3O_8 (pounds)	Grade (pounds per ton)
Blyvooruitzicht	673	414,941	0.617
Buffelsfontein	3,002	1,560,835	.520
Harmony	2,927	932,246	.317
Hartebeestfontein	1,742	787,147	.452
Vaals Reefs	2,260	1,430,844	.633
West Driefontein	799	440,583	.551
Western Deep Levels	620	338,844	.547
West Rand Consolidated	805	915,621	1.138
Total and average	12,828	6,821,061	.531

Source: Chamber of Mines of South Africa. Analysis of Working Results of Gold and Uranium Mining Members. January–December 1973.

about 9,500 tons of copper concentrate and 8,000 tons of zinc concentrate. Half of the zinc concentrate was sold to the Zinc Corp. of South Africa (ZINCOR); the other half was to be exported. ZINCOR, owned by ISCOR (35%), GFSA (33%), Vogelstruitsbult Gold Mining Areas Ltd. (22%), and Kiln Products Ltd. (10%), was expanding the production capacity of its electrolytic refinery from 50,000 tons per year to 75,000 tons to handle the additional PCM concentrate. The expansion was scheduled to take place over a 5-year period at a cost of $21 million.[25]

Zinc discoveries in northern Cape Province were expected to significantly boost zinc output in the Republic in the next few years. Phelps Dodge was evaluating two large base metal deposits, containing zinc, near Pofodder. Preliminary diamond-drill data indicated about 140 million tons of ore containing 0.5% to 2.3% zinc (see copper section) among other metals.

During 1973, Newmont Mining Corp. and O'okiep Copper Co. discovered a large zinc deposit at Gamsberg, about 80 miles east of O'okiep in Namaqualand. Diamond drilling over a portion of the 15,000-foot strike length indicated significant sulfide intersections of 30 to 100 feet in width, assaying 6% to 10% zinc with less than 0.5% lead. Metallurgical test work and drilling were continuing to further evaluate the deposit's economic potential.[26]

NONMETALS

Asbestos.—Production of asbestos minerals increased marginally over those of 1972 but sales rose significantly. Exports were up 28%, to 316,525 tons, and were valued at almost $64 million, up $19 million from 1972. Company profits were, however, adversely affected by the U.S. dollar devaluation in February. Griqualand Exploration and Finance Co. Ltd., a subsidiary of General Mining and Finance Corp. Ltd. (GMF), decreased annual production in 1973 by 14% to reduce stocks, but by yearend, the mine was returned to full production because of improved market prospects. Msauli Asbes Ltd. increased chrysotile production about 32% to 56,272 tons in 1973 and planned to further increase output in 1974. The company was installing additional facilities to raise production capacity by 25%.

Cement.—A high level of activity in the construction industry resulted in a high demand for cement in 1973. Production of cement increased more than 12% over the record amount produced in 1972 and local sales were up significantly. Rising costs continued to erode profits but the profit squeeze was alleviated, to some extent, in April when a 10% price increase was granted by the Price Controller.[27]

Cape Portland Cement Co. Ltd. continued construction of its new 19.5 million cement factory at De Hoek, near Piketberg, Cape Province. The plant, which has a planned capacity of 500,000 tons annually, was expected to be in production by the middle of 1974.[28] Union Lime Co. Ltd. and South African Quarry Industries Ltd. were constructing a lime and cement complex near a high-grade limestone deposit at Danielskuil. The project was sheduled for completion by 1980 at a cost of $58 million.[29]

Bosveld Kunsmis' Palcaso plant at Phalaborwa began commercial production of sulfuric acid and cement clinker from byproduct gypsum arising from the production of phosphoric acid. The designed capacity of the plant was 300 tons per day of both acid and clinker per 24-hour period. An annual output of about 100,000 tons of each product was planned initially. The clinker was being marketed by Palment (Pty.) Ltd.[30]

Diamond.—The diamond market was extremely firm until October, when the Middle East war affected demand and the Israeli diamond-cutting industry virtually closed down. However, for 1973, the Central Selling Organization attained record sales of about $1,331 million, 57% (40.5% in terms of rand) higher than the record amount set in 1972. Strong demand for gem diamonds in Japan, the United States, and Western Europe and price increases due, in part, to world currency fluctuations led to the sales record. South African diamond production increased 2.3% to 7,565,374 carats in 1973, whereas diamond sales, amounting to 7,277,866 carats, were $234.6 million, more than twice the 1972 figure. The increased output was attrib-

[25] Metals Sourcebook. No. 15, July 30, 1973, p. 1.
[26] American Metal Market. Newmont O'okiep Hit Zinc Sulfide. V. 80, No. 134, July 11, 1973, p. 6.
[27] Cement, Lime and Gravel. V. 48, No. 8, August 1973, p. 174.
[28] South African Digest. R13.5M Cement Factory. Oct. 12, 1973, p. 6.
[29] Cement, Lime and Gravel. V. 48, No. 4, April 1973, p. 79.
[30] Coal, Gold and Base Metals. Palcaso Plant—a World First—Comes on Stream. V. 21, No. 2, April 1973, pp. 27–35.

utable to higher average ore grades and to improvements in the tonnage of ore treated. De Beers Consolidated Mines, Ltd., diamond production increased by 88,493 carats to 6,807,436 carats, the main contributors being the Koffiefontein, Premier, and Namaqualand mines. In October, production from Dreyers Pan commenced on a single-shift basis at a planned production rate of 25,000 carats per month. Ore reserves at Dreyers Pan were substantially increased in 1973 following resampling of eight trench sections. The results of large-diameter exploratory drilling between the known diamond reserves of Dreyers Pan and the Annex Kleinzee boundary were encouraging and further additions to reserves were indicated.

Fluorspar.—South African fluorspar production of all grades was 210,324 tons, 482 tons less than in 1972. The trend toward increased output of acid-grade fluorspar continued. In 1973, 88% of production was acid-grade material compared with 68% in 1972. Overall demand for fluorspar was down for the year but local sales and exports of acid-grade material were up.

The new acid-grade mill at the Buffalo mine of Transvaal Mining and Finance Co. Ltd., a subsidiary of GMF, was fully commissioned in June, raising the acid-grade production capacity of the operation

Table 10.—Republic of South Africa: Diamond production of De Beers Consolidated Mines, Ltd.

(Carats)

Mine	1972	1973
De Beers	206,965	163,159
Dutoitspan	303,184	259,895
Finsch	2,478,875	2,495,096
Koffiefontein	307,652	373,174
Namaqualand Areas	487,103	532,820
Premier	2,453,634	2,501,689
Wesselton	477,705	481,603
Miscellaneous	3,825	--
Total	r 6,718,943	6,807,436

r Revised.

Source: De Beers Consolidated Mines Ltd. Annual Report, 1973.

Table 11.—Republic of South Africa: Diamond production, by province

(Carats)

Province	1972			1973		
	Mine	Alluvial	Total	Mine	Alluvial	Total
Transvaal	2,612,980	20,331	2,633,311	2,634,957	25,540	2,660,497
Cape	3,503,375	859,480	4,362,855	3,512,012	931,435	4,443,447
Orange Free State	398,799	9	398,808	461,017	413	461,430
Total	6,515,154	879,820	7,394,974	6,607,986	957,388	7,565,374

Source: Republic of South Africa. Department of Mines. Quarterly Information Circular. Minerals. 1973, p. 1.

Table 12.—Republic of South Africa: Diamond sales, by province

Province	1972		1973	
	Quantity (carats)	Value (thousands)	Quantity (carats)	Value (thousands)
Transvaal	2,482,801	$14,842	2,469,845	$25,947
Cape	4,374,230	91,593	4,362,229	182,922
Orange Free State	330,710	9,971	445,792	25,751
Total	7,187,741	116,406	7,277,866	234,620

Source: Republic of South Africa, Department of Mines. Quarterly Information Circular. Minerals. October–December 1973, p. 2.

to 150,000 tons annually. The Buffalo mine was reportedly the largest single producer of acid-grade fluorspar in the world.[31]

Marico Fluorspar (Pty.) Ltd., a subsidiary of United States Steel Corp., decided in mid-1973 to develop its fluorspar reserves in the Marico District in western Transvaal following successful completion of pilot plant flotation tests. The company planned to construct a concentrator to produce 170,000 tons of both acid and metallurgical grade fluorspar with production scheduled for 1975.

Zwartkloof Fluorspar Ltd. suspended operations at the end of the year due to insufficient ore of economic grade.

Vermiculite.—Palabora Mining Co. Ltd., the country's only vermiculite producer, increased production and export sales in 1973. The company planned to further expand mining, milling, and bulk stockpiling facilities.

MINERAL FUELS

Coal.—In 1973, the coal industry raised production by 7%, continued expansion programs, obtained additional export contracts, and planned new mining operations. Domestic consumption rose mainly because of increased steam powerplant requirements. Coal consumption by South African railways decreased significantly owing to continuing conversion of locomotives from steam to diesel and electric units. The industry continued to seek additional export contracts and benefited from the oil crisis late in the year. Several new export contracts were signed and others were under negotiation. Although coal exports rose 56% to 1.9 million tons in 1973, significant increases in coal exports were not expected until completion of the Richards Bay project in 1976.

Steep increases in working costs reduced working profits at many collieries despite increased sales and a price increase granted in July. Operations of collieries continued to be rationalized in an effort to reduce cost and extend the lives of mines. Industry leaders called on the Government to change the pricing policy for coal as it discouraged investment in the coal industry and hampered long-range planning.

Escalating production costs resulted in renegotiation of the $323 million blend coking coal contract with Japan. The new agreement provided for a 1.5% per year increase in price and provisions for currency fluctuation. The new contract, which was valued at about $500 million, called for shipments of 2.7 million tons per year between 1976 and 1986.[32]

The Transvaal Coal Owners Association (TCOA) and Gulf Stream Power Station of Mobile, Alabama, signed a contract which calls for delivery of 0.5 million tons of coal in 1974 and 1975 and 1 million tons in 1976. The total value of the contract was estimated at about $30 million. The coal was scheduled initially to be shipped from Lourenço Marques, Mozambique, and in 1976, from Richards Bay.

South Africa's anthracite producers, badly hit by declining steel production in the last few years, received a much needed contract to supply 1.5 million tons of anthracite, valued at about $17 million, to the French steel industry by the end of 1975.[33]

Arnot Colliery (Pty.) Ltd., a member of the AAC group, planned a $27.5 million open pit operation on its property in the Kriel coalfield in the Transvaal. Production at a rate of 4.2 million tons of coal per year was scheduled to commence early in 1975. The Durban Navigation Colliery (Pty.) Ltd., a wholly owned subsidiary of ISCOR, doubled the capacity of its mine near Dannhauser in Natal in 1973. The mine supplied 841,900 tons of coking coal to ISCOR's three steelworks in fiscal 1973. ISCOR continued testwork on form-coke at the Vanderbijlpark works using low-ash coal from the Hoornbosch mine near Ellisras. About 60,000 tons of washed coal were produced for the tests and in August sufficient stocks were on hand and the mine was closed. If the tests are successful, about 145 million tons of potential form-coking coal would be available.

The first battery of 50 coke ovens at ISCOR's Newcastle works were lit in October. The second battery was scheduled for operation in July 1975. The facilities were designed to produce 5,000 tons of coke from 9,000 tons of locally purchased coal every 24 hours. Initial coke production was to be sent to the Vanderbijlpark steel plant until the Newcastle works was completed in 1976.

[31] Mining Magazine. South Africa's Buffalo Fluorspar in Full Production. V. 29, No. 6, December 1973, p. 501.

[32] Mining Journal (London). Price Rise for S. A. Coal. V. 281, No. 7209, Oct. 19, 1973, p. 329.

[33] South African Digest. Boost for Anthracite. Sept. 28, 1973, pp. 4–5.

Petroleum.—In 1973, extensive efforts, both government-sponsored and private, continued in the search for oil in South Africa. Major interest continued in offshore areas where both drilling and seismic surveys were carried out. The drilling platform, Sedco 135, drilled several test holes along the southern Cape without success and was to be moved to the Orange River Delta Area to drill a well for Chevron-Regent early in 1974. Following this test well the Sedco 135 was scheduled to leave South African waters to drill in Angola.

Since 1965, a total of 91 wells have been drilled in the Republic of South Africa and offshore at a cost of about $110 million, of which the Government-sponsored Southern Oil Exploration Corp. (Pty.) Ltd. (SOEKOR) has contributed one-half. The search has been unsuccessful but drilling has revealed one potentially commercial natural gas find and has pointed out extensive uranium resources in the Central Karoo at relatively great depths. SOEKOR envisioned that from 1975 onward about 10 holes would be drilled offshore over a relatively extended period provided suitable structures can be located by seismic methods.

Refineries.—South Africa's refineries had the following crude oil throughput capacities at yearend:

Company	Quantity (barrels per day)
Caltex Oil (S.A.) (Pty.) Ltd., Cape Town	46,000
Mobil Refining Co. South Africa (Pty.) Ltd., Durban	60,000
National Petroleum Refiners of South Africa (Pty.) Ltd., Sasolburg	50,000
Satmar Ltd., Boksburg North	3,000
Shell & BP South Africa Petroleum Refineries (Pty.) Ltd., Durban	172,000
Total	331,000

Source: Oil and Gas Journal. V. 71, No. 53, Dec. 31, 1973, p. 104.

Shell & BP South Africa Petroleum Refineries (Pty.) Ltd. expanded its plant capacity form 84,000 to 172,000 barrels per day in 1973. In May a new $26 million oil refinery, a joint venture between Mobil Oil Co., Caltex Oil (S.A.) (Pty.) Ltd., and Total, was officially opened to produce lubricating base oils for further blending by the participants. The plant, which is physically located within the premises of Mobil's Durban refinery, has a capacity of 2,380 barrels per day.

At Richards Bay, 12 square kilometers were set aside for a highly sophisticated $1,300 million petrochemical industry with primary, secondary, and tertiary units linked by pipes.[34] The complex was planned to include a $115 million oil refinery tentatively scheduled to be onstream in 1977 or 1978, a $225 million ethylene cracking plant, and new plants that would more than double the production of high-density polyethylene, polystyrene, and polyvinyl chloride.

The South African Coal, Oil, & Gas Corp. Ltd. (SASOL), operators of the world's only commercial oil-from-coal plant, planned to increase production by 40% to make the country less dependent on oil imports. The expansion was expected to cost about $58 million.[35] SASOL's Sigma mine provided a record 4.5 million tons of coal in fiscal 1973 (ending June 30) for oil and gas production. A new shaft complex, completed early in 1973, resulted in a production increase of 160,000 tons per year, by reducing transportation distances underground. The area opened up by the shaft complex was reported to contain about 70 million tons of coal.[36]

SASOL successfully completed tests in a demonstration plant to methanate low-Btu gas from coal. The methanation unit, which operated continuously for more than 1 year, upgraded fuel gas made in an adjoining Lurgi pressure-gasification facility. The success of the test gave a boost to proposed U.S. projects for making pipeline gas from coal using the same process.[37]

[34] South African Digest. Export Artery. Nov. 9, 1973, pp. 8–11.
[35] Mining Journal (London). SASOL to Raise Output. V. 281, No. 7211, Nov. 2, 1973, p. 366.
[36] Mining Journal (London). New Shaft for SASOL. V. 280, No. 7175, Feb. 23, 1973, p. 159.
[37] Chemical Engineering. V. 80, No. 27, Nov. 26, 1973, p. 19.

The Mineral Industry of the Territory of South-West Africa

By James H. Jolly [1]

The mineral industry of the Territory of South-West Africa grew substantially in 1973 and continued to be a major factor in the country's economy, comprising about 50% of the gross domestic product (GDP). Although statistics were not available, the value of mineral production was estimated at $434 million,[2] 34% more than in 1972. More than 62% of the production value was attributed to the operations of Tsumeb Corp. Ltd. and Consolidated Diamond Mines of South-West Africa Ltd. (CDM).

Exploration and development work continued at a high rate. According to the Inspector of Mines, more than $40 million was spent on new facilities, development, and exploration by mining companies, including many international firms, in 1973. The Government amended the conditions of prospecting and mining grants to further encourage foreign investment and exploration. Foreign companies will be permitted to have 75% participation in grants instead of the previous limit of 50%.[3]

Major exploration and development interest centered on copper and uranium. The copper mine of Oamites Mining Co. (Pty.) Ltd. completed its first full year of operation, significantly boosting the Territory's copper concentrate output. Tsumeb Corp. reopened its Matchless mine in response to higher world copper prices. The Asis Ost copper mine was nearing the production stage, and the Otjihose copper deposit, 16 million tons of ore grading 2% copper, was under development by Johannesburg Consolidated Investment Co. Ltd. (JCI) and Minerts Development (Pty.) Ltd. (Minerts). Another copper deposit near Gorob was being considered for development.

The world's largest open pit uranium mine was under development at Rössing. The operation, scheduled for production in 1976, will involve mining at a rate of 120,000 tons of ore and overburden daily. The deposit reportedly contained more than 100,000 tons U_3O_8 (at $10 per pound U_3O_8).

The search for oil and gas continued without success; however, a few potential oil-bearing structures were located by seismic survey in the offshore area west of the Orange River mouth. Several test wells were planned in 1974. A borehole drilled onshore to obtain stratigraphic information for offshore oil exploration discovered what may eventually be an important coalfield. A 53-foot seam of anthracite coal was intersected in the borehole at a depth of about 2,350 feet. No further drilling was being considered in the near term because of the relatively great depth of the deposit.

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[1] Physical scientist, Division of Nonferrous Metals—Mineral Supply.

[2] Where necessary, values have been converted from South African rand (R) to U.S. dollars at a rate of R1=US$1.455 (average of monthly averages as given in volumes 26 and 27 of International Financial Statistics). The rate in 1972 was R1=US$1.293.

[3] Mining Journal. SWA: Encourages Foreign Interest. V. 281, No. 7212, Nov. 9, 1973, p. 386.

PRODUCTION AND TRADE

The South-West Africa Administration, Republic of South Africa, continued its policy of not disclosing mineral production statistics for the Territory. Most of the statistical data on production were derived from annual reports of companies operating in the country, mainly Tsumeb Corp. Ltd., CDM, and the South-West Africa Co. Ltd.

(SWACO). The Territory traditionally produces a large variety of minerals, particularly nonmetals, but output data are not available and these commodities are not listed in table 1.

Tsumeb significantly increased its production of arsenic, blister copper, and silver, whereas the output of cadmium and refined lead decreased. Zinc production was higher despite a large drop in zinc recovery by Tsumeb. The closing of SWACO's Brandberg West tin-tungsten mine in February sharply reduced the output of both tin and tungsten in 1973. Diamond production was up slightly, but the value of diamond exports (sales) was $184 million in 1973, compared with $103 million in 1972.

The Territory's foreign trade in mineral commodities is included in the trade statistics of the Republic of South Africa and cannot be differentiated. Most mineral commodities produced in the Territory of South-West Africa are processed in South Africa or shipped to world markets.

Table 1.—South-West Africa: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS [2]			
Arsenic, white [3 4]	3,701	2,370	8,147
Cadmium:			
Mine output, metal content, recoverable [4]	266	199	131
Metal, refined [4]	196	157	104
Copper:			
Mine output, metal content, recoverable [4]	32,039	21,618	27,471
Metal, blister [4]	26,922	26,119	36,049
Lead:			
Mine output, metal content, recoverable [4]	71,498	59,990	61,694
Metal, refined [4]	58,820	63,961	63,592
Silver:			
Mine output, metal content, recoverable [4] thousand troy ounces	1,728	1,357	1,563
Smelter output, content of blister copper [4] do.	1,413	1,679	1,998
Tin, mine output, metal content, recoverable long tons	949	979	779
Tungsten, mine output, metal content, recoverable	95	89	22
Vanadium, mine output, metal content of concentrates	794	529	649
Zinc, mine output, metal content [4]	43,696	34,742	37,919
NONMETALS			
Diamond: [5]			
Gem [e] thousand carats	1,566	1,516	1,520
Industrial [e] do.	82	80	80
Total do.	1,648	1,596	1,600
Lithium minerals, all types [6]	[r] 4,568	3,747	5,365
Pyrite concentrates:			
Gross weight	13,851	--	12,183
Sulfur content	6,550	--	5,539

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

[1] In addition to the commodities listed, South-West Africa, prior to 1967, produced bismuth concentrate, cesium ore, columbite-tantalite concentrates, gold, manganese ore, molybdenum concentrate, graphite, lime, mica, precious stones, salt, kyanite and sillimanite, wollastonite, 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, except in the case of salt, which is evidently still produced by the South-West Africa Co. Ltd. (SWACO), but even in this case, the output level is unknown.

[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); SWACO (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). All data for 1971 are for fiscal year ending June 30, 1971; data for 1972 are a summation of company figures for calendar year 1972 for Tsumeb Corp. Ltd. and for fiscal year ending June 30, 1972, for all other companies; data for 1973 are a summation of company figures for calendar year 1973 for Tsumeb Corp. Ltd. and for fiscal year ending June 30, 1973, for all other companies. Output of Tsumeb Corp. Ltd. for period July 1, 1971, through December 31, 1971 (which is not otherwise covered in table), is detailed in footnote 4.

[3] For 1971 and 1972, figures represent white arsenic equivalent of black arsenic produced; for 1973 figure represents white arsenic produced, plus white arsenic equivalent of other end products produced.

[4] Tsumeb Corp. Ltd. output for July 1, 1971, through December 31, 1971, was as follows (in metric tons unless otherwise specified): Arsenic, white—2,711; cadmium, mine—109; cadmium, refined—79; copper, mine—11,624; copper, blister—13,490; lead, mine—27,751; lead, refined—33,118; silver, mine—649,343 troy ounces; silver, content of blister copper—849,210 troy ounces; zinc, mine —2,868. (See also footnote 2.)

[5] Total figures reported by DeBeers Consolidated Mines Ltd. in company annual reports for calendar years; detail on gem and industrial estimated, assuming output to be 95% gem quality.

[6] Estimated, based on recorded imports by selected countries from the statistical territory of South Africa (Republic of South Africa, Territory of South-West Africa, Botswana, Lesotho, and Swaziland) minus known production from the Republic of South Africa. (There is no known production in the other three nations in this group.)

COMMODITY REVIEW

METALS

Tsumeb Corp. Ltd., operators of three major base metal mines, continued to be by far the largest producer of metalliferous ores in the Territory. Metal sales of $84.6 million, including $20.4 million from custom material, were 57% (in terms of rand) higher than those in 1972. Concentrate output was significantly higher owing to increased mill throughput, higher ore grades, and better recoveries. Tsumeb smelters produced 36,049 tons of blister copper and 63,592 tons of refined lead, compared with 26,119 tons of blister copper and 63,961 tons of lead in 1972. The 38% increase in blister copper output was mainly attributable to the smelting of a larger proportion of high-grade custom copper concentrate.

Table 2.—South-West Africa: Operations of Tsumeb Corp. Ltd.

		1972	1973
Tsumeb mine and mill:			
Ore mined, gross weight	metric tons	438,638	448,271
Ore milled, gross weight	do.	438,638	448,271
Metal content:			
Copper	percent	3.37	4.10
Lead	do.	11.49	11.51
Zinc	do.	3.20	2.65
Silver	ounces per metric ton	2.65	2.96
Concentrate production:			
Lead concentrate:			
Gross weight	metric tons	110,490	115,811
Metal content:			
Copper	percent	6.37	7.67
Lead	do.	40.79	39.55
Zinc	do.	4.98	4.83
Silver	ounces per metric ton	4.96	5.14
Copper concentrate:			
Gross weight	metric tons	16,206	18,650
Metal content:			
Copper	percent	39.91	43.29
Lead	do.	11.48	12.24
Silver	ounces per metric ton	29.65	32.76
Zinc concentrate:			
Gross weight	metric tons	9,661	5,933
Metal content:			
Zinc	percent	53.65	52.31
Cadmium	do.	1.07	1.11
Mill recovery (from all concentrates):			
Copper	percent of metal in ore milled	91.53	92.14
Lead	do.	93.09	93.20
Zinc[1]	do.	36.93	26.16
Kombat mine and mill:			
Ore mined and milled:			
Gross weight	metric tons	376,987	363,740
Metal content:			
Copper	percent	1.30	1.67
Lead	do.	1.47	1.88
Silver	ounces per metric tons	.44	.58
Concentrate production:			
Copper concentrate:			
Gross weight	metric tons	15,819	16,854
Metal content:			
Copper	percent	23.06	29.12
Lead	do.	5.79	5.79
Silver	ounces per metric ton	5.08	7.85
Lead concentrate:			
Gross weight	metric tons	8,521	9,540
Metal content:			
Copper	percent	11.00	8.81
Lead	do.	49.69	57.32
Silver	ounces per metric ton	3.20	3.05
Mill recovery (from all concentrates):			
Copper	percent of metal in ore milled	93.53	94.55
Lead	do.	92.89	94.41
Matchless mine and mill:			
Ore mined and milled:			
Gross weight	metric tons	13,049	102,036
Metal content:			
Copper	percent	.81	2.23
Sulfur	do.	17.45	13.77

See footnotes at end of table.

Table 2.—South-West Africa: Operations of Tsumeb Corp. Ltd.—Continued

	1972	1973
Matchless mine and mill—Continued		
Concentrate production:		
Copper concentrate:		
Gross weight—metric tons	--	9,325
Metal content:		
Copper—percent	--	20.95
Sulfur—do	--	e 36.60
Pyrite concentrate:		
Gross weight—metric tons	--	12,183
Metal content:		
Copper—percent	--	2.12
Sulfur—do	--	45.47
Mill recovery (from all concentrates):		
Copper—percent of element in ore milled	--	97.07
Sulfur—do	--	63.71
Smelting and refining:		
Copper concentrates smelted [2]—metric tons	33,195	40,251
Average assay:		
Copper—percent	31.33	33.56
Lead—do	8.55	7.50
Silver—ounces per metric ton	16.86	16.78
Lead concentrates smelted [2]—metric tons	125,582	126,764
Average assay:		
Copper—percent	6.53	7.81
Lead—do	41.04	40.84
Silver—ounces per metric ton	4.63	5.11
Custom materials smelted:		
Copper concentrate—metric tons	18,364	29,893
Average assay:		
Copper—percent	31.33	44.60
Lead—do	8.55	.98
Silver—ounces per metric ton	16.20	12.22
Lead concentrate—metric tons	19,712	20,928
Average assay:		
Copper—percent	1.14	3.21
Lead—do	64.47	62.20
Silver—ounces per metric ton	21.05	12.89
Metal sales:		
Value—thousands	r $48,490	$84,611
Quantity:		
Arsenic, refined As_2O_3 [3]—metric tons	1,465	6,140
Cadmium—kilograms	173,282	198,654
Copper, electrolytic—metric tons	25,626	29,459
Lead—do	50,335	67,349
Silver—troy ounces	1,749,620	1,910,409
Zinc—metric tons	3,883	2,807

e Estimate. r Revised.

[1] The lower recovery of zinc (to zinc concentrates) was due mainly to the shutting down of the zinc circuit on days when zinc heads were too low for economical operation.

[2] Concentrates from Tsumeb Corp. Ltd.

[3] Production.

Exploration and development continued at the Tsumeb, Kombat, and Matchless operations. Positive ore reserves in the Tsumeb mine were lower than in 1972, but additional reserves were indicated below the 36 level. In 1973, 49% of ore production come from stopes above the 30 level and 50% from stopes on the 32 and 34 levels. Development on the 35 level provided 1% of the ore. The south exploration drift on the 44 level was completed, and seven horizontal diamond drill holes were drilled through the pipe structure along the main sections. The results were disappointing as only patches of ore grade material were intersected. At the Kombat mine the development of the eight level main haulage drive was completed and deep exploration diamond drilling was started. Development of the Asis Ost ore body, which adjoins Kombat, continued in preparation for production by mid-1974. A recalculation of ore reserves, based on diamond drilling during 1973, reduced the tonnage of positive ore by about 25%, but the copper grade was substantially increased.

At the Kombat mill, the milling of higher grade ores with lower chalcocite contents resulted in increased separation circuit efficiency and better overall recoveries for both copper and lead. The mill at the Matchless mine was restarted in January after an 11-month shutdown. Copper values in the ore milled were higher than for the previous period of operation, and high copper recovery was maintained by continuous flotation of a pyrite concentrate.

Table 3.—Ore reserves of Tsumeb Corp. Ltd.[1]

	Quantity (thousand metric tons)	Grade (percent)			
		Copper	Lead	Zinc	Sulfur
Positive ore:					
Tsumeb	4,987	4.68	8.52	2.15	--
Kombat	1,155	1.93	3.07	--	--
Matchless	903	2.37	--	--	15.03
Asis Ost	441	2.57	.46	--	--
Probable ore:					
Tsumeb	2,550	2.33	1.87	.78	--
Kombat	1,418	1.71	2.27	--	--
Matchless	333	3.00	--	--	13.77
Tentative ore:					
Tsumeb	1,788	3.76	4.61	1.69	--
Matchless	1,146	2.63	--	--	16.60
Asis Ost	288	.70	1.80	--	--

[1] As of December 31, 1973.

Tsumeb continued exploration of numerous prospects in various parts of the Territory, both independently and jointly with SWACO and Anglo-Transvaal Consolidated Investment Co. Exploratory drilling operations at Uris, about 10 miles west of Tsumeb, revealed a small copper-lead-zinc ore body in a brecciated pipe structure. A total of 179,000 tons of ore, grading 2.27% copper, was proved. Further exploration of the Tsumeb west breccia pipe did not add any additional ore to the estimated 300,000 tons of 1.63% copper ore reserves already located.

Arsenic.—The Tsumeb arsenic plant roasted 11,946 tons of reverberatory and converter baghouse dusts, dross skims, and storage material in 1973, producing 8,266 tons of arsenic trioxide material of various grades. About 5,327 tons of pyrite concentrate from the Matchless mine was used as roaster flux. Estimated arsenic production was almost 3.5 times more than that in 1972 and double the record production of 1970. Sales of arsenic trioxide material were 5,473 tons in 1973.

Cadmium.—Tsumeb processed 5,467 tons of sinter baghouse dust in 1973, producing 104 tons of refined cadmium, 53 tons less than in 1972.

Copper.—The Oamites Mining Co. (Pty.) Ltd., a joint venture of Falconbridge Nickel Mines Ltd., Canada, and the International Development Corp. (IDC), an agency of the South African Government, completed its first full year of operation in 1973. According to the Falconbridge annual report, production statistics for the Oamites mine for 1972 and 1973 were as follows:

	1972 (9 months)	1973
Ore milled ----------tons--	353,000	556,000
Mill-head-grade percent copper--	1.39	1.35
Mill recovery ------percent--	92.29	92.98
Concentrate produced dry tons--	12,000	20,280
Recoverable copper -----tons--	4,543	6,997

The Oamites ore body, which occurs in a steeply dipping, highly variable sequence of metamorphosed sedimentary rock, ranges from 3.5 and 23 meters in width along a proven strike length of about 500 meters to a depth of about 360 meters. Indicated ore reserves were about 4.3 million tons, containing 1.33% copper and 0.74 ounce of silver per ton. Because of the relatively low grade of the ore, trackless mining methods were employed to reduce costs and labor requirements.[4] Mining efficiency improved steadily during 1973, and in the last quarter the mine output exceeded the planned production rate of 45,000 tons per month by 7,000 tons.

Copper concentrate production by Klein Aub Koper Maatskappy Ltd., a subsidiary of General Mining and Finance Corp., Ltd., decreased from 8,124 tons in 1972 to 7,251 tons in 1973, due mainly to mining problems caused by uncertain mineralization in the remaining part of the old mine. These problems were expected to be alleviated when the new section of the mine comes into production early in 1974. Total ore reserves were reported to be about 8 million tons of copper-silver ore grading an average of 2.5% copper.

JCI and Minerts planned to develop the

[4] South African Mining and Engineering Journal. Trackless Mining in South-West. V. 85, No. 4087, December 1973, p. 15.

Otjihase copper deposits, located about 20 kilometers northeast of Windhoek, at a cost of about 33 million.[5] Indicated ore reserves, to a depth of 1,200 feet, were 16 million tons averaging 2% copper with byproduct zinc, silver, and gold. Production was scheduled to commence in the latter half of 1975 at a planned milling rate of 100,000 tons per month. The copper and zinc concentrates produced were to be shipped to South Africa and world markets for smelting. Establishment of a smelter at Windhoek or Walvis Bay was being considered.

Nord Resources Corp. concluded an agreement in principle with Société Minière et Métallurgique de Peñarroya of France and JCI for the exploration and development by JCI of the Gorob copper deposit located about 140 miles southwest of Windhoek.[6] The deposit, which occurs in the same amphibolite belt as Tsumeb's Matchless mine and the Otjihase deposit, was reported to have 1 million tons of ore grading 2.6% copper.

Tsumeb and SWACO continued development of a small ore body at Asis Ost where production was scheduled to commence by mid-1974. The old shaft at Asis Ost was deepened and enlarged, and the north haulage drive on the four level was completed. Proven ore reserves, based on diamond drilling during 1973, were revised downward, but the grade was increased from 2.14% copper to 2.57% copper. Tsumeb's Kombat Division, operators of the mine, planned to process the Asis Ost ore in the Kombat mill.

Lead, Zinc, and Vanadium.—Concentrate production at the Berg Aukas operation of SWACO increased about 5% over that of fiscal 1972. However, owing to the processing of more oxidized ore, total lead and zinc sulfide concentrates decreased 29%, whereas the output of both vanadate and zinc silicate concentrate increased 18%. Production statistics for the Berg Aukas mine in fiscal 1972 and 1973 were as follows:

	Quantity (metric tons)		Grade (percent)		
	1972	1973	V_2O_5	Lead	Zinc
Ore hoisted	169,700	171,200	0.95	3.9	18.2
Ore milled	130,600	135,600	1.16	4.7	22.2
Concentrates:					
Lead vanadate	5,571	6,576	17.63	43.4	18.4
Zinc sulfide	10,268	6,988	--	3.2	55.0
Lead sulfide	821	919	--	56.3	17.0
Zinc silicate	23,690	27,930	--	2.9	46.2

The company continued development of ore bodies below the 14 level where the bulk of the mine ore reserves occur. The No. 2 shaft was sunk to 19 level, and the 17 level was developed, opening up the known ore bodies and connecting with the 14 level. Several development headings below the 17 level intersected a huge underground cavity rich in vanadium. Production from this cavity in the last quarter of the fiscal year was a major factor in boosting the output of lead vanadate concentrate in fiscal 1973. There was an overall improvement in estimated ore reserves, but because much of the ore was centered around the large underground cavity below the 14 level in a seemingly haphazard pattern, not all of the ore indicated in reserves might be minable.

During the fiscal year, the Rosh Pinah mine of Imcor Zinc (Pty.) Ltd., a subsidiary of South African Iron and Steel Industrial Corp. Ltd. (ISCOR), produced 29,700 tons of zinc concentrate and 8,100 tons of lead concentrate, compared with 23,201 tons and 9,556 tons, respectively, in fiscal 1972. The zinc concentrate was shipped to the Republic of South Africa for processing, and the lead concentrate was sold in the Territory. A new zinc ore body, discovered in 1972 and located adjacent to the existing mine, was being developed as an open pit operation. Production was scheduled to commence early in 1974.

Silver.—Production of silver, a byproduct of copper and lead mining, rose 15% over that of 1972 owing to increased concentrate output of higher silver grade. Tsumeb continued to be the largest silver producer in the Territory, recovering 1,340,099 ounces in company-produced concentrates. Virtually all of the silver produced in the country was processed by Tsumeb, which exported the silver in the form of blister copper and doré bullion for toll refining elsewhere. In 1973, sales of silver by Tsumeb were 1,910,409 ounces, valued at about $4.9 million.

Tin-Tungsten.—SWACO discontinued mining operations at the Brandberg West tin-tungsten mine in February and placed the mine on a care and maintenance basis. The mine was closed down because the operation became inefficient due to mechanical

[5] Mining Magazine. Go-ahead for Otjihase Copper, South-West Africa. V. 129, No. 3, September 1973, pp. 177, 179.

[6] Skilling's Mining Review. Nord Resources Agreement on Gorob Copper Property. V. 62, No. 34, Aug. 25, 1973, p. 18.

breakdowns and because of depressed metal prices, high operating costs, and uncertain future ore grades. The ore reserves at the end of fiscal 1973 were estimated at 6 million tons grading 0.153% tin and 0.079% WO_3. Fiscal 1973 production statistics for the Brandberg West mine were as follows:

	Quantity (metric tons)	Grade (percent)	
		Tin	WO_3
Plant feed	234,000	0.07	0.04
Tons milled	64,000	.23	.09
Concentrate produced	225	37.33	12.36

Tin production declined almost 10% in fiscal 1973 at the Uis tin mine operated by ISCOR. The tin concentrate output, which was shipped to ISCOR's Vanderbijlpark steelworks in the Republic of South Africa for processing, was 1,100 long tons containing about 708 long tons of recoverable tin.

The Krantzberg tungsten deposit near Omaruru was brought into production in May, at a cost of about $3 million, by Nordex Joint Venture Ltd., owned by Nord Resources Corp. (40%) and Ebco Mining Co. (60%), a subsidiary of Bethlehem Steel Corp.[7] The company was producing about 45 tons of 72% tungsten trioxide concentrate per month and planned to increase output to about 75 tons per month by mid-1974 by enlarging the mill capacity to 500 tons per day. Known reserves of 0.6% tungsten trioxide in the new granite contact zone were sufficient for a 7- to 10-year operation.

Uranium.—Rössing Uranium, Ltd., a joint venture of Rio Tinto South Africa, Ltd., General Mining and Finance Corp., and IDC, continued development of its large, open pit uranium mine, located 48 kilometers east of Swakopmund. Production was scheduled to begin in 1976 with full production by 1980. The open pit mining operation, which will be one of the largest in southern Africa, will involve ore and overburden removal at a rate of 120,000 tons daily with a possible increase to 240,000 tons daily by the mid-1980s. The ore, which averages only about 0.04% U_3O_8, occurs in an intrusive mass that is about 8 kilometers long, 1.6 kilometers wide, and of undetermined depth. Ore reserves are not known but have been estimated to be as high as 500 million tons. According to the Atomic Energy Board of South Africa, the U_3O_8 reserves were estimated at more than 100,000 tons (at $10 per pound U_3O_8).[8]

Total Compagnie Minière et Nucleaire (TOTAL), a wholly owned subsidiary of Compagnie Française des Pétroles, obtained a 10% share holding in Rössing Uranium, Ltd., in June. Under terms of the agreement, TOTAL agreed to purchase substantial quantities of uranium in concentrate under a long-term contract for delivery in the 1980's.[9]

NONMETALS

Diamond.—Diamond production continued to be the largest contributor to the mineral industry of the Territory. Production by CDM, producer of virtually all of the diamond recovered in the country, slightly exceeded the 1972 output of almost 1.6 million carats. As a result of improvements in the diamond market coupled with price increases in March, May, and August, CDM net income rose to $184 million, 59% (in terms of rand) higher than that of 1972. Sales of diamond from stocks reduced the production value of diamond on hand at yearend to $10.6 million, 36% less than in 1972.

Working costs rose 24%, due mainly to wage increases and substantial additional stripping of overburden. The volume of overburden stripped was 21.6% higher in 1973, reflecting the increased scale of mining operations in the Western block, where the stripping ratio is higher. The No. 1 and No. 4 conglomerate treatment plants operated satisfactorily, and throughput was increased. Reconcentration circuits, installed at both plants, decreased the amount of concentrates transported to the recovery plant by 50%. As a result of this, the heavy media separation plant was able to reprocess monthly up to 10,000 cubic meters of dump material which yielded diamonds of good grade and size.

Two additional conglomerate treatment plants were under construction between the two operating units. The No. 2 plant, with a designed capacity of 160,000 cubic meters per month, was scheduled for commissioning in November 1974. Design and preliminary work was well advanced for the No. 3 conglomerate treatment plant

[7] World Mining. V. 26, No. 5, May 1973, p. 77.
[8] Coal, Gold, and Base Metals. South Africa's First and Only Uranium Mine. V. 21, No. 1, March 1973, pp. 49–51.
[9] Mining Journal. TOTAL: Interest in Rössing. V. 280, No. 7193, June 29, 1973, p. 538.

Table 4.—South-West Africa: Operations of the Consolidated Diamond Mines of South-West Africa, Ltd.

Operation		1972	1973
Overburden stripped-bank	thousand cubic meters	14,631	17,788
Gravels mined and screened	do	6,027	6,341
Carats recovered		1,596,144	1,599,565
Mining grade	carats per cubic meter	.26	.25
Average diamond size	carats per stone	.88	.88
Cost per cubic meter of gravels mined and screened	dollars	3.60	5.00
Cost per carat recovered	do	13.63	19.80

which has a planned headfeed capacity of 173,000 cubic meters per month. This plant was expected to be commissioned at the end of 1975.

Mining of the foreshore, up to 70 meters seaward of the highwater mark, continued as extensions of the Western block area mines. An area of 44,300 square meters was mined in 1973, yielding an estimated 8,300 carats of diamond.

CDM continued offshore exploration in the area between the mouth of the Orange River and Bakers Bay. Basal gravels delimited by Alpine Vibracore drilling in 1973 to a water depth of 360 feet were to be sampled by the prospecting vessel *Ontginner,* after the ship was fitted with a large-bore sampler and sample treatment plant in 1974.

Sulfuric Acid.—The sulfuric acid plant at Tsumeb consumed 79 tons of sulfur in 18 days of operation in March and April, producing 186 tons of 98% H_2SO_4, all of which was consumed by Tsumeb.

MINERAL FUELS

Coal.—A potentially important anthracite coal seam, intersected in a borehole drilled to obtain stratigraphic information to assist in offshore oil exploration, was discovered in the area north of the Huab River and west of Brandberg.[10] The coal formed a continuous seam about 53 feet thick but occurred at the relatively great depth of about 2,350 feet. No plans to further explore the deposit were announced.

Petroleum.—During 1973 petroleum exploration was limited mainly to offshore seismic surveys. Aquitaine (SWA) Ltd. and Chevron Oil Co. of South-West Africa collected about 1,860 miles of seismic data in the respective concession areas. The drilling platform Sedco 135 was scheduled to drill a favorable structure, located by seismic data, for Chevron and Regent in block 12 about 110 miles due west of the Orange River mouth in 1974.

Offshore leasing in 1973 included an award to the Milford Argosy Corp. of blocks 18 and 19, covering about 17,000 square miles in water depths of 3,000 to 6,000 feet. Chevron and Regent were granted a 2,500-square-mile concession extending block 12 westward to the 3,000-foot isobath. Damson Oil Corp. and Merchants Petroleum acquired partial interests in block 9 from Aracco Exploration, Ltd. Seismic surveys were scheduled in all of these lease areas in 1974.

[10] Mining Journal. SWA Coal Find. V. 281, No. 7212, Nov. 9, 1973, p. 386.

The Mineral Industry of Spain

By Scott F. Sibley [1]

The economy of Spain continued to thrive in 1973, with real gross national product (GNP) up 7.9%. This brought per capita GNP up to $1,770,[2] compared with $350 in 1959. Monetary reserves increased $1.8 billion, and unemployment was at a relatively low 1.4% of the labor force, although inflation increased 14%, the highest since 1947. The economy in 1973 could be characterized as rapidly expanding and favorable.

The increased price of petroleum toward the end of the year had a disruptive effect on the economy, but Spain's immense international monetary reserves were expected to enable the nation to tolerate any adverse effects better than other countries, at least on a temporary basis. Tourism revenue reached $3.3 billion in 1973, but the forecast for 1974 was uncertain because of petroleum shortages and price increases.

Export growth was 24% in 1973, whereas imports grew about 28% compared with those of 1972. There was a total commodity trade deficit of approximately $4.5 billion in 1973. However, tourism and workers' remittances, which led to total monetary reserves of $6.8 billion in 1973, compensated to some extent for this deficit. The balance of trade in ore and metals in 1973 showed a deficit of $808.2 million, compared with $635.5 million in 1972 and $446.2 million in 1971. Imports from the United States increased 45% in 1973 to $1.5 billion.

Three steps the Government took to control inflation were (1) a price control on several key commodities, (2) a limit on corporate dividends, and (3) a freeze on real wage increases (commensurate with cost-of-living increases) through 1974. Another key factor in the inflation picture was the rapid growth in money supply, up 25% in November 1973 over that in the same month in 1972.

Industrial production continued to grow, up 16% in 1973, but a lower rate of increase was foreseen for 1974. Another indicator of Spain's healthy economy was U.S. Export-Import (EXIM) Bank loans totaling nearly $1 billion, including $544 million in undisbursed loans, making Spain one of the largest EXIM Bank customers in the world.

A preferential trade agreement between Spain and the European Communities (EC) was still not resolved by yearend 1973, although a temporary accomodation was reached on industrial goods.

A new mining law was passed in 1973 replacing the mining law of 1944. The new law included permit arrangements for the allocation and exploration of mineral areas, and a call for greater technical and economic resources on the part of companies awarded exploration permits. There was also a reclassification of mineral substances and, in general, greater government control of mining practices and other aspects of the mining industry.

PRODUCTION

Commodities showing significant production gains in 1973 compared with those of 1972 were aluminum metal (17%), pig iron (6%), crude steel (12%), primary lead (20%), primary zinc (8%), cement (14%), and crude petroleum (482%).

[1] Physical scientist, Division of Ferrous Metals—Mineral Supply.

[2] Where necessary, values have been converted from Spanish pesetas (Ptas) to U.S. dollars at the rate of Ptas 1.00=US$0.017367.

Table 1.—Spain: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Aluminum:			
Bauxite	5,432	6,087	5,500
Metal:			
Primary	125,848	143,241	167,867
Secondary	35,546	e 40,000	e 40,000
Antimony:			
Mine output, metal content	111	138	123
Metal (regulus)	319	384	NA
Bismuth, mine output, metal content ---kilograms--	25,080	2,944	e 3,000
Cadmium metal	102	111	100
Copper:			
Mine output, metal content	34,032	36,117	30,056
Metal:			
Blister	66,267	88,625	94,427
Refined, primary:			
Thermal	17,467	22,737	18,780
Electrolytic	93,255	113,571	104,112
Total	110,722	136,308	122,892
Refined, secondary	22,256	e 25,000	e 25,000
Iron and steel:			
Iron ore and concentrate, gross weight -thousand tons--	7,328	6,773	6,926
Pig iron ---do---	4,825	5,927	6,272
Electric furnace ferroalloys ---do---	130	171	241
Crude steel ---do---	7,794	9,554	10,675
Semimanufactures ---do---	5,771	6,966	e 8,000
Lead:			
Mine output, metal content	70,150	69,443	63,260
Metal:			
Primary	75,843	82,950	99,332
Secondary	3,761	e 4,000	e 4,000
Manganese ore and concentrate	r 18,006	13,171	12,377
Mercury:			
Mine output, metal content ---76-pound flasks--	50,831	53,994	e 63,000
Metal ---do---	49,317	37,597	60,076
Silver:			
Mine output, metal content ---thousand troy ounces--	1,701	1,678	e 1,530
Metal:			
Primary ---do---	4,019	3,890	e 3,900
Secondary ---do---	2,218	2,200	e 2,200
Tin:			
Mine output, metal content ---long tons--	396	373	344
Metal:			
Primary ---do---	r 4,580	4,686	4,191
Secondary ---do---	386	259	e 250
Titanium:			
Ilmenite concentrates:			
Gross weight	24,349	22,483	3,727
Titanium dioxide content	11,455	10,506	1,766
Titanium dioxide	16,334	19,004	19,940
Tungsten, mine output, metal content	407	294	382
Uranium, mine output, U_3O_8 content	148	150	119
Zinc:			
Mine output, metal content	87,540	89,433	94,454
Metal:			
Primary	85,671	99,658	106,921
Secondary	829	NA	NA
NONMETALS			
Barite	97,232	89,546	94,000
Cement, hydraulic:			
Natural ---thousand tons--	r 168	e 58	e 33
Other ---do---	16,993	19,442	22,203
Chalk ---cubic meters--	105,724	105,000	110,000
Clays:			
Bentonite	38,253	43,115	45,000
Kaolin, marketable:			
Crude	107,280	74,089	
Washed	r 323,857	135,491	620,114
Refractory	188,977	378,066	
Other ---thousand cubic meters	6,356	5,512	6,000
Diatomite and tripoli	18,335	19,189	20,000
Earths, industrial, n.e.s	14,827	18,500	20,000
Feldspar and pegmatite	61,732	62,987	65,000
Fertilizer materials:			
Crude potash salts, K_2O equivalent	604,484	637,591	571,182

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
NONMETALS—Continued			
Fertilizer materials—Continued			
Manufactured:			
Nitrogenous, nitrogen content ——thousand tons	589	459	513
Phosphatic, P_2O_5 content ——do	268	393	412
Potassic, K_2O equivalent ——do	505	533	473
Fluorspar:			
Gross weight:			
Acid grade [1]	r 286,010	312,685	e 288,000
Metallurgical grade [2]	r 49,731	90,368	e 100,000
Total	r 335,741	403,053	e 388,000
Calcium fluoride content:			
Acid grade [1]	r 254,732	271,162	e 253,000
Metallurgical grade [2]	r 29,741	52,390	e 83,000
Total	r 284,473	323,552	e 336,000
Gypsum and anhydrite, crude ——thousand tons	4,030	4,124	e 4,200
Kyanite and related materials, andalusite	5,850	5,500	5,600
Lime (quicklime and hydrated lime) ——thousand tons	356	r e 400	e 400
Magnesite, crude	258,500	272,875	300,000
Meerschaum (sepiolite), crude	30,058	51,837	53,000
Mineral pigments, ocher	12,897	10,602	10,000
Pumice	156,454	150,459	177,000
Pyrite, including cupreous:			
Gross weight ——thousand tons	2,440	2,140	2,188
Sulfur content ——do	1,142	1,001	1,006
Salt:			
Rock ——do	1,189	1,215	1,300
Marine and other evaporated ——do	790	650	722
Sand and gravel:			
Sand, silica ——thousand cubic meters	631	622	500
Other ——do	5,712	6,677	7,000
Stone:			
Calcareous:			
Dolomite ——do	598	712	800
Limestone ——do	28,147	31,530	40,000
Marble ——do	155	177	200
Marl ——do	2,536	2,408	2,500
Basalt ——do	1,437	818	900
Diabase ——do	5	5	11
Granite ——do	2,037	2,693	3,000
Ofite ——do	147	168	170
Phonolite ——do	215	138	NA
Porphyry ——do	55	31	33
Quartz ——thousand tons	287	383	e 400
Quartzite ——thousand cubic meters	168	248	260
Sandstone ——do	568	888	900
Serpentine ——do	28	23	25
Slate ——do	265	214	250
Trachyte ——do	64	98	100
Trass and tufa ——do	191	212	250
Strontium minerals	8,500	8,000	8,000
Sulfur, elemental, all forms	2,964	4,000	5,000
Sulfates, natural:			
Glauberite, Na_2SO_4 content	15,482	22,779	NA
Thenardite, Na_2SO_4 content	72,950	79,595	NA
Talc and steatite	40,743	40,358	40,500
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	18,050	18,100	16,300
Carbon black	50,000	e 50,000	50,183
Coal:			
Anthracite ——thousand tons	2,876	3,005	2,968
Bituminous ——do	7,811	8,001	6,945
Lignite ——do	3,081	3,056	2,997
Total ——do	13,768	14,062	12,910
Coke:			
Metallurgical ——do	4,066	4,255	4,280
Gashouse ——do	r 4	2	e 2
Fuel briquets, all types ——do	r 162	162	e 160
Gas:			
Natural, marketed ——million cubic feet	r 141	85	e 150
Manufactured:			
Gas works ——do	25,780	25,497	NA
Coke ovens ——do	60,105	61,059	NA
Blast furnaces ——do	92,453	99,340	NA
Total ——do	178,338	185,896	NA
Peat	18,195	15,839	15,000

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity		1971	1972	1973 p
MINERAL FUELS AND RELATED MATERIALS—Continued				
Petroleum:				
Crude	thousand 42-gallon barrels	874	1,020	5,932
Refinery products:				
Gasoline, aviation	do	9	--	--
Gasoline, motor	do	29,536	32,549	38,639
Jet fuel	do	11,093	14,205	15,697
Kerosine	do	2,387	1,703	1,778
Distillate fuel oil	do	57,360	62,997	72,764
Residual fuel oil	do	103,243	113,572	133,658
Lubricants including grease	do	1,500	1,584	1,874
Other	do	42,681	38,833	41,524
Refinery fuel and losses	do	11,861	10,597	15,000
Total	do	259,670	276,040	320,934

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

1 Data presented includes recorded production of salable acid-grade fluorspar from both fluorspar mines and lead-zinc-fluorspar mines, plus an estimate for the production of salable acid-grade fluorspar obtained by beneficiating a portion of total reported salable metallurgical-grade fluorspar output. Total reported production of acid-grade fluorspar was as follows in metric tons: 1971—gross weight 245,572 (calcium fluoride content—238,702); 1972—gross weight 253,870 (calcium fluoride content 246,716); 1973—gross weight 238,722 (calcium fluoride content 232,134). Estimated production of acid-grade fluorspar from beneficiation of metallurgical-grade fluorspar was as follows, in metric tons (with quantity of metallurgical-grade fluorspar reported as being processed in this manner given in parenthesis following estimated acid-grade output): (1971—gross weight 40,438 (101,095), calcium fluoride content 16,030 (40,074); 1972—gross weight 58,815 (147,037), calcium fluoride content 24,446 (61,116); 1973 (all estimated)—gross weight 49,000 (123,000), calcium fluoride content 21,000 (52,000).

2 Data presented are the difference resulting from the subtraction of that quantity of metallurgical-grade fluorspar reportedly consumed for the production of acid-grade fluorspar (footnote 1) from the total reported metallurgical-grade fluorspar content.

TRADE

The rate at which Spain's mineral trade deficit has grown in recent years declined significantly in 1973. An increase of only 7% over that of 1972 was registered, compared with a 46% increase for the 1972 deficit over that of 1971. Values for mineral commodity trade for the last 3 years were as follows:

	Value (million dollars)	
	Mineral commodity trade	Total commodity trade
Exports:		
1971	388	2,938
1972	520	3,831
1973	774	5,257
Imports:		
1971	1,521	4,963
1972	2,179	6,837
1973	2,555	9,752

Source: 1971, 1972, and 1973: Estadistica del Comercio Exterior de España (Madrid).

Exports of mineral commodities were valued at $774 million, an increase of 49% over those of 1972. Increased exports of iron and steel were partly offset by increased imports of copper, nickel, and iron and steel. Mineral fuels, valued at $248 million, accounted for approximately 32% of Spain's total mineral exports in 1973.

The value of mineral commodities imported during 1973 increased 17% over that of 1972. The value of nearly all minerals and metals imported in 1973 increased compared with those of 1972, to $2,555 million. Mineral fuels accounted for 50% of the total mineral imports in 1973 and, when combined with imports of iron and steel, accounted for nearly 70% of the total.

Mineral commodity trade in 1971 and 1972 is given in tables 2 and 3.

Table 2.—Spain: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Bauxite and concentrate	8	(1)	NA.
Oxide and hydroxide	28	6	Portugal 5.
Metal, including alloys:			
Scrap	74	115	West Germany 94; France 20.
Unwrought	6,682	1,306	United Kingdom 500; Portugal 450; Argentina 320.
Semimanufactures	8,617	7,269	United States 1,694; Portugal 1,467; Finland 599.
Antimony metal, including alloys, all forms	117	10	All to Venezuela.
Cadmium metal, including alloys, all forms	36	27	Netherlands 19.
Chromium:			
Chromite	55	--	
Oxide and hydroxide	16	23	Colombia 10; Portugal 6; Venezuela 5.
Copper:			
Ore and concentrate	--	178	All to Sweden.
Matte	38	(1)	NA.
Copper sulfate	(1)	1	All to Portugal.
Metal, including alloys:			
Scrap	26	107	West Germany 94.
Unwrought	6,415	3,089	France 2,538; West Germany 271.
Semimanufactures	3,559	3,841	Romania 956; Israel 470; Colombia 303 (unreported 899).
Iron and steel:			
Ore and concentrate, except roasted pyrite—thousand tons	2,345	1,896	West Germany 864; France 364; United Kingdom 234.
Roasted pyrite—do	796	939	West Germany 857; France 35; Belgium-Luxembourg 20.
Metal:			
Scrap	409	1,107	Belgium-Luxembourg 502; Netherlands 326.
Pig iron, including cast iron	8	--	
Sponge iron, powder and shot	12,389	16,012	Portugal 14,571; France 1,105.
Ferroalloys:			
Ferromanganese	6,075	15,204	West Germany 6,951; East Germany 3,035; Portugal 1,600.
Other	9,118	20,623	East Germany 6,308; West Germany 4,675; United Kingdom 3,574.
Steel, primary forms	221,883	545,331	Italy 239,466; Brazil 161,902; Argentina 57,559.
Semimanufactures:			
Bars, rods, angles, shapes, sections	512,803	693,892	U.S.S.R. 205,808; West Germany 120,402; United Kingdom 81,596.
Universals, plates and sheets	98,941	102,133	West Germany 50,864; United States 34,543; United Kingdom 5,997.
Hoop and strip	2,248	8,000	France 4,164; Portugal 1,271.
Rails and accessories	507	59	Taiwan 38.
Wire	3,527	7,494	Algeria 1,532; Morocco 1,427; Portugal 1,092.
Tubes, pipes, fittings	78,030	105,759	West Germany 43,349; Romania 11,523; France 11,266.
Castings and forgings, rough	3,635	3,287	Canada 526; West Germany 499; Portugal 478; United States 428.
Lead:			
Ore and concentrate	--	5	All to France.
Oxides	5	1	Mainly to Andorra.
Metal, including alloys:			
Scrap	22	--	
Unwrought	45	286	United Kingdom 178.
Semimanufactures	88	21	Andorra 14.
Magnesium metal, including alloys, all forms	29	--	
Manganese:			
Ore and concentrate	19	105	Belgium 85; Portugal 20.
Oxides	5	1	All to Portugal.
Mercury—76-pound flasks	32,895	30,980	United Kingdom 6,759; Japan 3,539; India 3,278.
Molybdenum metal, including alloys, all forms—kilograms	46	270	Mauritania 225.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Nickel metal, including alloys:			
Scrap	177	189	West Germany 92; Belgium 40; Netherlands 32.
Unwrought	6	3	Peru 1; Venezuela 1.
Semimanufactures	43	4	Portugal 3.
Selenium, elemental ---kilograms--	660	152	West Germany 150.
Silver metal, including alloys -troy ounces--	482	96,744	United Kingdom 96,452.
Tin metal, including alloys:			
Scrap ---long tons--	4	(1)	NA.
Unwrought ---do---	1,434	891	Netherlands 545; East Germany 142.
Semimanufactures ---do---	3	10	Angola 8.
Titanium:			
Ore and concentrate (ilmenite)	--	20	All to Austria.
Oxides	2,558	3,949	Netherlands 1,350; Poland 967; United States 776.
Tungsten:			
Ore and concentrate	592	440	West Germany 255; Netherlands 60; United Kingdom 54.
Metal, including alloys, all forms	7	23	West Germany 15.
Zinc:			
Ore and concentrate	5,022	4,519	West Germany 2,292; France 2,227.
Oxide and peroxide	782	732	West Germany 360; Netherlands 250; Algeria 39; Greece 35.
Metal, including alloys, all forms:			
Blue powder	547	1,042	United States 1,036.
Unwrought and semimanufactures	21,882	5,909	Portugal 4,334; United States 1,000.
Other:			
Ore and concentrate:			
Of molybdenum, tantalum, titanium, vanadium, zirconium	7	--	
Of base metals, n.e.s	8	--	
Ash and residue containing nonferrous metals	5,181	4,123	Portugal 2,080; Belgium 340; West Germany 214.
Oxides, hydroxides, peroxides of metals, n.e.s	202	232	Portugal 150; Norway 54.
Metals, including alloys, all forms:			
Rare-earth metals	12	117	All to United Kingdom.
Pyrophoric alloys ---kilograms--	15	15	Andorra 8; Ireland 4.
Other	1	2	Mainly to Venezuela.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	635	10,948	United Kingdom 10,535.
Grinding and polishing wheels and stones	2,113	1,988	West Germany 797; France 483.
Asbestos	2	1	Mainly to Greece.
Barite and witherite	60,457	77,303	Italy 36,035; West Germany 18,940; United Kingdom 12,049.
Cement	645,514	1,229,621	Nigeria 169,958; Algeria 163,773; United States 147,341.
Chalk	25	316	Algeria 200; Portugal 68; West Germany 25.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Bentonite	9,249	10,495	West Germany 4,505; France 3,048; Netherlands 1,358.
Kaolin (china clay)	54,937	55,369	West Germany 29,235; Italy 13,425; Poland 3,210.
Other	18,293	12,808	Portugal 2,833; Andorra 2,765; France 2,516; Netherlands 1,490.
Products:			
Refractory (including nonclay brick)	7,524	7,122	Cuba 3,804; Algeria 761.
Nonrefractory	106,922	133,298	West Germany 36,763; France 24,534; Netherlands 10,903.
Diamond, natural:			
Gem ---value, thousands--	$12	$1	All to Andorra.
Industrial ---do---	$6	$26	All to Mexico.
Total ---do---	$18	$27	
Diatomite and other infusorial earth	2,056	1,774	Belgium 400; West Germany 257; United Kingdom 223; Italy 220.
Feldspar	487	495	France 295; Lebanon 200.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Fertilizer materials:			
Nitrogenous	997	241	Andorra 117; Belgium 96; France 20.
Phosphatic	71,582	105,844	Algeria 72,561; U.S.S.R. 19,962; France 5,719.
Potassic	469,751	387,554	Norway 106,073; Algeria 57,682; Ireland 42,167.
Other, including mixed	1,355	1,013	Equatorial Guinea 743; France 90; Andorra 67.
Ammonia	4	11	Algeria 3; Equatorial Guinea 2; Belgium 2.
Fluorspar	209,354	176,797	United States 114,081; West Germany 50,175; India 4,357.
Graphite, natural	10	(1)	NA.
Gypsum and plasters	17,805	137,919	Sweden 123,910; Togo 4,300; Andorra 3,451; Denmark 3,435.
Lime	6,577	3,414	Equatorial Guinea 3,016; Andorra 329.
Magnesite	58,267	65,699	United Kingdom 37,904; West Germany 21,820; Sweden 1,730.
Mica, all forms	112	125	West Germany 29; Italy 16; Colombia 15.
Pigments, minerals, including processed iron oxides	13,342	11,871	United States 2,023; United Kingdom 1,390; Australia 981.
Precious and semiprecious stones (except diamond):			
Natural, gem ——value, thousands	$1	(1)	NA.
Manufactured ——do	$234	$238	Switzerland $173; France $36. United States $20.
Powder, natural or manufactured——do	$1	$3	Algeria $1.
Pyrite (gross weight) ——thousand tons	937	453	Belgium 140; Denmark 120; West Germany 61.
Salt and brine ——do	168	17	Denmark 7; Norway 4; Portugal 3.
Sodium and potassium compounds, n.e.s	18,066	11,388	Zaire 3,855; Brazil 2,289; Turkey 1,704.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	13,189	14,889	Italy 10,124; West Germany 1,956; France 667.
Slate	109	144	Andorra 129; West Germany 15.
Other	28,092	27,238	Italy 14,106; France 9,338; West Germany 3,483.
Worked:			
Slate	34,943	55,146	France 48,155; West Germany 4,229; Andorra 1,089.
Paving and flagstone	247	20	France 15; United States 3; Venezuela 2.
Other	13,978	18,072	West Germany 14,035; France 1,359; Andorra 522.
Dolomite, chiefly refractory grade	19,155	22,649	United Kingdom 19,754; Peru 1,365.
Gravel and crushed rock	4,938	16,300	Andorra 11,175; Algeria 3,500; United Kingdom 1,080.
Limestone	700	--	
Quartz and quartzite	90,135	89,784	Norway 76,338; Italy 9,780; Sweden 1,881.
Sand, excluding metal bearing	16,817	35,386	Andorra 34,719.
Sulfur:			
Elemental, all forms	175	1,377	Arab Republic of Egypt 600; France 444; Morocco 292.
Sulfur dioxide	265	3	Mainly to Algeria.
Sulfuric acid	10,096	9,486	Mauritania 4,820; Portugal 3,100; Andorra 1,560.
Talc, steatite, soapstone, pyrophyllite	164	65	France 20; Italy 20; Argentina 10.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum, amber, jet	26,150	38,161	United Kingdom 12,210; France 8,790; West Germany 8,315.
Other	69,964	121,597	France 46,477; West Germany 23,643; Netherlands 16,146.
Slag, dross and similar waste, not metal-bearing	--	62	United Kingdom 42; Netherlands 20.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Other nonmetals, n.e.s.—Continued			
Oxides and hydroxides of magnesium, strontium, barium	52	249	France 205; Republic of South Africa 44.
Building materials of asphalt, asbestos, fiber cement and unfired nonmetals, n.e.s	35,818	31,646	France 28,622; Netherlands 623.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	140	957	Equatorial Guinea 903.
Carbon black and gas carbon	8,120	7,741	Portugal 4,097; Morocco 1,828; France 974.
Coal and briquets:			
Anthracite	97,374	33,193	West Germany 20,940; Belgium 6,720; Italy 3,320.
Bituminous	47,328	8,920	Algeria 8,450; Iraq 300; Portugal 170.
Briquets of coal	980	2	All to Andorra.
Lignite and lignite briquets	601	526	Do.
Coke and semicoke	7,974	6,569	Belgium 3,364; Portugal 3,204.
Hydrogen, helium, rare gases	2	4	Algeria 2; Equatorial Guinea 2.
Peat, including peat briquets and litter	176	200	Mainly to Portugal.
Petroleum, refinery products:			
Gasoline (including natural) thousand 42-gallon barrels	5,162	8,079	Netherlands 2,090; United Kingdom 1,776; United States 1,041.
Kerosine and jet fuel ----------do----	883	1,485	West Germany 500; Portugal 270; Denmark 138.
Distillate fuel oil ----------do----	13,011	15,068	Netherlands 6,358; West Germany 1,807; Italy 1,623.
Residual fuel oil ----------do----	13,823	11,543	United States 5,367; Ship stores 3,458; Italy 1,159.
Lubricants ----------do----	85	146	Italy 112.
Mineral jelly and wax ----------do----	8	14	United Kingdom 13.
Other:			
Liquefied and petroleum gas -do----	760	985	Portugal 934.
Other ----------do----	508	797	Algeria 286; Portugal 139; Nigeria 70.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	3,932	17,973	Netherlands 10,810; United Kingdom 2,749; West Germany 1,633.

NA Not available.
[1] Less than ½ unit.

Table 3.—Spain: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite and concentrate	110,421	100,937	Greece 42,205; Guyana 28,278; Ghana 18,768.
Oxide and hydroxide	279,007	304,301	Guinea 125,677; France 90,628; Jamaica 77,762.
Metal, including alloys:			
Scrap	1,084	3,738	Canada 970; United States 835; Poland 544.
Unwrought	29,079	30,924	Canada 9,780; United Kingdom 7,751; Ghana 5,643.
Semimanufactures	5,923	7,906	Italy 1,526; Belgium 1,349; Switzerland 766.
Antimony:			
Ore and concentrate	352	550	Morocco 548.
Metal, including alloys, all forms	204	296	Belgium 121; People's Republic of China 84; Japan 58.
Arsenic:			
Trioxide, pentoxide, and acids	470	569	France 549.
Metal, including alloys, all forms	10	12	All from Sweden.
Bismuth metal, including alloys, all forms	44	93	Peru 21; West Germany 18; Japan 12.
Cadmium metal, including alloys, all forms	7	1	Mainly from West Germany.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Chromium:			
Chromite	49,490	54,837	Turkey 21,277; Republic of South Africa 20,511; Finland 5,000.
Oxide and hydroxide	226	454	Poland 269; West Germany 99; Bulgaria 85.
Metal, including alloys, all forms	22	27	United Kingdom 16.
Cobalt oxide and hydroxide	84	97	Canada 51; France 21; Belgium 18.
Copper:			
Ore and concentrate	69,586	144,948	Ireland 51,249; Australia 28,793; Cyprus 23,034.
Matte	22,738	24,529	Israel 13,562; Chile 8,409; Peru 1,759.
Copper sulfate	222	602	Bulgaria 299; Belgium 232; United States 50.
Metal, including alloys:			
Scrap	16,025	16,763	France 5,228; United States 3,126; West Germany 1,907; Canada 1,783.
Unwrought	39,351	35,779	Zambia 15,385; Chile 5,989; Belgium-Luxembourg 5,092.
Semimanufactures	9,827	14,018	United Kingdom 3,093; West Germany 2,835; Italy 2,020.
Gold:			
Metal, unworked and partly worked, all forms ---thousand troy ounces--	707	836	Switzerland 514; United Kingdom 321.
Waste and sweepings ---kilograms--	409	500	All from West Germany.
Iron and steel:			
Ore and concentrate, except roasted pyrite thousand tons--	3,248	4,147	Brazil 1,241; Canada 754; Liberia 604; Mauritania 507.
Roasted pyrite	1	341	Mainly from Morocco.
Metal:			
Scrap ---thousand tons--	1,382	1,825	United Kingdom 733; France 213; U.S.S.R. 75.
Pig iron, including cast iron ---do---	37	34	Canada 15; Finland 8; West Germany 5.
Sponge iron, powder, shot ---do---	6	7	Sweden 4; France 2.
Ferroalloys ---do---	19	21	Republic of South Africa 5; France 3; West Germany 2.
Steel, primary forms ---do---	252	353	Netherlands 103; West Germany 89; United Kingdom 49.
Semimanufactures:			
Bars, rods, angles, shapes, sections ---do---	116	139	West Germany 34; United Kingdom 15; Brazil 14.
Universals, plates, sheets --do---	413	529	United Kingdom 140; West Germany 136; France 76.
Hoop and strip ---do---	28	53	West Germany 16; France 15; Belgium-Luxembourg 6.
Rails and accessories ---do---	2	1	Mainly from United Kingdom.
Wire ---do---	9	13	West Germany 3; Belgium-Luxembourg 3; France 3.
Tubes, pipes, fittings ---do---	37	46	West Germany 11; France 11; Italy 7.
Castings and forgings, rough ---	349	695	France 220; Norway 192; West Germany 102; United States 102.
Lead:			
Ore and concentrate	8,820	24,728	Morocco 15,883; Algeria 4,394; Italy 2,709.
Oxides	5	3	Mainly from United Kingdom.
Metal, including alloys:			
Scrap	26	127	United States 92; Netherlands 25.
Unwrought	2,264	3,511	West Germany 3,202; United Kingdom 308.
Semimanufactures	337	175	West Germany 148.
Magnesium metal, including alloys, all forms	582	558	United States 432; Nicaragua 86.
Manganese:			
Ore and concentrate	173,993	259,677	Ghana 99,171; Republic of South Africa 62,823; Australia 41,815.
Oxides	865	1,582	Japan 1,060.
Metal	323	456	Republic of South Africa 185; Japan 123; France 67.
Mercury ---76-pound flasks--	6	5	Austria 3.
Molybdenum metal, including alloys, all forms	16	42	West Germany 30.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Nickel:			
Ore and concentrate	15	101	Australia 99.
Matte, speiss, similar materials	363	312	Finland 74; Republic of South Africa 69; Cuba 57.
Metal, including alloys:			
Scrap	112	167	France 84; Italy 42; West Germany 20.
Unwrought	2,717	3,789	United Kingdom 1,075; Canada 764; Republic of South Africa 768.
Semimanufactures	1,902	1,814	France 651; Italy 367; United Kingdom 266; Belgium-Luxembourg 229.
Platinum-group metals:			
Ore and concentrate	5	89	Belgium 42; United States 17; Sweden 10.
Waste and sweepings, including those of silver	295	431	United States 386.
Metal, including alloys, all forms troy ounces	62,983	73,304	France 40,381; Brazil 376.
Rare-earth metals:			
Oxides	82	110	France 78; United Kingdom 17; Finland 8.
Metal, including alloys kilograms	100	13,000	Mainly from France.
Selenium, elemental	7	11	Japan 3; West Germany 2; United Kingdom 2.
Silicon, elemental	3,656	2,419	France 740; Switzerland 450; Yugoslavia 426.
Silver metal, including alloys thousand troy ounces	4,565	16,108	France 8,359.
Tellurium, elemental	5	9	Mainly from Peru.
Tin:			
Ore and concentrate long tons	5,428	5,009	Zaire 1,671; Australia 1,402; Indonesia 569.
Oxides do	134	75	United Kingdom 51; West Germany 22.
Metal, including alloys, all forms do	157	120	United Kingdom 59; France 19.
Titanium:			
Ore and concentrate	30,268	39,468	Norway 30,251; Australia 9,190.
Oxides	6,917	7,841	West Germany 2,614; United Kingdom 1,718; Finland 1,445.
Tungsten:			
Ore and concentrate	--	208	Bolivia 198.
Metal, including alloys, all forms	8	20	United Kingdom 5; West Germany 4; France 2.
Uranium and thorium:			
Ore and concentrate (uranium) kilograms	55	56	All from Chile.
Oxides	3	2	France 1; United Kingdom 1.
Metal, including alloys, all forms kilograms	61	151	Italy 150.
Vanadium pentoxide do	342	400	United States 398.
Zinc:			
Ore and concentrate	6,227	48,121	Canada 15,436; Sweden 14,915; Algeria 6,350; Morocco 5,149.
Oxide and peroxide	297	375	West Germany 359.
Metal, including alloys, all forms	196	3,959	France 1,024; U.S.S.R. 498; Poland 439.
Zirconium metal, including alloys, all forms kilograms	430	1,000	Mainly from United Kingdom.
Other:			
Ore and concentrate:			
Of molybdenum, tantalum, titanium, vanadium, zirconium	1,241	5,491	Australia 4,988.
Of base metals, not elsewhere specified	6,560	14,165	Australia 9,581; Angola 4,572.
Ash and residue containing nonferrous metals	19,641	44,226	France 16,618; Peru 11,874; United States 7,244.
Oxides, hydroxides, peroxides of metals, n.e.s	1,105	1,364	West Germany 362; France 283; Norway 187.
Metals, including alloys, all forms:			
Alkali and alkaline earth	559	504	West Germany 490.
Pyrophoric alloys	9	10	West Germany 5; United Kingdom 2.
Base metals, including alloys, all forms, n.e.s	150	266	Belgium 100; Finland 35; France 30.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	1,550	2,512	Greece 1,520; United States 334.
Dust and powder of precious and semiprecious stones—value, thousands	$92	$61	France $26; United Kingdom $22.
Grinding and polishing wheels and stones	734	921	West Germany 175; Austria 164; France 161; Italy 148.
Asbestos	65,288	82,608	Canada 40,650; South Africa 34,433.
Barite and witherite	1,105	1,111	France 718; West Germany 260; United Kingdom 52.
Boron materials:			
Crude natural borates	44,574	32,524	United States 26,856; Turkey 5,499.
Oxide and acid	602	855	France 389; Yugoslavia 244; Turkey 200.
Cement	419,673	144,828	France 64,624; United Kingdom 42,137; Lebanon 31,580.
Chalk	11,131	7,476	France 4,387; Belgium 1,302; United Kingdom 1,066.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Bentonite	17,864	36,007	Italy 21,298; Morocco 8,447; United States 3,098.
Kaolin (china clay)	69,795	92,468	United Kingdom 65,361; France 10,278.
Other	35,718	51,183	United Kingdom 25,186; France 10,537; United States 1,605.
Products:			
Refractory (including nonclay brick)	20,081	27,441	Austria 9,523; France 4,402; United States 4,341; West Germany 3,213.
Nonrefractory	11,543	16,040	Italy 8,615; West Germany 3,186; France 2,019.
Cryolite and chiolite	872	1,250	Denmark 1,225.
Diamond:			
Natural:			
Gem, not set or strung, value, thousands	$4,187	$7,980	Belgium $6,388.
Industrial	$780	$928	Belgium $331; Republic of South Africa $268; Netherlands $97.
Total	$4,967	$8,908	
Manufactured, industrial	$176	$35	Ireland $33.
Diatomite and other infusorial earth	1,672	2,562	France 1,036; United States 980; West Germany 334.
Feldspar, leucite, nepheline, nepheline syenite	4,677	9,433	France 4,817; Republic of South Africa 1,951; Norway 964; West Germany 881.
Fertilizer materials:			
Crude:			
Nitrogenous	78,387	49,414	All from Chile.
Phosphatic—thousand tons	1,556	1,999	Morocco 1,689.
Potassic	--	5	All from France.
Manufactured:			
Nitrogenous	186,615	235,607	West Germany 67,726; France 56,522; Norway 37,257.
Phosphatic	58,471	64,191	Belgium-Luxembourg 18,268; Romania 14,581; France 12,072.
Potassic	669	1,525	All from West Germany.
Other, including mixed	75,404	61,393	Romania 41,123; Belgium-Luxembourg 7,249; United States 3,850.
Fluorspar	1	208	West Germany 198.
Graphite, natural	917	1,114	Malagasy Republic 401; West Germany 269; France 260.
Gypsum and plasters	3,966	921	Morocco 594; United States 203.
Iodine	35	58	Japan 47; Chile 10.
Lime	595	124	Morocco 109; France 14.
Magnesite	40,268	36,328	Greece 14,489; Austria 7,365; Brazil 5,732; United Kingdom 3,298.
Mica, all forms	1,135	1,346	Norway 376; United Kingdom 346; Austria 135.
Pigments, mineral, including processed iron oxides	3,211	3,792	West Germany 2,561; France 644.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Precious and semiprecious stones (except diamond):			
Natural:			
Gem ——value, thousands	$1,170	$2,467	West Germany $791; India $551; Belgium $374.
Industrial ——do	$39	$84	West Germany $55; India $14.
Manufactured ——do	$461	$603	Switzerland $450; France $89; United States $39.
Pyrite (gross weight)	68	91	Italy 79; United States 12.
Salt and brine	1,583	101,986	Italy 72,315; Tunisia 27,879.
Sodium and potassium compounds, n.e.s	37,182	45,297	Belgium 24,040; Italy 10,721; France 7,190.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Marble and other calcareous	32,889	44,227	Portugal 18,612; Italy 13,737.
Slate	128	34	West Germany 30.
Other	11,300	13,705	Norway 4,685; Sweden 4,685; Finland 1,445.
Worked:			
Slate	818	647	Italy 555; France 64.
Paving and flagstone	17	58	Belgium 36; Italy 19.
Other	1,310	1,965	Italy 931; Portugal 453; Norway 262.
Dolomite, chiefly refractory grade	3,986	2,353	Norway 1,097; Belgium 628; France 560.
Gravel and crushed rock	36,834	51,218	Morocco 40,583; France 6,487.
Quartz and quartzite	994	1,172	Sweden 580.
Sand, excluding metal bearing	68,581	90,230	Morocco 30,572; Belgium 22,283; Netherlands 6,288.
Sulfur:			
Elemental:			
Other than colloidal	80,675	94,361	France 43,927; Poland 20,544; Canada 13,497.
Colloidal	1,271	699	West Germany 437; France 250.
Sulfur dioxide	93	40	Netherlands 39.
Sulfuric acid	21,475	304,177	West Germany 146,137; Poland 67,181; Portugal 29,594.
Talc, steatite, soapstone, pyrophyllite	4,825	6,000	France 2,862; Norway 1,518.
Other nonmetals, n.e.s.:			
Crude:			
Meerschaum, amber, jet	81	90	Mainly from Republic of South Africa.
Other	46,709	58,493	Italy 18,903; Greece 12,182; Australia 8,882.
Slag, dross and similar waste, not metal bearing	333	598	France 388; West Germany 164.
Oxides and hydroxides of magnesium, strontium, barium	1,908	3,009	Brazil 1,000; United Kingdom 946; France 329.
Building materials of asphalt, asbestos, fiber cement, and unfired nonmetals, n.e.s	1,108	1,157	France 568; Belgium-Luxembourg 261.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	919	543	United States 418; United Kingdom 85.
Carbon black and gas carbon	17,586	17,162	United Kingdom 7,015; France 4,660; United States 2,118.
Coal and briquets:			
Anthracite ——thousand tons	42	10	All from Republic of South Africa.
Bituminous ——do	2,895	2,931	United States 1,978; Poland 672; West Germany 184.
Briquets of coal	2	30	Netherlands 25.
Lignite and lignite briquets	13,914	21,431	France 21,428.
Coke and semicoke ——thousand tons	87	340	West Germany 114; United States 104; Italy 80.
Gas, natural, liquefied ——thousand cubic feet	15,764	45,368	All from Libya.
Hydrogen, helium, rare gases	171	585	Belgium 213; Netherlands 116; West Germany 82.
Peat, including peat briquets and litter	3,212	3,742	Poland 914; Ireland 612; Finland 444; West Germany 440.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	259,337	286,580	Saudi Arabia 118,132; Algeria 37,267; Kuwait 24,072.

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

Commodity	1971	1972	Principal sources, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products:			
Gasoline (including natural) thousand 42-gallon barrels	599	1,430	Italy 776; Surinam 235; United Kingdom 179.
Kerosine and jet fuel ---do---	266	32	West Germany 18; France 9.
Distillate fuel oil ---do---	415	664	Italy 240; Netherlands 150; Portugal 143.
Residual fuel oil ---do---	5,006	1,691	Italy 1,396; Portugal 128; Netherlands 126.
Lubricants ---do---	327	387	United States 140; United Kingdom 50; Portugal 48.
Mineral jelly and wax ---do---	101	103	West Germany 23; United States 21; France 17.
Other:			
Liquefied petroleum gas ---do---	3,920	5,963	France 4,114; Netherlands 711; Australia 313.
Other ---do---	1,116	2,306	United States 1,067; West Germany 291; Netherlands 212.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ---thousand tons---	100	144	United States 106.

COMMODITY REVIEW

METALS

Aluminum.—Production of primary aluminum was nearly 168,000 tons in 1973, compared with about 140,000 tons in 1972. The value of aluminum exports increased from $6.4 million in 1972 to $7.5 million in 1973, whereas the value of imports decreased from $47.9 million to $32.85 million. The Spanish aluminum industry experienced a rapidly growing domestic market in 1973, due principally to a thriving economy and high tariff barriers. In spite of increased smelter capacity, Spain imported large quantities of aluminum. Areas in which demand rose sharply in 1973 were automobile manufacturing, construction, and wire and cable manufacturing. Principal imports were received from Poland, the United Kingdom, and Norway.

Electric power rates were increased on May 1, 1973, and authorization of an increase in domestic aluminum prices was expected, in order to compensate for the new rates. However, as of December 1973, the Ministry of Industry had not approved the increase. The cost of electricity has largely accounted for the inflated domestic prices of aluminum and has resulted in an erosion of the internal markets of Empresa Nacional del Aluminio, S.A. (ENDASA), and Aluminio de Galicia, S.A. (ALUGASA), by imports of unwrought metal sold at international market prices. The response of the producers has been twofold: (1) To try to establish a corner on the domestic market through further vertical integration of the aluminum industry, and (2) to obtain special power rates from the Government in order to bring domestic prices closer in line with international prices.

Demand for aluminum was expected to increase at an average rate of 9% per year; a demand of 168,000 tons was forecast for 1974. Demand from the wire, cable, and foundry sectors was expected to remain stable, but usage by extruders, especially in the areas of architectural profiles, irrigation equipment, and metal furniture, will probably rise sharply.

Early in 1973, the Spanish Government decided to abandon its original plan to implement production of alumina by using the Genal method on domestic bauxite deposits of high silica content. These deposits occur in the provinces of Lerida, Barcelona, Tarragona, Teruel, and Castillon. The most important reserves, situated in the Beceite-Fuentspalda Region of Teruel, average 36% Al_2O_3, but contain a minimum of 15% silica. The specific plan, which called for a 300,000-ton-per-year plant on the Tarragona coast, was canceled. Thus, the hope of complete backward integration of Spain's aluminum industry has been suppressed for the immediate future. Spain obtained most of its alumina from Guinea, Jamaica, France, Guyana, and Greece.

Major new plans were made in 1973 for a $440 million alumina and aluminum production complex, to be undertaken

jointly by ENDASA and Péchiney Ugine Kuhlmann (PUK). (ENDASA is 50% held by Instituto Nacional de Industria (INI), and PUK is 68% owned by ALUGASA.) In the new corporation, ENDASA will take an equity position of 55% and ALUGASA, 45%. The initial phase of the project, to be built on the Northwest coast of Spain in the Orosa Area of Galicia, is expected to be completed by 1977, and the final phase completed by 1982. The proposed complex will consist of an alumina plant with an annual capacity of 800,000 tons and an aluminum smelter with an annual capacity of 175,000 tons. The alumina plant will be constructed in three successive stages of 400,000, 600,000, and 800,000 tons per year. In order to supply some of the bauxite for the plant, INI, the Government's industrial development agency, will acquire a portion of the Brazilian Cia. Valc do Rio Doce-Alcan Aluminum Ltd. project. The Brazilian project is expected to furnish 400,000 tons of bauxite annually to Spain. Guinea may also supply a substantial tonnage, but no formal contract was signed in 1973. In order to provide adequate electric power to the complex, INI plans to invest about $414 million in the expansion of its thermal powerplant, located at Puentes de Garcia Rodriguez. The joint venture between INI, ENDASA, and ALUGASA further strengthens their hold as an oligopoly over the Spanish aluminum market.

In other developments, work was expected to be completed in mid-1973 on the expansion of ENDASA's Avilés smelter, increasing its capacity by 20,000 tons to 88,000 tons per year. By 1975, capacity was expected to reach about 100,000 tons per year. ENDASA also planned to expand its aluminum semimanufactures complex at Alicante at a cost of $930,000.

Copper.—Spain's copper industry produced 122,892 tons of refined copper in 1973, a decrease of 10% from that of 1972. Blister copper production increased 6% over that of 1972. In addition, there were increases of blister and refined copper exports (from $8.7 million in 1972 to $25.5 in 1973) and imports (from $95.9 million in 1972 to $153.6 million in 1973).

Plans were announced in late 1973 by Rio Tinto Patiño (RTP) for the second phase of an expansion program at its copper refinery at Huelva. Under the initial phase of the program, virtually completed in 1973, capacity was increased from 60,000 to 84,500 tons per year. Reportedly, capacity is expected to be brought up to 105,000 tons per year by July 1975. RTP obtained a license for an Outokumpu flash smelter at Huelva with a feed capacity of 1,000 tons per day of concentrate. This expansion program was implemented due to increased copper concentrate output from the Cerro Colorado mine, which began operation in 1970. RTP reportedly decided to place its Santiago open pit copper deposit into production at a rate of 4,000 tons per day.

Unión Explosivos Río Tinto S.A. (UERT) made a study of the feasibility of treating Spanish pyrites. Of particular concern was the extraction of nonferrous metals, such as copper, lead, and zinc. The program developed by UERT envisions the establishment of a plant to treat all of the available roasted pyrites residues (including dust) in Spain. The plan included producing enough sulfur to meet Spain's needs through 1985, and providing the chemical industry with a raw material competitive with elemental sulfur. To carry out the project, UERT established the Sociedad Aprovechamiento Integral de Piritas, S.A. (AIPSA), with UERT holding 45% of the capital. The other shareholders are Tharsis Sulfur and Copper Co. and Metalquimica del Nervion.

Iron Ore.—Iron ore output in 1973 was 6,926,000 tons (about 3,404,100 tons iron content), compared with 6,773,000 tons (about 3,326,200 tons iron content) in 1972. From April 1 to August 7, 1973, 3,051,157 tons of iron ore and pellets was imported: 1,595,000 tons for Empresa Nacional Siderúrgica, S.A. (ENSIDESA); 1,052,000 tons for Unión de Siderúrgicas Asturianas, S.A. (UNINSA); and 403,657 tons for Altos Hornos de Vizcaya S.A. (AHV). The most important source of iron ore was Brazil with 701,000 tons, followed by Sweden with 607,000 tons, Liberia with 430,000 tons, Venezuela with 402,000 tons, Australia with 255,000 tons, and Canada with 218,957 tons. Other sources were Mauritania, Morocco, and the Republic of South Africa.

In 1973, Compañia Minera de Sierra Menera, S.A., announced an investment program whereby iron ore output will be expanded to 1.5 million tons per year by 1977, including a 2.0-million-ton-per-year pellet plant, planned for the port of Saguto. Installations will include 1,000-ton-

per-hour unloading facilities, 2,000-ton-per-hour loading facilities, an 80,000-ton-capacity ore stockyard, and a 100,000-ton pellet stockyard. The company was expected to find domestic outlets for the pellets. This plan was partially the result of the discovery of large deposits of iron ore in the provinces of Teruel and Guadalajara, where mines already were located. Reserves were approximately 110 million tons. Agrupacion Minera, S.A. (Agruminsa), ceased production at its Alquife iron ore mine in mid-1973 because the ore had been exhausted. Agruminsa planned to exploit iron ore from Vizcaya, and also planned to install a sintering plant there. The output of this plant would then be transported by conveyor belt to the Baracaldo works of AHV. Reportedly, Agruminsa expected to secure important iron ore concessions in Guadalajara and Teruel provinces. The company began prospecting in the Alquife-Marquesado Area in order to determine the possibilities of mining iron ore in this region.

In September 1973, AHV announced that it will replace one of its two sinter plants (La Mudela). The new plant, scheduled to begin operation in 1976, will treat a carbonate from the region that contains only 34% iron.

The West German firm Heinrich Koppers GmbH, Essen, along with its Spanish affiliate Koppers Española, Bilbao, completed construction of a 200-square-meter sinter plant, the largest in Spain. The plant includes a comprehensive ore blending and proportioning unit for domestic and imported ores and was designed for a maximum capacity of 40 tons per square meter per day.

Another foreign company, British Ropeway Engineering Ltd. was awarded a contract by Compañía Andaluza de Minas of Madrid for an iron-ore-handling and ship-loading plant at the port of Almeria on the southeast coast of Spain. The contract encompasses the design, supply, and installation of the facilities. Completion was scheduled for mid-1974. Moreover, construction of the new facilities, undertaken as a joint venture between British Ropeway and Tecnicas Siderúrgicas, will enable ships with capacities of 10,000 and 45,000 tons to be loaded at a maximum rate of 2,200 tons per hour.

Iron and Steel.—The iron and steel industry continued to expand in 1973, although the trade deficit persisted, in terms of value. However, in terms of volume, exports exceeded imports by 233,000 tons. Imports of iron and steel went from $368.1 million to $499.5 million, a 36% increase. Steel production in 1973 was 10.7 million tons, an 11% increase over production in 1972. Exports of iron and steel for the year also increased dramatically, from $161.8 million to $309.9 million, a 91% increase.

Steel production for the first 6 months of 1973 was 5.5 million tons (up 9.6% over the corresponding period for 1972). According to Unión Siderúrgicas-Empresa Nacional (UNESID), apparent consumption (ingot equivalent) was 5.3 million tons (up 12.8%), and exports were 1,043,000 tons (up 61.1%), or 22% of production. According to the International Institute of Iron and Steel, Spain went from 22d to 13th place between 1960 and 1972 on the list of steel-producing countries.

Spanish scrap steel importers were hit particularly hard by the export restrictions imposed in the United States on scrap steel, and were forced to look to other foreign sources, including the Soviet Union. However, it was reported unlikely that the amount of scrap obtained would be sufficient to maintain previous production levels. As a result, prices for scrap increased as much as 30% from May to October. An average price increase of 6% was authorized on May 14 for various steel products, and another increase was anticipated at the beginning of 1974.

Spain imported 1,013,140 tons of scrap in the first half of 1973, valued at $61.9 million. The principal supplier was the EC, with 513,363 tons. Source countries from the EC were the United Kingdom (323,122 tons), France (72,462 tons), and West Germany (44,840 tons). The Eastern bloc supplied 107,797 tons, with the U.S.S.R. supplying 86,823 tons of that total. Spanish scrap consumers were paying a minimum of $104.20 per ton in November 1973.

Although the relationship between Spain and the EC remained undetermined in 1973, negotiations did take place, and iron and steel were included in the discussions. One of the problems Spain faced in 1973 as a result of its nonmembership in the EC was the loss of British scrap steel. Tariff barriers have also been a problem. It was estimated by Perez de Bricio, general director of the steel industry, that a transition period of more than 4 years would be needed before complete integration into

the EC could be achieved.

ENSIDESA, AHV, Altos Hornos de Mediterraneo (AHM), and UNESID held talks with EC representatives concerning (1) possible progressive phasing out of custom tariffs on steel products in line with other industrial goods over a period of 10 years, (2) a guarantee on scrap supplies from the EC (badly needed after U.S. curbs on scrap exports), and (3) a transitional period for conforming Spain's steel product prices to those of the EC. However, because of the relatively healthy state of its steel industry, Spain was not considered likely to win all its requested terms in any future arrangement.

Final approval for the merger of the state-controlled companies ENSIDESA and UNINSA was obtained from the Spanish Government in October 1973. With its increased capacity, it was expected that the new firm would be able to compete on an equal basis with EC steelmakers. Of particular advantage was the proximity of UNINSA's Verina plant to ENSIDESA's Avilés works. It was expected that El Musel harbor would soon be capable of accepting 100,000-ton ships.

For the first 6 months of 1973, ENSIDESA's output rose substantially. Steel production was 1,584,000 tons (up 13%), and rolled products (ingot equivalent) were 1,860,000 tons (up 42%). A semicontinuous hot mill, introduced in 1972, produced 800,000 tons of hot-rolled coil (up 250%). ENSIDESA's new galvanizing line designed by Aetna Standard Engineering of the United States was brought into production, and two Univac 1106 computers were ordered for the company's plant in Avilés, and were scheduled to be functioning by mid-1974.

AHV reported that in the first 6 months of 1973, it produced 969,363 tons of pig iron; 1,020,183 tons of raw steel; 528,358 tons of hot-rolled products; and 210,468 tons of cold-rolled products. The Vizcaya works produced the greatest portion: 678,320 tons of pig iron; 703,000 tons of raw steel; and 346,646 tons of rolled steel. To maintain high levels of production and to insure an adequate supply of coking coal and iron ore, AHV representatives reportedly negotiated the purchase of certain foreign mining sites. AHV also reportedly planned to double the capacity of its hot-rolling mill at Ansio in 1973. Other plans were made to expand the Echevarri works and construct a new sinter plant.

The sale of Laminaciones de Lesaca to AHV was finalized in December 1973. AHV supplied about 40% of Lesaca's 300,000-ton-per-year requirement for hot-rolled sheet. Lesaca was the seventh-largest steel firm in Spain and was a major reroller of welded tubes, special sections, and galvanized sheets. The company mainly served the automobile and electrical industries.

AHV planned to reduce its share in AHM from 46% to 40% in 1977. The remaining 6% would be purchased by the Internationanl Finance Corp. (of the World Bank) and AHV shareholders.

Progress was made in 1973 toward establishment of a huge new steel plant on a 540-acre tract along the Mediterranean coast of Spain at the port of Sagunto. A $50 million financing package for the first phase of the project was put together in mid-1973 by Equibank, N.A., of Pittsburgh, and completion of the first phase was scheduled for late 1975. Additional financing was obtained through the EXIM Bank, Ste. Generale de Banque of Brussels, and Banco de Credeto Industrial of Madrid. The first phase was to include a major steel-finishing mill capable of cold rolling about 2 million tons of sheet per year. By 1980, it is expected that a completely integrated complex with an annual steelmaking capacity of 6.6 million tons, in conjunction with rolling and processing facilities, will be finished. The plant will be constructed by AHM, which is 46% owned by AHV, 39% by a group of 12 Spanish banks, and 15% by United States Steel Corp. When the entire complex is completed, it is expected to furnish most of the flat-rolled steel used by Spain's rapidly growing auto industry. The first phase of this project was estimated to cost $120 million—$50 million for U.S. machinery and services, and $70 million to purchase land, buildings, and services from Spanish companies and suppliers. Three U.S. companies are involved in the first phase of construction: Wean United Inc., Westinghouse Electric Corp., and Lee Wilson Engineering Co. Lee Wilson will deliver 38 single-stack, direct-fired, cylindrical (bell-type) annealing furnaces and four-stack rectangular furnaces, with 84 matching bases.

By December 1973, preliminary work on the first phase of the project had reached

an advanced stage, and construction was expected to begin shortly. Contracts were awarded on November 30, 1973, for plant and civil engineering. In addition, AHM set up a new division, Direccion del Proyecto de la Fase Integral, to study and execute the second and third phases of the project. As part of the new project, the mining company Sierra Menera reportedly plans to construct a 2-million-ton-per-year iron ore pellet plant at Sagunto. At yearend, Wean United, Inc., received a multimillion-dollar order from AHM for three steel-strip finishing lines to be constructed at the Sagunto works. This turnkey installation will involve complete responsibility for machinery design, construction engineering, supply of United States and Spanish mechanical and electrical equipment, and the installation of all the machinery.

The finishing line of the stainless steel plant of Compañia Española para la Fabricación de Acero Inoxidable (ACERINOX) at Algericas was completed in 1973. Expansion of the facilities continued and an order was placed for a second Sendzimer mill, which had a speed of 400 meters per minute. The mill was to start operation by yearend 1974. ACERINOX was also considering the installation of a second annealing and pickling line. The firm worked closely with the Japanese partners (Nissho–Iwai Co., Ltd., and Nisshin Steel Co., Ltd.) on the stainless steel project at Algericas. Targets for the first phase of the project were set at 30,000 tons per year of cold-rolled sheet and coil (from hot coil supplied by Nisshin Steel) in the first stage, and 72,000 tons per year in the second. For the second phase, a goal of 150,000 tons per year was set, with the installation of a 60-ton arc furnace, a 60-ton converter and continuous caster, a hot planetary mill for coil up to 1,500 millimeters wide, and two Sendzimer cold mills. A third phase will extend over a period of 8 years, with the goal of producing 300,000 tons per year of steel.

Olarra S.A., another Spanish steel producer, announced plans to expand its works at Larrando (Bilbao). Olarra also began constructing a new steel works at Sanguese (Navarra) in 1973. The new works, covering 250,000 square meters, will have two electric arc furnaces, two rolling mills, and a blooming mill to be installed later. A production rate of 36,000 tons per year was scheduled for 1975, increasing to 120,000 tons per year in 1978. The Larrando plant will specialize in stainless steels to be sold mostly for export, whereas the Sanguese plant would concentrate on supplying the domestic market.

In other developments, Elaborados Metalicos, S.A. (EMSA), planned to build a 300,000-ton-per-year minimill at Salon-Arteijo in Galacia. Capital will be provided by the State company established to develop the area, a banking consortium, various private companies, and the construction industry. Another steel manufacturer, Aceros de Llodio, announced in 1973 that it planned to increase production capacity about 60% in 2 years. Greater integration of operations with the French firm Creusot-Loire was also planned.

Lead and Zinc.—Exploration by the Instituto Geologico y Minero, Spain's geological survey under the Ministry of Industry, yielded important results during the year. Reserves of lead and zinc were found in the southern region of Murcia Province and were estimated at 95,000 tons of lead. This increased local reserves of lead by 31%. A complex zinc-iron-manganese carbonate deposit was also found at Mazarron (Murcia) and was expected to yield about 160,000 tons of zinc.

In August 1973, Union Minière S.A. set up a new exploration subsidiary, Astruminera S.A., in association with the Spanish companies Asturiana de Zinc S.A. and Fina Iberica S.A., the Spanish affiliate of the Belgian oil company Petrofina S.A. Union Minière held a 40% interest in the new company, which will explore for both ferrous and nonferrous metals on lands held by the two companies.

Asturiana de Zinc, was preparing to increase zinc production from 80,000 to 120,000 tons per year. Installations for zinc-blende roasting and the production of sulfuric acid from the resulting roaster gases were to be constructed by Turgi Española, S.A., of Madrid. The facilities were expected to become operational in late 1974. The zinc blende will be roasted by the Lurgi Vielle-Montagne process, and the cleaned roaster gas will be converted into sulfuric acid in a double-catalysis plant, yielding about 280 tons per day of zinc monohydrate.

The four principal producers of lead in 1973 were Sociedad Minera y Metalurgica de Peñarroya España, S.A., Minas de Priorato, Compañía La Cruz, and Asturienne des Mines S.A. As of December 1973,

26 mines were being worked, as well as 30 concentrators for lead-zinc and other complex lead ores. Over the previous 5 years, the number of mines declined 47%, whereas the production of lead increased 24%.

The battery industry, led by Española del Acumulador Tudor, experienced a large increase in demand because of expansion in the automobile industry. In addition, company officials of Peñarroya España expected the expansion in the automobile industry to result in a demand for battery lead of up to 75,000 tons by 1980. Although the use of lead in pipes was expected to decrease, the loss would be offset by an expansion in the building industry and the upgrading of existing structures. The company forecasts that by 1980 lead and zinc consumption in Spain will reach at least 170,000 and 190,000 tons, respectively.

Production of both primary lead and zinc increased 8% in 1973.

Mercury.—Minas de Alamadén, Spain's largest mercury producer, had a relatively good first half-year in 1973, exporting 23,855 flasks of mercury, compared with 13,681 flasks exported during a similar period in 1972.

Throughout 1973, Spain and other major mercury producers participated in meetings organized to try to stabilize the price of mercury. The prospect of continuing mercury sales by the U.S. General Services Administration of 157,000 flasks over several years worried producers. Short-term, large disposals of mercury would have an extremely adverse effect on the market. A meeting was held in Geneva, Switzerland, attended by representatives from Algeria, Italy, Mexico, Spain, and Yugoslavia, in which it was decided that producers would not sell directly to dealers except as agents, or when there was proof of a sale. The producers hoped to stabilize the market and induce more constant buying habits, agreeing on a maximum price per flask of $320. The strategy was apparently effective, since at mid-year the price had risen to between $285 and $292 per flask as producers held back supplies.

A trial program for extracting mercury from furnace residues was begun by Minas de Almadén; this could yield a total of 300,000 flasks at a rate of 5,000 to 10,000 flasks annually. Two tons of residue was reportedly sent to Moscow for study by Soviet metallurgists. The rock dumps and tailings have been accumulating at the Almadén mines for the more than 2,000 years. It was reported that the Soviet foreign trading organization, Machinoexport, was negotiating with the Spanish firm Almadén Arraynes to supply a complete plant to produce mercury. Minas de Almadén also reportedly planned construction of a laboratory and furnace control unit at its mining complex.

Two mines in Asturias, the Miere and Pola de Tina, were forced to reorganize after reduced mercury prices resulted in cessation of operations. Government authorities reportedly have guaranteed a minimum price for the production of the mines in order to sustain operations.

Tin and Tungsten.—The first stage of the Centro Minero de Pernouto tin mine, located at Viana del Bollo, began operating in June 1973. On completion of the second stage in 1974, the mine was expected to produce 1,500 tons per year of tin, as well as 75 tons per year of tantalite. Total cost of the project is estimated at $3.5 million. Ore reserves at the location were estimated at 15 million tons of 0.1% tin.

The Sindicato Nacional del Metal petitioned the Director General of Mines in April 1973 concerning the introduction of a guaranteed price for Spanish tungsten production. Since the major portion of tungsten production is exported, profits for producers are especially sensitive to fluctuations in the international price, which was not favorable during the first half of 1973.

The Japanese firm Mitsubishi Metal Mining Co., Ltd. of Mitsubishi Corporation recently acquired controlling interest in Murex Hispania, S.A., one of the leading Spanish producers of carbide tools. The Valencia-based firm will be renamed Metals Aleciones, S.A.

Titanium.—A new titanium dioxide (TiO_2) plant reportedly was planned for Huelva (Andalusia) in 1973. Construction of the 30,000-ton-per-year plant will be carried out by UERT, and completion is expected by 1975. The new company, to be named Titanio, S.A., will be held by UERT (55%) and British Titan Ltd. of the United Kingdom (45%). The new facility will probably necessitate increased imports, at least until 1980, unless additional reserves are found. Nevertheless, a goal of self-sufficiency in titanium has been set for 1980. The only other titanium producer in Spain, Dow-Unquinesa, planned

to expand the capacity of its 24,000 ton-per-year plant at Axpe Bilbao by 5,000 tons per year.

E. I. duPont de Nemours & Co. reportedly was considering Spain as a site for a new titanium plant with a capacity of more than 100,000 tons per year of TiO_2. However, no commitment was made at yearend. In response to the proposed DuPont project, UERT sought government permission to increase its investment in the Huelva project by $75 million. This increase would double UERT's capacity by 1976; production is set at 100,000 tons per year by 1978.

NONMETALS

Cement.—Further expansion of cement production facilities began in July 1973. At that time, the Ministry of Public Works signed a price convention that increased cement prices 3%. In addition, a surcharge of $0.96 per bag of cement was levied. The surcharge will go into a fund to subsidize imports of cement. As a result of these higher prices, the following cement companies have announced expansion plans: Cement Molins S.A. (northeastern Spain) was to increase output 940,000 tons; Asland S.A. was to raise production at its Mocada plant 830,000 tons; Auxiliar de Construcción was to increase production at San Felice 495,000 tons; Cementos Figots S.A. will increase production 350,000 tons; and Catalana de Cementos Portland S.A. was to increase its Valirana output 380,000 tons. The construction boom in Spain has caused a shortage of cement, and the plant expansions should help alleviate the situation.

Clays.—Laporte Industries of the United Kingdom bought a 40% interest in the Spanish bentonite producer Minas de Gador. Minas de Gador produces about 35,000 tons per year of bentonite; this accounted for about 80% of the bentonite production of Spain. The company's operations are located primarily near Almeria in southern Spain. Laporte plans to develop the Spanish company's deposits and market its products outside Spain.

Chlorine.—Energia e Industrias Arogonesos, S.A. (EIASA), commissioned and brought onstream a 43,000-ton-per-year chlorine plant at Huelva, and expanded the capacity of its Tarragona chlorine plant from 48,000 to 70,000 tons per year. In addition, Desarrollo Quimico Industrial (owned 50% by EIASA and 50% by E. I. du Pont de Nemours & Co.) completed a 12,000-ton-per-year chloromethanes plant at Palos in mid-1973. The new facilities of EIASA brought Spain's chlorine production capacity to more than 100,000 tons per year.

Fertilizer Materials.—*Nitrogen and Phosphates.*—Abonons de Surete (ASUR) began building an ammonium nitrate plant at Cartagena in 1973. The plant will have a capacity of 120,000 tons per year and will double ASUR's total capacity when completed in 1975. Española de Investigacion y Desarrolla (ESPINDESA) will provide the technology for a new 100,000-ton-per-year nitric acid plant that is expected onstream at the same time as ASUR's ammonium nitrate unit. Total investment in both of the new plants will be about $6.95 million.

A sulfuric acid plant for Fosforico Español S.A. with a capacity of 1,045 tons per day was built at Huelva in 1973. Pyrite feed will be used by the acid plant at the rate of 72 tons per day. The output of the plant was expected to supply most of the sulfuric acid required by Fosforico for producing phosphoric acid.

UERT also announced plans for investment in an ammonia plant and a urea plant with capacities of 300,000 and 164,000 tons per year, respectively. The plants together will cost $43.07 million and are due onstream in 1975. This should make UERT self-sufficient in these chemicals.

Three other companies, UERT, Fuinsa, and Compañía Insular de Canarias, requested permission from the Spanish Government to build a phosphoric acid plant in the Canary Islands. The proposed project would utilize feed from the newly developed Bu Craa phosphate deposits in the Spanish Sahara, and its capacity would range from 40,000 to 100,000 tons per year.

The first supplies of Bu Craa phosphates reached Spain in April 1973. It was expected that 300,000 tons of material would be produced by the end of 1973, and 10 million tons would be produced annually by 1980. Large-scale open pit equipment is used at the site. Reserves were estimated at 1,300,000 tons, grading 70% to 72% bone phosphate of lime. The largest conveyor belt in the world carries the phosphate 62 miles across the Sahara Desert from Bu Craa to the Port of El Aaiun.

Fluorspar.—The Spanish fluorspar industry flourished as a result of a large ex-

port market. There was very little local demand; thus, the bulk of Spanish production was exported to the United States. Minerales y Productos Derivados (Minersa) and Fluoruros S.A. are the largest fluorspar producers. Minersa, which produced acid-grade fluorspar, operated mines throughout the country. The operations of Fluoruros were all concentrated in the Asturias region of northern Spain.

Pyrites.—Under a restructuring plan developed by the Spanish pyrite industry, production priority was to be given to phosphoric and sulfuric acid industries. This reorganization was a result of the relatively poor world price for sulfur, which caused Spanish producers to cut back production 9.1% in 1972. New plans were made by both UERT and Compañía Andaluza de Piritas for expansion of facilities. UERT will process residues from pyrite roasting, whereas Metallgesellschaft. A.G. and Banco Central will develop a 50,000,000-ton pyrite reserve at the mines of Andaluza de Piritas at Aznocollar.

MINERAL FUELS

Petroleum and Natural Gas.—Production of crude petroleum more than quadrupled in 1973, to 5.9 million barrels, an increase of 482% over that of 1972. Moreover, five oil wells were being drilled in September of 1973, and three were due to be drilled soon thereafter, reflecting a boom in oil exploration. Approximately 30 oil groups had been granted permission for drilling at yearend 1973. Activity was also expected to pick up in the Bay of Biscay with the arrival of the drilling ship *Glomar Grand Isle,* which was to operate on Exxon Oil Co. permits in the area. Production from the Amposta Field began in February 1973 with an output of 20,000 barrels per day. The crude oil was being pumped to a 40,000-ton storage tanker near the site of the production platform.

In the Spanish Mediterranean, seven offshore exploration permits were awarded to a subsidiary of Atlantic Richfield Company (ARCO), Arco Exploration, Inc., of Madrid. Authorities in Spain had granted 38 offshore exploration concessions to 8 U.S. oil companies as of November 1973. The companies awarded the contracts were Davis Oil Co., Union Texas Petroleum Corp., Getty Oil Co., Amoco Oil Co., Ashland Oil Inc., Continental Oil Co. (Conoco), and Texas Pacific Oil Co. Inc. Three more offshore blocks were awarded to the Shell Oil Co.-Compania Arrendataria del Monopolio de Petroleos, S.A. (Campsa) partnership. Thirteen others went to a consortium, which included Spanish and French corporations. Anadarko Production Co. and Norwegian State Oil Co. (Statoil) together bought a 50% interest in 20 permits held by Tenneco Oil Co. Several wildcat wells have been drilled by Tenneco; one of these had reached a depth of 12,000 feet.

According to geologists, the best prospects for new oil production are along the Mediterranean coastal shelves or in the Gulf of Cadiz. The Shell-Campsa partnership performed some exploratory drilling in the Cadiz Area in 1973, and extensive drilling took place along the Mediterranean coast. It is believed that Spain will not be able to evaluate its full petroleum potential until additional wildcat wells are drilled. Spanish companies were also involved in foreign ventures during 1973. The state-owned company, Hispanica de Petróleo (Hispanoil), bought into an exploration venture off the coast of Indonesia and one off the coast of Madagascar. Hispanoil acquired a 50% interest in a 3,435-square-mile contract area on Java, Indonesia, held by the French company, Compagnie Française des Pétroles (CFP). In another foreign venture, Hispanoil reportedly signed an operating contract with Petroperu.

A Government-controlled organization reportedly submitted a report to the Foreign Ministry in 1973 urging extension of Spanish sovereignty over territorial waters and the underlying Continental Shelf up to 200 miles. Amending the 1958 Hydrocarbon Exploration Act was also being considered.

In March 1973, subsidiaries of Texaco Inc. and Standard Oil Co. of California (SOCAL) reportedly acquired 10% of the shares of Empresa Nacional de Petróleos de Tarragona, S.A. (ENTASA). The balance of the shares in ENTASA were held by Instituto Nacional de Industria. ENTASA will construct and operate a refinery and olefin plant at Tarragona. The olefin plant will process naphtha from the refinery, to yield 325,000 tons annually of ethylene, proylene, and other petrochemicals; the refinery itself will have a processing capacity of 140,000 barrels per day of crude oil. The refinery will serve both the city of Barcelona and the heavily industrialized Catalonia Region. At Corunna, Carbonoil Iberia S.A. reportedly will proceed with the con-

struction of a 100,000-ton-per-year petroleum coke plant.

Legislation affecting the quantity of petroleum stocks held in Spain was passed March 1973. Under the new law, refineries were required to have 50% of their stocks in crude or intermediate products. In cases where refineries had to use these stocks, prior application to the Direccion General de Energia was required. Power stations using fuel oil were required to have stocks that would permit them to operate for 500 hours at full capacity.

In March 1973, Shell reduced its commitments for supplying crude oil to Compañia Española de Petróleos, S.A. (CEPSA), by 10%, from 650,000 to 585,000 tons. At the beginning of February 1973, Shell cut back its commitments to Rafineria de Petróleos Escombreros, S.A., by 500,000 tons. These cuts were deemed necessary, according to Shell officials, because of reduced supply.

At Bilbao, port facilities were to be expanded by April 1974. There will be one berth for 150,000-ton tankers and, by July 1975, another one for 500,000-ton tankers.

The Government encouraged various energy-saving measures during the year, but these were not made mandatory. It was estimated that 10,000 tons per day of crude oil would be saved if individuals complied with the suggestions.

Exports of both coal and petroleum were valued at $247.5 million in 1973, compared with $203.1 million in 1972. In addition, the Minister of Commerce granted several licenses to various Spanish companies to export $3.3 million worth of diesel oil and kerosine to the United States.

The development of natural gas supplies for Spain was disrupted during the first quarter of 1973 by a government decision to suspend the conversion from manufactured gas to natural gas. This decision came as a result of numerous explosions caused by natural gas.

Nuclear Energy and Uranium.—Three nuclear reactors designed for electrical power supply were operating in Spain in December 1973, according to the Junto de Enérgia Nuclear. Five research reactors of various types were also operating, and seven new reactors were scheduled for completion in 1977 and 1978. Moreover, 11 additional reactors were proposed to be built throughout the country.

Iberduero, S.A., announced plans to build six of the proposed nuclear stations, with a total value of $2,258 million. Construction requests reportedly have been submitted to the Ministry of Industry. The stations were to be built in the provinces of Salamanca, Navarra, Guipuzcoa, and Vizcaya, and each would produce 7 billion kilowatt-hours annually.

The state-controlled Empresa Nacional del Uranio, S.A. (ENUSA), submitted an application in May 1973 for the construction of a uranium-concentrating plant. The plant, which would have an annual processing capacity of 100,000 tons of ore, would be located at Saelices el Chico (Salamanca province), and would process ores mainly from the Ciudad Rodriguez Area. It was expected to become operational about mid-1975. As of mid-1973, there was only one uranium ore processing plant, located at Andujar in southern Spain.

The current uranium needs of Spain's nuclear powerplants were to be supplied by a contract signed with Canadian Denison Mines Ltd. By the year 2000, about 70 nuclear power stations are expected to be producing 80% of Spain's electrical requirements, which were forecast at 700,000 megawatt-hours. In the first half of 1973, Spain's production of electrical energy totaled 38,365 million kilowatt-hours, compared with 34,653 million kilowatt-hours for the same period in 1972.

The Mineral Industry of Sweden

By F. L. Klinger [1]

Production and trade of the principal mineral commodities increased in 1973. New record highs were set in output and exports of iron ore and steel. Owing mainly to rising prices for crude oil and petroleum products, Sweden's trade deficit for mineral commodities increased about 40% in dollar value compared with that of 1972. In mining developments, a new iron ore pelletizing plant was completed at Malmberget; mine output of copper increased 47%; new reserves of lead ore were reported in the Laisvall and Vassbo areas; and copper-zinc deposits at Stekenjokk were being developed for production in 1976. Two small iron mines in central Sweden were closed. Smelting and/or refining capacity for aluminum, arsenic, copper, lead, iron, and steel was being increased. Two sponge-iron production facilities were closed. Housing construction continued to decline, but there was a major increase in exports of cement during 1973, and production of byproduct gypsum (from manufacture of phosphoric acid) was expected to reach significant levels in 1974. In the fuels sector, imports and consumption of crude oil were less than in 1972, but completion of a new refinery at Lysekil in 1974 was expected to increase Sweden's oil refining capacity 50%. Experimental extraction of uranium from shale was continued at Ranstad, and three nuclear powerplants (using imported fuel) were scheduled to begin service in 1974. Offshore exploration for oil and gas was also continued, but no commercial desposits were found.

PRODUCTION

Preliminary indices of the volume of production in the mineral industry in 1972 and 1973 were as follows:

Industry sector	(1968=100) 1972	1973
Iron ore mining	r 113	119
All mining and quarrying	110	117
Primary metals	r 118	128
Nonmetallic mineral manufacturing	r 102	107
Petroleum refining	r 124	116
All industry	r 118	127

r Revised.

Source: Central Bureau of Statistics (Stockholm). Statistiska Meddelanden, Nr. I-30, July 22, 1974, pp. 2-5.

As suggested by the indices and confirmed by information available from producers, production of most mineral commodities increased in 1973 with the exception of petroleum products. Output of iron, steel, aluminum, and copper was appreciably higher than in 1972. Production of lead and zinc concentrates also increased, although the output of refined arsenic, lead, and zinc clinker at Rönnskär declined. In the nonmetals sector, output of some manufactured commodities such as glass was less than in 1972.

Indices of producer prices increased in most sectors of the mineral industry in 1973, except for iron ore and aluminum, which declined by 7% and 3.5%, respectively. The lower index for iron ore had the effect of reducing the index for all mining and quarrying in 1973. Producer price indices increased as follows for the sectors indicated: iron, steel, and ferroalloys (18%); all nonferrous metals (25%, with an increase of 36% for copper); nonmetallic mineral manufactures (6%); and products of petroleum and coal (17%). The indices for all sectors increased substantially after the end of the year.[2]

Production of mineral commodities is detailed in table 1.

[1] Physical scientist, Division of Ferrous Metals—Mineral Supply.

[2] Central Bureau of Statistics (Stockholm). Statistiska Meddelanden, Nr. P.-14, July 25, 1974, pp. 14-17.

Table 1.—Sweden: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Aluminum, unalloyed:			
Primary	[r] 74,434	75,992	81,399
Secondary	[r] 590	628	260
Arsenic:			
White, refined	17,500	16,200	15,200
Metallic	1,000	1,100	1,100
Bismuth, mine output, metal content [e]	15	15	15
Copper:			
Mine output, metal content	30,221	30,619	44,819
Matte	599	--	--
Metal, unrefined	8,770	3,883	2,420
Metal, refined:			
Primary	34,542	41,464	47,863
Secondary	15,089	10,132	11,628
Total	49,631	51,596	59,491
Gold:			
Mine output, metal content, troy ounces	54,528	57,550	80,923
Metal, including alloys, do.	98,928	125,902	122,141
Iron and steel:			
Iron ore and concentrate, gross weight:			
Direct shipping ore, thousand tons	25,673	23,917	22,107
Concentrates, do.	8,694	10,062	12,620
Total, do.	34,367	33,979	34,727
Pig iron and sponge iron [2], do.	2,759	2,533	2,753
Electric furnace ferroalloys, do.	236	239	221
Crude steel, do.	[r] 5,271	5,257	5,663
Steel semimanufactures:			
Bars, rods, sections, do.	1,512	1,451	1,591
Plate and sheet, do.	[r] 1,769	1,896	2,048
Strip, do.	145	128	142
Rails and accessories, do.	50	45	45
Pipe and tube stock, do.	235	236	229
Other, including forgings and castings, do.	233	215	221
Total, do.	[r] 3,944	3,971	4,276
Lead:			
Mine output, metal content	79,454	75,841	75,777
Metal (refined):			
Primary	39,305	47,532	46,632
Secondary and remelted	8,469	8,837	[e] 9,000
Magnesium metal, primary and secondary	8	11	NA
Nickel metal, unalloyed	5,631	4,900	[e] 5,000
Selenium, elemental (refined)	51	42	[e] 50
Silicon metal	[r] 13,266	17,959	19,381
Silver:			
Mine output, metal content, thousand troy ounces	3,895	4,255	4,690
Metal, including alloys, do.	4,825	5,412	6,303
Tungsten, mine output, metal content	--	--	217
Uranium oxide (U_3O_8) [e]	70	70	70
Zinc:			
Mine output, metal content	99,043	113,728	118,542
Clinker (70% to 75% zinc)	26,800	32,400	28,200
NONMETALS			
Cement, hydraulic, thousand tons	3,950	3,732	3,787
Chalk	25,756	29,240	33,816
Clays, refractory [e]	240,000	200,000	186,000
Diatomite:			
Crude	5,067	--	--
Calcined	514	--	444
Feldspar, salable, crude and ground	28,706	34,091	27,955
Fertilizer materials, manufactured:			
Nitrogenous, thousand tons	447	505	NA
Phosphatic:			
Thomas slag, gross weight, do.	265	225	143
Other, do.	279	504	NA
Mixed and other, do.	913	991	NA
Fluorspar	--	--	4,636
Lime (quicklime, hydrated lime, dead-burned dolomite), thousand tons	[r] 849	831	784
Pigments, natural mineral	1,345	1,438	1,578
Pyrite and pyrrhotite, including cupreous:			
Gross weight, thousand tons	592	486	450
Sulfur content, do.	298	250	232

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
NONMETALS—Continued			
Stone and sand and gravel:			
Dimension stone:			
Unworked:			
Limestone and marble ---thousand tons--	57	49	45
Granite and gneiss ---do---	[r] 107	93	83
Quartz ---do---	75	46	44
Quartzite ---do---	23	23	31
Micaceous schist ---do---	15	16	20
Sandstone ---do---	48	49	50
Other ---do---	[r] 37	39	38
Worked, all types ---do---	[r] 131	123	115
Crushed, broken and other:			
Clay slate ---do---	75	72	81
Dolomite:			
Crude ---do---	319	269	260
Burnt ---do---	50	41	36
Granite and gneiss ---do---	[r] 10,348	6,890	6,464
Limestone:			
For cement ---do---	[r] 5,722	5,661	5,682
For lime ---do---	[r] 1,201	1,155	1,221
For other industrial uses ---do---	[r] 1,466	1,463	1,571
For unspecified uses (includes lime marl) ---do---	[r] 1,393	1,540	1,730
Marble ---do---	116	140	149
Micaceous schist ---do---	NA	15	16
Quartz ---do---	17	19	21
Quartzite ---do---	1,529	1,603	1,861
Sandstone ---do---	283	283	304
Other ---do---	[r] 698	674	544
Sulfur:			
Elemental [e]	5,000	5,000	5,000
Sulfuric acid (100%) and oleum	[r] 758,971	934,701	949,000
Talc and steatite	24,045	26,405	28,029
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	21,860	23,602	[e] 24,000
Coal, all grades [e] ---thousand tons--	10	10	10
Coke:			
Coke oven ---do---	499	536	533
Gashouse ---do---	371	120	--
Oil shale—			
For fuel production use ---do---	136	133	126
For other use ---do---	55	44	8
Peat—			
For agricultural use [e] ---do---	120	[r] 125	130
For fuel use ---do---	27	33	28
Petroleum refinery products:			
Gasoline ---thousand 42-gallon barrels--	11,407	10,702	11,058
Jet fuel ---do---	1,096	864	953
Kerosine ---do---	78	78	39
Distillate fuel oil ---do---	26,043	26,177	24,230
Residual fuel oil ---do---	34,206	32,781	29,630
Lubricants ---do---	576	588	595
Other ---do---	7,751	9,116	5,606
Refinery fuel and losses ---do---	4,623	4,240	10,668
Total ---do---	85,780	84,546	82,779

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

[1] In addition to the commodities listed, cobalt, molybdenum, nickel (as nickel sulfate), and metallic titanium are also produced, but output is not reported and information is inadequate to make reliable estimates of output levels.

[2] Includes sponge iron as follows in thousand tons: 1971—174; 1972—178; 1973—NA.

TRADE

Swedish exports of mineral commodities in 1973 [3] were valued at approximately $1.88 billion,[4] about 38% more than in 1972. The principal items continued to be iron ore and iron and steel, which accounted for 19% and 51%, respectively, of the total mineral export value.

[3] Including the following numerical divisions of the Standard International Trade Classification (SITC): 27, 28, 32, 33, 34, 51.3, 56, 66, 67, and 68.

[4] Conversions from Swedish kronor (SKr) to U.S. dollars were made at the following rates: 1972—SKr 4.762=U.S.$1.00; 1973—SKr 4.357=U.S. $1.00. Source: International Monetary Fund International Financial Statistics, v. 27, No. 9, September 1974, p. 334.

Imports of mineral commodities in 1973 were valued at approximately $2.68 billion, about 39% more than in 1972. The major items were petroleum fuels and iron and steel, which accounted for 40% and 25%, respectively, of the total import value.

The apparent trade deficit for mineral commodities in 1973 was about $800 million, about 43% higher than in 1972. The higher cost of petroleum products was mainly responsible. The average import value of petroleum products increased more than 40% in 1973, and the average value of crude oil imports rose about 18%. The rising costs of imported petroleum fuels offset significant gains made during the year in exports of iron, steel, and nonferrous metals.

Trade in mineral commodities in 1971 and 1972 is shown in tables 2 and 3.

Table 2.—Sweden: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum metal, including alloys:			
Scrap	1,692	1,144	West Germany 812; Denmark 263.
Unwrought	23,662	14,946	Norway 10,774; West Germany 2,397.
Semimanufactures	28,915	33,255	Denmark 7,439; Finland 7,402; Norway 6,090.
Arsenic oxides and acids	12,669	12,638	NA.
Chromium, chrome ore and concentrate	4	32	NA.
Cobalt oxide	--	2	NA.
Copper:			
Ore and concentrate	3,650	14,127	East Germany 14,087.
Matte	706	40	All to Belgium-Luxembourg.
Metal, including alloys:			
Scrap	758	796	United Kingdom 429; West Germany 277.
Unwrought	33,892	26,801	United Kingdom 8,355; West Germany 5,887; France 3,864.
Semimanufactures	35,874	44,874	Norway 12,067; Denmark 10,897; United States 6,704.
Iron and steel:			
Iron ore and concentrate, except roasted pyrite ---thousand tons	26,180	27,610	West Germany 9,421; Belgium-Luxembourg 7,683; United Kingdom 4,062; Netherlands 1,776.
Roasted pyrite ---do---	378	457	West Germany 237; United Kingdom 200.
Metal:			
Scrap ---do---	13	12	West Germany 8.
Pig iron[1] ---do---	73	83	United Kingdom 18; West Germany 10; Japan 10.
Ferroalloys ---do---	64	67	United Kingdom 25; United States 20.
Steel, primary forms ---do---	79	102	Denmark 29; West Germany 24; United Kingdom 19.
Semimanufactures:			
Bars, rods, angles, shapes, sections ---do---	388	436	United Kingdom 101; United States 53; Denmark 51; West Germany 42.
Universals, plates, sheets ---do---	641	764	Denmark 140; West Germany 123; Norway 106; France 86.
Hoop and strip ---do---	60	68	Denmark 10; United States 9; West Germany 7.
Rails and accessories ---do---	35	25	Norway 9; People's Republic of China 6; West Germany 4.
Wire ---do---	58	62	United States 11; West Germany 7; France 6.
Tubes, pipes, fittings ---do---	180	190	United Kingdom 22; Finland 21; West Germany 19.
Castings and forgings, rough ---do---	4	4	Finland 1.
Total ---do---	1,366	1,549	
Lead:			
Ore and concentrate	70,452	55,129	West Germany 29,496; Belgium Luxembourg 6,280.
Oxides	r 766	795	NA.
Metals, including alloys, all forms	26,885	37,118	Italy 12,005; West Germany 10,795.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Magnesium metal including alloys:			
Scrap	59	197	United States 83; West Germany 71.
Unwrought and semimanufactures	4	3	NA.
Manganese:			
Ore and concentrate	293	303	Czechoslovakia 243.
Oxide	25	76	NA.
Molybdenum ore and concentrate	487	1,464	West Germany 1,164; Czechoslovakia 178.
Nickel:			
Ore and concentrate	--	5	NA.
Metal, including alloys:			
Scrap	491	679	West Germany 397.
Unwrought	2,650	2,830	Netherlands 2,319.
Semimanufactures	1,853	1,566	Netherlands 180; Romania 175; United Kingdom 156.
Platinum-group metals and silver:			
Waste and sweepings value, thousands	r $1,004	$972	West Germany $673; United Kingdom $182.
Metals, including alloys, unworked or partly worked:			
Platinum group ----------do----	$237	$337	Finland $169.
Silver ----------do----	$9,115	$7,947	West Germany $4,742; Switzerland $1,597.
Silicon, elemental	8,891	12,807	East Germany 2,851; United Kingdom 1,884; West Germany 1,741.
Tin metal, including alloys:			
Scrap ----------long tons--	55	28	NA.
Unwrought and semimanufactures do----	r 122	135	France 67; Finland 65.
Titanium:			
Ore and concentrate	205	100	All to Brazil.
Oxide	7	33	NA.
Tungsten:			
Ore and concentrate	21	107	France 97.
Metal	163	26	United States 7; West Germany 4.
Zinc:			
Ore and concentrate	211,257	216,178	West Germany 64,908; Belgium-Luxembourg 60,332; Norway 39,019.
Oxide and peroxide	639	1,110	United Kingdom 658; Norway 260.
Metal, including alloys:			
Scrap	2,330	2,508	Norway 843.
Unwrought and semimanufactures	376	611	Finland 478.
Zirconium ore and concentrate	25	33	Norway 30.
Other:			
Ore and concentrate	r 4	26	NA.
Ash and residues containing nonferrous metals	49,816	47,003	Norway 36,152; Italy 5,193.
Oxides, hydroxides, peroxides of metals, n.e.s	r 18	15	Denmark 3.
Base metals, including alloys, all forms	372	2 453	Finland 135; United Kingdom 82.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc. value, thousands	$5	$7	All to Colombia.
Dust and powder of precious and semiprecious stones ----------do----	$8	$5	All to West Germany.
Grinding and polishing wheels and stones	2,701	2,480	West Germany 525; France 312.
Cement, hydraulic	94,398	221,073	NA.
Chalk	5,306	6,158	Denmark 1,758; Norway 1,712.
Clays and clay products (including all refractory brick):			
Crude clays	563	1,051	Denmark 883.
Products:			
Refractory (including nonclay bricks)	34,725	28,378	Denmark 8,796; Norway 8,666.
Nonrefractory	29,003	29,023	Denmark 10,592; Norway 6,955.
Diamond:			
Gem, not set or strung value, thousands	$108	$183	NA.
Industrial ----------do----	$26	$45	United Kingdom $36.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Fertilizer materials:			
Crude, phosphatic	3,914	199	NA.
Manufactured:			
Nitrogenous	54,255	69,622	NA.
Phosphatic, including Thomas slag	r 16,159	137,842	NA.
Potassic	1	3,209	NA.
Other, including mixed	13,457	22,171	NA.
Fluorspar	878	1,526	Finland 1,044.
Graphite, natural	192	126	West Germany 123.
Gypsum and plasters	45	10	NA.
Lime	2,000	2,534	Norway 2,274.
Magnesite	50	36	Norway 34.
Pigments, mineral:			
Crude	18	20	Sri Lanka 13.
Iron oxide	24	5	NA.
Pyrite, gross weight	40,798	10,976	All to United Kingdom.
Salt and brine	546	349	Norway 202; Denmark 120.
Stone and sand and gravel:			
Dimension stone, crude and partly worked:			
Granite, gneiss, sandstone, etc	584,983	621,527	Netherlands 482,816; West Germany 64,631.
Marble and other calcareous	4,236	4,558	Denmark 3,140.
Slate	7,506	7,827	Norway 4,679; Netherlands 2,467.
Dolomite, chiefly refractory grade	4,146	2,563	Denmark 1,306; Norway 1,081.
Gravel and crushed stone thousand tons	1,207	1,186	Denmark 596; West Germany 511.
Limestone	532,484	658,795	Finland 374,554; West Germany 183,381.
Quartz and quartzite	80,369	62,175	Norway 28,737; West Germany 14,273.
Sand, excluding metal bearing	43,974	48,842	Norway 32,933; Denmark 7,804.
Sulfur:			
Elemental, all forms	(3)	68	Norway 66.
Sulfuric acid	215,408	339,863	United Kingdom 137,328; Canada 68,919; Norway 43,170.
Sulfur dioxide	8,951	5,036	Poland 2,953; Norway 1,778.
Talc, steatite, soapstone, and pyrophyllite	2,055	1,627	Netherlands 750; Belgium-Luxembourg 600.
Other nonmetals, n.e.s.:			
Crude	37,516	49,260	United Kingdom 31,128; West Germany 8,241.
Slag, dross, and similar waste, not metal bearing	73,337	65,148	Liberia 30,057; Norway 29,896.
Oxides, hydroxides of magnesium, strontium, barium	34	64	Norway 31; Denmark 25.
Building materials of asphalt, asbestos, fiber cement, and unfired nonmetals, n.e.s	23,492	22,562	West Germany 17,989; Denmark 2,672.
MINERAL FUELS AND RELATED MATERIALS			
Coal and coke, including briquets	10,824	4,090	Norway 3,680.
Noble gases	r 182	4 268	Finland 127; Norway 79; Denmark 54.
Peat, including briquets and litter	24,713	21,226	Denmark 12,341.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	r 1,126	1,496	Denmark 987; Norway 500.
Jet fuel do	224	198	Denmark 163.
Kerosine do	70	81	Norway 79.
Distillate fuel oil do	2,495	2,843	Denmark 1,995; Norway 673.
Residual fuel oil do	4,229	5,013	Denmark 3,198; Norway 994.
Lubricants do	465	451	Norway 135; Finland 102; Denmark 89.
Other:			
Liquefied petroleum gas do	73	387	Denmark 300; Norway 86.
Naphtha do	2,155	1,019	United Kingdom 937.
Not specified do	1,028	1,444	Denmark 377; Norway 371.
Total do	r 11,865	12,932	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	33,145	19,026	Denmark 6,931.

r Revised. NA Not available.

[1] Includes shot, grit, sponge, spiegeleisen, etc., of iron and steel.

[2] Includes beryllium, molybdenum, tantalum, cobalt, and manganese metal.

[3] Less than ½ unit.

[4] Primarily argon; does not include helium.

Table 3.—Sweden: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite and concentrate	34,083	45,823	Greece 24,274; Guyana 10,528; Australia 7,956.
Oxide and hydroxide	197,097	202,294	Jamaica 151,221; West Germany 32,357.
Metal, including alloys:			
Scrap	1,380	1,525	Norway 1,145.
Unwrought	33,528	33,701	Norway 17,838; Ghana 4,558; U.S.S.R. 3,214.
Semimanufactures	29,945	35,156	Norway 8,376; West Germany 3,942; Switzerland 3,581.
Chromium:			
Chromite	187,656	146,177	U.S.S.R. 109,998; Turkey 22,273; Finland 8,262.
Oxide and hydroxide	2,389	2,176	West Germany 685; U.S.S.R. 554; France 544.
Cobalt and hydroxide	5	5	Belgium-Luxembourg 3.
Copper:			
Ore and concentrate	65,901	39,693	Norway 16,007; Chile 9,952; Ireland 8,166.
Matte	10,845	7,159	France 7,075.
Metal, including alloys:			
Scrap	8,277	4,974	United States 1,906; France 1,200; Denmark 838.
Unwrought	69,281	68,714	Chile 20,291; Zambia 17,508; Belgium-Luxembourg 10,436.
Semimanufactures	22,254	24,404	United Kingdom 8,658; Finland 5,127.
Iron and steel:			
Ore and concentrate, except roasted pyrite	2,469	139	NA.
Roasted pyrite	5,945	898	Mainly from Finland.
Metal:			
Scrap	184,115	198,065	U.S.S.R. 109,601; Denmark 36,639; Netherlands 13,038.
Pig iron, including cast iron	358,875	352,670	Finland 102,722; U.S.S.R. 104,352; East Germany 63,258.
Ferroalloys	102,840	129,024	Norway 42,465; India 13,047; New Caledonia 10,627.
Steel, primary forms	53,862	158,261	Finland 104,885; West Germany 28,051.
Semimanufactures:			
Bars, rods, angles, shapes, sections	397,733	443,332	Belgium-Luxembourg 96,649; West Germany 82,829; France 61,857.
Universals, plates, sheets	854,613	947,506	West Germany 173,682; Belgium-Luxembourg 126,385; Finland 63,114.
Hoop and strip	82,118	112,081	West Germany 20,345; Poland 19,942; Belgium-Luxembourg 19,339.
Rails and accessories	4,777	3,387	West Germany 1,739; United Kingdom 403.
Wire	22,846	20,373	United Kingdom 7,044; Belgium-Luxembourg 3,941.
Tubes, pipes, fittings	205,721	235,369	West Germany 69,181; United Kingdom 40,515; France 22,472.
Castings and forgings, rough	8,662	7,070	Poland 3,404; Norway 1,345.
Total	1,576,470	1,769,118	
Lead:			
Oxides	1,219	1,205	United Kingdom 454; East Germany 418.
Metal, including alloys:			
Unwrought	8,247	4,629	United Kingdom 1,926; Peru 1,895.
Semimanufactures	1,612	1,515	West Germany 868.
Magnesium metal, including alloys:			
Unwrought, including scrap	773	912	Norway 716.
Semimanufactures	130	94	Norway 30; United States 18; France 17.
Manganese:			
Ore and concentrate	150,058	101,820	U.S.S.R. 35,148; Zaire 9,933.
Oxides	957	1,141	Japan 521; People's Republic of China 355.
Mercury ——76-pound flasks	1,566	1,363	Spain 1,015; Turkey 174; Mexico 145.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Molybdenum metal, including alloys, all forms	36	51	West Germany 20; Poland 8; Austria 8.
Nickel:			
Matte	1,254	1,488	Canada 774; U.S.S.R. 690.
Metal including alloys:			
Scrap	408	453	United Kingdom 159; United States 146; Netherlands 61.
Unwrought	15,110	15,377	Norway 4,762; United Kingdom 3,083.
Semimanufactures	4,555	4,802	Netherlands 3,603; United Kingdom 531.
Platinum-group metals and silver:			
Ore and concentrate value, thousands	$2,024	$2,914	Peru $1,951; United States $740.
Waste and sweepings do	$474	$1,014	United States $740; Denmark $121.
Metals, including alloys, unwrought or partly worked:			
Platinum group do	$1,878	$2,252	United Kingdom $1,539; West Germany $530.
Silver do	$5,341	$7,324	United Kingdom $4,963; West Germany $1,937.
Tin:			
Oxide long tons	47	39	United Kingdom 31; West Germany 7.
Metal, including alloys:			
Unwrought, including scrap do	554	543	United Kingdom 352.
Semimanufactures do	172	158	United Kingdom 110; West Germany 23.
Titanium:			
Ore and concentrate	2,728	2,927	Australia 2,693.
Oxides	6,770	5,574	West Germany 1,515; Finland 1,372; Japan 704.
Tungsten:			
Ore and concentrate	2,792	2,397	Thailand 1,019; Brazil 534.
Metal, including alloys, all forms	35	21	West Germany 6; United States 5.
Zinc:			
Oxide	2,246	2,284	Netherlands 690; Poland 573; East Germany 383.
Metal, including alloys:			
Blue powder	455	122	Norway 81; United Kingdom 35.
Scrap	--	18	All from Denmark.
Unwrought	37,805	42,893	Norway 26,014; Poland 4,129.
Semimanufactures	1,426	1,356	West Germany 610; Norway 395.
Other:			
Ores and concentrates of molybdenum and zirconium	5,740	6,357	United States 1,585; Netherlands 1,522; Chile 1,245.
Ash and residues containing nonferrous metals	50,031	41,134	West Germany 24,561; Poland 4,908.
Oxides, hydroxides, peroxides of metals, n.e.s	1,392	1,867	Finland 705; West Germany 270; United Kingdom 261; United States 201.
Metals, including alloys, all forms	5,204	5,900	France 951; Norway 826; U.S.S.R. 414.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	448	400	Italy 162; Netherlands 113.
Dust and powder of precious and semiprecious stones value, thousands	$787	$640	United States $277; United Kingdom $144.
Grinding and polishing wheels and stones	3,423	2,701	United Kingdom 975; Austria 652; West Germany 385.
Asbestos	13,231	15,532	Canada 7,205; U.S.S.R. 5,629.
Barite and witherite	2,284	2,185	West Germany 2,103.
Boron materials:			
Crude natural borates	10,682	14,918	United States 9,175; Turkey 4,161.
Oxide and acid	914	691	France 295; Turkey 213.
Cement	31,675	24,864	Denmark 17,666.
Chalk	10,195	12,118	Denmark 7,618; West Germany 3,095.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Clays and clay products, including all refractory brick:			
Crude clays, n.e.s. (bentonite, kaolin, refractory)	275,348	264,702	United Kingdom 223,884; United States 14,356.
Products:			
Nonrefractory	30,928	37,228	Poland 14,807; U.S.S.R. 3,610; West Germany 2,882.
Refractory, including nonclay bricks	124,808	108,778	Austria 31,949; United Kingdom 24,941; West Germany 22,554.
Cryolite and chiolite	2,081	1,704	Denmark 1,684.
Diamond:			
Gem, not set or strung value, thousands	$1,624	$2,415	Belgium-Luxembourg $1,176; Israel $480; U.S.S.R. $473.
Industrial ——do	$1,094	$935	Netherlands $269; United Kingdom $216.
Diatomite and other infusorial earth	8,136	6,013	Denmark 2,668; United States 2,131.
Fertilizer materials:			
Crude:			
Nitrogenous	25,246	18,824	All from Chile.
Phosphatic	476,114	545,969	Morocco 357,118; United States 100,347.
Manufactured:			
Nitrogenous	477,378	530,674	Norway 450,124; Netherlands 37,224.
Phosphatic	13,769	39,250	Tunisia 28,802; Netherlands 10,401.
Potassic	207,991	248,356	NA.
Other	103,401	126,772	Norway 80,834; Netherlands 33,638.
Ammonia	91,264	90,554	Norway 86,967.
Fluorspar	19,552	11,819	People's Republic of China 7,819; East Germany 1,469.
Graphite, natural	1,234	1,035	West Germany 451; People's Republic of China 165.
Gypsum and plasters	505,377	501,784	Poland 208,394; France 136,260; Spain 113,919.
Lime	4,569	3,919	Denmark 3,583.
Magnesite	10,989	9,865	U.S.S.R. 5,240; Austria 1,677.
Mica, all forms	1,197	1,033	United Kingdom 354; Norway 326; West Germany 129.
Pigments, mineral:			
Natural, crude	94	144	West Germany 81; France 44.
Iron oxides, processed	6,475	6,318	West Germany 5,893.
Precious and semiprecious stones, excluding diamond ——value, thousands	r $266	$368	West Germany $167.
Pyrite	115,511	115,024	Norway 114,968.
Salt	959,583	966,964	Netherlands 448,043; West Germany 196,767; United Kingdom 132,405.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	75,945	69,574	Belgium-Luxembourg 46,979; United Kingdom 15,327.
Caustic potash	370	462	West Germany 395.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Marble and other calcareous stone	1,601	1,520	Italy 770; Norway 423.
Slate	4,330	2,353	Norway 2,085.
Other, including granite, gneiss, etc	5,663	3,490	Norway 1,919; Portugal 680; Finland 498.
Worked, all types	17,107	10,595	Portugal 5,764; Italy 1,329.
Dolomite, chiefly refractory grade	18,347	20,858	Norway 19,823.
Gravel and crushed stone	71,557	76,168	Norway 28,515; Denmark 26,743; Finland 12,129.
Limestone (except dimension)	127,588	115,676	United Kingdom 64,778; Denmark 38,974; Norway 10,680.
Quartz and quartzite	24,305	31,191	Portugal 27,884; Spain 1,882.
Sand, excluding metal bearing	366,061	613,247	Denmark 515,853; Belgium-Luxembourg 76,256.
Sulfur:			
Elemental, all forms	126,585	92,288	Poland 46,912; Finland 23,290; France 15,305.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Sulfur—Continued			
Sulfuric acid, including oleum	r 97,428	78,950	Finland 43,183; Norway 35,575.
Sulfur dioxide	1,742	3,077	Norway 1,696; West Germany 1,276.
Talc, steatite, soapstone, and pyrophyllite	20,462	22,088	Norway 11,931; Austria 2,764.
Other nonmetals, n.e.s:			
Crude	51,883	43,601	West Germany 29,391; Norway 8,087.
Slag, dross, and similar waste, not metal bearing	171	1,003	West Germany 902.
Oxides and hydroxides of magnesium, strontium, barium	15,254	14,925	Norway 10,368; United Kingdom 1,428.
Bromine, iodine, and fluorine	20	12	Japan 8.
Building materials of asphalt, asbestos, fiber cement, and unfired nonmetals, n.e.s	18,884	17,634	West Germany 5,154; Belgium-Luxembourg 4,415; Finland 3,488.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	991	708	United States 340; Trinidad and Tobago 221.
Carbon black	17,288	10,995	West Germany 4,855; United Kingdom 3,282.
Coal and briquets:			
Anthracite and bituminous coal thousand tons	1,422	985	U.S.S.R. 400; United States 331; Poland 216.
Coal briquets	580	150	All from East Germany.
Lignite and lignite briquets	8,285	6,484	East Germany 6,049.
Coke and semicoke thousand tons	1,220	1,208	West Germany 415; U.S.S.R. 240; United Kingdom 146.
Peat and peat briquets	448	615	Finland 500; Poland 95.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	87,110	82,684	Nigeria 21,919; Oman 11,048; Venezuela 6,676; Kuwait 6,513.
Refinery products:			
Gasoline ---do---	r 17,174	17,969	United Kingdom 4,679; Trinidad and Tobago 3,427; Denmark 3,162.
Jet fuel ---do---	r 1,093	1,035	United Kingdom 503; Netherlands 326.
Kerosine ---do---	r 1,858	1,566	United Kingdom 560; U.S.S.R. 489; Belgium-Luxembourg 336.
Distillate fuel oil ---do---	50,239	47,950	United Kingdom 16,645; Trinidad and Tobago 6,003; Belgium-Luxembourg 5,306; Denmark 5,039.
Residual fuel oil ---do---	58,824	57,660	U.S.S.R. 21,235; United Kingdom 8,361; Norway 5,681; Belgium-Luxembourg 3,851.
Lubricants ---do---	r 1,365	1,234	United Kingdom 487; West Germany 244.
Other:			
Liquefied petroleum gas ---do---	33	154	United Kingdom 76; Denmark 29; Netherlands 21.
Naphtha ---do---	6,620	7,647	Italy 3,554; Norway 1,825; United Kingdom 952.
Mineral jelly and wax ---do---	r 86	92	West Germany 54.
Not specified ---do---	r 469	1,350	Denmark 214; Netherlands 189.
Total ---do---	r 137,761	136,657	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	29,389	32,800	Netherlands 9,660; Belgium-Luxembourg 6,851; United Kingdom 6,180.

r Revised. NA Not available.

COMMODITY REVIEW

METALS

Aluminum.—Gränges Aluminium division of Gränges AB continued to be the only Swedish producer of primary aluminum. Output of primary metal in 1973 was about 98% of rated productive capacity of the smelter at Sundsvall. The company's production of foundry alloys at Mansbo (12,000 tons) was unchanged compared with 1972, but shipments of semimanufactures from Finspång rose 24% in 1973 to 72,000 tons. Strong demand for aluminum products was expected to continue into 1974.

Swedish production of primary metal was based mainly on imported alumina, for which annual demand at Sundsvall was about 170,000 tons at the present capacity of the smelter. Imports of aluminum oxide and hydroxide in 1973 totaled 188,000 tons, about 10% less than in 1972; imports of bauxite increased about 6% to 49,000 tons. The Gränges company will have a 10% interest in a plant for alumina production that will be built in Ireland by Alcan Aluminium Ltd. by 1978. The participation by Gränges will entitle the company to 80,000 tons of alumina per year.[5]

In November 1973, Gränges Aluminium announced its intention to expand productive capacity at the Sundsvall smelter to 135,000 tons per year at a cost of about $65 million. No date for completion was announced.

Exports of aluminum in 1973 were up about 30% compared with 1972 and included 20,000 tons of unwrought metal and 43,000 tons of semimanufactures. Imports increased about 22% and included 42,000 tons of unwrought metal and 42,000 tons of semimanufactures. Consumption of primary metal (87,400 tons)[6] was slightly less than in 1972.

A new company, Alufluor AB, was formed in 1973 to produce aluminum fluoride. The new company, which is jointly owned by Boliden AB and the Swiss firm of Schweizerische Aluminum A.G., was expected to begin production at Hälsingborg in 1975. Capacity of the proposed plant was not announced.

Arsenic.—Output of refined arsenic at Rönnskär in 1973 was about 6% less than in 1972, but production of arsenic metal was unchanged. Boliden Aktiebolag, which accounts for all Swedish production, reported that its new plant for producing arsenic metal would probably come on-stream in mid-1974. The plant was to have a production capacity of 1,500 tons of metal per year.

Exports of arsenic appeared to decline in 1973, although the total value increased about 10% compared with that of 1972. Exports of arsenic metal[7] in 1973 declined to about 1,180 tons valued at $3.8 million; the value of arsenic oxides exported (quantities were not reported) was approximately $1.6 million.

Copper.—Sweden's mine production of copper increased by about 46% in 1973, as the production capacity of the Aitik mine was increased early in the year. The mine produced 5.9 million tons of crude ore containing 0.4% to 0.5% copper in 1973, 80% more than in the previous year. The copper refinery at Rönnskär was also expanded early in 1973, and output of refined copper was 15% more than in 1972. Plans to build a new plant for cleaning gases from the copper smelter were also announced.[8]

Boliden AB began construction of mine and mill facilities at the Stekenjokk copper-zinc deposits, near the Norwegian border, in 1973. The mine was expected to begin production in 1976. Ore reserves at Stekenjokk were reported to be about 8 million tons, averaging 1.6% Cu and 3.3% Zn.

The Boliden and Gränges companies continued to be active in exploration and development of copper deposits abroad. In Canada, Boliden was associated with Great Lakes Nickel, Ltd., in developing low-grade copper-nickel deposits in Ontario. Gränges, which owned 25% of Bethlehem Copper Corp., reported additional ore reserves in British Columbia in 1973 and continued prospecting of copper and nickel deposits elsewhere in Canada. In Peru, negotiations between Gränges and Minero-Peru concerning development of certain copper deposits in that country apparently continued in 1973.

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[5] Gränges AB. Annual Report to Stockholders for 1973. P. 12.

[6] World Bureau of Metal Statistics (London). World Metal Statistics. V. 27, No. 7, July 1974, p. 10.

[7] Includes exports of elemental selenium, tellurium, and boron.

[8] Boliden Aktiebolag. 1973 Annual Report.

Reserves of copper ore in Sweden, owned or leased by Boliden were reported to be approximately 150 million tons in 1973. Most of the reserves were located at Aitik.[9]

The Gränges Metallverken division produced and shipped approximately 116,000 tons of copper and alloy semimanufactures in 1973, about 20% more than in 1972. During 1973, the company decided to increase production capacity for copper tubes at Västeras by 3,000 tons per year. Expansion of tubemaking capacity at Granefors to 9,000 tons per year was underway during 1973.

Trade in unwrought copper and alloys was less in 1973; exports totaled 19,000 tons and imports totaled 63,000 tons. Trade in semimanufactures increased, however; exports totaled 54,000 tons and imports were 26,000 tons. Sweden's consumption of refined copper was reported[10] at 114,000 tons in 1973 compared with 96,900 tons in 1972.

Iron Ore.—Both production and exports of iron ore reached record levels in 1973. Exports increased to 33.3 million tons, 19% more than in 1972 and 5% more than the previous record set in 1969. The value of exports in 1973 was equivalent to about $350 million, 20% more than in 1972; however, in terms of Swedish kronor, the total value increased only 11% owing to the lower prices received. The average value of iron ore exported in 1973 (SKr 46.4 per metric ton) was 6% less than in 1972. In late 1973, the major Swedish producers obtained price increases averaging about 25% in contracts for iron ore deliveries to foreign consumers in 1974. The 1974 prices were about 15% higher than those obtained in 1971 and 1972.

Production and shipments of iron ore by principal producers in 1973 were as follows, in thousand metric tons:

Company	Production	Shipments		
		Export	Domestic	Total
Luossavaara-Kiirunavaara AB (LKAB)	[1] 27,800	28,800	800	29,600
Tuolluvaara Gruv AB [2]	NA	NA	NA	1,000
Gränges AB	[3] 3,226	2,325	1,511	3,836
Stora Kopparbergs Bergslags AB (SKB)	NA	--	874	874

NA Not available.
[1] Including 6.0 million tons of pellets.
[2] Shipments for Tuolluvaara Gruv AB as reported by LKAB.
[3] Including 1.2 million tons of pellets.

Sources: LKAB and Gränges AB: annual reports to stockholders for 1973; SKB: Skillings' Mining Review. V. 63, No. 15, Apr. 13, 1974, p. 20.

Stocks of iron ore at Swedish mines at yearend totaled 6.2 million tons, compared with 8.8 million tons 1 year earlier.

Production and exports of iron ore pellets by Luossavaara-Kiirunavaara AB (LKAB) were about 1 million tons more than in 1972. The increase was due to completion of a new pelletizing plant at Malmberget. The plant began production in September 1973, and has a nominal output capacity of 2.5 million tons of pellets per year. Total pelletizing capacity of LKAB at yearend was about 7.8 million tons per year, and total production capacity for pellets in Sweden was approximately 10.2 million tons per year.

Swedish exports of iron ore products in 1973 included 6.4 million tons of pellets, 8.1 million tons of unagglomerated ore fines and concentrate. and 18.4 million tons of lump ore. Shipments by LKAB through the Norwegian port of Narvik totaled 23.3 million tons in 634 cargoes, the largest of which was 108,000 tons. LKAB shipments through the Baltic port of Luleå totaled 6.6 million tons in 339 cargoes, the largest of which was about 66,400 tons. Exports by Gränges AB were shipped through Oxelösund.

During 1973. LKAB continued development work on the new main haulage drift on the (—) 540-meter level at Kiruna. Ancillary shafts and a seventh crushing station were completed. Driverless trains were reported[11] to have begun operating on this level in 1973. Sinking of ventilation shafts and an inclined drift to the (—) 775-meter level was also in progress. At the Vitåfors concentrator, which processes Malmberget

[9] Boliden AB. Facts About Boliden–1973. P. 12.
[10] World Metal Statistics. July 1974, p. 36.
[11] Boman, J. Sweden. Min. Ann. Rev., 1974, p. 459.

ore, new concentrating lines were completed that raised productive capacity of the plant to 8 million tons of concentrate per year. Production of hematite ore was begun, and the electrostatic separation plant was expected to start production of hematite concentrate early in 1974.

In central Sweden, Gränges AB continued to mechanize the Grängesberg mine. The company expected to invest about $9 million in 1974, to increase production capacity for low-phosphorous concentrates to 2.5 million tons per year. Stora Kopparbergs Bergslags AB continued to improve production facilities at the Häksberg, Vintjärn, and Blötberget mines. Uddeholms AB ceased production of iron ore at the Finnmosse mine near Persberg in 1973, and in October the Bodas mine near Hofors was closed by Sandvikens Jernverks AB.

Iron and Steel.—Swedish production, trade. and consumption of iron and steel increased in 1973. Compared with the quantities in 1972, production was up about 8%, exports were up 17%, imports increased 12%, and consumption of steel rose 5.8% to 4.28 million tons.

The index of Swedish producer prices for iron, steel, and ferroalloys in 1973 averaged 18% higher than in 1972. For finished steel semimanufactures, the average value of Swedish exports in 1973 was equivalent to $475 per ton ($385 in 1972); the average value of imports was equivalent to $256 per ton ($195 in 1972). The higher prices and increased volume of production and shipments in 1973 resulted in substantially increased profits for at least one major producer of iron and steel. Total investment in the iron and steel industry in 1973 was estimated at $200 million. compared with about $175 million in 1972.

Annual production capacity for pig iron and raw steel in Sweden at yearend was about 3.7 million tons and 6.8 million tons, respectively.[12] Compared with 1972, this represented an increase of 32% for pig iron and 13% for raw steel. The increase for pig iron was due to completion of a new blast furnace at Norrbottens Järnverk AB, the State-owned steelworks at Luleå. Swedish steelmaking capacity was distributed as follows, by process: oxygen, 40%; electric, 40%; and open-hearth, 20%. Alloy and high-carbon steel continued to account for about 28% of total steel output. Production capacity for sponge iron was reduced to 194,000 tons per year, as a plant was closed at Persberg by Uddeholms AB.

Gränges Oxelösunds Järnverk (GOJ), a division of Gränges AB, increased production capacity of its continuous-casting facility by 25%, to 470,000 tons per year. GOJ produced 884,000 tons of pig iron and 939,000 tons of raw steel in 1973. The Nyby division of Gränges, an important producer of stainless steel, expected to complete installation of an argon-oxygen-decarburizing (AOD) converter in the spring of 1974. The Hedlund division of Gränges decided to discontinue production of heavy-gage gasline pipe, which the company has been exporting to the Soviet Union for the last 10 years; the company planned to double its production of helically welded pipe, with particular attention to markets in the developing oil and gas industries of the North Sea area. In southern Sweden, Höganäs AB continued to increase production and shipments of iron powder; shipments by the company rose to 98,000 tons in 1973 (78,000 tons in 1972). A major supplier of iron ore for the Höganäs operations was LKAB, which produced a magnetite concentrate containing 71.2% Fe and 0.008% P from Malmberget ore.

Production of crude forms of alloy and high-carbon steel in 1972 and 1973 is shown by the following tabulation in thousand metric tons:

Type of steel	1972	1973
Stainless	389	467
Heat-treatable, case-hardening, and spring	264	307
High-carbon (unalloyed)	206	230
Tool	77	108
High-speed	23	29
Free-machining	9	13
Other, including ball-bearing	465	442
Total	1,433	1,596

Source: Svensk Järnstatistik, No. 1, 1974, table 5–b.

Imports of raw materials for steelmaking in 1973 included 337,000 tons of pig iron; 278,000 tons of iron and steel scrap; 247,000 tons of chromite; 60,000 tons of manganese ore; 8,000 tons of molybdenum concentrate;[13] 3,800 tons of nickel ore and 12,000 tons of unwrought nickel; 713 tons of vanadium pentoxide and other compounds; and 15,800 tons of fluorspar.

[12] Järnverksföreningen (Stockholm). Svensk Järnstatistik, No. 1, 1974, table 15.

[13] Including ores and concentrates of titanium, tantalum, vanadium, and zirconium.

Consumption of selected raw materials in the manufacture of pig iron, sponge iron, ferroalloys, and raw steel in 1972 is shown in table 4.

Lead and Zinc.—There appeared to be no significant changes in production, trade, or consumption of lead and zinc in 1973. Exports of mine concentrates were up about 4%, but production and trade of lead metal declined. Smelting of zinc concentrates continued to be done abroad, with part of the metal produced being returned to Sweden. Lead concentrates and bullion not processed in Sweden were mostly exported to West Germany, where Boliden AB, the major Swedish producer, had a 50% interest in a smelter and refinery at Nordenham. A 50% interest in the Norwegian zinc smelter at Eitrheim was also owned by Boliden.

Additional reserves of lead ore were reported by Boliden at Guttsjö, about 7 kilometers from the Vassbo mine in west central Sweden. Although lead content was not specified, the quantity of ore in the Vassbo area was said to increase reserves by the equivalent of 10-years' production.[14] The Vassbo mine produced about 211,000 tons of ore in 1972. Boliden's reserves of lead

[14] Boliden AB. 1973 Annual Report. P. 14.

Table 4.—Consumption of selected raw materials

(Thousand metric tons unless otherwise specified)

Materials	Pig iron	Sponge iron [1]	Ferro-alloys	Raw steel
Metallic:				
Iron ore:				
Lump	229	--	--	30
Concentrates (unagglomerated)	--	162	1	--
Pellets	520	84	(2)	88
Sinter [3]	3,524	--	--	(2)
Scrap:				
Iron (including purchased)	27	--	--	202
Steel:				
Stainless	--	--	--	292
Other	6	--	22	[4] 2,736
Pig iron	4	--	--	[5] 2,515
Manganese:				
Ore	--	--	90	--
Metal ---tons	--	--	377	2,977
Chromium:				
Ore	--	--	160	--
Metal ---tons	--	--	--	897
Nickel:				
Unwrought, including scrap	--	--	--	14
Ferronickel	--	--	--	21
Molybdenum:				
Ore ---tons	--	--	2,134	1,937
Compounds ---do	--	--	--	112
Ferromolybdenum ---do	--	--	--	2,736
Vanadium compounds ---do	--	--	809	--
Tungsten ore ---do	--	--	813	3
Ferrocolumbium ---do	--	--	--	442
Cobalt metal ---do	--	--	--	151
Aluminum, unwrought, including scrap ---do	--	--	630	3,436
Nonmetallic:				
Quartz and quartzite	--	--	183	19
Limestone and dolomite	22	14	1	98
Lime [6]	6	--	80	329
Refractory brick, etc	12	2	4	133
Fluorspar	--	--	--	10
Oxygen:				
Liquid ---tons	--	--	--	8,523
Compressed ---thousand cubic meters	41	--	--	173
Fuels and energy:				
Coal	--	--	24	1
Coke	1,248	67	88	4
Fuel oil ---thousand cubic meters	85	17	6	202
Electricity ---million kilowatt-hours	68	75	1,254	1,584

[1] Including pulverized sponge iron.
[2] Less than ½ unit.
[3] Estimated (on basis of table 20 of source publication) to consist about 83% of iron ore and 17% of additives such as mill scale, furnace dust, lime, slag, etc.
[4] Including 121,000 tons of purchased scrap.
[5] Including 1.1 million tons of purchased scrap.
[6] Including slaked lime but excluding lime used in production of iron ore sinter and pellets.

Source: Statistiska Centralbyrån (Stockholm). Bergshantering 1972. Pp. 102–109.

ore, which are mostly located in north Sweden near Laisvall, were reported to be at least 35 million tons in 1973.[15]

Additional deposits of lead and zinc were also reported from Laisvall in 1973, and the company was investing in new production facilities for lead-zinc ore at the Gräns mine (Smedjebacken County) and in development of the copper-zinc deposit at Stekenjokk. (See section on copper.) Expansion of the Zinkgruvan mine near Åmmeberg was also continued by Bolaget Vieille-Montagne.

At Rönnskär, Boliden expected to increase smelting capacity for lead to 60,000 tons per year by using oxygen. A rotary Kaldo furnace will also be installed to process intermediate products obtained from the copper smelter and slag-fuming plant. The Kaldo furnace was expected to produce about 7,000 tons of lead bullion per year, plus other materials containing antimony, arsenic, tin, and zinc. Installation of the oxygen plant and Kaldo unit was scheduled to be completed in 1975.

Consumption of refined lead and slab zinc in Sweden in 1973 was reported to be 33,400 tons and 41,000 tons, respectively.[16] Total consumption was as follows, by end use, in thousand metric tons:

Lead:	
Storage batteries	21.0
Cable sheathing	16.0
Pigments and chemicals	3.3
Alloys	2.4
Miscellaneous	4.6
Zinc:	
Galvanizing	24.0
Brass	17.0
Zinc oxide	2.6
Zinc alloys	2.0

Silicon.—Production and exports of silicon metal continued to increase. Exports in 1973 totaled 16,900 tons, 32% more than in 1972.

Tungsten.—Production data for crude ore or concentrates of tungsten from the Yxsjöberg mine was not available. Development of lower levels of the mine was reportedly underway, and additional equipment for the concentrator was being installed. The operation was designed to produce about 500 tons of scheelite concentrate per year, plus byproduct concentrates of chalcopyrite and fluorspar.

Imports of tungsten concentrate in 1973 totaled 2,442 tons, about the same as in 1972.

NONMETALS

Cement and Other Construction Materials.—With a continuing decline in housing construction, production of cement remained below the levels of 1969–71. As in 1972, output in 1973 was equivalent to about 70% of production capacity. However, exports of cement rose to 796,000 tons in 1973, more than three times the volume exported in 1972. The Euroc Group, which includes AB Cementa (formerly Skånska Cement AB) probably accounted for most exports. Euroc reportedly had a 3-year contract to sell 400,000 to 500,000 tons of cement to a Florida firm. In mid-1973, AB Cementa purchased AB Gullhögens Bruk, giving the Euroc Group a virtual monopoly of the Swedish cement market.

Imports of gypsum totaled 471,000 tons in 1973, about 6% less than in 1972. Imports are expected to decline sharply as production of byproduct gypsum is increased at Boliden's phosphoric acid plant at Hälsingborg. Production in 1973 was less than expected because of start-up problems at the plant. Output of byproduct gypsum was scheduled to reach about 500,000 tons per year, of which about one-half has been committed under long-term contract to Swedish manufacturers of wallboard and cement products.

Fertilizer Materials.—Imports of crude phosphate increased to 627,000 tons in 1973, 15% more than in 1972, and 31% more than in 1971. The average kronor value of imports in 1973 was 20% higher than in 1972. Boliden reported that export prices for crude phosphate from Morocco and the Soviet Union had tripled in 1973. Supra AB, a subsidiary of Boliden and the principal Swedish producer of fertilizer (1.2 million tons in 1973), raised fertilizer prices by an average of 10% in June 1973 and by an additional 11% in December. About 80% of the fertilizer manufactured by Supra contains phosphorus.

Imports of potassium salts and manufactured fertilizers in 1973 totaled 863,000 tons, down slightly compared with 1972. Exports of phosphate fertilizer were reduced about

[15] Boliden AB. Facts About Boliden–1973. Company brochure, p. 14. This figure does not include lead ore contained in complex ores containing copper, zinc or other metals. Reserves of complex ores were stated to be at least 45 million tons.

[16] Pages 69–96 of work cited in footnote 6.

40% to 81,000 tons. Production of phosphoric acid by the Chemicals Division of Boliden increased to 95,600 tons (51,800 tons in 1972) although mechanical difficulties interrupted production in the company's new acid plant at Hälsingborg. The plant's production capacity for phosphoric acid was rated at 100,000 tons per year.

Supra AB was participating with Norwegian, Danish, and British companies in studying the feasibility of constructing an ammonia plant in Scotland. The proposed plant would have a production capacity of 700,000 tons of ammonia per year, based on natural gas, and would be completed by 1977. Supra would have a 25% interest in the venture. Production capacity for ammonia in Sweden was about 110,000 tons per year, using fuel oil and waste oil as raw materials.[17] Imports of nitrogenous fertilizers have averaged more than 500,000 tons per year since 1970.

Fluorspar.—Production of fluorspar concentrates at the Yxsjöberg mine, Sweden's only producer, was more than 4,500 tons in 1973. Imports of fluorspar increased, however, to 15,800 tons.

Consumption of fluorine-bearing materials in the manufacture of primary metals in 1972 included 9,973 tons of fluorspar and 1,825 tons of hydrofluoric acid. Fluosilicic acid was being produced by Boliden in 1973 as a byproduct of the phosphoric acid plant at Hälsingborg.

Sulfur.—Production of sulfuric acid by Boliden totaled 822,000 tons in 1973, slightly less than in 1972. Output from smelter gases at Skellefteå included 164,900 tons of acid and 32,500 tons of liquid sulfur dioxide. Production from pyrite at the company's Hälsingborg plants included 657,100 tons of acid and 23,600 tons of liquid sulfur dioxide. The reduction in output of acid was mainly due to more stringent pollution controls. Boliden produced about 87% of Sweden's output of sulfuric acid; the remainder was produced by Gränges AB, Stora Kopparbergs Bergslags AB, and Elektrokemiska AB.

Exports of sulfuric acid in 1973 totaled 265,000 tons, about 22% less than in 1972. Imports increased to 112,000 tons. Imports of elemental sulfur totaled 101,000 tons.

MINERAL FUELS

Energy.—*Electric.*—Production of electricity in 1973 was 78.08 billion kilowatt-hours, 9% more than in 1972. Hydroelectric plants accounted for about 77% of the total output; conventional thermoelectric plants produced 20%; and nuclear powerplants produced 3%. Total generating capacity installed in Sweden at yearend was 22,260 megawatts, of which 61% was in hydroelectric facilities, 36.5% in conventional thermal plants, and 2.5% in nuclear powerplants. Consumption of electricity in 1972 was distributed as follows: industry 55%, households 42%, and railways 3%.

Consumption of fuels in the generation of electricity in 1972 (17.9 billion kilowatt-hours) was as follows:

Fuel oils ——thousand cubic meters——	3,203
Gasoline, kerosine, and diesel oil —do——	5
Blast-furnace and coke-oven gas —do——	167,884
Wood waste ——————————do——	219
Trash ——————————thousand tons——	129
Other fuels thousand-ton oil equivalent [1]——	399

[1] 1-ton oil equivalent stated to be equal to 4.19×10^{10} joules.

Source: Statistiska Centralbyrån (Stockholm). 1972 Elförsöjningen (Electric Energy Statistics). Statistiska Meddelanden, No. I–1973:51, p. 43 (table 19).

Nuclear.—The Oskarshamn powerplant continued to be the only nuclear facility of commercial size operating in Sweden, and it accounted for about 98% of the electricity produced from nuclear sources in 1973. Three more plants, with a total generating capacity of 2,160 megawatts, were expected to begin service in 1974: one at Oskarshamn and two near Göteborg. Seven additional plant with total generating capacity of 5,200 megawatts were scheduled to begin service by 1981 and 1990, but these were not yet approved by the Government. Nuclear powerplants were expected to produce 15% of Sweden's output of electricity in 1975, 30% in 1980, and 50% in 1985.[18]

AB Atomenergi continued experimental extraction of uranium from low-grade deposits in shale at Ranstad. The Swedish Geological Survey was intensifying its search for additional deposits of uranium, and an increase of funds for this purpose (to $2.2 million) was approved by the Government for fiscal year 1974.[19]

[17] Sveriges Kemiska Industrikontor (Stockholm). Sweden's Chemical Industry. 1973, p. 11.
[18] U.S. Embassy, Stockholm. State Department Airgram A-368, Sept. 7, 1973.
[19] U.S. Embassy, Stockholm. State Department Airgram A-262, Aug. 27, 1974.

Coal and Coke.—Imports of solid fuels in 1973 included 1.03 million tons of coal, 1.5 million tons of coke, and about 10,000 tons of lignite. Compared with 1972, imports of coke increased 24% in quantity and 31% in value. A small amount of low-grade coal continued to be produced in southern Sweden by Höganäs, as a byproduct of clay-mining operations.

Some statistics on consumption of purchased coal and coke by mining and primary metal industries in 1972, in metric tons, were as follows:

	Coal	Coke
Iron ore mines	23,260	129,156
Iron and steel works	841	1,322,891
Ferroalloy works	24,215	88,168
Other iron-manufacturing	14	2,604
Nonferrous metal smelters	64,538	6
Lime manufacturing	8,827	16,387
Other mines, quarries, etc	83	5
Total	121,778	1,559,217

Source: Statistiska Centralbyrån (Stockholm). Bergshantering 1972. Pp. 66–67, table 8.

Petroleum.—Exploration for oil and gas in the Baltic and North Sea areas was continued in 1973 by Oljeprospektering AB. Seven offshore wells were reportedly drilled in 1973; two off southern Skåne, two in Hano Bay, and three south of the island of Götland.[20] No significant deposits of oil or gas were reported. A new company, Petroswede AB, was organized in 1973 to extend exploration for oil and gas to foreign areas including the North Sea. The company is owned 50% by the Government and 50% by private concerns.

Imports of crude oil in 1973 totaled 10.6 million tons, 5% less than in 1972 and 11% less than in 1971. Imports of petroleum products rose to 19.6 million tons; exports of petroleum products declined to 1.4 million tons. Throughput of crude oil and feedstocks at Swedish refineries in 1973 totaled 11.6 million tons, about 5% less than in 1972. Inland consumption of petroleum products was reported as follows, in thousand metric tons:

	1972	1973
Gasoline	3,003	3,163
Kerosine	137	138
Gas/diesel oil	8,961	9,487
Residual fuel oil	12,430	12,314
Other	1,600	1,875
Total	26,131	26,977

Source: Organization for Economic Cooperation and Development (Paris). Provisional Oil Statistics by Quarters, 1st Quarter 1974, 21 pp.

Petroleum-refining capacity in Sweden in 1973 remained at about 13 million tons per year. This total was expected to increase to 20 million tons per year in 1974 when a new refinery is completed near Lysekil. Participants in the Lysekil venture included the Swedish consumers' cooperative, Oljekonsumenterna AB, and Texaco, Inc. Near Göteborg, British Petroleum Raffinaderi AB and AB Svenska Shell were planning to increase annual refining capacity of existing plants by 9 million tons and 7 million tons, respectively. Also, AB Nynäs-Petroleum was reportedly planning to build a large refinery at Hissingen.[21]

[20] Petroleum Publishing Co. International Petroleum Encyclopedia. Sweden. Tulsa, Okla., 1974, p. 36.

[21] Petroleum Publishing Co. International Petroleum Encyclopedia. Sweden. Tulsa, Okla., 1974, p. 39.

The Mineral Industry of Taiwan

By K. P. Wang [1]

Because of the scarcity of local resources and the rising demand for minerals in an industrial economy, Taiwan's importation and processing activities in minerals and metals overshadow indigenous extraction. A comparison of output values show that the mineral processing sector outweighed the mining sector by 19 to 1 in 1973, up from 15 to 1 only a year earlier. In fact, the mineral processing sector accounted for 20.6% of the 1973 estimated gross national product (GNP), compared with 1.1% for the mining sector; in absolute values, the former made a gain of 36% during the year whereas the latter gained only 7.3%. Breakdown by value of output for specific mineral-related sectors, in million U.S. dollars [2] follow:

Economic sector	1972	1973
Overall mining	88.6	95.2
Coal	48.2	48.0
Metals	8.7	12.8
Oil and natural gas	24.1	28.4
Salt evaporation	3.4	2.5
Nonmetals and quarrying	4.2	3.5
Manufacturing of mineral and related products	1,346.0	1,839.0
Chemical products	522.0	695.0
Oil and coal products	344.0	411.0
Nonmetallic mineral products	210.0	227.0
Base metals	230.0	428.0
Metal products	40.0	78.0

GNP growth in 1973, at 22% in current prices and 12% in constant 1966 prices, was not quite as spectacular as mineral growth, although it was above the goal of the fifth 4-year plan which began in 1969. Estimated GNP for 1973 was $8.92 billion at current prices and $6.38 billion at 1966 prices, compared with $7.31 billion and $5.68 billion, respectively, for 1972. The trend towards greater industrialization continued in 1973 with industrial production increasing to 38% of the net domestic product and agricultural production declining to below 16% for the first time. Rapid advances in the economy have been made despite severe inflation. In 1973 average prices showed sharp upturns of 23% for wholesale prices and 13% for consumer prices, compared with 1972.

Taiwan was also caught in the oil squeeze which saw the f.o.b. Middle East price per barrel of light crude increase from about $2.59 to $11.65. However, the Government kept down the price of oil and electricity as well as prices of transportation and communication services and did not announce price adjustments until January 26, 1974.

The importance of foreign investment to development plans, especially U.S. capital, continued to be emphasized. Total foreign equity arrangements were still possible, if the Government was interested in a specific project. Effective January 1974, the Statute for the Encouragement of Investment was amended as follows: (1) Corporate income tax rates were raised to 30% to 35% for newly organized enterprises with the old rates of 22% to 25% still in effect for existing enterprises until 1980, and (2) the withholding tax on dividends paid by nonresidents was increased from 15% to 35%, but any amount above 15% was refundable to the extent not allowed by home governments as tax credits. The criteria for industries eligible for "encouragement" was revised to emphasize high technology and large-scale industries and to remove "primary and saturated" industries from the approved list. The basic incentives, however,

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[1] Physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

[2] Where necessary, values have been converted from New Taiwan dollars (NT$) to U.S. dollars at the rate of NT$40=$1.00. This rate prevailed until February 16 when it was officially changed to NT$38=US$1.00. In the fall, the oil crisis caused the exchange rate to fluctuate somewhat.

were retained, including tax holidays, depreciation allowances, quick processing of applications, effective preinvestment consultations, prompt handling of foreign exchange remittances, and close cooperation with foreign embassies on investment insurance. In 1973, direct foreign investment approvals reached $249 million, nearly twice the amount for 1972. U.S. investment was $67 million in 1973, excluding foreign-based U.S.-affiliated firms.

Taiwan's large governmental mineral projects were either under the central government, usually the Ministry of Economic Affairs (MEA), or the provincial government. Within MEA there is a Department of Mines, a small organization dealing with policy and administrative matters. In October 1973, the Institute of Industrial Technology was formed, to merge the work and facilities of the Mining Service Organization in Taipei, the Metal Industries Research Institute in Kaohsiung, and the Union Research Institute in Hsinchu, all three formerly belonged to MEA. The new semiofficial organization will have 21 laboratories with assets of over $10 million, a staff of 500 initially, and independent paying and hiring policies and schedules. The hope was to develop a strong resources research institute in Taiwan to support the mineral and related industries.

Taiwan moved ahead on its program to expand mineral processing and refining industries based primarily on foreign raw materials. Scheduled construction of the large integrated steel complex of China Iron and Steel Corp. Ltd. will be delayed only slightly despite the change of technical consultants from Voest Steel Corp. of Austria, to a subsidiary of United States Steel Corp. Taiwan Aluminum Corps.'s (TALCO) project to build a new 32,000-ton-per-year reduction plant (together with a corresponding alumina plant) to complement the 38,000-ton plant now in existence has been moved up in schedule to yearend 1975. The China Petroleum Corp. (CPC) was scheduled to add 70,000 barrels per day (bpd) capacity to the more than 200,000 bpd already installed. All three of these plants are in Kaohsiung, reflecting the city's importance as an industrial city. CPC was also building a 100,000-bpd oil refinery complex in the north near Keelung, due for completion by 1975. The Taiwan Ship Building Corp. recently completed three 100,000-ton tankers for CPC. The proposed 30,000-ton-per-year integrated copper smelter of Taiwan Metal Mining Corp (TMMC) was still on the drawing boards.

Taiwan's output of electric power was about 19.8 billion kilowatt-hours in 1973, 13.1% higher than that of 1972. The bulk of Taiwan's power was produced by the Taiwan Power Co. (TPC). Taiwan's installed power capacity was 3.5 million kilowatts in early 1973, and about 3 million kilowatts was expected to be added by 1976. The Talin thermal powerplant in Kaohsiung with two existing units aggregating 600,000 kilowatts, was being greatly expanded; an additional three units were being built (for completion by 1974 and 1975) totaling 1,250,000 kilowatts. The Chinshan nuclear powerplant with two units of 636,000 kilowatts each was started in November 1970 and scheduled for completion by yearend 1976. These two projects together were budgeted for approximately $520 million. TPC also has a $20 million contract for completing four units at Linkou by 1974 with a combined generating capacity of 265,000 kilowatts.

Taiwan's industries consumed 13.52 billion kilowatt-hours of electricity in 1973, including 6.2 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, 1,302; basic industrial chemicals, 1,050; cement, 763; chemical fertilizers, 536; aluminum, 181; other chemical products, 1,546; mining and quarrying, 311; metal products, 324; and ceramics, 150.

PRODUCTION

Coal output declined 15%, whereas crude oil and natural gas production gained 16% and 15%, respectively. Neither oil nor gas production was of consequence by world standards, but the former was important to the domestic economy. The real significance in oil was in the production and consumption of refinery products derived from imported crude, which far overshadowed domestic crude in overall oil sup-

ply. Production of gasoline, diesel oil, and fuel oil in 1973 went up 15.0%, 25.8%, and 26.2%, respectively, over that of 1972.

Steel ingot output rose by 11% during 1973. Aluminum production showed an increase of only 9% as a result of a power shortage in the first half of 1973. Mine copper production made a slight recovery, because of successful leaching operations, and refined copper production increased by 42% over 1972.

The chemical fertilizer industry showed a sharp gain in ammonium sulfate output, and only minor changes in output of most other fertilizer products. Salt output took another radical downturn despite plans to expand output. Increased domestic demand for cement absorbed the 5% growth in output. The marble industry suffered a major setback (down 40%), after 2 years of significant gains.

Table 1.—Taiwan: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Aluminum:			
Alumina, gross weight	43,011	52,602	e 57,500
Metal, primary	26,546	32,104	35,111
Sheet	[1] 14,635	18,593	20,822
Copper:			
Mine output, metal content e	2,400	2,000	2,100
Metal, refined, secondary	3,670	4,677	6,649
Gold metal, primary—troy ounces	19,496	17,882	22,197
Iron and steel:			
Iron ore and concentrate	--	28,291	e 30,000
Pig iron	76,622	81,022	149,776
Ferroalloys (ferrosilicon)	7,675	7,003	7,997
Crude steel	391,882	456,914	507,474
Silver metal, primary—thousand troy ounces	73	74	93
NONMETALS			
Asbestos	2,327	2,687	5,308
Cement, hydraulic—thousand tons	5,043	5,690	5,975
Fertilizer materials, manufactured:			
Urea (46% N)—do	140	201	180
Ammonium sulfate (21% N)—do	401	392	529
Ammonia, anhydrous—do	142	159	145
Nitrochalk (20% N)—do	18	11	23
Compound fertilizer (20% N, 5% P_2O_5, 10% K_2O)—do	141	199	216
Calcium superphosphate (18% P_2O_5)—do	195	205	201
Gypsum:			
Precipitated	3,662	2,541	1,470
Other	12,676	3,459	3,534
Lime—thousand tons	171	177	136
Pyrites and pyrrhotite (including cupreous): [2]			
Gross weight	45,229	30,326	11,216
Sulfur content e	17,100	11,500	4,300
Salt, marine	669,692	440,079	314,749
Stone:			
Dolomite—thousand tons	91	98	126
Limestone—do	7,564	8,534	e 9,000
Marble—do	1,510	1,773	1,069
Sulfur, elemental, native other than Frasch [3]	5,191	3,663	5,595
Talc and related materials, soapstone	39,042	24,792	23,124
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	146	197	e 200
Coal, bituminous—thousand tons	4,097	3,913	3,327
Coke—do	254	249	218
Gas, natural: [4]			
Gross production—million cubic feet	38,520	44,632	51,358
Marketed—do	38,427	44,186	e 51,000
Natural gas liquids:			
Condensate—thousand 42-gallon barrels	792	910	NA
Liquefied petroleum gas from natural gas—do	419	614	NA
Natural gasoline—do	127	163	NA
Petroleum:			
Crude—do	792	910	1,055
Refinery products:			
Gasoline—do	5,097	5,567	6,401
Jet fuel e—do	4,600	5,000	5,900
Kerosine—do	291	258	204
Distillate fuel oil—do	7,676	8,888	11,181
Residual fuel oil—do	17,759	24,965	31,519
Liquefied petroleum gas—do	1,581	2,418	2,842
Asphalt—do	951	913	1,012
Lubricants—do	260	329	549
Other [5]—do	1,018	1,044	1,124

e Estimate. p Preliminary. NA Not available.

[1] Taiwan Aluminum Corp. production only, does not include small quantities that may have been produced by independent producers.

[2] From Chinkuashih only.

[3] Excludes sulfur produced by oil refineries.

[4] Largely processed into natural gas liquids.

[5] Includes only solvents and base oils according to Chinese definitions.

TRADE [3]

Rapid trade expansion continued to be the principal force behind the country's fast economic growth in 1973. Taiwan has become a major trading nation, ranking within the first 20 in the world. On the basis of customs statistics, the two-way trade reached $8.28 billion (weighted conversion by Taiwan's Inspectorate General of Customs), up by 50.4% from the previous year. Exports rose by 50.0% to $4.48 billion, and imports rose by 50.9% to $3.79 billion; both were record achievements by wide margins. Industrial products represented 85% of all exports, with textiles, electrical machinery and supplies, wood products, and machinery and metal products leading the way in that order. The largest import items were electrical machinery and supplies, tools and machinery, basic metals, and chemicals in that order. The United States and Japan remained the most important trading partners.

In 1973 mineral and metal products represented 3% to 4% of all exports and possibly 16% of all imports, reflecting Taiwan's reliance on imported raw materials and semimanufactures. During the year, mineral exports declined by roughly $20 million, mainly on account of reduced exports of steel products. Mineral imports showed no great change, with base metal imports increasing and liquid fuel imports declining. Table 2 shows the breakdown of principal mineral items traded during the last 3 years, in terms of value.

[3] Industry of Free China (Taipei, Taiwan). Brief Report of Taiwan's Economy, 1973. March 1974, pp. 23–30.

Table 2.—Value of principal mineral exports and imports

(Million New Taiwan dollars (NT$)) [1]

Commodity	1971	1972	1973
EXPORTS			
Iron and steel products	1,860	3,137	2,218
Nonferrous metals	420	805	772
Copper, primary materials	120	140	NA
Cement and products	560	555	312
Glass products	403	549	739
Structural clay	122	137	NA
Refined oil products	321	498	707
Bunkering oil	NA	1,000	1,100
IMPORTS			
Iron and steel products	5,000	6,891	11,333
Scrap iron	1,060	1,050	2,023
Nonferrous metals	1,720	2,697	3,760
Natural phosphates	110	125	122
Chemical fertilizers	183	175	286
Crude oil	2,352	6,871	3,784
Refined petroleum	1,215	1,288	[2] 1,637
Coal and coke	45	92	200
Bauxite	61	55	NA
Iron ore	53	NA	76
Other metallic ores and oxides (mainly titania)	NA	NA	230
Asbestos	52	NA	111
Clays	51	55	164
Glass products	38	236	NA
Sulfur	153	132	110
Other nonmetallics	NA	300	350

NA Not available.

[1] The value of the NT$ was NT$40=US$1.00 during 1971, and Jan. 1 to Feb. 15, 1973. The rest of 1973 was officially at NT$38=US$1.00, although the oil crisis affected the rate in the last quarter.

[2] Includes NT$1,268 million fuel oil and NT$260 million lubricating oil.

Source: Industry of Free China, (Taipei, Taiwan). March 1974, pp. 106–143. Monthly Statistics of Trade, Inspectorate General of Customs (Taipei, Taiwan). December 1973.

Table 3.—Taiwan: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Oxide and hydroxide	NA	720	Hong Kong 300; Republic of Korea 200; Singapore 200.
Metal, including alloys, all forms	3,954	8,972	Hong Kong 2,933; South Vietnam 1,320; Japan 1,010.
Copper:			
Ore and concentrate	2,462	575	All to Japan.
Metal, including alloys, all forms	3,419	15,601	Japan 12,539; Hong Kong 2,705.
Iron and steel:			
Metal:			
Scrap	11,710	59,952	Japan 25,208; Hong Kong 15,443; Thailand 14,336.
Pig iron, ferroalloys, and other similar materials	10,820	32,706	Japan 24,744; Thailand 1,590; India 1,500.
Steel, primary forms	5,411	37,115	Hong Kong 10,175; Ryukyu Islands 9,400; Indonesia 5,350; Malaysia 4,600.
Semimanufactures:			
Bars, rods, angles, shapes, sections thousand tons	222	346	Indonesia 130; Saudi Arabia 84; United States 40.
Universals, plates, sheets --do	17	35	Indonesia 12; Thailand 10; Saudi Arabia 3; Singapore 2.
Other --do	101	126	United States 64; Indonesia 21.
Lead metal, including alloys, all forms	(1)	152	Japan 131; Hong Kong 20.
Magnesium metal, including alloys, all forms	NA	100	All to Japan.
Manganese oxide	NA	100	All to Khmer Republic.
Nickel metal, including alloys, all forms	NA	1,178	Japan 1,021; Hong Kong 145.
Platinum metal, including alloys, all forms kilograms	127	7,465	All to United Kingdom.
Tin metal, including alloys, all forms long tons	16	55	Singapore 31; Hong Kong 13.
Zinc:			
Oxide	NA	639	Philippines 225; Thailand 126; Malaysia 96.
Metal, including alloys, all forms	--	35	United States 13; Jamaica 8; Australia 4.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	64	44	Japan 19; Philippines 19.
Asbestos	21	5	All to Hong Kong.
Cement	977	1,081	South Vietnam 365; Hong Kong 338; Indonesia 216.
Chalk	NA	9	United States 8.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	75	1,751	Thailand 932; Philippines 615.
Products	41,229	21,582	Hong Kong 9,768; Malaysia 4,684; Philippines 1,402.
Feldspar and fluorspar	NA	120	Thailand 60; Philippines 30; Indonesia 25.
Fertilizer materials:			
Manufactured:			
Nitrogenous	5,630	58,055	Indonesia 28,004; India 18,750; Philippines 6,500.
Phosphatic	NA	19,851	Thailand 19,850.
Potassic	--	2,000	All to Republic of Korea.
Other, including mixed	18,278	143	Hong Kong 93; Philippines 50.
Ammonia	374	114	Singapore 48; South Vietnam 43; Japan 23.
Graphite, natural	10	10	Ryukyu Islands 10.
Salt and brine	--	13,693	Hong Kong 7,193; Philippines 4,000; Ryukyu Islands 2,500.
Sodium and potassium compounds, n.e.s	8,075	9,512	Indonesia 4,603; Hong Kong 2,483; Republic of Korea 814.
Other nonmetals, n.e.s.:			
Crude	226,175	611	Indonesia 200; Thailand 145; South Vietnam 100.
Slag, dross and similar waste, not metal bearing	3,591	448	Thailand 400; Indonesia 30.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	332	3,103	Hong Kong 1,528; Ryukyu Islands 531.

See footnotes at end of table.

Table 3.—Taiwan: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
MINERAL FUELS AND RELATED MATERIALS			
Coal and coke, including briquets	14,142	13,740	Thailand 4,260; Singapore 3,965; Hong Kong 1,695.
Peat	NA	7	All to Hong Kong.
Petroleum refinery products:			
Gasoline (including natural) thousand 42-gallon barrels	205	120	Australia 117.
Kerosine ---do---	75	535	United States Territories in the Pacific Area 464; Hong Kong 70.
Distillate fuel oil ---do---	452	1,350	Japan 1,125; Hong Kong 184.
Residual fuel oil ---do---	NA	36	All to Singapore.
Lubricants ---do---	316	343	Japan 204; Republic of Korea 71; Philippines 34.
Other ---do---	309	71	Indonesia 30; South Vietnam 25.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	43,008	100,462	Japan 79,489; Philippines 18,018.

NA Not available.
[1] Less than ½ unit.

Table 4.—Taiwan: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Bauxite and concentrate ---thousand tons---	132	106
Metal, including alloys:		
Scrap	3,223	4,012
Unwrought and semimanufactures	5,415	8,066
Arsenic, natural sulfides	6	3
Chromite	NA	4,026
Cobalt oxide and hydroxide	9	11
Copper:		
Ore and concentrate	4	[1]
Metal, including alloys, all forms	13,798	28,948
Iron and Steel:		
Ore and concentrate ---thousand tons---	100	82
Metal:		
Scrap ---do---	506	603
Pig iron, ferroalloys, and other similar materials ---do---	70	16
Steel, primary forms ---do---	57	26
Semimanufactures ---do---	739	830
Lead metal, including alloys, all forms	5,787	7,767
Magnesium metal, including alloys, all forms	NA	73
Manganese oxide	2,312	3,332
Mercury ---76-pound flasks---	3,741	2,273
Nickel metal, including alloys, all forms	685	1,295
Tin metal, including alloys, all forms ---long tons---	739	934
Titanium oxides	7,110	9,321
Zinc:		
Oxide and peroxide	NA	376
Metal, including alloys, all forms	17,949	28,816
Other:		
Ore and concentrate	23,831	1,987
Ash and residue containing nonferrous metals	5,427	760
Base metals, including alloys, all forms, n.e.s	403	271
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	3,474	4,738
Asbestos	4,961	7,175
Cement	2,901	4,141
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	1,248	54,609
Products	4,703	4,452
Feldspar and fluorspar	NA	9,716

See footnote at end of table.

Table 4.—Taiwan: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1971	1972
NONMETALS—Continued			
Fertilizer materials:			
Manufactured:			
Nitrogenous		1,140	1
Potassic		99,133	111,546
Other, including mixed		260	55
Ammonia		NA	10
Graphite, natural		5,813	4,247
Gypsum	thousand tons	102	142
Mica, crude, including splittings and waste		58	394
Salt and brine		NA	17,596
Sodium and potassium compounds, n.e.s.:			
Caustic soda		3,041	1,554
Caustic potash, sodic and potassic peroxides		263	406
Sulfur, elemental, all forms	thousand tons	148	243
Other:			
Crude		209	20,381
Slag, dross, and similar materials, not metal bearing		34,735	6,989
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s		418	116
MINERAL FUELS AND RELATED MATERIALS			
Carbon black and gas carbon	thousand tons	6	8
Coal and coke, including briquets	do	11	25
Petroleum:			
Crude and partly refined	thousand 42-gallon barrels	25,691	81,831
Refinery products:			
Distillate fuel oil	do	11,955	13,404
Residual fuel oil	do	NA	6
Liquefied petroleum gas	do	NA	640
Lubricants	do	297	297
Mineral jelly and wax	do	55	41
Other	do	112	114
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals		20,961	132

NA Not available.
[1] Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—The Government-owned TALCO, sole producer of primary aluminum, was not able to sustain full-scale operations at its newly expanded Kaohsiung facilities, rated at 76,000 tons of alumina and 38,000 tons of aluminum annually, until the second half of 1973 because of power shortages during the first part of the year. A $70 million program was underway to increase capacity further to 140,000 tons of alumina and 70,000 tons of aluminum annually by yearend 1975. The French company Péchiney had been providing technical assistance to TALCO since 1963, having been intimately involved in the recently completed first-stage expansion, and will also give help in the second-stage expansion now being implemented. The cost of U.S. goods and services in the latest expansion will total about $22 million, and the Export-Import Bank of the United States had agreed to finance 45% of this sum and guarantee another 45% in the forms of loan from private banks.

In 1973, Taiwan produced 35,111 tons of primary aluminum ingot (a gain of 9% over 1972 production), approximately 3,000 tons of secondary aluminum, 20,822 tons of aluminum sheets, 18,805 tons of aluminum products, and 1,864 tons of aluminum foil. All of the primary aluminum, the bulk of the sheets and plates, all of the foil, and a minor part of the products were produced by TALCO. Two small private firms—China Wire & Cable Co. and Walsin Electric Wire & Cable Co.—produced the entire tonnage of secondary aluminum and more than 80% of the extrusions. At yearend 1973, the two private aluminum extruders together had one 3,000-ton press, one 2,000-ton press, three 1,500-ton presses, two 1,200-ton presses and a number of smaller presses.[4] TALCO's hot-rolling capacity of 50,000 tons and cold-rolling capacity of 23,000 tons per year were being greatly expanded. In

[4] Wang, C. Taiwan. Aluminum (Dusseldorf, Germany). V. 50, No. 1, January 1973, pp. 82–83.

1973, a 1,500-ton-per-year aluminum rod and wire mill, an aluminum can plant, a shipping container, a truckbody-kit plant, and a 36-inch coating line were placed in operation by TALCO.

Taiwan's 1973 aluminum consumption was estimated at 50,000 tons, up more than 70% from 1972. TALCO officials believe that consumption might even grow to 90,000 tons by late 1976 if government restrictions are lifted. Building and construction, transportation, electrical goods, containers and packaging, consumer durables, and machinery and equipment were the major areas of consumption.

In 1973, Taiwan exported about 9,000 tons of aluminum semimanufactures, including 4,600 tons of sheets and plates, 1,400 tons of wire, 1,500 tons of bars, and 700 tons of extrusions. Household utensils were the only important end product exported; the total was about 4,200 tons. Imports totaled over 30,000 tons in 1973, including 14,672 tons of unwrought aluminum, 13,225 tons of scrap, 1,000 tons of bars and rods, 780 tons of sheets and plates, and 700 tons of foil.

As usual, Taiwan imported all the necessary bauxite (the island consumed about 140,000 tons in 1973, and will need about 10% more in 1974), mainly from two adjoining mines in Johore, Malaysia and from Australia. The bauxite was converted to alumina by TALCO, requiring about 18,000 to 20,000 tons of caustic soda. There was still no serious effort to consider importing alumina, and expansion plans underway for making alumina indicate that foreign bauxite will continue to be the principal raw material for at least 3 more years. Power shortages have been a problem at reduction plants, but TALCO's new diesel plant should help to relieve this. However, costs will be high. TALCO has cut down electricity consumption per unit to about 16,000 kilowatt-hours per metric ton of aluminum.

Copper.—The Government-owned TMMC controlled most of the copper business in Taiwan. Output of mine copper (virtually all from the Chinkuashih mine) increased only slightly, but most of the product was in the form of cement copper (25% to 30% copper) and copper matte (40% to 45% copper) rather than concentrates (15% to 20% copper). Expansion of an inplace leaching program brought production to about 1,000 tons of cement copper per year; ultimately, the hope is to double this. Previously, the entire production had been sent to Japan for custom smelting. A matte smelter was completed at Chinkuashih during the year. Japanese official trade returns show that 1,038 tons of copper concentrates and 5,681 tons of cement copper and copper matte were imported from Taiwan in 1973. Chinkuashih also provided small amounts of precious metals and considerable by-product pyrite.

TMMC's existing refinery uses copper and brass scrap plus imported high-grade cement copper (80% or more copper) for raw materials, and production of refined copper in 1973 was 6,649 tons or 42% more than in 1972. The company does not produce wire and other rolled products, and its bid to erect a small fabrication plant did not materialize. There was also no news on TMMC's hope to build an integrated copper plant of possibly 30,000 tons per year, based mainly upon imported raw materials. Copper requirements in Taiwan have been increasing at about 15% yearly. The bulk of the demand has been met by imports, with domestic supply of primary and secondary copper at only a few thousand tons annually each. During 1973, Taiwan imported 14,180 tons of refined copper plus over 10,000 tons of products.

Copper exploration in the Chimei area of eastern Taiwan was completely stopped due to low ore grade and limited known reserves. Investigations on Lanyu Island, off the east coast, were also suspended. However, work continued on the Tuluanshan copper prospect in the Coast Range of eastern Taiwan.

Iron and Steel.—China Iron and Steel Corp.'s, proposed integrated steelworks at Kaohsiung moved ahead, with construction of roads, water facilities, and power supply already underway. This newly formed government company originally had a contract to have the Voest Steel Corp. of Austria build and partly finance the steelworks. Voest's arrangement, however, fell through in the Spring, because the two devaluations of the U.S. dollar greatly increased costs. United States Steel Corp. through its subsidiary, U.S.S. Engineers and Consultants, Inc., was subsequently invited to replace Voest in supplying technical knowledge, leaving the Chinese to provide the financing which was being done without undue hardship. Foreign investment would still be welcome. The new estimate of costs

would be closer to $350 million, and start-up date for first-stage facilities has been moved back to possibly late 1977. More U.S. equipment would be used.

Most basic concepts of the integrated steelworks have not undergone change. The initial installed capacity would be about 1.5 million tons of crude steel per year (or 1.1 million tons of steel products), to be upped to about 5 million tons eventually. Major facilities would include wharves, coke and sinter plants, blast furnaces, basic oxygen furnaces (BOF's), and continuous casters for production of billets, slabs, plates, rods, and bars, as well as related processing, warehousing, and shipping facilities. The technical assistance program calls for United States Steel's subsidiary to provide extensive training both in the United States and at the plant site. The original plan to produce structural steel in competition with small plants was changed to produce cold-rolled steel and steel plates for shipbuilding.[5] The steelworks will be physically near China Shipbuilding Corp.'s large shipyard, capable eventually of building 250,000-ton ships. Billets will also be produced.

Taiwan's existing steel industry is comprised of approximately 160 steel mills, the largest of which produces 20,000 tons per month and the smallest only 50 tons or so. Taiwan Iron Manufacturing Corp. and the Tang Eng Iron Works are the two leading producers. Taiwan as a whole produced about 1.5 million tons of steel products in 1973, and most of the output was bars and structural shapes. There was a severe shortage of steel, partly due to a government ban on new steelmills. The ban was subsequently lifted in June.

Taiwan's principal iron raw materials consisted of domestic and imported industrial scrap plus ship scrap. The island's ship scrapping business is big by world standards, and during 1972, a total of 1.6 million ton of ships (220 vessels) were scrapped. Scrap imports in 1973 totaled 715,761 tons (worth NT$2,023 million, nearly twice the value of 1972 scrap imports), about 70% from the United States. Pig iron imports were only 68,973 tons, but much of the semimanufactures imported were further processed. Electric furnaces, particularly arc furnaces, were widely used. When China Iron and Steel's first blast furnaces, start operation, Australian iron ore is expected to be used. China Iron and Steel will also supply billets for the electric furnaces of small plants to complement the scrap now used. Thus, the whole steel economy is due for basic changes.

Taiwan's steel business was most active in 1973. Steel ingot production gained 11%, reaching 507,000 tons. The quantity of ship scrap and plates directly processed into products and the amount of semimanufactures further worked are not known. Nearly 300,000 tons of steel bars and structural steel were exported despite the acute shortage and sharp rise in prices. Excluding scrap, imports of iron and steel totaled more than 1.2 million tons in 1973, with sheets and plates (739,000 tons imported, four-fifths from Japan) leading the way. Iron and steel imports in 1973 were valued at more than NT$11 billion and exports in excess of NT$2 billion. Consumption increased sharply as private and public construction continued to boom. With many large industrial projects underway and economic development moving ahead at a fast pace, it appeared that Taiwan's future steel requirements can easily support the modern integrated steelworks now being built.

Titanium.—Taiwan entered the titania business during the year with commitments to build a 30,000-ton-per-year ilmenite beneficiation plant in Kaohsiung. Taiwan Alkali Corp., a subsidiary of CPC ordered a hydrochloric acid regeneration system from a United Kingdom firm, Woodall-Duckham of Sussex,[6] to implement new technology developed by the U.S. firm Benilite Corp. This would be the world's first closed-cycle effluent-free ilmenite-upgrading plant built on a commercial scale. Taiwan's ilmenite sands would be beneficiated into a natural rutile substitute for use as a titanium oxide raw material. Most of the output would be marketed abroad, probably in Japan, since no pigment or titanium sponge is currently produced in Taiwan.

Other Metals.—In 1973, Taiwan produced 22,200 troy ounces of gold and 93,000 ounces of silver, mainly from the Chinkuashih copper mine. Under soaring gold price conditions, the Tai Yang Mining Co. was getting ready to resume mining at Juifang near Keelung at yearend, on a property with about 2 million tons of ore reserve from which 300,000 ounces of gold might

[5] Modern Asia (Hong Kong). Big Boost for Taiwan Steel. October 1973, pp. 76–77.
[6] Mining Magazine (London). V. 129, No. 5, November 1973, p. 474.

be recovered. At its peak Tai Yang had 4,000 workers.

Taiwan does not produce any primary zinc, lead, tin, and nickel, but consumes sizable tonnages. In 1973, about 30,200 tons of zinc and products valued at NT$547 million were imported, including 23,589 tons of unwrought zinc. Lead imports totaled about 11,000 tons valued at NT$172 million, including 5,281 tons of unwrought lead and the rest mainly scrap. Tin imports totaled about 1,250 tons valued at NT$237 million, including 903 tons of unwrought tin. Nickel imports totaled about 1,850 tons valued at NT$257 million, including 1,748 tons of unwrought nickel. During 1973, Taiwan produced 29,685 tons of galvanized sheet, 20,401 tons of tinplate, and 252,765 storage batteries.

NONMETALS

Cement.—Taiwan cement production gained 5% over 1972, and established a record output of 5,974,997 tons in 1973. However, exports were cut in half, from 1,081,461 tons in 1972 to 543,784 tons in 1973. Hong Kong and Indonesia were the major destinations, with the South Vietnamese market virtually eliminated. Prospects for long-term exports were far from bright, in view of the competition from other Asian cement exporting countries like the Republic of Korea, the Philippines, and Thailand. However, domestic demand continued to rise sharply, justifying increases in national capacity to nearly 8 million tons at yearend. Taiwan has abundant cementmaking raw materials, except for gypsum. In 1973, Taiwan's apparent supply of gypsum was about 120,000 tons, of which 111,873 tons had to be imported, half from Mexico.

The Taiwan Cement Corp. (TCC), rated at about 2.7 million tons, flourished under private ownership. Its three large cement plants—Kaohsiung, Chutung, and Suao—each have a fairly large and new suspension preheater type of kiln. There were about 11 other companies, each with a plant, in the cement business. Asia Cement Corp., with a 1.7-million-ton plant at Tahu near Hsinchu, ranked next to TCC. During the year, the Chengtai Cement Co. started to double its capacity by building a 1,000-ton-per-day four-stage suspension preheater kiln at the Panpingshan plant near Kaohsiung, primarily with loans from the Export-Import Bank of the United States. The Kuanhua Cement Co. was expanding its Kuanhsi plant from less than 100,000 tons annually to 400,000 tons.

Fertilizers.—The Government-owned Taiwan Fertilizer Co. (TFC), largest of Taiwan's three nitrogen producers, operated four ammonia fertilizer plants with a primary capacity of about 390,000 tons per year (tpy) NH_3.[7] In mid-1973 TFC readied plans to construct a $30 million, 300,000-tpy ammonia and 100,000-tpy urea facility at Miaoli for startup during 1976 or 1977. The Kaohsiung Ammonium Sulphate Corp. and CPC were the other firms engaged in nitrogen production. TFC has a phosphoric acid plant in Kaohsiung. The China Phosphate Industries Corp., a new government enterprise, moved ahead on its program to construct a phosphate complex in Kaohsiung with a 100-ton-per-day phosphoric acid plant and a 350-ton-per-day sulfuric acid plant. Local sulfur might be available from petroleum refineries, but phosphate rock must be imported. During 1973 Taiwan imported 139,947 tons of phosphate rock, mainly from the United States and Jordan. At yearend Taiwan had an annual capacity of about 600,000 tons of ammonium sulfate, 300,000 tons of urea, 200,000 tons of calcium superphosphate, and 250,000 tons of compound fertilizers. The nitrogen needed comes from the air, but Taiwan virtually has no potash for making compound fertilizers. TFC has built a 300-ton-per-day compound fertilizer plant in Kaohsiung.

Salt.—Taiwan's salt output declined by 125,000 tons, to 315,000 tons in 1973. Consumption continued to increase, however, mainly in the soda-chlorine industry which produced 238,715 tons of caustic soda in 1973 (151,906 tons in 1972) and 53,979 tons of soda ash (54,207 tons in 1972). Imports totaled nearly 70,000 tons. A 100,000-ton-per-year ion-exchange membrane salt plant furnished by the Japanese firms Marubeni Corp. and Asahi Chemical Industry Co., aimed at relieving the salt shortage, was nearing completion.

Stone.—*Marble.*—For the first time since 1970, Taiwan's relatively new marble industry, located on the east coast near Hualien and started by the Retired Servicemen's Engineering Agency, suffered a setback in production. The decline was by

[7] Nitrogen (London). British Sulphur Corp. Ltd. V. 85, September–October 1973, p. 14.

704,000 tons, or about two-fifths of the 1972 output. Taiwan's marble reserves are extensive, and good in variety and quality. Marble craft used to be the mainstay of the business, but future growth will be in structural marble. Exports were increasing in importance, mainly to Australia and the United States.

Other Nonmetals.—Taiwan's sulfur situation is not clear. Imports of elemental sulfur at 121,900 tons in 1973 were more than 20 times the reported production. The quantity of sulfur or sulfuric acid recovered from petroleum refining is not known, but is probably large. Pyrite production, mainly from the Chinkuashih copper mine, reportedly dropped precipitously during the year. Talc production was 23,124 tons, compared with steatite imports of 2,300 tons. Asbestos imports of 13,096 tons (8,812 tons from the Republic of South Africa) was nearly 2.5 times domestic output. Over 120,000 tons of dolomite was produced in 1973. Clays were both exported and imported. Taiwan relied totally on imports for mica (360 tons), graphite (4,197 tons), abrasives (nearly 5,000 tons), and fluorspar during 1973.

MINERAL FUELS

Coal.—Coal production was only 3.327 million tons, a 15% decline from 1972 and the lowest tonnage in more than a decade. The industry has been suffering from fundamental resource limitations coupled with severe flooding damage from typhoons a few years back. Conversion to private enterprise stimulated the industry briefly, but new investments were not forthcoming and government aid also fell far short. As easily workable coal reserves dwindled, mine safety became a more critical problem and workers shunned the coal mines despite soaring wages. The new Law of Mines Safety promulgated in December 1973 could have an initial adverse effect on production.

Coal was steadily losing its markets to petroleum and natural gas. In fact, one reason why 1973 coal sales dropped sharply was that some former large coal consumers changed over to liquid fuel. This was before the oil crisis late in the year. Coal has since become slightly more attractive, although output cannot be expanded to any great extent. During the year, there was more talk about coal imports, particularly from Australia. When the integrated steel complex is built some of Taiwan's good coking coal might find a new market.

Federal and Provincial authorities, primarily through the Taiwan Mining Bureau, were making a concerted effort to protect a certain minimum level of domestic coal output while improving mechanization and productivity. A 4-year mechanization program has been mapped out, to be financed by a Coal Industry Development Fund derived from an assessment on natural gas that might amount to $1 million to $1.3 million annually beginning in 1975. The hope was to preserve a 3-million-ton annual coal production capacity, with the target for 1974 set at 3.8 million tons. Whether this goal will be achieved is problematical, but coal's position vis-a-vis high-cost oil has definitely improved of late.

Petroleum.—Output of indigenous crude oil increased 15%, but this represented less than 2% of all oil imports. During 1973, Taiwan imported 5.447 million metric tons of crude oil (to convert to barrels, multiply by roughly 7.3), 1.618 million tons of fuel oil (to convert to barrels multiply by roughly 6.7), plus small amounts of other refined petroleum products. Combined value of all oil imports was about NT$5.42 billion (conversion rate somewhere between NT$38=US$1.00 and NT$40=US$1.00), compared with NT$8.16 billion (conversion rate NT$40=US$1.00) in 1972. The main reason for the sharp decline is because a large surplus was imported a year ago. Actually, Taiwan's oil consumption has been increasing at an annual rate of 10% to 15%. Most of the crude came from the Middle East, lead by Saudi Arabia and Kuwait. Kuwait and secondarily Bahrain were the major suppliers of refined petroleum to Taiwan.

The oil crisis helped promote a visit by a five-member economic mission from Saudi Arabia to Taiwan in early 1974. A joint communique announced that Taiwan and Saudi Arabia would consider joint ventures for the construction of an oil refinery, a methyl plant, and a urea plant. Taiwan would provide technical aid in rural electrification powerplant management, and agriculture and fisheries.

CPC dominated every major aspect of Taiwan's oil and gas activities. During fiscal year 1975 (July 1974–June 1975), CPC plans to spend more than $200 million on refineries, petrochemical facilities, and explora-

tion. The Kaohsiung refinery will be enlarged 70,000 bpd by mid-1974, from the more than 200,000 bpd already installed. To supply a major petrochemical complex, another 200,000-bpd refinery (perhaps 100,000 bpd initially) at Kaohsiung was being considered. CPC was in the process of completing a 100,000-bpd refinery in the north by yearend 1975. The firm already keeps five 100,000-ton tankers fully busy, and may venture into tankers of larger size. CPC's ambitious 12-year program starting in 1973 will cost billions of dollars. Its only natural gas plant, located at Miaoli, produced about 51 billion cubic feet of gas and 245,000 metric tons (multiply by 11.6 for barrels) of liquefied petroleum gases in 1973.

Taiwan's petrochemical industry is strongly government-oriented in the basic products (feedstock) and fertilizer fields, mostly under CPC or subsidiaries. On the other hand, downstream and intermediate products are largely handled by the private sector, headed by Formosa Plastics, and Hercules Co. At yearend 1973, Taiwan had the capacity to produce 108,000 tons per year of ethylene, half from CPC's naphtha cracker in Kaohsiung and the other half from CPC's ethane cracking plant based upon Toufen natural gas. CPC was constructing a second naphtha cracker (in Kaohsiung) with an annual capacity of 230,000 tons of ethylene and 115,000 tons of propylene due for completion at yearend 1974. A duplicate of the second cracker was also being built, for completion by yearend 1975. Hundreds of millions of dollars will be invested in various petrochemical projects. Downstream products will be made by about eight companies including China Petrochemical Development Corp. (CPDC), CPC's principal subsidiary in this area. Hercules Co. started to build a 50,000-ton-per-year polypropylene plant near Kaohsiung jointly with CPC, using the propylene feed from CPC's new naphtha cracker in the same location.

Offshore, in the Senkaku Islands (Tiaoyu-t'ai), some progress was made on exploration and drilling, despite jurisdictional problems vis-a-vis the People's Republic of China and Japan. About five concessions had previously been granted to various international oil companies. So far, nothing of economic significance has been uncovered.

The Mineral Industry of Thailand

By H. B. Wood [1]

Thailand's economic growth rate was only 3.9% in 1972 and it was predicted to be lower in 1973. Reduced agricultural production, due to severe and extensive drought, a sharp rise in inflation, labor strikes, and political upheaval, contributed to the slower growth rate and unhealthy state of the economy. Government limitation of exports and food price controls failed to halt rising prices and relieve the consumers. Overall mineral output and exports increased in quantity and value, and helped to reduce the trade deficit. World trade markets were favorable, but Thailand was not able to capitalize fully on the favorable markets.[2]

On October 15, 1973, the military-controlled Thai Government abdicated and a caretaker government was appointed by the King. Because of the political turmoil, very few new business enterprises were announced during the last quarter of 1973 and no changes were announced in the Royal Thai Government's (RTG) foreign policy.

Action on construction of a sea level canal across the Isthmus of Kra was rejuvenated in September when a feasibility study on the project, prepared by Tippetts-Abbett McCarthy-Stratton and Nathan Associates Inc. was presented to the Thai Government. Then after the change of prime ministers, the new administration announced that the project would not be given precedence. However, the RTG National Energy Authority continued the route survey and feasibility studies on the project. Another proposal, to build a 95-mile pipeline across the Isthmus of Kra, was still seriously being considered.

Government Policies.—The RTG Alien Business Decree and Alien Occupation Decree, which was enacted near the close of 1972, had an adverse effect on foreign investments during the first part of 1973. This decree required foreign-owned firms to convert to majority Thai ownership within 2 years, required all foreigners working in Thailand to obtain a work permit, and restricted employment of certain professions such as lawyers, architects, engineers, accountants, and brokers. However, these decrees did not apply to promoted (invited) firms or industries, leaving an open door for a large variety of industrial enterprises.[3]

In July 1973 the RTG announced privileges for mining, smelting, mineral ore dressing, and metal and alloy production industries. Mining and ore dressing priorities were listed in the following order: Tin, tungsten, fluorite, barite, antimony, zinc, copper, lead, manganese, iron, columbium–tantalum, rock salt, feldspar, marl, and other minerals. Foreign investors were required to make specific financial expenditures and complete specific performances.[4]

The most positive development for foreign investors occurred near the close of the year when the RTG liberalized its policy toward foreign majority ownership of mining operations. The old mining law, which required operations north of the 11th parallel to be at least 51% Thai owned, has been a major stumbling block by preventing the development of large mining operations in the potentially mineral-rich North Thailand area along the Burmese border. It has been difficult to find Thai

[1] Mining geologist, Division of Nonmetallic Minerals—Mineral Supply.

[2] Far Eastern Economic Review. Asia, 1974 Yearbook, pp. 308–316.

[3] Hartley, William D. Thai Laws Restricting Business and Jobs of Foreigners are Causing Mass Confusion. Wall Street Journal, July 27, 1973, p. 30.

[4] U.S. Embassy, Bangkok, Thailand. Investment Opportunity—Mining Smelting, Mineral Ore Dressing and Metal and Alloy Production Industries are Eligible for Promotional Privileges in Thailand. Airgram A-202, July 13, 1973.

partners with adequate capital to join mining ventures. RTG authorities recognized that undercapitalized mining ventures are not likely to place the industry on a rational basis; therefore, a more liberal attitude was adopted, but the old mining law has not been rescinded.

On July 15, 1973, the RTG revalued the rate of exchange of the Thai baht (B). The rate was reduced from B20.8 to B20.5 per US$1.00, and from B54.3 to B49.235 per £1.00. By December the exchange rate was again reduced to B20.25 per US$1.00. For 1973, most of the exchange values were calculated at B20.5 per US$1.00.

In a move to curb rampant illegal mining of fluorite and tungsten, the Thai Government announced in April a plan which offered better incentives to informers. The Director General of Mineral Resources announced that the reward for information leading to the arrest of illegal miners will now be 50% of the price received for the confiscated ore at public auction. Previously, informers received 50% of the fine levied on offenders. The Thai Fluorite Association estimated that 20% of Thailand's fluorite production is illegally mined. It was also estimated that about 50% as much tungsten is illegally smuggled out of Thailand as is legally exported.[5]

The absence of any effective central government control to stop illegal mining and dredging has been for years a deterrent to mining development along the Burmese and Malaysian borders. Also, prospecting has been forbidden in national parks, forests, and wildlife preserves, whose boundaries are not well defined.

PRODUCTION

The production and exports of chemical and metallurgical grade manganese ore, lead and zinc ore, asbestos, barite, clays, feldspar, gypsum, quartz, and pyrophyllite increased notably. Production of antimony, tin, tungsten, cement and fluorspar continued at about the same rate. The export value of tin, antimony, and monazite increased. In particular the Japanese market for fluorspar and the United States market for tin were unfavorable; consequently, exports decreased and production decreased. The oil embargo limited shipping facilities, and the domestic revolution deterred any new trade negotiations thereby further slowing production.

[5] Engineering and Mining Journal. Thailand Cracks Down on Illegal Mining. V. 174, No. 5, May 1973, pp. 36, 40.

Table 1.—Thailand: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Antimony:			
Ore:			
Gross weight	5,397	11,172	8,033
Metal content	2,294	4,748	3,414
Metal	[r] 225	202	199
Chromite, gross weight	1,000	--	--
Columbite-tantalite concentrates, gross weight	42	14	24
Copper, mine output, metal content	NA	[e] 6	1
Iron and steel:			
Iron ore, 55% iron, gross weight	[r] 41,591	27,818	36,309
Pig iron	[r] 13,560	11,918	14,063
Crude steel	119,994	181,943	[e] 190,000
Steel billets	51,931	100,800	[e] 102,000
Lead, mine output, metal content	[r] 1,473	1,819	3,704
Manganese ore:			
Battery grade and chemical grade 75% MnO_2	[r] 4,597	5,437	11,368
Metallurgical grade 46% to 50% MnO_2	[r] 10,735	14,415	24,950
Total	[r] 15,332	19,852	36,318
Monazite, gross weight	112	171	318
Tin:			
Mine output, metal content—long tons	21,346	22,072	20,591
Metal—do	[r] 21,427	21,929	22,565
Tungsten concentrate:			
Gross weight	[r] 4,864	6,485	5,048
Metal content	[r] 2,507	3,343	2,602
Zinc, mine output, metal content [e]	900	700	1,500
Zircon, gross weight	1,526	366	402
NONMETALS			
Asbestos	NA	22	83
Barite	63,539	97,091	111,930
Cement, hydraulic—thousand tons	[r] 2,771	3,378	3,745
Clays, kaolin	10,133	15,290	18,995
Feldspar	NA	1,500	4,510
Fertilizer materials, crude, phosphatic	--	--	810
Fluorspar, 80% to 85% CaF_2	[r] 427,498	395,070	[2] 398,005
Gypsum	167,903	89,805	236,265
Salt [e]—thousand tons	160	160	160
Sand, silica	27,440	48,080	51,450
Stone:			
Marl (used for cement)—thousand tons	490	372	246
Quartz, not further described	NA	2,248	13,837
Talc and related materials:			
Pyrophyllite	50	1,550	9,550
Talc	NA	75	75
MINERAL FUELS AND RELATED MATERIALS			
Coal, lignite—thousand tons	445	345	361
Petroleum:			
Crude—thousand 42-gallon barrels	95	[r e] 47	[e] 45
Refinery products:			
Gasoline—do	12,521	8,160	9,008
Jet fuel—do	3,237	4,937	4,283
Kerosine—do	1,139	1,804	1,515
Distillate fuel oil—do	11,972	13,474	13,753
Residual fuel oil—do	11,488	15,753	19,470
Naphtha—do	219	2,072	2,466
Liquefied petroleum gas—do	1,100	1,903	2,539
Asphalt—do	713	854	7,742
Other—do	2,816	6,620	5,727

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

[1] In addition to the commodities listed, Thailand produces other varieties of crude construction materials (clays, sand, gravel, and stone, etc.) but output is not reported and available information is inadequate to make reliable estimates of output levels.

[2] Includes 56,000 tons of subgrade ore that was not marketed for consumption.

TRADE

Historically Thai mineral trade has been with Japan, the United States, West Germany, and the United Kingdom, listed here in order of combined export and import volume. Thailand's overall exports to Japan increased 24% but imports from Japan decreased 3%. The trade gap with Japan, Thailand's leading trading partner, was 39% in favor of Japan. The possibility of reducing the trade gap in the near future is slim. Import and export trade with the United States decreased 13% and 23%, respectively. Imports from the United States were 40% higher than exports.

The increased cost of imported oil during 1973 was estimated by an importing oil company official at $500 million. The Bank of Thailand estimated a $500 million increase in the value of Thai commodity exports, but it also estimated a 1973 loss of U.S. military expenditures in Thailand and a reduction in tourism, which together may total $100 million.

Tin, tungsten, cement, fluorspar, and gem stones were Thailand's best mineral foreign exchange earners. The major mineral imports have been unwrought and semimanufactured aluminum, gold, iron and steel as scrap, pig iron and semimanufactured steel, silver, unwrought zinc, industrial diamond, fertilizers, elemental sulfur, crude and partly refined petroleum.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, including alloys, semimanufactures	64	--
Antimony:		
Ore and concentrate	4,702	5,082
Metal [2]	22	64
Columbite-tantalite [2]	2	15
Copper metal, including scrap and alloys	30	--
Iron and steel:		
Ore and concentrate	4,500	--
Metal:		
Pig iron, including cast iron	304	3,325
Semimanufactures	12,403	25,828
Lead:		
Ore and concentrate [2]	5,180	--
Metal, including alloys:		
Unwrought	1,200	--
Semimanufactures	--	322
Manganese, ore and concentrate [2]	8,279	3,298
Tin metal, including alloys, unwrought ---long tons--	21,528	21,495
Tungsten, ore and concentrate [2]	4,384	5,843
Zinc metal, including alloys, semimanufactures	67	24
Other, metallic ores and concentrates	32,958	43,254
NONMETALS		
Barite [2]	37,700	40,450
Cement	252,361	646,432
Chalk	100	--
Clay and clay products:		
Kaolin	4,440	1,712
Fuller's earth, dinas, chamotte, and others	200	1,463
Diatomite and other infusorial earth	3,500	--
Fertilizer materials:		
Potassic	186	402
Other and mixed	10	--
Fluorspar	335,774	274,490
Gypsum	22,513	7,593
Precious and semiprecious stones, except diamond:		
Natural ---thousand carats--	7,052	15,494
Manufactured ---do---	11,870	1,676
Salt	39,870	1,476
Stone, sand and gravel:		
Dimension stone, crude and partly worked:		
Calcareous	--	(3)
Other	6	--
Gravel and crushed rock	169	228
Limestone	266	84
Talc and related materials, pyrophyllite [2]	15	200
Other, slag and ash, not metal bearing, n.e.s	3,465	180

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products: [4]		
Gasoline, motor ---thousand 42-gallon barrels--	654	865
Kerosine ---do---	142	166
Jet fuel ---do---	24	164
Distillate fuel oil ---do---	582	1,518
Lubricants ---do---	12	17
Other ---do---	130	101

[1] Source unless otherwise specified: Department of Customs, Bangkok, Thailand. Foreign Trade Statistics of Thailand, December 1971 and December 1972, 1973 and 1974.
[2] Source: Department of Mineral Resources, Bangkok, Thailand. Mineral Production, Exports and Domestic Consumption of Thailand, 1964-1973. 1974, 51 pp.
[3] Less than ½ unit.
[4] Includes bunker.

Table 3.—Thailand: Preliminary data on exports of selected mineral commodities in 1973 [1]

(Metric tons unless otherwise specified)

Commodity [2]	Quantity	Value [3] (thousands)
Antimony:		
Ore and concentrate, gross weight	6,319	$2,695
Metal	45	
Barite	94,438	2,356
Cement [4]	745,685	12,492
Clays (kaolin only)	6,715	97
Columbite-tantalite concentrates, gross weight	44	150
Fluorspar	268,401	9,744
Gypsum	50,900	556
Lead ore	800	87
Manganese ore, gross weight	4,580	271
Rare-earth minerals, monazite	457	48
Salt [4]	84,264	1,064
Talc and related materials, pyrophyllite	250	2
Tin metal ---long tons--	24,582	100,605
Tungsten ore and concentrate, gross weight	4,756	14,378

[1] Source unless otherwise specified: Department of Mineral Resources, Bangkok, Thailand. Mineral Production, Exports and Domestic Consumption of Thailand, 1964-1973. 1974, 51 pp.
[2] Source indicates iron ore exports were nil in 1973.
[3] Converted from reported figures in bahts (B) at the rate of B20.67 = US$1.00.
[4] Department of Customs, Bangkok, Thailand. Foreign Trade Statistics of Thailand. October 1973, 436 pp. (Data are for 10 months, January through October, only.)

Table 4.—Thailand: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Bauxite and concentrate	3,374	--
Metal, including alloys:		
Scrap	549	486
Unwrought	9,358	12,894
Semimanufactures	3,817	5,544
Antimony:		
Ore and concentrate	6	--
Metal, including alloys, all forms	--	(1)
Arsenic trioxide, pentoxide and acids	124	32
Chromite	5	--
Cobalt, oxides and hydroxides	28	6
Copper:		
Matte	3	141
Copper sulfate	52	81
Metal, including alloys:		
Scrap	541	632

See footnotes at end of table.

Table 4.—Thailand: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS—Continued		
Copper—Continued		
Metal, including alloys—Continued		
Unwrought	48	546
Master alloys	2	5
Semimanufactures	4,669	4,765
Gold metal, unworked or partly worked ——troy ounces	135,532	925,908
Iron and steel:		
Ore and concentrate	--	23
Metal:		
Scrap	200,730	280,654
Pig iron, ferroalloys, and similar materials	6,313	4,409
Sponge iron, powder and shot	90	135
Steel ingots and other primary forms	r 35,528	1,952
Semimanufactures	r 442,081	610,217
Lead:		
Ore and concentrate	10	--
Oxide	548	463
Metal, including alloys:		
Scrap	49	105
Unwrought	4,628	4,155
Semimanufactures	232	493
Magnesium metal, including alloys:		
Ore and concentrate	45	80
Unwrought	1	(1)
Semimanufactures	(1)	3
Manganese:		
Ore and concentrate	314	424
Oxides	361	489
Mercury ——76-pound flasks	148	489
Molybdenum metal, including alloys, all forms	r (1)	(1)
Nickel:		
Ore and concentrate	--	(1)
Matte, speiss and similar materials	6	12
Metal, including alloys:		
Scrap	7	6
Unwrought	2	--
Semimanufactures	225	783
Platinum-group metals, including alloys, all forms ——troy ounces	2,186	2,186
Silver metal, including alloys ——do	394,811	933,141
Tin:		
Oxides ——long tons	6	(1)
Unwrought ——do	3	1
Semimanufactures ——do	(1)	2
Titanium:		
Ore and concentrate	181	461
Oxides	1,868	2,315
Tungsten metal, including alloys, all forms	r (1)	1
Zinc:		
Ore and concentrate	--	(1)
Oxide	1,423	1,846
Metal, including alloys:		
Scrap	55	555
Powder and dust	9	30
Unwrought	18,870	24,501
Semimanufactures	1,269	1,493
Zirconium ore and concentrate	--	1
Other:		
Ore and concentrate of base metals, n.e.s	1,952	4,476
Ash and residue containing nonferrous metals	97	--
Metals, including alloys, all forms:		
Alkali, alkaline earth and rare-earth metals	5	(1)
Pyrophoric alloys	7	16
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	1,730	1,615
Dust and powder of precious and semiprecious stones ——kilograms	3	2
Grinding and polishing wheels and stones	817	941
Asbestos	33,423	26,175
Barite and witherite	39	21
Bromine:		
Elemental ——kilograms	20	10,036
Compounds, n.e.s ——do	53,603	20,349
Cement	4,860	1,018
Chalk	239	292
Clays and clay products:		
Crude clays, n.e.s.:		
Fuller's earth, dinas, and chamotte	17,213	1,002
Kaolin	6,185	5,160

See footnotes at end of table.

Table 4.—Thailand: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972
Clays and clay products—Continued		
Products:		
Refractory (including nonclay brick)	14,713	7,758
Nonrefractory	13,215	907
Cryolite and chiolite	(1)	9
Diamond:		
Gem, not set or strung ——carats	10,200	6,513
Industrial ——do	109,736	653,158
Diatomite and other infusorial earth	--	86
Feldspar, leucite, nepheline, and nepheline syenite	2,531	3,786
Fertilizer materials:		
Crude and manufactured:		
Nitrogenous	53,414	39,250
Phosphatic	5,014	5,547
Potassic	3,906	4,860
Other, including mixed	r 171,319	338,664
Ammonia, anhydrous	357	214
Fluorspar	89	100
Graphite, natural	1,014	746
Gypsum, anhydrite and plasters	1,060	742
Lime	267	64
Magnesite	297	246
Mica	91	52
Pigments, mineral, including processed iron oxides	682	70
Precious and semiprecious stones, except diamond ——thousand carats	89,016	37,069
Pyrite (gross weight)	--	50
Salt	18,207	163
Sodium and potassium compounds, n.e.s	4,385	1,851
Stone, sand and gravel:		
Dimension stone:		
Crude:		
Calcareous (marble)	660	291
Slate	--	45
Other	530	496
Worked:		
Calcareous (marble)	1,072	338
Slate	62	62
Paving and flagstone	--	3
Other	962	199
Dolomite, chiefly refractory grade	4	1
Gravel and crushed rock	11,490	341
Limestone (except dimension)	93	5
Quartz and quartzite	1,057	1,017
Sand, excluding metal bearing	444	333
Sulfur:		
Elemental:		
Other than colloidal	21,789	8,748
Colloidal	6,190	389
Sulfur dioxide	1	78
Sulfuric acid	55	17
Talc and steatite	3,179	4,195
Other nonmetals, n.e.s.:		
Crude	9	--
Slag, dross and similar waste, not metal bearing	1,599	2,110
Oxides and hydroxides of barium, magnesium and strontium	28	36
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	8	41
Carbon black	7,040	8,597
Coal, all grades, including briquets	535	429
Coke and semicoke	17,438	14,726
Peat	50	5
Petroleum:		
Crude and partly refined:		
Crude ——thousand 42-gallon barrels	7,543	8,387
Partly refined ——do	32,044	39,618
Refinery products: [2]		
Gasoline, aviation ——do	116	68
Gasoline, motor ——do	473	128
Kerosine ——do	117	79
Jet fuel ——do	87	89
Distillate fuel oil ——do	5,049	3,966
Residual fuel oil ——do	38	7
Lubricants ——do	511	612
Mineral jelly and wax ——do	r 50	76
Other:		
Nonlubricating oils, n.e.s ——do	277	192
Liquefied petroleum gas ——do	(1)	4
Pitch, pitch coke, and petroleum coke ——do	39	38

See footnotes at end of table.

Table 4.—Thailand: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972
MINERAL FUELS AND RELATED MATERIALS—Continued		
Petroleum—Continued		
Refinery products [2]—Continued		
Other—Continued		
Bitumen and other ----------thousand 42-gallon barrels--	7	6
Bituminous mixtures, n.e.s ----------do----	6	5
Other ----------do----	828	256
Total ----------do----	r 7,598	5,526
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals --	307	638

r Revised.
[1] Less than ½ unit.
[2] Includes bunker.

COMMODITY REVIEW

METALS

Antimony.—Antimony metal production decreased 28%, to 3,414 tons (metal content). In June 1973, it was announced that Amco Metal Industries Corp. Ltd. planned to build in Lampang Province a $1.2 million antimony mining and smelting operation with an annual smelter capacity of 14,000 tons of 99.8% Sb.

Iron and Steel.—Thailand produced about 36,000 tons of iron ore (55% iron), a 31% increase over the low 1972 production of 27,800 tons. About 306,000 tons of pig iron, crude steel, and steel billets were produced. Imports of iron scrap, pig and sponge iron, steel ingots, and semimanufactured material totaled 897,000 tons in 1972 and preliminary estimates for 1973 are the same. Only about one-fourth of the total steel consumption is produced indigenously. Imports of iron and steel products from the United States totaled $24.3 million in 1973, about 12% of the total U.S. exports to Thailand.[6]

The 1973 exports of manufactured steel products were estimated to be less than the 1972 total of 29,000 tons. Most of the imported scrap iron is purchased from the United States, but because of a shortage of scrap iron and steel in the United States, exports to Thailand were limited. Some Thai companies were forced to reduce production because of a worldwide shortage of steel scrap.

There are many drawbacks to an iron and steel industry in Thailand. The iron deposits are inadequate. They are low grade, poorly located in relation to power sources and markets, and energy costs (electricity) for arc-furnaces are high. G. S. Steel Co.[7] announced that it was going to install a hot-rolled sheet mill at Sriracha with a monthly output of 5,000 tons. During the year, it also planned to increase production of such commodities as angle steel, flat bars, and square bars by 30,000 tons per annum. Siam Iron and Steel Co. (SISCO) announced that it was going to double wire making capacity to 12,000 tons per year. Japanese companies have been invited to bid on construction of new plants.[8]

Lead and Zinc.—Production from the Kanchanaburi District doubled during 1973 to 9,608 tons of lead ore containing about 40% lead. Only 800 tons of lead ore was exported.

About 1,500 tons of zinc was produced in 1973. In August 1973, New Jersey Zinc Co. (NJZ) signed an agreement with Thai Zinc Ltd. to mine 200,000 tons of zinc ore from the Pa Daeng deposit at Mae Sot. The deposit is located about 350 miles northwest of Bangkok in the heavily forested mountainous area 50 miles west of Tak, near the Burmese border. NJZ started developing the mine in the fall of 1973, but no significant ore shipments were made until 1974 and then only for test purposes. According to reports, the mineralization consists mainly of hemimorphite and smithsonite in a gangue of limestone and calcareous sandstone. This zinc carbonate ore is to be shipped to Palmerton, Pa., where NJZ has a smelter that processes similar ore from the Sterling Hill deposit in New Jersey. The high-grade Pa Daeng

[6] U.S. Embassy, Bangkok, Thailand. U.S.-Thai Trade in 1973. Airgram-138, May 21, 1974, pp. 1-2.
[7] Japan Metal Bulletin. Steel Makers, Traders to Bid for Projects in Thailand. No. 2973, Apr. 24, 1973.
[8] Work cited in footnote 7.

deposit can be mined by open pit methods. Plans to build a smelter near the mine with a 50,000-ton-per-year output are still underway. In 1969, the Bhumiphol power dam was completed making electric power available for the electrolytic process needed to extract the zinc. Also in 1970 and 1971, new access roads into the mining area were completed.

Zinc sulfide deposits are known to occur in Thailand; but during 1973, no extensive activity was reported at these prospects. Thailand imports over 2,000 tons of zinc oxide annually.

Manganese.—No new manganese mines or processing plants were developed during 1973. Production of battery-grade manganese, 75% MnO_2, doubled to 11,368 tons of which about 3,500 tons was exported. Metallurgical-grade, 46% to 50%, MnO_2 production increased about 73%, to 24,950 tons, of which about 1,000 tons was exported. The reported average value of all grades of manganese increased from $33.70 to $36.70 per ton. Most of the increase was in the value of battery-grade ore.

Tin.—Tin is the most valuable mineral product of Thailand. Tin metal production was 22,000 long tons in 1972 and 22,600 long tons in 1973. The production of tin concentrate containing about 73% tin decreased from 29,650 long tons valued at $81 million in 1972 to 28,110 long tons valued at $89.5 million in 1973.[9] Tin metal exports increased from 21,500 long tons in 1972 valued at $79 million to 24,600 long tons in 1973 valued at $101 million. The United States sold 19,262 long tons of tin metal on the open market from the General Services Administration stockpile during 1973. This indirectly caused the Thailand exports to the United States to decrease from 13,046 to 7,258 long tons. Normally, the United States has been the largest market for Thailand's tin. Of the 656 mines that operated in 1973, almost the same number as in 1972, there were 25 dredges, 266 gravel pump mines, 8 hydraulic mines, 108 ground sluicing operations, 216 tin-tungsten mines, and 33 miscellaneous operations. An average of 3,800 employees were permanently employed.

In mid-year tin production and exports started to fall short of the quota allocated by the International Tin Council (ITC). Some of the deposits that were minable at low cost and with simple equipment were depleted during the year and Thailand's largest and most modern dredge, the Temco II of Thailand Exploration & Mining Co. Ltd., (TEMCO) operated about 80% of the time. During the last quarter of the year, tin mining in southern Ranong and Phuket provinces was curtailed by a shortage of diesel oil needed to operate the pumps and by a 1-week labor strike.

During the year, the tin metal price New York, N.Y., ranged from $1.70 to $3.45 per pound; and the export price f.o.b. Bangkok, increased from $1.76 per pound in January to $2.43 per pound in December. In some world markets the 1973 metal price nearly doubled during the year; but in the more stable markets, the overall price rose only 65% to 70%. Mr. W. Fox[10] stated that the amounts of tin sold by the U.S. Government from federal stockpiles and the amount sold by the ITC exceeded the shortage estimated by consumers, but still the price accelerated. It was reported that the phenomenal tin price increase was caused by three major factors: An unusual increase of more than 15,000 long tons in demand by regular consumers in 1973, an increase in mine costs, and a depreciation of currency values of major consuming countries. Speculation by brokers admittedly also caused some of the price fluctuation. Some of these conditions will continue to exist during 1974.

Thailand's first electrolytic tinplate plant was under construction at Samudprakarn and was scheduled for completion late in the summer. The plant, with a capacity of 60,000 tons per year, is expected to make Thailand self-sufficient in tinplate and should result in more than a $15 million-per-year saving on imports.

Metals Exploration N.L. of Australia reportedly signed an agreement with a Thai company which can give Metals Exploration a 50% interest in an offshore alluvial tin prospect in the Butang Island Group in southwest Thailand. A seismic survey has been carried out, and borings were started in January from a drilling barge. Southern Kinta Consolidated Ltd. modified its Takuapa near-shore suction dredge by increasing pumping capacity, enlarging suction dragheads, installing hydrocyclones for dewatering, and adding more swell compensators and longer suction pipes to enable

[9] Bank of Thailand. Monthly Bulletin. V. XIV, No. 6, June 1974, p. 91.

[10] Fox, W.O.B.E. What has been Happening to the Tin Price? Tin International, v. 47, April 1974, pp. 96-99.

them to operate at 60-foot depths when necessary, thereby increasing output by 63%. Kamunting Co., which operates a two-bucket dredge at Bangtoe in the Panga District, announced that their boring results indicated that only 2 years of dredging time remained. Canadian Siam Resources Ltd. exploring for tin in southern Thailand, reported encouraging results from its drilling program. Jootee Tin Dredging in a joint venture with Leighton Mining N.L. reported favorable results from their drilling offshore northwest of Phuket Island. They plan to operate a dredge in water up to 150 feet deep.

Tungsten.—Tungsten production decreased 22% to a gross weight of more than 5,000 tons of concentrate, and 94% of the production was exported. The value of tungsten concentrate continued to decrease slowly fom $3,498 per ton in 1971 to $3,066 per ton in 1972. In 1973, the export value of tungsten concentrate (65% WO_3) was reported at $3,023 per ton, totaling $14,378,000. In value tungsten remained as Thailand's second largest foreign exchange earner in the mineral group. During 1973, an average of 9 tungsten mines operated and employed an average of 654 men regularly.

Severe mud slides and floods in the northern mining area during 1973 were a factor in the curtailment of production, but the most basic problem was the Government's inability to stop illegal digging or to enforce legal claims in the areas concerned. Also, rich deposits in both north and south Thailand have been skimmed of high-grade ores, and resulted in half the minerals being wasted. Until conditions become more stable, tungsten mining is not likely to become attractive to foreign investors.

Other Minerals.—No imports of gold bullion have been reported since August 1971. Thailand's gold stock as of December 31, 1973, was valued at $99 million based on a $38 per ounce value. Imports of unworked or partly worked gold metal, to be used mostly as jewelry, increased about seven times in 1972, to about 926,000 ounces and preliminary 1973 estimates are for about the same quantity. Silver metal imports increased 136% in 1972, to 933,000 ounces. Silver was used in jewelry and for industrial purposes. Padech and Associates Co., Ltd., announced that it planned to produce 1,000 tons of copper annually by 1975 from a malachite-azurite deposit occurring in sandstone. The deposit is located 7 kilometers from the Thailand-Laos border at Amphoe Pak Tha, Uttaradit Province.

NONMETALS

Barite.—Thailand and Indonesia are the most significant producers of barite in Southeast Asia. Barite is used in making drilling mud for the petroleum exploration industry. Increased well drilling in southeast Asia has stimulated production sharply and announcements to drill more wells in 1974 than in 1973 will probably further increase production in 1974. Barite (93% $BaSO_4$) output rose to 112,000 tons, a 15% increase over 1972 output. Exports more than doubled to 94,000 tons, but the reported value remained the same at $25 per ton. An average of 6 mines employing 300 people operated during the year. Most of the barite mines are in the southern province of Songkhla.

Cement.—Cement production and sales increased moderately again in 1973, and the cement industry maintained its position as the second largest mineral producing industry in Thailand. Cement production increased 11% to 3,745,000 tons, which is still far below the total capacity of 4.3 million tons. Present plans are to increase the capacity to 6.8 million tons and to export most of the increase. Total domestic and export sales increased 13% to 3,664,000 tons. Value of exports increased about 48% to $12.5 million in 1973. Thailand exported 20% of total sales; the remainder was used internally.

The RTG, Ministry of Industry, authorized Thai Sathapana Co. Ltd. to build a new cement plant at Amphur Pak Tho, Ratchburi Province. Siam City Cement Co. Ltd., Jalaprathan Cement Co. Ltd., and Siam Cement Co. Ltd. have been authorized to increase the capacity of their present cement factories.

During the energy crisis in the fall of 1973, the Thailand Government offered the oil-rich countries cement for oil, but apparently the Arab countries were not interested, and no exchange resulted. The fuel oil crisis forced the export price of cement up 21%, but due to price controls domestic prices increased officially only half as much.[11]

The building industry in Thailand was hurt badly during 1973, as the cost of fuel

[11] U.S. Embassy, Bangkok, Thailand. Cement: Production and Sales in 1973. State Department Airgram A-113, Apr. 19, 1974, pp. 1-3 and 1 enclosure.

oil, cement, and other building materials increased rapidly. Building contractors with fixed price contracts were hurt the most and reportedly 60 construction companies went out of business or accepted bankruptcy.

Domestic demand for cement was normal during the year, but in other countries of southeast Asia there was a cement shortage which caused the Thailand export price increase. Spot sale prices in Thailand at the end of the year were reported to exceed $26 per ton for ordinary Portland cement and $39 per ton for white cement.[12]

Fertilizers.—The development of a fertilizer industry in Thailand has been hampered by the absence of any known indigenous raw materials such as sulfur, potash, or phosphate rock. The development of a fertilizer industry based on hydrocarbons obtained from the Mae Moh lignite deposits, which are located more than 500 miles from the major farmlands, has not been satisfactory. The price of foreign, imported fertilizer when available has been competitive to the Mae Moh products. Imports of certain fertilizers were banned by the RTG. Thai farmers use less fertilizer per ton of rice produced than any other Asiatic country, and still agricultural products were Thailand's leading export item in value and tonnage. No immediate plans have been presented by the Government or industry to relieve the current fertilizer shortage in Thailand.

Normally, Thailand imports about 400,000 tons of fertilizer annually, with Japan being traditionally its major source. Because of the worldwide shortage, Japan limited its fertilizer exports to Thailand. Thailand also tried to purchase 50,000 to 100,000 tons from the United States, however adequate supplies of fertilizer, to prepare the Thai soil for 1974 plantings, were not available at the end of 1973. Fertilizer supplies for Thailand are most important because Thailand supplies a large portion of the food for southeast Asia.

Fluorspar.—During 1973, about 398,000 tons of fluorspar was produced, less than a 1% increase over that of 1972. This total production included 56,000 tons of subgrade ore that was mined and sold to a beneficiating plant. About 268,000 tons of the Thai production was exported: 223,000 tons, or 56% of the output, was shipped to Japan, and the rest was shipped to the U.S.S.R., Australia, West Germany, and India.

The value of met-spar f.o.b. Bangkok remained about the same as in 1972 and averaged about $36 per ton. The price of acid-grade fluorspar remained unchanged at $65 per ton f.o.b. Bangkok.

The Thai Fluorite Processing Co. Ltd. continued to operate its flotation plant at Ban Lard and produced about 50,000 tons of acid-spar of which about 30,000 tons was shipped to Japan. The plant has an input capacity of 360 tons per day, with an ore grade of 50% to 55% CaF_2. Although the current flotation plant has an output capacity of 55,000 tons per year, it can be readily enlarged. In March Universal Mining Co's. 60,000-ton-per-year heavy-media separating plant in the Ban Hong District near Chiengmai, Lamphun Province, went onstream to produce quality metallurgical gravel spar. The Ban Hong plant brought much needed mechanization to a traditionally labor-oriented industry.

Production in Thailand would probably have been larger if a few suppressing factors had not affected production. Heavy rains in the Lamphun District of northern Thailand destroyed roads and temporarily suspended fluorspar rail and truck shipments to Bangkok. Worldwide shortages of diesel fuel for freighters forced buyers to stockpile fluorspar in the Bangkok area until lower priced shipping facilities could be obtained. Also, deposits that have been mined by cheap surface mining methods have become scarce in some of the older districts.

In January 1974, it was announced that a Thai-Australian enterprise intended to build a $2 million froth flotation plant in the Cha-am area to produce 150,000 tons per year of chemical grade fluorite.[13]

The first imports of fluorspar into Thailand, about 35 tons, were reported in 1970; subsequently, 89 tons was reported in 1971 and 100 tons in 1972. These imports probably came across land from Burma.

In March 1973, Sompan Pisolayabutr was elected the new president of the Thai Fluorite Association (TFA). As Vice President of the United Fluorite Co., a subsidiary of Eastern Mining Co., he had strong support. He planned to set up a TFA buffer stock, restrict production of TFA members, require members to pur-

[12] Business Review. Construction Materials. November 1973, pp. 12–15.

[13] Modern Asia. Joint Ventures. January–February 1974, v. 8, No. 1, p. 34.

chase the output of small miners in order to stabilize the price, and to ask the Royal Thai Government to arrest unlicensed miners.

Gem Stones.—Thailand is now considered the main gem stone market in southeast Asia. Precious stones, as they are sometimes classified, were reported as the eighth ranking Thai export commodity, totaling in value $30.4 million, an increase of 67% in value over 1972. In 1972, Thailand imported 37 million carats of precious and semiprecious gems and exported 15 million carats, but the value was increased 4½ times. Most of the internal production came from open pit mines in Chanthaburi and Kanchanaburi Provinces. Nearly all of the mining is done by laborers called jewel diggers. They are also skilled tradesmen, who can readily identify a sapphire, ruby, opal, topaz, or emerald stone in an open pit or waste dump. They readily separate the valuable from the less valuable stones and sell them on the local market or ship them to lapidary companies in Bangkok. Bangkok is the center of the lapidary industry for southeast Asia and employs more than 20,000 people at cutting and polishing raw stones.

Gypsum.—Gypsum production has been erratic in the past 3 years dropping from 168,000 tons in 1971 to 90,000 tons in 1972, and then increasing dramatically to 236,000 tons in 1973. During 1972, an average of 680 people were employed continuously at five mines; and during 1973, an average of 700 people were employed at six mines and production nearly doubled. The average price increased about 2%, to $10.82 per ton. During the last quarter of 1973, the fuel oil crisis caused a slowdown in building construction and consequently there was an oversupply at year's end. About 51,000 tons of gypsum was exported, almost seven times as much as was exported in 1972.

Salt.—During 1973, more than 84,000 tons of sea (solar) salt, valued at $1.1 million, was exported from Thailand. This was a notable increase over the 1972 export total of 1,500 tons. About 160,000 tons of salt was produced, the same amount as in 1972. The production would have been larger if the solar operations had not been damaged by typhoons. The first rock salt operation for Thailand was licensed in 1973 by the Thai Asahi Caustic Soda Co. Ltd. The mine and plant are located in the Pimai District of Nakhon Ratchasima Province. Planned capacity is 100,000 tons of salt annually and will be used entirely to feed the company's caustic soda and fertilizer factory. This new salt capacity will greatly reduce Thailand's import expenditures and help their growing chemical industry.

Other Minerals.—The production of columbite-tantalite, monazite, zircon, and zenotime from dredge tailings, totaled 770 tons. Columbite and zenotime were new minerals that were added in 1973 to the recovery list. As more large suction dredges go into operation an increase in production is predicted. Minor tonnages of asbestos, quartz, and talc were produced. Pyrophyllite production increased six-fold, to 9,550 tons. The total value of all other minerals produced only equaled about $263,000. Kaolin and silica sand production increased moderately, 24% and 7%, respectively, over 1972 production. Production of feldspar, a new mineral product in 1972, was reported at 4,510 tons.

MINERAL FUELS

Energy.—Thailands source of energy is derived from petroleum (84%), hydroelectric plants (8%), and other sources (8%), consisting chiefly of lignite and wood. The increase in consumption of petroleum has been more than 9% annually. Thailand's supply of petroleum is susceptible to outside forces that are beyond the control of the Thai Government. Although plans for nuclear powerplants and additional hydroelectric plants have been announced, no new plants were reported under construction during 1973. Mr. Kasem Chatikavanij, General Manager of the Electricity Generating Authority of Thailand (EGAT), announced late in 1973 that the RTG cabinet had approved the proposed site at Ao Phai (Phai Bay) in Chon Buri province for the construction of a 500- to 600-megawatt nuclear powerplant. No power output is anticipated prior to 1981, and when the plant is completed, it will generate only 3% of the Kingdom's total energy demands.

Eight hydroelectric dams have been scheduled for construction by 1982. Thailand's total installed electrical capacity will grow from approximately 1,400 to 4,500 megawatts, hydroelectric plants accounting for nearly 1,400 megawatts (31%).

Coal.—Lignite production continued from three and sometimes four mines in the Mae Moh valley of northern Thailand. About 700 people were continuously em-

ployed at the mines. A modest production increase of 4.6%, to 361,000 tons, was reported, and the total value was reported to be $2.2 million. Most of the lignite was burned at the Mae Moh steam electric powerplant, which is a government project built at an estimated cost of $37 million.

Petroleum.—Thailand depends on oil to generate 85% of its energy, and nearly all of its oil is imported from Saudi Arabia, Kuwait, and Qatar. The output from the Fang Field in Northern Thailand decreased from 47,000 barrels in 1972 to an estimated 45,000 barrels in 1973. This oilfield is controlled by the Defense Energy Department of the RTG. Large reserves of oil shale occur in the Mae Sot area of Tak bordering on Burma, but to date no serious effort has been made to develop these deposits.

Meanwhile, large quantities of crude petroleum and secondarily refined petroleum were imported. In 1972 partly refined oil and crude oil imports totaled 48 million barrels, up 8 million fom 1971, and refined oil imports (mainly diesel fuel oil) totaled 5.5 million barrels, down 2 million barrels from 1971. Preliminary estimates for 1973 report that Thailand refineries processed about 56 million barrels of oil, a 17% increase over that of 1972. Three local refineries, having a total capacity of about 165,000 barrels per day, produced most of the Kingdom's requirements. They are operated by Thai Oil Refinery Corp. (TORC), Summit Industrial Corp. (SUMMIT), and ESSO. Currently domestic consumption of all petroleum products is about 144,000 barrels per day. Fuel oil demands exceed all others, and the refineries can supply only one-half the demand.

Oil exploration in Thailand started onshore in 1962 and offshore in 1966. During the first part of 1973, Union Oil Co. of Thailand officially reported encountering oil and gas in its concession block 12 near Chumphon in the Gulf of Thailand (Siam). The test well flowed 11 million cubic feet of gas plus 300 barrels per day of 45° condensate.[14] An unconfirmed report was received that Tenneco Thailand Inc. had struck oil at a site 135 miles from Songkhla in the Gulf. No output from these discoveries is anticipated before 1978. During 1973, 10 wells were reported to have been drilled by four companies in the Thailand waters of the Gulf. Eighteen exploration wells are planned for the Gulf during 1975, and most of them are to be drilled by Union Oil and Tenneco Thailand. An 11,000-foot well was drilled onshore in the Khao Wong subdistrict in Kalasin Province during 1973, but no trace of oil was found.

New grants were announced by the RTG in 1973, when Chevron Oil Co. and Texaco Thailand Inc. were permitted to share drilling rights on the concessions controlled by Thailand Gulf Oil Co.

During the last 3 months of 1973 an oil embargo by the Organization of Petroleum Exporting Countries (OPEC) reduced oil imports by 15%. Thailand's Premier, in a talk before the United Nations Assembly, supported the Arab nations' cause, but the OPEC restrictions on exports to Thailand were not lifted. The RTG, at the request of Saudi Arabia, opened negotiations to exchange parboiled rice for oil, but no agreement was announced by either government before yearend. Damage caused by the petroleum shortage was softened by countrywide conservation programs and by the release of some U.S. military oil reserves. However, some hoarding and black market operations reduced the effectiveness of the conservation program. In December, the People's Republic of China (PRC) offered to sell to Thailand 375,000 barrels of diesel oil at a price higher than the retail price in Bangkok.

In 1970 the import price for crude oil at Bangkok was $1.80 per barrel; in June 1973 the price was $2.89 per barrel; and in October the price was $3.65 per barrel. Additional price increases were predicted for the end of the year making energy more costly. The 1973 discovery of oil and gas in two wells in the Gulf of Thailand will insure an additional supply of fuel oil for steam generators.

Thailand has an undeveloped source of energy in their oil shale deposits at Mae Sod, Tak Province and at Lee, Lamphun Province, where they claim to have 2,500 million tons of oil shale containing about 30 liters of oil per ton. Although the cost of nuclear fuel power appears to be a lot less than the cost of developing fossil fuel for Thailand, the financing and construction of nuclear fuel plants is far in the future.[15]

[14] Union Oil Company. 1973 Annual Report. Page 6.

[15] Bangkok Bank Monthly Review. The World Energy Crisis and Thailand. V. 14, No. 11, November 1973.

The Mineral Industry of Tunisia

By Roland W. Merwin [1]

Tunisia's gross domestic product (GDP) was approximately $2,484 million,[2] an increase of 5% over the revised GDP of 1972. The mineral share of the GDP, exclusive of the manufacturing sectors of the mineral industry, was about 5% of the 1973 total. Crude petroleum production accounted for approximately 77% of the mineral portion of the GDP. Not only is the mineral segment of the GDP significant by world standards, but it is of particular importance to Tunisia as a source of foreign exchange.

For the first time in many years the outlook for Tunisia's mineral industry took a sudden turn for the better. This was mainly due to the increase in world prices of phosphate rock, phosphatic fertilizers, petroleum, lead, and zinc because these are the resources on which the mineral industry of Tunisia is primarily based. Additionally, the Government of Tunisia was increasingly active in promoting foreign investment in the mineral industry with emphasis on projects that would process raw materials in Tunisia.[3]

The petroleum industry continued to be the most important sector of the mineral industry both as to present output and prospects for the future. Two new major fields, one onshore and one offshore, were in the process of being brought into production. Together, they were expected to increase Tunisia's present output by nearly 50%. There was an increase in exploration activities in Tunisia in 1973, with additional exploration permits being granted. In addition to prospects for success in their efforts, foreign oil companies were attracted to Tunisia because of the stable political climate and the favorable terms under which concessions could be obtained.

The placing into operation of the domestic natural gas pipeline from the El Borma Field and an agreement for the construction of the major Algerian-Tunisian-Italian natural gas pipeline established a firm base for further expansion of Tunisia's mineral-related industrial complexes.

The phosphate industry continued to be the second most important segment of the mineral industry. The Government of Tunisia continued to regard its revitalization as one of its most important objectives. Government-supported programs were aimed toward modernizing mining operations and processing phosphate rock to finished fertilizers. The objectives were to use the fertilizer industry as a base for the industrialization of Tunisia and to obtain a larger return of foreign exchange from the phosphate industry.

The nonferrous and nonmetallic mineral industries continued to receive increasing attention under the auspices of the Government-owned mining company, Société Tunisienne d'Expansion Minière (SOTEMI). Emphasis was placed on increasing production and exportation of lead, zinc, and fluorspar.

PRODUCTION AND TRADE

As in the past, most of Tunisia's mineral production was exported. In 1972 and again in 1973, combined exports of petroleum products and fertilizers accounted for approximately one-third of Tunisia's total exports by value.

The major portion of Tunisia's trade

[1] Supervisory physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

[2] Where necessary, values have been converted from Tunisian dinars (TD) to U.S. dollars at the rate of TD1 = US$2.32.

[3] U.S. Embassy, Tunis, Tunisia. State Department Airgram A-71, Industrial Outlook Report: Minerals, 1973. May 3, 1974, 9 pp., 3 attachments.

was with the European market, particularly with the European Community (EC) with which it has favorable trade agreements. The second most important sector of Tunisia's trade was with the East European Communist Bloc countries, also under special trade agreements. 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]	1971	1972	1973 [p]
METALS			
Iron and steel:			
Iron ore and concentrates, gross weight—thousand tons	936	890	809
Pig iron—do	98	143	[e] 157
Steel, crude—do	86	[2] 131	[e 2] 134
Lead:			
Mine output, metal content	18,900	18,300	15,998
Metal, primary, unalloyed plus antimonial	19,159	[3] 25,073	[3] 25,963
Mercury metal, primary—76-pound flasks	340	238	112
Silver metal, primary—thousand troy ounces	106	242	[e] 250
Zinc, mine output, metal content	11,800	10,200	7,950
NONMETALS			
Barite	1,783	1,188	18,566
Cement, hydraulic—thousand tons	584	629	550
Clays, construction [e]—do	245	260	[e] 230
Fertilizer materials:			
Crude natural, phosphate rock—do	3,162	3,387	3,473
Manufactured:			
Hyperphosphate—do	7	9	22
Superphosphate—do	422	42	44
Triple superphosphate—do		413	371
Fluorspar:			
Chemical grade	28,405	40,547	43,304
Metallurgical grade	4,554	5,485	3,296
Total	32,959	46,032	46,600
Lime, hydraulic—thousand tons	166	162	[e] 175
Salt, marine—do	250	330	355
MINERAL FUELS AND RELATED MATERIALS			
Gas, natural:			
Gross production—million cubic feet	327	1,353	4,513
Marketed production—do	35	699	4,018
Natural gas liquids, natural gasoline—thousand 42-gallon barrels	NA	1	2
Petroleum:			
Crude oil—do	31,542	31,607	29,828
Refinery products:			
Gasoline—do	850	796	[e] 870
Jet fuel—do	320	484	[e] 617
Kerosine—do	563		
Distillate fuel oil—do	2,274	2,453	[e] 2,357
Residual fuel oil—do	2,840	2,989	3,203
Other—do	1,257	[e] 612	[e] 760
Refinery fuel and losses—do	1,020	[e] 807	[e] 1,351
Total—do	9,214	8,141	[e] 9,158

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

[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] Production of billets, used in lieu of unreported ingot production.

[3] Pig lead only (excludes lead content of antimonial lead).

Table 2.—Tunisia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum metal, including alloys, all forms	121	40	All to Italy.
Copper metal, including alloys, all forms	491	466	Spain 137; France 129; West Germany 61.
Iron and steel:			
Ore and concentrate	812,243	664,100	Italy 490,000; Romania 148,100; United Kingdom 25,000.
Metal:			
Scrap	4,581	4,896	Italy 4,800; Spain 96.
Pig iron and ferroalloys	3,310	850	All to Italy.
Steel, primary forms	8,262	23,627	Italy 15,753; Morocco 7,280.
Semimanufactures	28,928	45,037	United States 23,729; United Kingdom 12,983; Morocco 4,795.
Lead:			
Ore and concentrate	2,805	6,266	France 6,260; Algeria 6.
Metal, including alloys, all forms	13,809	13,786	France 5,375; Italy 2,750; Greece 2,502.
Magnesium metal, including alloys, all forms	(1)	--	
Mercury—76-pound flasks	275	50	All to Netherlands.
Nickel metal, scrap	(1)	--	
Silver—troy ounces	32,119	322	All to France.
Zinc:			
Ore and concentrate	16,143	16,400	All to Italy.
Metal, including alloys	(1)	--	
NONMETALS			
Barite and witherite	2,000	--	
Cement	26,464	31,323	Algeria 16,372; Libya 11,032; Italy 2,155.
Clays and clay products (including all refractory brick):			
Crude clays	159	75	Algeria 34; United States 30.
Products, nonrefractory	99,757	107,062	Libya 106,135; Algeria 900.
Feldspar and fluorspar	17,372	38,525	Italy 17,250; United States 12,850; West Germany 4,200.
Fertilizer materials, phosphatic:			
Crude phosphate rock (including ground)—thousand tons	2,663	2,475	Poland 492; France 486; Czechoslovakia 240; Turkey 232; Greece 201.
Manufactured, superphosphate—do.	415	407	France 85; Italy 61; Bulgaria 40; Belgium-Luxembourg 35.
Lime	1,800	553	Algeria 320.
Salt and brine	223,130	255,001	Norway 82,045; Spain 34,695; Finland 26,843; United States 26,000.
Sulfur:			
Elemental, all forms	30	--	
Sulfuric acid, oleum	1,639	--	
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades, including briquets	5	--	
Carbon black	--	1	All to Libya.
Petroleum:			
Crude—thousand 42-gallon barrels	22,686	28,517	Italy 13,324; West Germany 7,203; France 4,794.
Refinery products:			
Gasoline—do.	967	384	Italy 374; bunkers 10.
Kerosine—do.	473	392	Bunkers 391.
Distillate fuel oil—do.	260	106	All to bunkers.
Residual fuel oil—do.	195	308	United States 284.
Lubricants—do.	11	2	Mainly to bunkers.
Total—do.	1,906	1,192	

[1] Less than ½ unit.

Table 3.—Tunisia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum metal, including alloys:			
Unwrought	(1)	(1)	NA.
Semimanufactures	861	1,183	United Kingdom 402; France 261; Spain 166.
Chromium, oxide and hydroxide	6	3	West Germany 2; France 1.
Copper metal, including alloys, all forms	937	1,579	France 884; Belgium-Luxembourg 281; Italy 246.
Gold metal, unworked or partly worked thousand troy ounces	22	23	Switzerland 21.
Iron and steel:			
Ore and concentrate	NA	(1)	NA.
Metal:			
Scrap	232	534	West Germany 252; France 233; Belgium-Luxembourg 50.
Pig iron and ferroalloys	787	902	France 865; Norway 30.
Sponge iron, powder and shot	53	45	France 29; Italy 16.
Steel, primary forms	22,165	14,128	France 7,741; Belgium-Luxembourg 4,019; Italy 1,458.
Semimanufactures	54,644	87,670	France 37,056; Japan 23,607; Italy 9,909.
Lead:			
Ore and concentrate	--	200	All from Italy.
Oxides	11	34	France 19; United Kingdom 10.
Metal, including alloys, all forms	23	27	France 23.
Magnesium metal, including alloys, all forms	7	6	Mainly from Italy.
Mercury 76-pound flasks	(1)	40	All from France.
Nickel metal, including alloys, all forms	10	14	France 7; United Kingdom 4; Switzerland 2.
Platinum-group metals and silver metals, including alloys:			
Platinum group troy ounces	1,029	257	All from France.
Silver do.	45,879	85,810	Switzerland 54,045; Italy 20,898.
Tin metal, including alloys, all forms long tons	47	55	Malaysia 23; France 11; Spain 10.
Titanium oxide	182	351	West Germany 126; France 117; United Kingdom 78.
Zinc:			
Oxide	283	200	France 123; West Germany 50; Belgium-Luxembourg 25.
Metal, including alloys, all forms	329	622	France 428; Belgium-Luxembourg 86; Italy 65.
Other:			
Ore and concentrate, n.e.s	6	1	All from France.
Oxides, hydroxides and peroxides of metals, n.e.s	161	115	United Kingdom 90; West Germany 20.
Base metals, including alloys, all forms, n.e.s	39	31	People's Republic of China 13; India 10; Sweden 6.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	16	66	Italy 61; France 5.
Grinding and polishing wheels and stones	61	83	France 34; Italy 20; Denmark 10.
Asbestos	1,859	2,288	Canada 963; Italy 800.
Barite and witherite	2,201	2,492	Greece 1,424; France 868; Italy 200.
Boron materials:			
Crude natural borates	2	3	All from France.
Oxide and acid	86	61	Italy 50; France 10.
Cement	18,084	58,682	Turkey 29,088; Italy 15,478; France 12,076.
Chalk	249	665	All from France.
Clays and clay products (including all refractory brick):			
Crude clays	8,541	11,866	Morocco 5,823; United Kingdom 2,993; France 1,453.
Products:			
Refractory	4,333	4,876	Morocco 1,071; Austria 1,016; Italy 897; France 632.
Nonrefractory	--	(1)	
Diatomite and other infusorial earth	88	141	France 79; West Germany 39; United States 22.
Feldspar and fluorspar	1,403	504	Italy 500.
Fertilizer materials:			
Manufactured:			
Nitrogenous	74,539	37,353	France 18,220; West Germany 6,614; Poland 5,697; Bulgaria 5,538.
Phosphatic	141	134	West Germany 108; Belgium-Luxembourg 24.
Potassic	6,386	546	Belgium-Luxembourg 544.
Other, including mixed	1,619	301	Mainly from West Germany.
Ammonia	53	32	West Germany 19; France 13.

See footnotes at end of table.

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

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Graphite, natural	1	1	All from France.
Gypsum and plasters	602	381	Do.
Lime	5	5	Do.
Magnesite	25	4	Mainly from Austria.
Mica, all forms	18	6	Mainly from France.
Pigments, mineral, including processed iron oxides	102	109	West Germany 97; France 6.
Pyrite (gross weight)	10,020	5,185	All from U.S.S.R.
Salt and brine	3	7	United Kingdom 5; France 1; West Germany 1.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	6,496	7,235	France 4,572; Italy 1,590; Netherlands 350.
Caustic potash, sodic and potassic peroxides	48	19	France 13; West Germany 6.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	1,970	6,082	All from Italy.
Worked	119	235	Italy 232.
Dolomite, chiefly refractory grade	158	220	France 123; Italy 96.
Gravel and crushed rock	810	1,043	Mainly from Italy.
Quartz and quartzite	1,004	522	Belgium-Luxembourg 500; Italy 20.
Sand, excluding metal bearing	15	5	Mainly from France.
Sulfur:			
Elemental, all forms	172,348	167,946	Poland 126,188; United States 28,372; France 13,385.
Sulfuric acid, oleum	4,282	19,042	West Germany 13,699; Belgium-Luxembourg 2,083.
Talc, steatite, soapstone and pyrophyllite	1,825	1,174	France 686; Italy 479.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,112	109	Italy 104.
Carbon black	300	(1)	
Coal, all grades, including briquets	37,487	24,543	U.S.S.R. 14,931; Poland 9,612.
Coke and semicoke	65,347	112,216	Netherlands 53,112; West Germany 26,529; Italy 26,525.
Peat, including peat briquets and litter	1	--	
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	2,387	5,596	Saudi Arabia 3,481; Iran 1,484; Iraq 239.
Refinery products:			
Gasoline ---do---	6	300	United Kingdom 112; Belgium-Luxembourg 100.
Kerosine ---do---	18	305	Italy 227; United Kingdom 47; Spain 12.
Distillate fuel oil ---do---	3	579	Italy 245; U.S.S.R. 243.
Residual fuel oil ---do---	824	1,322	Italy 517; France 409; U.S.S.R. 147.
Lubricants ---do---	91	108	United States 73; Italy 20; France 12.
Mineral jelly and wax ---do---	5	7	West Germany 5.
Other ---do---	117	118	Italy 111.
Total ---do---	1,064	2,739	

NA Not available.
[1] Less than ½ unit.

COMMODITY REVIEW

METALS

Iron and Steel.—Iron ore production decreased slightly below that of 1972 as a result of gradual depletion of reserves at both the Djebel Djerissa mine, which was a major producer, and the smaller Tamera mine. Exports of iron ore, mainly to Italy, decreased substantially below those of 1972 because of an increase in domestic consumption at the state-owned El Fouladh iron and steel mill.[4] The Government of Tunisia, Korf Industrie and Handel GmbH und Co., West Germany, C. Itoh & Co., Ltd., Japan, and Companhia Vale do Rio Doce (CVRD), Brazil, signed a letter of intent covering the construction of a direct reduction iron plant at Gabes at a projected cost of $55 million. The plant would import 1.5 million tons of Brazilian iron ore annually, use Tunisian natural gas, and produce 1 million tons

[4] Page 8 of work cited in footnote 3.

per year of iron sponge for export to the European market.[5]

Lead.—Mine output decreased substantially from that of 1972. All production was obtained from the operations of SOTEMI with the Djebel Hallouf and Djebel Agred mines being the most significant producers. Lead concentrates were smeltered at the Société Peñnaroya's Mégrine smelter. This smelter also processed imported lead concentrates, principally from Morocco and Algeria. Smelter output increased slightly over that of 1972, with more than one-half of the refined lead production being derived from imported concentrates.[6]

Zinc.—Zinc production in the form of high-grade ores and concentrates decreased below that of 1972. All of it was produced by SOTEMI from mines located in western Tunisia near the Algerian border, with all of the output being exported to Italy. There were discussions between the Governments of Tunisia and Algeria regarding the possible establishment of a zinc refinery in Algeria for the treatment of Tunisian and Algerian ores and concentrates.[7]

NONMETALS

Cement.—Cement was produced at two plants, one in Tunis and one in Bizerte. Because of present and projected increases in construction activities, plans were made to increase cement production capacity as an alternate to heavy imports of this commodity. The Bizerte cement plant was to be expanded and planning was in progress for a new cement plant at Gabès. Additionally, the Government of Tunisia reached a provisional understanding with the Algerian Government to build a cement plant with a capacity of 1 million tons per year at Thala in western Tunisia near the Algerian border. The output would be shared by the two countries.[8]

Fertilizer Materials. — *Phosphates.* — Tunisia maintained its position as the world's third largest exporter of phosphate rock, ranking below Morocco and the United States. The production of phosphate rock in 1973 amounted to 3.47 million tons, or 3% more than that of 1972, and was slightly more than the previous peak output of 3.44 million tons in 1968. In 1972, 73% of the production was exported directly in the form of crude and ground phosphate rock. The remaining 27% of the output was utilized by Tunisia's fertilizer complexes for the manufacture of phosporic acid and triple superphosphates, also mainly for export. In 1973 exports of crude and ground phosphate rock were slightly lower than those of 1972 with a larger proportion of the mine output being consumed by domestic fertilizer manufacturers.

In the past, Tunisia found it difficult to market its low-tenor ores produced at high-cost underground mines in competition with other countries that produced higher grade ores from lower cost open-pit mines. However, Tunisia's competitive position improved dramatically during 1973 as a result of a worldwide shortage of phosphate rock and phosphatic fertilizers. In November 1973, Tunisia's Ministry of National Economy announced that it had tripled the export price of phosphate rock from $13 to $39 per ton, a step designed to increase export revenues and improve the financial positions of Tunisian mining companies.[9]

Tunisia's phosphate rock production is almost entirely derived from mines owned and operated by the government-controlled Compagnie des Phosphates et du Chemin de Fer de Gafsa (Sfax-Gafsa) with operations centered in the Gafsa region of central Tunisia. The older mines, Metlaoui, Redeyef, Monlares and M'dila have been the basic sources of production. The 4-year plan 1973–76 called for opening new mines at M'rata, Sehib, and Kef Sehefera, also in the Gafsa region. It was anticipated that the opening of new mines would allow greater mechanization and efficiency. In addition to the Sfax-Gafsa operations, the Société Tunisienne d'Exploitation Phosphatière, a privately owned company in which the Government of Tunisia owned a 10% interest, operated the Kalaa Djerda mine in the west central region of Tunisia near the Algerian border. Tunisia's proven phosphate rock reserves were stated to amount to 300 million tons and were believed to be actually much greater.[10]

[5] Mining Journal (London). Tunisian Iron-Ore Plant Pact. V. 281, No. 7208, Oct. 12, 1973, p. 307.
[6] Pages 6 and 7 of work cited in footnote 3.
[7] Page 8 of work cited in footnote 3.
[8] Page 9 of work cited in footnote 3.
[9] U.S. Embassy, Tunis, Tunisia. State Department Telegram 6628, November 29, 1973, 2 pp.
[10] Page 4 of work cited in footnote 3.

Tunisia's domestic fertilizer manufacturing industries continued to expand their facilities. The Government of Tunisia actively encouraged and supported these expansion programs as offering the best opportunity to improve the position of the Tunisian phosphate rock industry. This thinking was based on the availability of low-cost (but low-grade) phosphate rock, which is normally difficult to market in international trade, and the favorable trade agreement with the EC, which gives Tunisia an advantage in marketing finished fertilizers in the European market. Additionally, the exportation of finished fertilizers in lieu of phosphate rock would obtain a better return of foreign exchange.

Tunisia's three established fertilizer manufacturers continued to expand and modernize their production facilities. Industries Chimiques Maghrébines (ICM), a government-owned company in which French and Italian organizations have a participating interest, operated a phosphoric acid plant at Gabès. Production amounted to about 90,000 tons. ICM was constructing a new plant with a capacity of 140,000 tons per year, and a third plant was in the planning stage. Triple superphosphate was produced by NPK Engrais, a private company, and the government-owned Société Industrielle d'Acide Phosphorique et d'Engrais (SIAPE).[11] During the year SIAPE completed modernization of the phosphoric acid sector of its fertilizer complex at Sfax with the capacity of the plant remaining unchanged at 100,000 tons per year.[12]

Plans were announced for constructing Tunisia's first monoammonium phosphate plant to be built at Gabès. It will be operated by a new company, Resources Tunisie S.A., which has been set up by the Central Resources Corp. (CRC) of New York in association with a group of Tunisian companies: ICM, SIAPE, and Société Nationale d'Investissement (SNI). Scheduled to come onstream in early 1975, the plant will be built next to ICM's plants from which phosphoric acid will be obtained. CRC, which holds 70% of Resources Tunisie. is to supply sulfur to ICM.[13]

Fluorspar.—Production and exports of chemical and metallurgical-grade fluorspar in 1973 were only slightly higher than those in 1972. All of the output was obtained from the operations of SOTEMI in the Zaghouan Region of Central Tunisia. Fluorspar reserves are estimated to be a minimum of 10 million tons.[14] Late in 1973 the Government of Tunisia entered into an agreement with a French company, Huertey, and its Swiss associate, Buss, to establish an aluminum fluoride plant at Gabès. The plant will cost an estimated $11 million and will employ more than 700 people. Over 90% of the financing was guaranteed by a French credit.[15]

MINERAL FUELS

Natural Gas. —There was more than a fivefold increase in the marketed production of natural gas compared with that of 1972. This was the result of the completion in late 1972 of a 300-kilometer natural gas pipeline from the El Borma Field to the city of Gabès. An agreement was concluded late in 1973 for the construction of a 388-billion-cubic-foot-per-year natural gas pipeline from Algeria, through Tunisia, underwater to Sicily, and on to the Italian mainland. In return for transit rights, some of the gas would be made available to meet Tunisia's future industrial needs including future ammonia production.[16]

Petroleum.—Tunisia's crude petroleum production decreased slightly below that of 1972, with most of the output obtained from the El Borma Field. However, it was anticipated that Tunisia's decline in production would be reversed in 1974 when the developing offshore Ashtart Field is brought into production at an expected rate of 20,000 to 30,000 barrels per day.[17] Additionally, it was expected that the onshore Sidi Behara Field, discovered in 1971, would be brought into production in 1974.[18]

At yearend 1973, 22 exploration permits covering about 195,000 square kilometers were outstanding compared with 19 permits covering 177,000 square kilometers at

[11] Page 4 of work cited in footnote 3.
[12] Phosphorus & Potassium (London). New Plants and Projects, Tunisia. No. 68, November–December 1973, p. 14.
[13] Page 13 of work cited in footnote 12.
[14] Page 7 of work cited in footnote 3.
[15] U.S. Embassy, Tunis, Tunisia. State Department Airgram A-198, Dec. 21, 1973, 2 pp.
[16] U.S. Embassy, Tunis, Tunisia. State Department Airgram A-006, Economic Trends Report for 1973, Jan. 16, 1974, p. 7.
[17] Page 5 of work cited in footnote 3.
[18] Oil and Gas Journal. Worldwide Production. V. 71, No. 53, Dec. 31, 1973, p. 130.

yearend 1972. About half of the area covered was offshore.[19]

Drilling activity decreased in 1973, with only 9 exploration wells being drilled as compared with 12 in 1972. However, there was an increase in exploration drilling offshore, with five wells being completed during the year. No new oil discoveries were reported in 1973.[20]

Overall there was an increase in the interest in, and conduct of, exploration activities in Tunisia in 1973. This reflected the urgent worldwide search for petroleum by oil companies, particularly in such countries as Tunisia, which was still extending concessions on favorable terms and was maintaining a relatively favorable climate for new investment. U.S. petroleum interests became very active, with four oil companies holding exploration permits in Tunisia having already started exploration drilling or planning to do so in the near future.[21]

[19] Page 5 of work cited in footnote 3.
[20] Page 6 of work cited in footnote 3.
[21] U.S. Embassy, Tunis, Tunisia. State Department Airgram A–161, Petroleum: Developments Regarding New Exploration Activities, Oct. 30, 1973, 4 pp.

The Mineral Industry of Turkey

By E. Shekarchi [1]

During 1973, the Turkish economy continued to expand. However, the mineral industry's contribution to the total economy remained unchanged in 1973 when compared with that of 1972. A program of heavy investments in the next few years to develop domestic resources, as well as basic and intermediate industries, indicates a more effective input from the mineral industry in the future. The gross national product (GNP) increased 24% to a record level of $21.16 billion [2] in 1973 compared with 1972 data. Per capita GNP increased 3.7% or from $459 in 1972 to $476 in 1973.

The contribution of Turkish worker's remittances to the economy of Turkey remained significant. Approximately 1 million Turks were employed abroad in 1973. Their currency remittances were $1.18 billion, an increase of 57.3% compared with the 1972 figure.

The text of the third 5-year plan (1973–77) became available in the latter part of the year. The basic target of long-term development strategy was to make the Turkish economy competitive with that of Europe by 1995 when Turkey is scheduled to become a full member of the European Communities (EC).

On January 1, 1973, Turkey entered into the second and transitional stage of association with the EC. The current transitional phase is due to last 12 years, but may be extended to 22 years to protect developing industries. Since the beginning of 1973, a 10% reduction in tariffs on nonsensitive goods has been in force; also certain goods were imported duty free.

During the period 1966–72, $700 million was invested in Turkish mining by the state and private sectors of the economy. According to the Official Gazette, reporting on decisions made in the National Assembly, the investment forecast for the period 1973–77 was $1.2 billion. The emphasis in this period is expected to be generally on iron, copper, phosphates, boron minerals, and magnesite. More specifically, state mining investment during this period will be directed to pelletizing Divrigi iron ore in 1974, developing the Hasan Çelebi iron ore mine in 1976, expanding manganese production, preparing and implementing a bituminous coal plan, expanding lignite works, and producing natural gas. Also included in Turkey's investment projects were exploration for oil, streamlining production efforts on tungsten in 1974, increasing production of copper from the eastern Black Sea Area, production of phosphate rock from the Mardin Region in 1975, increasing marble production to 25,000 cubic meters annually, and production of chromite from the Kefdagi mines in 1975.

The controversial Mining Reform Bill was still awaiting ratification at yearend. The most significant feature of the bill, prepared by the various engineering organizations of Turkey, provided for exploitation of boron minerals by the states either alone or in partnership with the Turkish private sector. The legislation was approved by the parliament in May 1973, but was vetoed by the President. It was scheduled to be reconsidered by the parliament in 1974.

Maden Tetkik ve Arama Enstitüsü (MTA), the Mineral Research and Exploration Institute of Turkey, continued geological and geophysical studies for iron ore, lead-zinc-copper, coal, oil shale, phosphates, marble, graphite, and perlite. The work of MTA on the preparation of smokeless fuel

[1] Physical scientist, Division of Ferrous Metals—Mineral Supply.

[2] Where necessary, values have been converted from Turkish Lira (LT) to U.S. dollars, at the rate of LT1 = US$0.15.

was reportedly technically successful at the end of 1973; however, the economical feasibility of the process remained to be proven. Geological mapmaking, one of the major activities of MTA, continued; several quadrangles of 1:50,000 scale became available during the year.

The World Bank announced in February that a credit of $74 million was provided to the State Water Works of Turkey for the Ceylan irrigation and power project. This credit will be repayed over 40 years at an interest rate of 7.25% with the first payment due in 1982.

In October 1973, Turkey and the Soviet Union signed an agreement providing for the joint construction of a dam and irrigation project on the Arpacay River, which forms part of the frontier between the two countries. It is expected that the $18 million project will be completed within 4 years.

PRODUCTION AND TRADE

The available data on mineral production and trade are given in the following tables:

Table 1.—Turkey: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Aluminum, bauxite	153,253	471,342	33,424
Antimony:			
Ore:			
Gross weight	25,929	35,471	38,991
Mine output, metal content	r 2,723	3,724	4,094
Regulus	r 2	26	e 26
Chromite ore (48% Cr_2O_3 content)—thousand tons	r 349	e 290	e 300
Copper:			
Mine output, metal content	r 22,440	24,960	e 37,500
Metal:			
Smelter output:			
Primary	r 16,843	16,722	24,714
Secondary	r 719	375	450
Refined output	17,520	15,000	14,880
Iron and steel:			
Iron ore, gross weight—thousand tons	r 2,421	1,989	2,556
Pig iron and ferroalloys:			
Ferrochromium e	9,500	r 9,500	9,500
Pig iron and other ferroalloys—thousand tons	r 881	1,135	896
Crude steel (including castings)—do	1,122	1,442	1,209
Lead, mine output, metal content [1]	r 5,967	5,860	8,922
Manganese ore, gross weight	13,942	15,077	5,552
Mercury—76-pound flasks	r 10,518	8,084	9,352
Zinc, mine output, metal content [2]	r 18,933	19,348	17,129
NONMETALS			
Abrasives, natural emery	r 83,095	79,835	90,008
Asbestos	3,893	4,924	4,718
Barite	28,547	65,896	64,524
Boron minerals	r 609,202	622,444	534,218
Cement, hydraulic—thousand tons	r 7,553	8,424	8,952
Clays:			
Bentonite	e 2,000	e 5,000	7,814
Kaolin	NA	NA	23,967
Other	NA	NA	30,112
Fertilizer materials, all types	r e 650,000	680,884	667,897
Fluorspar	2,694	2,311	1,967
Gypsum e—thousand tons	r 302	r 337	358
Magnesite, crude ore	r 361,882	334,561	341,144
Meerschaum—kilograms	18,300	19,350	22,150
Perlite	9,180	30,417	17,329
Pyrite, cupreous:			
Gross weight	58,447	77,062	43,530
Sulfur content	26,887	35,880	20,459
Salt, all types—thousand tons	r 536	430	e 730
Sodium sulfate	18,467	30,213	36,838
Stone, sand and gravel, n.e.s.:			
Limestone:			
Dolomitic	NA	NA	336,793
Other	NA	NA	3 93,400
Marble	e 115,000	4,753	1,209
Quartzite	NA	NA	114,113

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
NONMETALS—Continued			
Stone, sand and gravel—Continued			
Sand, siliceous	NA	NA	52,479
Shale (argillite)	NA	NA	13,929
Sulfur, refined	r 23,650	21,020	17,750
Wollastonite	NA	NA	10,295
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural ---thousand tons	23 e	168	286
Coal: [4]			
Bituminous ---do	r 4,648	4,650	4,624
Lignite ---do	r 6,225	7,353	5,644
Coke and semicoke:			
Metallurgical ---do	1,280	e 1,300	e 1,284
Gashouse ---do	99	e 27	e 30
Breeze ---do	66	123	e 120
Total ---do	1,445	1,450	1,434
Gas, natural:			
Gross production e ---million cubic feet	25,000	24,000	24,000
Marketed production e ---do	5,000	5,000	5,000
Petroleum:			
Crude ---thousand 42-gallon barrels	r 24,724	24,416	25,810
Refinery products:			
Gasoline ---do	r 9,788	12,885	16,006
Jet fuel ---do	888	1,710	1,927
Kerosine ---do	3,744	3,918	4,466
Distillate fuel oil ---do	r 15,710	18,932	23,453
Residual fuel oil ---do	26,619	31,236	36,786
Lubricants ---do	NA	338	NA
Other:			
Liquefied petroleum gas ---do	2,576	3,861	4,620
Naphtha ---do	1,035	1,806	2,082
Petroleum asphalt ---do	1,145	1,279	1,407
Unspecified ---do	56	75	75
Refinery fuel and losses ---do	1,323	3,959	3,483
Total ---do	[5] r 62,884	79,999	[5] 94,305

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

[1] Total content of material reported as run-of-mine lead ore and lead-zinc ore; excludes lead content of material reported as run-of-mine zinc ore.

[2] Total content of material reported as run-of-mine zinc ore and lead-zinc ore; excludes zinc content of material reported as run-of-mine lead ore.

[3] Does not include crushed limestone used in the manufacture of cement.

[4] Data for 1971 and 1972 are for washed coal and direct sales of run-of-mine, whereas for 1973 data for the latter is not available.

[5] Total are listed figures only; does not include an estimate for lubricant production.

Table 2.—Turkey: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Bauxite	66,600	150,000	All to U.S.S.R.
Semimanufactures	126	543	West Germany 168; Kuwait 141; Lebanon 117.
Copper:			
Ore and concentrate	6,755	5,560	All to West Germany.
Semimanufactures	2,575	12,590	United States 7,150; Belgium-Luxembourg 2,465; West Germany 1,900.
Chromium ore and concentrate	538,949	342,257	United States 87,387; Switzerland 58,961; Czechoslovakia 29,864.
Iron and steel:			
Ferroalloys	3,481	12,590	United States 7,150; Belgium-Luxembourg 2,465; West Germany 1,900.
Semimanufactures	2,886	11,409	Syria 5,068; West Germany 3,163; Lebanon 1,164.
Unspecified ---value, thousands	$126	$71	NA.
Lead ore and concentrate	11,551	11,351	Bulgaria 5,950; Switzerland 3,088; United Kingdom 1,113.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Zinc:			
Ore and concentrate	20,292	16,691	Italy 9,288; Spain 2,400; Bulgaria 1,820.
Semimanufactures	70	509	All to West Germany.
Other:			
Nonferrous base metal ore and concentrate, n.e.s	3,881	8,429	United States 3,000; West Germany 2,138; Italy 1,050.
Metalliferous ores, concentrates, scrap, n.e.s. -value, thousands	--	$85	West Germany $64.
Nonferrous base metals, n.e.s	101	117	NA.
NONMETALS			
Abrasives, natural	87,055	75,043	Mainly to Netherlands.
Cement, hydraulic ---thousand tons	1,070	1,362	Israel 456; Hungary 192; Nigeria 169.
Clays and clay products (including all refractory brick):			
Crude clays	92,384	81,906	Austria 55,251; East Germany 5,040; Belgium-Luxembourg 4,460.
Products:			
Refractory (including nonclay brick)	NA	1,841	Iraq 1,605.
Nonrefractory	NA	911	NA.
Pyrite, unroasted (gross weight)	36,634	36,265	All to West Germany.
Stone, sand and gravel	3,198	4,100	NA.
Other:			
Crude minerals, n.e.s	356,285	400,626	Italy 101,181; France 54,445; West Germany 49,490.
Lime, worked stone, and building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s. value, thousands	$31	$114	Israel $55; France $8; United States $6.
MINERAL FUELS AND RELATED MATERIALS			
Coal, coke, briquets	15,355	--	
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	--	166	Netherlands 126; Belgium-Luxembourg 40.
Refinery products:			
Gasoline ---------- do	452	3,497	West Germany 1,822; Syria 415; Greece 397.
Kerosine and jet fuel -- do	190	822	Greece 284; Lebanon 280; Arab Republic of Egypt 258.
Distillate fuel oil ----- do	239	1,408	West Germany 546; Greece 445; United Kingdom 146.
Residual fuel oil ------ do	--	1,403	Greece 420; Italy 289; France 187.
Other ---------- do	38	--	
Total ---------- do	919	7,130	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	NA	17,560	All to West Germany.

NA Not available.

Table 3.—Turkey: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum metal, including alloys, all forms	32,205	35,435	Canada 11,061; West Germany 5,256; Switzerland 4,602.
Copper:			
Ore and concentrate	--	21,340	All from Philippines.
Metal, including alloys, all forms	308	1,212	West Germany 681; Belgium-Luxembourg 157; United Kingdom 146.
Iron and steel:			
Ore and concentrate -thousand tons	125	245	All from Brazil.
Metal:			
Scrap -do-	103	109	United States 61; West Germany 12; Netherlands 9.
Pig iron, ferroalloys, similar materials -do-	35	36	U.S.S.R. 19; West Germany 5; Norway 4.
Primary forms -do-	337	303	U.S.S.R. 82; United States 44; Japan 41.
Semimanufactures:			
Bars, rods, angles, shapes, sections -do-	225	70	U.S.S.R. 43; West Germany 12; Czechoslovakia 4.
Universals, plates, sheets do	17	70	Netherlands 28; France 13; Italy 8.
Hoop and strip -do-	3	4	Austria 1; France 1; West Germany 1.
Rails and accessories -do-	13	13	France 6; Italy 4; U.S.S.R. 3.
Wire -do-	5	7	West Germany 5; Belgium-Luxembourg 1; United Kingdom 1.
Tubes, pipes, fittings -do-	32	31	U.S.S.R. 12; Japan 5; West Germany 5.
Castings and forgings, rough do	1	2	France 1; Italy 1.
Total -do-	296	197	
Lead metal, including alloys, all forms	5,821	7,074	United Kingdom 5,970; Tunisia 491; United States 372.
Nickel:			
Matte, speiss, similar materials	134	110	United Kingdom 71; Netherlands 32.
Metal, including alloys, all forms	225	257	West Germany 148; United States 31; Austria 19.
Platinum-group metals and silver value, thousands	$545	--	
Tin metal, including alloys, all forms long tons	1,137	693	Belgium-Luxembourg 364; Switzerland 280.
Zinc metal, including alloys, all forms	9,628	17,652	West Germany 6,120; United Kingdom 4,618; Switzerland 2,478.
Other:			
Metalliferous ores, concentrates, scrap, n.e.s -value-	--	$51,100	NA.
Nonferrous metal ore and concentrate, n.e.s	550	2,620	United Kingdom 1,810.
Nonferrous metals, n.e.s. value, thousands	$627	$96	NA.
NONMETALS			
Abrasive materials:			
Crude, n.e.s -do-	$176	$155	NA.
Grinding and polishing wheels and stones	592	759	West Germany 174; Czechoslovakia 112; Norway 112.
Asbestos, crude	10,595	11,577	Canada 4,789; U.S.S.R. 3,041; United Kingdom 1,708.
Cement, lime, worked stone	1,365	1,619	NA.
Clay products:			
Refractory (including nonclay brick)	28,273	53,762	U.S.S.R 26,618; West Germany 11,073; Austria 5,924.
Nonrefractory	389	115	Mainly from West Germany.
Diamond, industrial -value, thousands	--	$104	NA.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Fertilizer materials:			
Crude:			
Nitrogenous	7,497	10,650	Mainly from Belgium-Luxembourg.
Phosphatic	291,879	360,658	Tunisia 230,186; Israel 67,423; Jordan 55,049.
Manufactured:			
Nitrogenous	330,689	650,929	Italy 356,632; West Germany 93,954; Netherlands 84,447.
Phosphatic	7,855	2,596	All from U.S.S.R.
Potassic	203	16,276	All from West Germany.
Other	328,327	528,928	West Germany 177,490; Italy 122,175; France 59,432.
Mica, worked	--	37	NA.
Pigments, mineral, natural	8,846	5,923	West Germany 2,345; Netherlands 924; France 663.
Pyrite:			
Unroasted (gross weight)	--	135,675	Cyprus 105,727; Switzerland 21,967.
Roasted (gross weight)	25,551	--	
Sulfur:			
Elemental	NA	4	NA.
Sulfuric acid	109,039	61,439	Switzerland 49,467.
Other:			
Minerals, crude, n.e.s. value, thousands	$600	$1,227	United States $375; U.S.S.R. $199; West Germany $129.
Inorganic bases and metallic oxides, n.e.s.	34,366	95,232	Italy 38,751; Lebanon 38,048; Canada 3,880.
MINERAL FUELS AND RELATED MATERIALS			
Coal, coke, briquets	2,435	9,957	Mainly from West Germany.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	41,516	49,701	Saudi Arabia 22,498; Iraq 10,360; Iran 6,245.
Refinery products:			
Gasoline ---do---	341	281	Mainly from Italy.
Kerosine and jet fuel ---do---	89	208	U.S.S.R. 161.
Distillate fuel oil ---do---	1,606	1,401	U.S.S.R. 923; Italy 333; Greece 114.
Residual fuel oil ---do---	668	1,608	Italy 1,484; U.S.S.R. 124.
Lubricants ---do---	832	1,181	United States 653; Romania 155; United Kingdom 154.
Other:			
Liquefied petroleum gas value, thousands	$1,925	$135	Italy $134.
Mineral jelly and wax thousand 42-gallon barrels	38	34	West Germany 13; Iraq 8; People's Republic of China 5.
Unspecified ---do---	3	--	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	NA	1,774	NA.

NA Not available.

COMMODITY REVIEW

METALS

Aluminum.—The integrated aluminum plant at Seydişehir, began partial operation in March 1973. Full operation of the plant was delayed by shortages of power and construction materials. Annual capacity of the first unit of the plant was 20,000 tons of aluminum billets. When completed in 1975, the total capacity of the complex will be approximately 200,000 tons of aluminum, 60,000 tons of aluminum billets, beams, plates and foil, and about 25,000 tons of semifinished aluminum products. Total construction cost is estimated to be $286 million, of which $62 million was supplied by the Soviet Union under a bilateral agreement.

The Seydişehir complex will use bauxite ore from the Murtas and Dogankuzu concessions where reserves are estimated at 30 million tons of bauxite averaging 57%

aluminum oxide. Because of the delay in full operation of the aluminum complex, only 33,424 tons of bauxite were mined during the year. Some of the bauxite was exported to the Soviet Union under the aforementioned agreement.

Chromite.—The chromite concentration plant at Guleman mine was completed in the early part of 1973 and operated successfully, upgrading ores from 35% chromite content to 46%. Expansion of the ferrochrome plant at Antalya, southwest Turkey, was completed in 1973.

The production of chromite ore increased 3.5% in 1973 compared with 1972 output figures. The increased production was from Etibank's eastern mine where two new ore bodies were brought into production during the year.

Copper.—The Karadeniz Bakir Isletmeleri (KBI), the Black Sea Copper Co., owned 49% by Etibank and the remainder by private Turkish banks, started operating its copper smelter at Samsun in 1973. By yearend, about 10,000 tons of blister copper was shipped to a Yugoslavian refinery. When the Cakmakkaya mine and mill in the Murgul Area and the Hopa filtering-slurry pipeline become fully operational at the end of 1974, the Samsun copper smelter will reach its maximum capacity of 41,000 tons of blister copper per year.

Production of blister copper increased 48% in 1973 compared with 1972 output. Production figures for gold and silver from the Samsun smelter were not available at yearend.

Iron Ore.—The main iron mines of Turkey were in central Anatolia at Divrigi, west of Sivas, and Malatya. Other smaller deposits were in Kayseri, Adana, and western Turkey. The overall average iron content in Turkish iron ore was about 52%, although it was over 60% in several areas. The iron ores of Turkey also averaged about 7% silica, 0.1% phosphorus, and from 0.1% to 2.3% sulfur in some hematites.

A beneficiation plant has been proposed for the Divrigi Area to test some of the sulfurous magnetite ores of central-eastern Turkey. The beneficiated ore would be pelletized.

Increased demand by steel plants in Turkey for iron ore and pig iron in 1973 necessitated importing 600,000 tons. However, with the construction of a beneficiation and pelletizing plant, the Government foresees a curtailment in iron ore imports and thus a savings of hard foreign exchange.

Iron and Steel.—Turkey has two integrated iron and steel plants: The public sector works at Karabük with an annual production acpacity of 520,000 tons; and the private sector plant at Ereğli with an annual production capacity of 800,000 tons. There were several private scrap smelters with rolling mills, and many smaller rerollers.

Ereğli Demir ve Çelik Fabrikalari A.S. (ERDEMIR), Ereğli Steel Plant of Turkey, ordered a hot-strip mill from the United States valued at about $30 million. The new mill was part of an expansion plan aimed at increasing the Eregli plants' capacity for hot-rolling sheet and strip to 2 million tons annually.

An agreement was signed by the Turkish Government and Tiajpromexport of the U.S.S.R. in January 1973 to expand the capacity of the Iskenderun integrated steel plant from 1 million to 2 million tons annually. The total cost of the original plant was estimated at $435 million. In 1970, the Soviet Union agreed to partially finance the plant in exchange for raw materials from Turkey. The completion date was given as the latter part of 1974. The ore requirements of the Iskenderun integrated steel plant was expected to be about 1.7 million tons annually, of which 85% has to be sintered; the remainder can be lump ore. Pellets will be added to the burden at a later date. The principal units of Iskenderun steel plant were as follows:

Coke-Oven Plant.—Full coal handling, storage, and blending facilities for feeding two batteries of 69 ovens each and the necessary coke quenching tower, handling equipment and byproduct-recovery units.

Raw Material Preparation.—Large-scale handling, storage, and blending facilities are provided for ore, limestone, other fluxes, and coke breeze along with crushing and screening equipment to serve three 75-square-meter sinter stands. About 1.5 million tons of fluxed sinter will be produced annually.

Ironmaking Plant.—The ironmaking plant will consist of two 1,386-cubic-meter blast furnaces, each rated at 1,570 tons per day of hot metal. Ancillary equipment includes conventional stoves, gas cleaning plant, pig-casting, and slag processing.

Steelmaking Plant.—The steel plant will consist of two 130-ton basic oxygen furnaces

(BOF) vessels, with a 1,300-ton inactive mixer, scrap preparation bay, calcining plant for up to 100,000 tons per year of lime, hot metal ladles, and a tonnage oxygen plant comprised of three air-separation units with a total maximum production rate of 15,000 cubic meters per hour.

Continuous Casting.—This section consisted of three four-strand machines capable of producing 265 and 340 millimeter blooms.

Rolling Mills.—The output in the first stage will not include flats; production will be as billets, bars, rods, and light sections.

Other shops and equipment are for repair and maintenance, foundry, forge, fabrication, and heat treatment. The powerplant has conventional boilers and two 30-megawatt generators. External power supply will come from the Cukurova Electrical Authority. Maximum use will be made of seawater for cooling purposes.

Production of crude steel decreased 16% in 1973 compared with 1972 output. The decrease was attributed partly to the energy shortage and partly to a shortage of raw materials, particularly domestic iron ore. However, with the Ereğli plant expansion and construction of the Iskenderun complex, Turkey was looking for an export market for its steel production in the near future.

To avoid a steel shortage in Turkey in 1973, the Government ordered import duty relaxation for 1 year on electrical sheets, hot dipped, and electrolytic tinplate.

Lead and Zinc.—The construction of a lead and zinc smelter in Kayseri Province, near the Zamanti mine was delayed for another year. In the latter part of 1973, Allis-Chalmers Co. of Canada was awarded a contract to supply equipment for the smelter. The contract, valued at $6.6 million, included four rotary kilns together with two 16- by 6-foot rotary coolers. The equipment was scheduled to be delivered early in 1974. Furthermore, Allis-Chalmers agreed to construct the smelter, as well as manage the mine as part of the contract. The smelter will be capable of producing annually 20,000 tons of electrolytic zinc, 10,000 tons of galvanized zinc, 2,000 tons of refined zinc, 3,000 tons of lead ingots, and about 140 tons of byproduct cadmium.

Production of lead and zinc in 1973 was 843 tons more, or 3% higher than the 1972 output.

Mercury.—Mercury production increased 16% in 1973 compared with that of 1972. Etibank obtained a 40-year concession to operate mines in an area near Baltali in Uşak Province. The size of the concession, 1,000 hectares, suggested intensive exploration activity in this region for the coming years.

Tungsten.—West German credits totaling about $9.5 million were secured for developing the Uludag tungsten mine and concentrator in 1973. Etibank, the present owner of the mine, reported a proven ore reserve of 1.5 million tons. The deposit, a few miles from Bursa, was near the peak of Uludag Mountain at 8,000 feet. The sheelite ore body was in two horizons: The upper was garnetiferous and of low grade; the lower was granitic and contained about 0.4% WO_3.

The concentrator was designed to treat sheelite from both horizons at a rate of 560,000 tons annually, and to produce 3,000 tons of concentrate containing 65% WO_3. Initial production was scheduled for mid-1974.

NONMETALS

Barite.—Barit Maden Turk A.S. exported a record amount of barite in 1973, though production decreased 2% compared with that of 1972. Most of the barite was exported to the oil-producing nations of the Middle East and some was exported to the United States.

Boron.—Etibank remained the main boron producer in Turkey in 1973. Boron production at Etibank's plant in Bandirma increased from 6,662 tons in 1968 to 26,930 tons in 1973. Similarly, boric acid production increased from 1,764 tons to 11,168 tons during the same period. The capacity of the Bandirma boric acid plant was expected to reach 25,000 tons of acid by 1975.

Etibank conducted a feasibility study for constructing a new sodium perborate plant in the Bandirma Area. The plant, with a 20,000-ton annual capacity, will cost $6 million; construction was scheduled to start in late 1974.

Etibank's clay-washing plant, completed in 1973, had a 450,000-ton annual capacity. Prior to the opening of this plant, ore was up-graded by handpicking. Another plant, for up-grading borate by concentration, was due to begin operation in 1974 at Kirka. The annual capacity of this plant reportedly will be 400,000 tons of concentrate.

Production from the Kirka plant will be used in the glass industry and in the manufacture of sodium borate.

Etibank initiated an expansion program at the port of Bandirma on the Sea of Marmara, making it possible to load and unload cargo at the rate of 2,000 tons per hour. Etibank ships most of its boracite ore, boric acid, boron compounds, and sulfur through this port.

Other companies involved in the borate industry in 1973 were as follows: (1) the Mortas-Bortas group, which in addition to mining colemanite in the Mustafa Kemal Paşa and Bigadic Area, has taken over operation of the Emet mine as well. The Emet mine previously was operated by Turk Boraks Madençilik A.S., a subsidiary of RTZ-Borax Ltd., of the United Kingdom. (2) Rasih ve Ihsan A.S., a subsidiary of Péchiney Ugine Kuhlmann, S.A., of France and Kerr McGee Chemical Corp. of the United States operated mines in the Bigadic Area. (3) Ali Sayacki, Yakal Borasit Ltd., and Kemal, S.A., all financed by Turkish private concerns, operated borate mines in various parts of the country.

Celestite.—The celestite deposit, discovered in 1972 and owned by Barit Maden Turk A.S., remained idle in 1973. Several tons of ore was shipped to West Germany for analysis and feasibility studies. By yearend, no firm decision had been made on exploitation of the deposit.

Cement.—Cement production rose from 8.4 million tons in 1972 to 8.9 million tons in 1973, an increase of 6%. Cement, a new foreign exchange earner for Turkey, contributed $80 million to the general economy of the country during the year although cement exports had to be curtailed due to heavy domestic demand. Turkish cement was exported for the most part to Syria, Iran, Hungary, and Australia.

Aşkale tesis Müdürluğu operated its new cement plant at Erzurum. Investment in new cement facilities and expansions during 1973 were the heaviest of the last 10 years. The following plants were under construction with completion scheduled for early 1975 (new annual capacities are given in parenthesis): Bolu Çimento Sanayii A.S. at Bolu (550,000 tons); Göltaş Çimento A.S. at Isparta, (620,000 tons); Mardin Çimento A.S. at Mardin, a new plant (580,000 tons); and Ünye Çimento A.S. at Ünye, a new plant (620,000 tons).

Clays.—*Bentonite.*—Samas Sanayii Madenleri, A.S., continued drilling its Reşadiye and Tokat bentonite concessions during 1973. At yearend, it was reported that bentonite reserves of the sodium variety exceeded 15 million tons. Most of the production from the company's new bentonite beneficiation plant was used domestically. Negotiations with representatives of foreign companies to export bentonite to Europe and to the Middle East continued during the year.

Total production in 1973, was 7,814 tons, 46% higher than that of the previous year.

Fertilizer Materials.—In little more than a decade Turkey has advanced from an insignificant user of fertilizers to a position where total vegetative plant nutrient consumption exceeded the world average. Between 1960 and 1972 fertilizer consumption increased from 1.1 kilograms of nutrient per hectare of arable land to 33.9 kilograms.

To cope with increased consumption, public and private companies invested heavily in new construction and plant expansion. Istanbul Gubre Sanyii, with financial aid from the World Bank, started constructing a fertilizer plant in Izmit in 1973. The Izmit plant, when completed, will produce 1,000 tons of ammonia and 1,550 tons of urea per day. Also Azot Sanayii at Kutahya planned to add ammonia fertilizer capacity totaling 590,000 tons of nitrogen per year to its various installations around the country.

Fluorspar.—Fluorspar-rich veins are known to occur in six locations in the Anatolian plateau, central Turkey. Production from these veins has been intermittent, and in 1973 output declined to 1,967 tons. To satisfy its domestic requirement, Turkey imported approximately 3,000 tons of fluorspar in 1973.

Magnesite.—Magnesite production in 1973 was 2% higher than the 1972 output. Most of the output was from the Eskişehir and Kutahya mines. Additional geological work in the Kutahya and Tavşanli Area has indicated higher ore reserves than the 6 million tons previously reported.

Sumerbank's chromite-magnesite refractory brick plant at Meran, near Konya, produced about 84,000 tons of refractory brick, most of which were used domestically. The company also produced about 3,000 tons of chrome-magnesite brick and 3,000 tons of tar-bound magnesite brick.

A new dead-burned magnesite plant was under construction in 1973 near Kutahya in west-central Turkey. The plant, which belonged to Kutahya Manyezit Isletmeleri A.S. (Kumas), was designed to produce 80,000 tons annually of refractory-grade MgO and was expected to be onstream in 1976. Feed material for the plant will come from the company's own magnesite mines in Kutahya, supplemented by higher quality magnesite from the Eskişehir Area.

The Eskişehir-Kutahya Region was the center of Turkey's magnesite activities through the operation of Magnesite Anonim Şirketi and Continental Magnent Ltd. (COMAG). Magnesite Anonim Şirketi, an associate of Veitscher Magnesitwerke of Austria, produced 50,000 tons annually in its dead-burning plant at Eskişehir and exported the bulk of the output to Austria and West Germany. COMAG, a former subsidiary of Continental Ore Corp., produced 35,000 tons annually of caustic calcined magnesite at its Kutahya plant.

MINERAL FUELS

The greatest challenge facing the mineral industry of Turkey lies in the fuel sector. Despite substantial coal reserves, output has not kept abreast of population and industrial expansion. Mechanization of coal mining is difficult and costly owing to the highly faulted nature of the coalfields and the increasing depth of the coal seams to be mined. However, to meet Turkey's greater energy demand, the gates of the Kaban dam were lowered in November 1973, and the power project went into operation. The project was delayed from its original 1971 scheduled completion date by a shortage of construction materials. At full capacity, the Kaban hydroelectric project will generate nearly 6,000 million kilowatt-hours of electricity, sufficient to meet the energy demand of a large part of the population. In the face of a world oil crisis and rapidly rising oil prices, oil exploration in Turkey was accelerated. A decision was made to redrill some old oil wells to depths of 6,000 meters instead of the 4,500 meters previously drilled. Also, intense negotiations continued during the year between the Turkish Government and neighboring countries, Iran and Iraq, to permit the transit of natural gas and petroleum through Turkey to Europe.

Electric power production has been steadily increasing in Turkey, as it has all over the world. In 1950, Turkey's total electric production was 780 million kilowatt-hours; in 1960, it increased 3.5-fold and reached 2.8 billion kilowatt-hours; in 1970, production tripled to 8.6 billion kilowatt-hours. A recent forecast by Government officials covering the next decade called for a 3.5-fold increase. This increase would place total electric-power production in Turkey at 30 billion kilowatt-hours by 1980. The level of production during 1973 remained comparatively low at 12.3 billion kilowatt-hours.

Exploratory drilling for geothermal energy, under United Nations (U.N.) aegis, discovered large deposits of high-pressure steam near Denizli in northwest Turkey. The steam reportedly had a high lime content, and the U.N. recommended building a small pilot powerplant until the degree of scaling could be determined. MTA independently discovered steam sources in Afyon, and was conducting a geophysical investigation at Kizilcahamam, northwest of Ankara.

Coal.—*Bituminous and Lignite.*—The center of Turkey's coal mining industry was the Zonguldak coalfields, which extended for 80 to 112 kilometers along the Black Sea Coast from Ereğli to Amassya; the seams were up to 12 kilometers wide. In years past, Turkey exported hard coal from the Zonguldak basin; however, the country was barely able to meet domestic needs in 1973. Bituminous coal production reached about 4.6 million tons in 1973, compared with a 10-million-ton target set by the planning organization. Reportedly, the ash content of washed Turkish coal was about 12.5% to 14.5%, dry basis, sulfur 0.6% to 0.8%, and volatile matter 30% to 32% with 10% to 12% moisture.

Most of the known lignite fields were in western Turkey, but in the last few years, vast reserves have been discovered at Maras-Elbistan in eastern Turkey about 160 kilometers north of the Syrian border. The Elbistan lignite deposits contained approximately 3 billion tons of proven reserves. The thickness of recoverable lignite seams averaged 20 meters. The ash content averaged 16% and calorific value was 1,100 kilocalories per kilogram.

During 1973, Turkish authorities were seeking financial backing for the Elbistan power project, which would include a lignite open-cast mining operation and a thermal powerplant. The total planned installed capacity would be 1,200 megawatts,

and the cost of the entire project was estimated at $400 million. By the end of 1973, no financial backing had been secured from any international finance center. Lignite production decreased to 5.6 million tons in 1973 compared with 1972 output.

Petroleum.—*Exploration.*—Turkiye Petrolleri A.O. (TPAO) remained first in exploratory well drilling. It obtained 295 permits for exploration off the coast of Thrace in the Black Sea, between Iskenderun and Antalya in the Mediterranean Sea, and in the northern portion of the Aegean Sea.

The Ministry of Energy and Natural Resources announced that preparatory work was completed in 1973 and that offshore drilling for petroleum and natural gas in the Aegean Sea was expected to begin in 1974. TPAO's offshore exploration activity in 1974 was expected to be limited to the Antalya Bay in the Mediterranean Sea.

Onshore, TPAO was drilling in Thrace, 50 miles from the Bulgarian border in an area that had been relinquished by a foreign firm several years before. Reportedly, the Turkish drilling resulted in discovering a well capable of producing at the rate of 1,200 barrels per day of crude petroleum. This was the first report of commercially exploitable oil being discovered in European Turkey.

In August 1973, the Ministry of Energy and Natural Resources announced that TPAO had discovered oil deposits, 40 miles north of Diyarbakir, in southeast Turkey. The oil was reported to be of high quality and low sulfur content. One well was producing 2,500 barrels of 34° API-quality oil daily.

During 1974, TPAO's onshore drilling was expected to be limited to the Erzurum, Karacadag region.

Turkish Beach Petroleum Pty. Ltd. (TBP), an affiliate of Australia's Beach Petroleum N.L. reached an agreement with Turkish Shell under which TBP would earn a 50% interest in Turkish Shell's permit area in the Diyarbakir Basin. TBP was to conduct a seismic survey and finance drilling of two wells in the basin during 1974.

Production.—Production of crude oil during 1973 totaled 22.4 barrels, of which 7.1 barrels was produced by Turkish-owned companies and 15.3 barrels by foreign-owned companies. Of the 67,000 barrels of crude produced daily, Shell produced 39,000 barrels per day; TPAO 20,000 barrels per day; Mobil 7,800 barrels per day; and Ersan Corp. 700 barrels per day. Domestic production supplied only one-third of Turkey's annual consumption.

Refineries.—According to the budgetary report of the Petroleum Department, approximately 83.2 barrels of crude oil was processed in Turkish refineries during 1973, which is an increase of 18.4% over that of the previous year. Much of this increase was due to the completion and near-capacity operation of the new Aliağa refinery. The Aliağa refinery processed an average of about 60,000 barrels of petroleum per day.

Production of various Turkish refineries in 1972 and 1973 and their locations are given in the following tabulation in thousand tons:

Refinery plant and location	1972	1973
Turkiye Petrolleri A.O.: (TPAO): Batman:		
Domestic	809.2	990.1
Istanbul Petrol Refineresi A.S. (IPRAS): Izmit:		
Domestic	679.1	562.0
Imported	4,400.2	4,733.8
Anadolu Tasfiyehanesi A.S. (ATAS): Mersin:		
Domestic	1,796.7	1,862.5
Imported	2,414.5	2,482.2
Turkiye Petrolleri A.O.: Aliağa:		
Domestic	43.0	82.5
Imported	810.4	2,260.0
Total	[1] 10,953.3	12,973.1

[1] Data may not add to total shown because of independent rounding.

Exports.—Owing to the world energy crisis, Turkish exports of refinery products, which had become a significant exchange earner in 1972, were reduced 62,800 tons in 1973. Exports of petroleum products during 1971–73 were as follows, in units of 1,000 metric tons:

Product	1971	1972	1973
Asphalt	5.2	--	--
Gasoline	41.9	319.3	368.2
Jet fuel	12.8	70.6	94.2
Diesel oil	33.1	237.5	185.7
Fuel oil	--	154.1	78.3
Naphtha	--	97.5	89.8
Total	93.0	879.0	816.2

Imports.—Turkish imports of crude oil increased about 40% in the first 6 months of 1973 when compared with imports for the same period of the previous year. During 1973, Turkey imported 9.3 million tons of crude petroleum. Of this total, 4.9 million tons was imported from Saudi Arabia, 2.9 million tons from Iraq, and the remainder from Iran, Qatar, Libya, and Algeria.

Turkey's imports of refined products totaled 170,200 tons in 1973 and included 144,600 tons of lubricants, 5,600 tons of special preparations, and 19,900 tons of fuel oil.

Pipeline.—Iraqi-Turkish petroleum pipeline discussions made some progress during the year, and construction of the pipeline was set tentatively for early 1974. The pipeline was to be 990 kilometers long and 42 inches in diameter. It would include five pumping stations and would carry 35 million tons of oil per year. About 290 kilometers of the pipeline were to be in Iraq and the remaining 700 kilometers in Turkey. The pipeline would connect the Kirkuk oilfield of Iraq National Petroleum Co. to the port of Iskenderun in Turkey. The cost of the pipeline was estimated at $400 million.

Petrochemicals.—Expansion of the Government-owned Petrol-Kimia Kurumu (Petkim) plant at Izmit continued during the year. The cost of expansion was estimated at $3 million. The plant produced caustic soda, chloralkali, and polyethylene.

The state-owned Turkish Petrochemical Co. revised its plans for a massive petrochemical complex by accepting tenders from five companies in 1973. The value of the planned complex was estimated at $600 million, and it will include the construction of a naphtha cracker, polyethylene facilities, a polyvinylchloride plant, and a polypropylene facility. The indications were that authorities regarded this project as urgent and were ready to begin construction once financing could be arranged through foreign banks. The Government-owned petrochemical plant at Izmit began production of carbon black and codecyl-benzole in February 1973. Reportedly, this plant was scheduled to undergo further expansion in 1974.

Industrial Gas.—Anatolian Industrial Gas inaugurated its industrial gas plant at Izmit in November 1973. The Izmit gas plant was to produce 18,000 cubic meters of nitrogen, argon, and helium gas per day. Most of the production was earmarked for the domestic market and for export to Saudi Arabia and Israel.

The Mineral Industry of the U.S.S.R.[1]

By V. V. Strishkov [2]

The U.S.S.R., with a centrally planned economy and low-wage labor, is the world's second largest producer of industrial products. In 1973, the annual plan for production of coal, steel, steel pipes, some nonferrous metals, mineral fertilizers, and cement was met, but crude oil, petroleum products, and natural gas production failed to meet even the reduced growth rate set for 1973. Transportation of oil and gas through pipelines was much below the reduced plan goals. Other sectors that fell behind reduced 1973 goals, were pig iron, rolled ferrous metals, and many nonferrous metals.[3] Exploration lagged behind targets, particularly for fossil fuels, and productivity remained far below Western standards.

The Soviet Union was the world's leading producer of iron, manganese and chromium ores, platinum-group metals, potassium salts, and cement. It occupied second place, following the United States, in world output of steel, aluminum, lead, petroleum, natural gas, coal, and phosphate rock; it ranked second, after Canada, in the production of nickel and asbestos; and follows the Republic of South Africa in gold production.

The following production increases (in million of tons) have been reported over 1972 figures: raw coal, 12.8; oil, 28.5; pig iron, 3.6; steel, 5.4; iron ore, 7.9; mineral fertilizers, 6.2 (Soviet standard); and cement, 5.5. Electric power output increased 58 billion kilowatt-hours. There were also increases in the output of nonferrous and rare metals and in petrochemical products. The average monthly earnings of Soviet workers and employees was 135 rubles,[4] compared with 130.2 in 1972, an increase of 3.6%. In 1973, the raising of the monthly minimum wage from 60 to 70 rubles continued in the northern and far eastern regions.

Expansion of the mineral industry continued to be achieved mainly through increased labor and capital rather than advancing technology. It is estimated that 2 to 3 times more investment and labor in real terms are required in the U.S.S.R. than in the principal countries of the West to achieve a given increase in mineral output. Because of mineral commodity shortages, efforts were directed chiefly toward fulfilling quantitative goals with less attention paid to quality. A considerable part of industrial output did not meet Soviet standards of quality. Labor and equipment productivity was below planned levels, and practically all sectors of the mineral industry maintain a greater number of production personnel than required by plan targets.[5] Turnover in the labor force is a particular problem in the northern and eastern regions, where it reaches 30%.[6]

The U.S.S.R. experienced considerable difficulty in constructing mineral industry projects because of shortages of equipment, materials and labor, and poor work organization. Construction of new projects remained inadmissibly slow, expensive, and frequently dispersed over a large number of projects, with the work taking two to

[1] This publication is based on a review of the sources published by the U.S.S.R.

[2] Mining engineer, Division of Fossil Fuels—Mineral Supply.

[3] Pravda (Moscow). Jan. 26, 1974, pp. 1–3.

[4] Official exchange rate is 1 ruble=US$1.34. 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 $0.20 to $0.50.

[5] Pravda (Moscow). Jan. 26, 1974, pp. 1–3.
Planovoye khozyaystvo (Planned Economy). Moscow. No. 11, November 1973, pp. 16–23.
Stal' (Steel). Moscow. No. 12, December 1973, p. 1067.

[6] Zhurnalist (Journalist), Moscow. No. 11, November 1973, pp. 12–14.

four times as long as specified by the U.S.S.R. State Construction Committee. An example of the lag in development schedules may be seen from the following figures, in months:[7]

Project	Planned (months)	Actual (months)
Anzher coal mine, Kuznets Basin	52	248
21-bis coal mine, Donets Basin	74	174

The nearly 10-year delay in completion of the Bratsk aluminum plant led to the fact that electric power produced by the Bratsk hydroelectric powerplant has already been allocated and the aluminum plant may have to wait for the electric power to be produced by the Ust'–Ilimsk hydroelectric plant, now under construction.[8]

Prolonged delays are necessary to achieve design capacity. For example, on September 1, 1973, planned capacity goals had not been reached at 28 blast furnaces, 3 open-hearth shops, and 12 rolling mills in the Ukraine alone.[9]

The delay in completing projects resulted in large overexpenditures. For example, the cost of constructing and installing the No. 2 blast furnace at the Krivoy Rog plant was set at 93 million rubles, but actually it has reached 145 million rubles. The corresponding figures for the 3,600 mill at the Zhdanov Azovstal' plant are 178.4 and 197.6 million rubles; for oxygen convertor shop No. 2 of the Novolinetsk plant, 80 and 154 million rubles; for the first section of the cold-rolling shop at the Verkhhe-Isetsk plant 157.6 and 198.7 million rubles.[10]

The total capital investment in the Soviet economy amounted to 98 billion rubles in 1973 (4% higher than in 1972). Production facilities either new, expanded, or renovated, commissioned during the year were as follows, in million tons: iron ore, 39; iron pellets, 2.7; agglomerate, 2.8; coal, raw, 34; pig iron, 3.7; finished ferrous rolled metal, 3.5; mineral fertilizers (Soviet standard), 8.9; cement, 3.7; powerplants totaled 11 million kilowatts. Plans for new construction, renovation of existing enterprises and expansion were not met for many projects in 1973, including projects for iron ores, pig iron, mineral fertilizers, cement, natural gas, petroleum, and steel.

Practically all mineral commodity exports rose in 1973, with fuel exports showing the fastest growth. Fuel, mineral raw materials and metals play the largest role in Soviet exports, representing about 40% of total official exports during 1973. Oil, gas, and metal exports are expected to continue rising, despite increasing home demand and reported production and transportation difficulties. Despite the rise in exports, however, there were shortages of many mineral materials needed by Soviet consumer industries.[11] For example, despite the increased asbestos exports in recent years, the domestic deficit reached 200,000 tons in 1971 and is expected to be about 100,000 tons in 1975.[12] Exports of mineral commodities produce foreign exchange to help pay for imports, even though almost all mineral commodities exported could be easily consumed within the country.

Although the U.S.S.R. does not publish statistical data on injuries in the mineral industry, available Soviet information reveals that there are many fatal injuries. The largest number of accidents have for many years occurred at production and developmental faces as a result of roof collapse. The second largest number of accidents occurs during underground haulage. The third largest number consists of accidents caused by machines and electric currents. The fourth largest number of accidents occurs during blasting and when handling explosives. Accidents caused by roof falls are the result of inadequate support, mainly due to the shortages of props.[13] The neglect of proper roof control in mining steep coal seams of large and medium thickness at mines in the Prokop'evsk Region of the Kuznetsk Basin resulted in an increase in the number of fatal accidents caused by workers falling into the discharge openings.[14] There were 14,000 accidents in geological prospecting operations

[7] Voprosy ekonomiki (Problems of Economics), Moscow. No. 8, August 1973, p. 37.
[8] Page 44 of work cited in footnote 7.
[9] Rabochaya gazeta (Worker's Gazette). Kiev. Sept. 5. 1973, p. 2.
[10] Ekonomika stroitel'stva (Economics of Construction), Moscow. No. 7, July 1973, pp. 30–35.
[11] Pravda (Moscow). Jan. 26, 1974, p. 3.
[12] Narodnoye khozyaystvo Kozakhstana (National Economy of Kazakhstan), Alma-Ata. No. 12. December 1971. p. 89.
[13] Bezopasnost' truda v promyshlennosti (Labor Safety in Industry), Moscow. No. 7, July 1973, p. 2.
[14] Bezopasnost' truda v promyshlennosti (Labor Safety in Industry). Moscow. No. 11, November 1973. p. 30.

in 1971, resulting in the loss of 230,000 working days.[15]

The accumulation of dust at work sites in underground mines of the Soviet Union is high and often exceeds the sanitary standard.[16]

The Novorossiysk cement combine has been found guilty of destroying 612 hectares of forest. About 80% of the trees dried up because of a thick layer of cement dust on the trees. All houses located within a radius of 500 meters of the cement plants have been vacated. The combine is increasing production capacity and putting new sections in operation. However, they are not being adequately equipped with dust treatment facilities. The new facilities were started without the permission of the sanitation-supervising organizations.[17]

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, and sometimes required miners to work two to three shifts in succession, and even required underground miners to work an 8-hour shift instead of a 6-hour shift in violation of the labor law.[18]

Government Policies and Programs.—Soviet mineral policy continued to be based upon the principle of maximum use of the domestic resources, even at the cost of submarginal production. 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 minerals and metals. 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 many mineral ventures in the Soviet Union would be uneconomic by Western standards. Mineral development, as the basis of industrial growth, holds a key place in the Soviet economic policy. Very large amounts of money are spent on mineral exploration and production, and the funds are distributed over a dozen specialized ministries.

Considerable attention is now being devoted to economic "integration" of the COMECON[19] countries, which makes East Europe, Mongolia, and Cuba more dependent upon the Soviet mineral industry. In the past, COMECON nations loosely coordinated plans for the 5-year periods, but the U.S.S.R. now examines plans at the compilation stage. The COMECON nations are participating, with their capital, machinery, and labor, in construction of mineral projects and in joint exploration of mineral resources; the countries also agree to integrate their effort in geological prospecting and technological research.

As a part of the plan coordination for the 1971–75 period, agreements were concluded with Czechoslovakia and East Germany for an increase in the production capacity of the Soviet oil and gas industry; Poland and Hungary were involved in expanding the "Friendship" crude oil pipeline, and Bulgaria was to establish additional capacity in the gas industry. Agreements signed between the U.S.S.R. and Czechoslovakia and East Germany provide for credits to the U.S.S.R. for expanding crude oil production in the Urals-Volga and Western Siberia. Czechoslovakia will deliver, on credit, machinery, equipment, pipe, and other items in the amount of 4 billion crowns needed for extracting and transporting crude oil.[20] In November 1973, the East European COMECON nations signed a long-term agreement with the U.S.S.R. to jointly build the Kiembay asbestos complex in Orenburg Oblast'. A new agreement between the Soviet Union, Czechoslovakia, East Germany, Hungary, and Romania is being prepared that requires each of these countries to build 500 kilometers of the natural gas pipelines from the Orenburg Region to these COMECON partners, totaling 2,500 kilometers.[21]

The Soviet Union employs every means to encourage State control over mineral resources in the non-Communist countries. The U.S.S.R. sends out technicians and makes loans to countries willing to promote State development and distribution of fuels

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[15] Razvedka i okhrana nedr (Exploration and Conservation of Natural Resources), Moscow. No. 5, May 1973, p. 57.
[16] Sovetskiy shakhter (Soviet Miner), Moscow. No. 7, July 1973, p. 7.
Promyshlennst' Armenii (Industry of Armenia), Yerevan. No. 7, July 1973, p. 64.
[17] Literaturnaya gazeta (Literary Gazette), Moscow. July 25, 1973, p. 1.
[18] Work cited in footnote 16.
[19] 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.
[20] Neftyanik (Oil Man), Moscow. No. 4, April 1973, pp. 1–4.
[21] Ekonomicheskaya gazeta (Economic Gazette), No. 7, February 1974, p. 20.

and minerals. Soviet technical assistance and economic aid programs include several hundred projects in 63 countries at a cost of about 5 billion rubles. The Comecon International Investment Bank has set up a special fund of 1 billion rubles to grant credits for economic and technical assistance to developing countries. The fund started functioning in January 1974. In many instances, the assistance to developing countries is linked with mineral supplies to the U.S.S.R.

Because of shortages 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.

The State plan for 1974 was approved by the Supreme Soviet on December 14, 1973. The plan calls for an overall increase in industrial output of 6.8%, including a 6.6% increase in heavy industry output and a 7.5% increase in consumer goods output. Planned production of power is 975 billion kilowatt-hours, or 6.6% over that of 1973. Electric power generation from nuclear powerplants is to reach 16.1 billion kilowatt-hours, 38% over that of 1973. Crude oil and condensate extraction is to be increased about 30 million tons, and gas production to rise 20.8 billion cubic meters. Steel output is to be increased 4.9 million tons; finished ferrous rolled metal, 3.8 million tons; mineral fertilizers, 7.9 million tons (Soviet standard); and cement, 4.5 million tons.

It is planned to increase production of aluminum 8.2% and nickel output 13.7%. Oil refinery production is expected to be 6.8% above the 1973 figure. Production of raw coal is to be increased 11.1 million tons. The 1974 plan envisages 104.2 billion rubles of total investments in development of the Soviet economy, or 6.5% more than in 1973. It is planned to increase the average monthly earnings of Soviet workers and employees in 1974 to about 140 rubles, or 3.6% over those of 1973.

The 1974 plan calls for commissioning 9,000 kilometers of trunk oil and gas pipelines and 85 pumping and compressor stations. It is planned to obtain the basic increment in petroleum and gas extraction in Western Siberia and Central Asia. The construction of the third and fourth stages of the Central Asia-Center gas pipeline and the system of gas pipelines from the north of Tyumen' oblast' to the center of the country is to be completed.

In 1974, the power potential of the U.S.S.R. is to be increased by 11.3 billion kilowatts over that of 1973. The first section of the Leningrad nuclear powerplant (1million kilowatts) is scheduled to go into operation in 1974. The total rated capacity of two reactors is to be 2 million kilowatts. The 7-million-ton increment in new steel capacity is to be obtained by the completion of oxygen converter units at the West Siberian plant (3 million tons) and at the Novolopetsk plant (4 million tons). The No. 9 blast furnace (annual capacity 4 million tons) at the Krivoy Rog plant and the No. 4 at Novolipetsk plant (capacity 1.8 million tons), are scheduled to be commissioned in 1974.

The 1974 plan envisages a 24% increase in capital investment in nonferrous industry of Kazakhstan over that of 1973 (253 million rubles in 1974).

The level of Soviet industrial production in 1972 and 1973, and that planned for 1974 follows, in million tons unless otherwise specified:

Commodity	Actual		Planned
	1972	1973	1974
Iron ore (usable)	208.1	216.0	221.0
Pelletized iron concentrate	[e] 17.8	21.4	24.2
Pig iron	92.3	95.9	99.5
Steel, raw	125.6	131.0	135.9
Finished ferrous rolled metal	87.5	91.4	95.2
Steel pipes	13.8	14.4	15.1
Cement	104.0	109.5	114.0
Mineral fertilizers:			
Soviet standard	66.1	72.3	80.2
In nutrient content	15.9	17.4	19.3
Coal, raw (bituminous, anthracite, and lignite)	655.2	668.0	679.1
Coke	79.7	81.2	82.5
Natural gas, billion cubic meters	221.4	236.0	256.8
Petroleum, crude, including condensate	400.4	428.9	458.9
Power, electric, billion kilowatt-hours	857.0	915.0	975.0

[e] Estimate.

The commissioning of production capacities through new construction and expansion or renovation of existing facilities in 1972 and 1973, and planned for 1974, in million tons except as noted, follows:

Commodity	Actual 1972	Actual 1973	Planned 1974
Iron ore, crude	28.5	39.0	36.7
Coal, raw	18.0	34.0	27.9
Pig iron	--	3.7	5.8
Steel	2.2	--	7.0
Finished ferrous rolled metal	1.6	3.5	4.8
Mineral fertilizers [1]	7.0	8.9	10.5
Cement	4.2	3.7	5.8
Powerplants ---- million kilowatts	1.5	11.0	11.3

[1] The average ingredients in mineral fertilizers (nitrogen, phosphorus, and potash) are expressed in terms of Soviet standard units, which are not the same as those used in the United States. 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_2), and ground rock phosphate (phosphatic flour) is expressed as 19% P_2O_5.

PRODUCTION

Soviet mineral statistics are secret in most cases; therefore, much of data in the production table is estimated. At best it represents an order of magnitude and indicates a trend from the previous year.

Most of the Soviet economy's major indices failed to meet the original targets of the ninth 5-year plan (1971–75). According to Soviet sources, national income increased 6.8% in 1973, compared with the original plan of 7.2%. Total industrial output for 1973 was 7.4%, down from 7.8% in the original plan. Although the raw coal and power targets for 1975 look attainable, the 1975 targets for major mineral commodities now seem to be well out of reach. At the present rate of progress, gas will be around 30 billion cubic meters short, iron ore 20 million, pig iron 5 million, steel 5 million, finished ferrous rolled metal 5 million, steel pipes 3 million, and cement 5 million.

Table 1.—U.S.S.R.: Estimated [1] production of mineral commodities
(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973 [p]
METALS			
Aluminum:			
Ores and concentrates:			
Bauxite, 26% to 52% alumina	[r] 4,100	[r] 4,200	4,300
Nepheline concentrate, 25% to 30% alumina	[r] 1,120	[r] 1,700	2,150
Alunite ore, 16% to 18% alumina	[r] 400	[r] 500	600
Alumina	[r] 2,100	[r] 2,300	2,400
Metal, smelter:			
Primary	1,180	1,250	1,360
Secondary	120	120	125
Antimony, mine output, metal content ---- metric tons	6,900	7,000	7,100
Arsenic, white (As_2O_3) ---- do	7,150	7,200	7,250
Beryllium, beryl, cobbed, 10% to 12% BeO ---- do	1,300	1,350	1,450
Bismuth, mine output, metal content ---- do	55	55	55
Cadmium, smelter ---- do	2,400	2,450	2,500
Chromium, chromite ore, 30% to 56% Cr_2O_3	1,800	1,850	1,900
Cobalt:			
Mine output, metal content ---- metric tons	1,600	1,650	1,700
Smelter ---- do	1,600	1,650	1,700
Copper:			
Ore:			
Gross weight, 0.5% to 2% Cu	62,000	66,500	70,000
Metal content, recoverable	620	665	700
Blister:			
Primary	620	665	700
Secondary	140	150	150
Refined:			
Primary	590	630	665
Secondary	140	140	150
Gold, mine output, metal content -- thousand troy ounces	6,700	6,900	7,100
Iron and steel:			
Iron ore, 55% to 63% Fe [2]	203,008	208,127	216,104
Agglomerated products: [3]			
Sinter	140,658	143,000	146,123
Pellets	13,475	17,500	21,400

See footnotes at end of table.

Table 1.—U.S.S.R.: Estimated [1] production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS—Continued			
Iron and steel—Continued			
Pig iron and ferroalloys: [3]			
Pig iron for steelmaking	79,044	82,374	86,225
Foundry pig iron	9,203	8,956	8,712
Spiegeleisen	124	102	83
Ferromanganese	856	869	888
Other blast furnace ferroalloys	27	26	25
Total	89,254	[2] 92,327	95,933
Steel: [3]			
Ingots	112,984	117,438	122,726
Steel for casting	7,653	8,151	8,733
Total	120,637	[2] 125,589	131,459
Semimanufactures: [3]			
Sections	32,599	33,768	35,915
Wire rods	7,350	7,492	7,990
Pipe stock	4,931	5,142	5,290
Tubes from ingots	1,577	1,608	1,657
Plates and sheets:			
Over 5 millimeters thick	11,169	11,688	11,964
Other	14,467	14,936	15,954
Strip	8,154	8,326	8,914
Railway track material	3,683	3,742	3,678
Wheels, tires, axles	927	908	945
Unspecified shapes for sale	716	674	682
Other and unspecified	81	84	73
Total semimanufactures	85,654	88,368	93,062
Selected end products: [4]			
Welded pipes and tubes [3]	7,655	7,622	8,304
Seamless pipes and tubes [3]	5,701	5,924	6,062
Total [3]	13,356	13,546	14,366
Cold rolled sheet	[5] 5,458	[6] 5,502	[6] 5,654
Tinplate	[5] 515	[6] 518	[6] 542
Galvanized sheet	[5] 538	[6] 554	[6] 600
Electrical sheet	[5] 980	[6] 996	[6] 998
Cold reduced strip [3]	223	264	320
Wire, plain [3]	3,293	3,420	3,473
Lead:			
Mine output, recoverable metal content	450	460	470
Smelter:			
Primary	450	460	470
Secondary	90	90	90
Magnesium metal, including secondary	52	54	57
Manganese ore, gross weight [2]	7,318	7,819	8,000
Mercury metal, including secondary ____ 76-pound flasks	50,000	50,000	52,000
Molybdenum, mine output, metal content ___ metric tons	8,000	8,200	8,500
Nickel:			
Mine output, metal content	120	125	135
Smelter	120	125	135
Platinum, mine output, metal content thousand troy ounces	2,300	2,350	2,450
Silver metal, including secondary ____ do ____	39,000	40,000	41,000
Tin:			
Mine output, recoverable metal content ___ long tons	28,000	28,500	29,000
Smelter:			
Primary ____ do ____	28,000	28,500	29,000
Secondary ____ do ____	10,000	10,000	10,000
Titanium metal ____ metric tons	r 34,000	r 37,000	40,000
Tungsten concentrates, contained tungsten ____ do ____	7,000	7,200	7,400
Vanadium content of exported slag [7] ____ do ____	2,646	3,375	3,365
Zinc:			
Mine output, recoverable metal content	650	650	670
Metal:			
Primary	650	650	670
Secondary	70	70	70
NONMETALS			
Asbestos	1,150	1,220	1,280
Barite	300	310	320
Boron minerals and compounds, B_2O_3 content	72	75	75
Cement, hydraulic [2]	r 100,331	104,299	109,500
Clays: Kaolin (including china clay)	1,900	2,000	2,100
Corundum, natural ____ metric tons	6,500	7,000	7,000

See footnotes at end of table.

Table 1.—U.S.S.R.: Estimated [1] production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973 [p]
NONMETALS—Continued			
Diamond:			
Gem: thousand carats	1,800	1,850	1,900
Industrial do	7,000	7,350	7,600
Total	8,800	9,200	9,500
Diatomite	370	380	390
Feldspar	250	260	270
Fertilizer materials:			
Crude:			
Nitrogen compounds, N content	[2] 6,055	[2] 6,551	7,000
Phosphatic:			
Apatite:			
Ore, 17.7% P_2O_5	28,000	28,300	31,300
Concentrate, 39.4% P_2O_5	11,650	12,000	13,000
Sedimentary rock:			
Ore, 13% P_2O_5	20,000	21,000	21,500
Concentrate, 19% to 25% P_2O_5	10,000	10,500	10,750
Potassic, potash, K_2O equivalent	[2] 4,807	[2] 5,433	5,900
Manufactured:			
Nitrogenous, gross weight	[2] 29,530	[2] 31,945	34,700
Phosphatic:			
Meal, gross weight	[2] 5,420	[2] 5,319	5,700
Other, gross weight	[2] 14,826	[2] 15,663	17,300
Postassic, gross weight	[2] 11,556	[2] 13,061	14,500
Other and unspecified, gross weight	66	[r] 78	100
Total [3]	61,398	66,066	72,300
Fluorspar	420	430	440
Graphite	80	80	85
Gypsum	[2] 4,700	4,700	4,700
Lime, dead burned	[2] 21,000	22,000	22,000
Magnesite, crude	3,200	3,300	3,400
Mica	38	39	40
Pyrite:			
Gross weight	[r] 7,000	[r] 7,200	7,300
Sulfur content	[r] 3,300	[r] 3,400	3,500
Refractory materials:			
Dinas (quartzite-lime)	[2] 597	[2] 618	600
Magnesite and chrome magnesite	[2] 1,451	[2] 1,444	1,500
Magnesite powder	[2] 1,319	[2] 1,298	1,350
Shamotte	[2] 6,133	[2] 6,102	6,200
Total	[2] 9,500	[2] 9,462	9,650
Salt, all types	[2] 12,000	[2] 12,200	12,200
Sulfur, elemental (excluding sulfur content of pyrite):			
From ores	[r] 2,100	[r] 2,200	2,300
Byproduct recovered	[r] 1,600	[r] 1,700	1,850
Talc	380	390	400
MINERAL FUELS AND RELATED MATERIALS			
Coal: [8]			
Anthracite	[2] 75,760	[2] 75,417	75,500
Bituminous:			
Coking	[2] 169,000	[2] 169,991	173,000
Other (not specifically identified)	[2] 242,779	[2] 254,061	261,500
Total "hard" coal	[2] 487,539	[2] 499,469	510,000
Lignite and brown	[2] 153,342	[2] 155,719	158,000
Coke, oven, beehive, breeze and gas coke [9]	[r] 78,329	79,773	81,401
Fuel briquets:			
From anthracite and bituminous coal [9]	1,444	1,488	1,474
From lignite and brown coal [9]	6,244	6,533	6,673
Total	7,688	8,021	8,147
Gas, natural:			
Gross production million cubic feet	7,900	8,200	8,800
Marketed production [2] do	7,501	7,818	8,334
Peat:			
Agricultural use	27,000	27,000	27,000
Fuel use	[2] 54,300	[2] 68,800	60,000
Petroleum:			
Oil shale	[2] 26,253	[2] 29,258	30,000

See footnotes at end of table.

Table 1.—U.S.S.R.: Estimated [1] production of mineral commodities—Continued
(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973 [p]
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Petroleum, crude:			
As reported, gravimetric units [2]	377,075	[r] 400,440	428,900
Converted, volumetric units thousand 42-gallon barrels	[r] 2,771,501	[r] 2,943,234	3,094,350

[p] Preliminary. [r] Revised.
[1] Estimated except where otherwise noted.
[2] Reported in Soviet sources.
[3] Source: Unless otherwise specified, data for 1971 and 1973 are derived from United Nations Annual Bulletin of Steel Statistics for Europe. V. 1, 1973, New York, 1974, p.23; and data for 1972 are estimates based on reported figures for 1971 and 1973 and reported output for the first half of the year.
[4] Items reported under this heading are produced from semimaufactures listed above and possibly also from similar imported materials. Therefore, these data are not additive to the total of semimanufactures listed.
[5] Source: United Nations Annual Bulletin of Steel Statistics for Europe. V. 1, 1973, New York, 1974, p. 23.
[6] Estimate based on reported figures for first 6 months of year as reported in source cited in footnote 5.
[7] Partial figure representing only that vanadium in exported slags; does not include vanadium produced for domestic consumption in any form or for export in any form except slag.
[8] Run-of-mine coal; the average ash content of coal shipped from mines was over 20% and the average calorific value was a little more than 5,000 kilocalories per kilogram in 1973.
[9] Source: United Nations Annual Bulletin of Coal Statistics for Europe. V. 8, 1973, New York, 1974, pp. 31, 58.

The Asian part of the U.S.S.R. (east of the Urals) provided about 45% of the total Soviet coal output, more than 30% of the natural gas, over 20% of the crude oil, and around 30% of the electric power. The Russian Soviet Federated Socialist 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 100% of the platinum-group metals, more than 80% of the petroleum, about two-thirds of the electric power, and roughly half of the metal, natural gas, and coal. The Ukraine continued to rank first in the output of coking coal, manganese, and iron ores, and second in natural gas.

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 1973 planned targets for an increase production of alumina (6.9%), copper (11.5%), and titanium (8%) in this Republic over that of 1972 were not met. Armenia did not fulfill the refined copper production plan in 1973.[22]

The official hypothetical and speculative mineral resources of the U.S.S.R. are large, but they are no more than a geologic prognoses that must still be discovered and explored. For example, according to the estimates made in 1968, Soviet official geological reserves of coal and lignite were 6,800 billion tons, or about 55% of world coal reserves. Of these, 4,500 billion tons are reserves of hard coal and 2,750 billion tons reserves of lignite. But official Soviet economic minable (so-called balansovye) reserves of coal and lignite in place of measured (Soviet category A), indicated (category B), inferred (category C1), and hypothetical (category C2) categories are only 523.7 billion tons (including 334.1 billion tons of hard coal and 189.6 billion tons of lignite), or only about 8% of total geological potential resources.[23]

The irregular geographical distribution of iron ores leads to long and expensive railroad shipments. For example, the ore from the Korshunov concentrating combine is delivered to the Western Siberian metallurgical complex, a distance of 1,950 kilometers; from the Atasuysk iron ore administration to the same complex, 1,750 kilometers; from the Kursk region to the Orsk-Khalilovo metallurgical complex, 2,200 kilometers; the iron ore concentrates from the Kola Peninsula are transported to the Cherepovets plant, a distance of 1,500 kilometers; the Nizhniy Tagil plant is separated from its raw-material base by 750

[22] Kommunist (Communist). Yerevan. Dec. 26, 1973, p. 2.
[23] Kratkiy spravochnik gornogo inzhenera (Short Reference Book of the Mining Engineer). Moscow. 1971. pp. 5–15.

kilometers. The Magnitogorsk, Novokuznetsk, and Nizhniy Tagil plants, where half of the Soviet pig iron is produced, are oriented toward long-distance-shipped ores to a considerable degree. The Karaganda metallurgical complex receives only 65% of its iron ore from nearby deposits.[24] Approximately 20% of the iron ore reserves require complicated methods of concentration.

Reserves of nonferrous metals are also very unfavorably distributed. Thus, for example, in regions where there are large hydroelectric powerplants, there are almost no deposits of bauxite, titanium, or magnesium, the production of which requires an enormous consumption of electric power. A shortage of surveyed reserves in certain old mining regions of the Soviet Union is also being felt; a shortage of copper ores in the Urals, nickel on the Kola Peninsula, mercury in the Ukraine, and lead in Central Asia.[25]

The quality of raw materials for producing nonferrous metals frequently does not correspond to the requirements of commercial production, and the majority of the deposits are located in unfavorable geographical and mining conditions. Because of the acute shortage of bauxite, aluminum industry development is being delayed. To cover this shortage, nephelines and alunites are used, but their application requires additional capital investments and an increase in operating expenditures.[26]

The main purpose of Soviet mineral exploration in recent years has been the discovery of economic reserves that would compensate for the existing unbalanced or unsatisfactory distribution of raw materials. But during the last 10 years, it has not obtained any increment in tin reserves even in the Soviet Far East. A comparable situation exists for high-quality bauxites, lead, zinc, and mercury reserves.[27] Despite the increasing demands for minerals, there has been reduction in reserves of some materials. A total of about 3 billion rubles were spent on geological exploration in 1973.

There are shortages of high-quality aluminum, tungsten, mercury, iron ore, tin, mica, fluorspar, and bauxite reserves. The problem of creating a future mineral-raw material base for the U.S.S.R. requires large expenditures for the study and discovery of new mineral deposits.[28]

The mechanization of labor-intensive manual work in the Soviet mineral industry is proceeding very slowly. In the past 3 years, the number of manual workers has increased substantially.[29] In many enterprises, the proportion of manual labor in mechanized flow is large.[30] According to Socialist Industry[31] the work performed manually without machines at coal mines comprises 60% at longwalls, 57% in development, and 100% on repair of workings. At nonferrous mines and plants in Kazakhstan, manual labor comprises 54%, and planned production goals are met increasing manual labor.[32]

The production of mining equipment has grown substantially, but the technical standards and the quality of machinery and equipment produced are poor. The Uzlovaya, Kiselevsk, Druzhkovka, Yasnogorka, and other machine-building plants have been criticized for this in the Soviet press.[33] The quality of one-half of the equipment at nonferrous concentration plants is poor. The repair enterprises of the Ministry of Nonferrous Metallurgy are obliged through their own resources to produce up to 40% of the total volume of sand and mud pumps manufactured in the country.[34] Frequently, plants preferred to manufacture old models rather than to undertake new technology. Production of mining equipments for mechanization of auxiliary processes proceeds slowly, and spare-parts output for the mining machinery is inadequate.

During the 1971–75 period, the emphasis of Soviet mining machinery engineers has been directed toward copying and producing new more advanced Western mining equipment. The U.S.S.R. is interested in Western processes, equipment,

[24] Voprosy ekonomiki (Problems of Economics), Moscow. No. 1, January 1974, pp. 27–36.
[25] Work cited in footnote 24.
[26] Work cited in footnote 24.
[27] Razvedka i okhrana nedr (Exploration and Conservation of Natural Resources), Moscow. No. 5, May 1973, pp. 1–10.
[28] Work cited in footnote 24.
[29] Planovoye khoyaystvo (Planned Economy), Moscow. No. 5, May 1973, pp. 113–124.
[30] Kommunist (Communist), Yerevan. Oct. 18, 1973, p. 2.
[31] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Oct. 5, 1972, p. 2.
[32] Narodnoye khozyaystuo Kazakhstana (National Economy of Kazakhstan), Alma-Ata. No. 4, April 1973, pp. 25–26.
[33] Sotsialisticheskaya industriya (Socialist Industry), Moscow. July 7, 1972, p. 2; Dec. 4, 1973, p. 2; Jan. 30, 1974, p. 2.
[34] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Jan. 4, 1974, p. 2.

and design, either alone or in combination with its own.

At many operations, machines were not used satisfactorily. Idle time of equipment was great, and about 70% of the mining machinery and equipment was under repair or inoperative. The low degree of utilization of machinery resulted from defects in construction, lack of sufficient repair shops and spare parts, poor organization, and poor training of operators.[35] Because of shortage of spare parts, almost all 46 of the Bel–AZ–540 trucks at the Agarak copper and molybdenum complex in Armenia were in state of deterioration.[36] The shortage of billets and slabs resulted in idle time at many rolling mills and low utilization of their capacities.[37] Usually, mining machinery was operated 22 to 24 hours per day, and expensive equipment was worked until worn out. It was impossible under such a regime to organize timely and correct servicing and scheduled preventive maintenance system for equipment.[38]

During the past 3 years, over 5 billion rubles was spent on equipment repairs at enterprises of the U.S.S.R. Ministry of Ferrous Metallurgy. These expenditures exceeded by three times the cost of the production assets of the giant Magnitogrosk metallurgical complex. The reasons for such high expenditures included intensification of production not supported by adequately reliable and durable equipment, increased reduction in the time given to repairs and low quality of repairs, and a low mechanization of labor. The main reason however, was an inefficient system of economics which directs repair subcontractors toward increasing work costs. The higher these costs, the better it is for the plan.[39]

At a number of concentrating plants, the recovery of metals is low. Still unsolved is the problem of gold and zinc recovery from the copper-pyrite ores in the Urals. At many polymetallic ore deposits, the constituent elements, especially rare metals, are being inadequately recovered. A major reason for the poor recovery is the dilution of the ores. This results from evaluating mining enterprises on the tonnage of ore extracted and not on the quality of ore extracted. Therefore mining enterprises seek to extract large tonnages regardless of the grade.

Many metallurgical plants did not receive planned quantities of raw materials. For example, the Novokuznetsk metallurgical works failed to receive almost 100,000 tons of steel ingot from its suppliers during the first 5 months of 1973. Consequently the plant failed to fulfill its production quota for rolled metal by 63,000 tons. As a result, the Novokuznetsk plant failed to supply other plants and construction projects. During the same period, the Chelyabinsk metallurgical plant failed to receive 58,260 tons of steel ingot from other plants.[40]

In the Urals, in Eastern Siberia, and Kazakhstan, ferrous metallurgical complexes were receiving unsatisfactory raw materials.[41] The iron content of agglomerate supplied was 53.2% iron compared with the planned 56%.[42] Also, because of the shortage of natural gas, heat temperatures at blast furnaces were much below the planned level.[43]

Research and planning agencies did not cooperate adequately with the industries. New ideas were abundant, but their testing and application were delayed by the absence of a research-testing base, insufficient coordination, and duplication of effort on the part of the research institutes.

Developments in the Soviet economy were marked by increased production, accompanied by shortages of labor. The gap between the demand for workers and supply stemmed from a large volume of auxiliary manual work, considerable stoppages of basic operating equipment, and organization of labor, which resulted in low productivity.[44]

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[35] Stal' (Steel), Moscow. No. 12, December 1973, p. 1067.
Sovetskiy shakhter (Soviet Miner), Moscow. No. 12, December 1973, p. 17.
Narvdnoe khozyaystvo Kazakhstana (National Economy of Kazakhstan), Alma-Ata. No. 4, April 1973, p. 27; No. 6, June 1973.
Kazakhstanskaya pravda (Alma-Ata). June 20, 1973, p. 2.
[36] Trud (Labor), Moscow. July 7, 1973, p. 2.
[37] Rabochaya gazeta (Worker's Gazette), Kiev. Sept. 5, 1973, p. 2.
[38] Sotsialisticheskaya industriya (Socialist Industry). Moscow. July 7, 1972, p. 2; Feb. 8, 1974, p. 2.
[39] Pravda (Moscow). Sept. 8, 1973, p. 2.
[40] Sotsialisticheskaya industriya (Socialist Industry). Moscow. No. 6, July 1973, p. 2.
[41] Work cited in footnote 27.
[42] Sotsialisticheskaya industriya (Socialist Industry). Moscow. Feb. 8, 1974, p. 2.
[43] Work cited in footnote 42.
[44] Narodnoye khozyaystvo Kazakhstana (National Economy of Kazakhstan), Alma-Ata. No. 9, Sept. 1973, pp. 19–23.

Labor productivity continued to be below the planned levels in 1973.[45]

Many enterprises, for example, the Alaverdy copper mining and metallurgical complex and the Kafan copper-molybdenum mining and concentrating complex in Armenia regularly do not fulfill the plan for labor productivity.[46] According to Planned Economy,[47] about 250,000 workers were employed in industry above the number envisaged in the plan. Ferrous metallurgy employed 17.7% more workers than the planned number including 23.4% in pig iron production, 18% in production of raw steel, and 14.2% at rolling mills.[48] The rolling mill being built at the Azovstal' steelworks employed about 12,000 construction workers, and that of the Karaganda and Verkh-Isetsk metallurgical plants, 10,000 persons at each.[49] Over 4,500 workers were employed in the construction of a blast furnace at the Karaganda metallurgical works.[50]

Shortage of labor was felt especially in the mining industry of central Asia, Siberia, and the Soviet Far East. The U.S.S.R. employed a number of workers from East European Communist countries in the development of the Soviet mineral industry.

The U.S.S.R. is increasing the production of metals and fuels from year to year, but the Soviet economy is constantly experiencing shortages. There are shortages of coal, and rolled ferrous and nonferrous metals. Although many minerals are mined and processed in the U.S.S.R., insufficient attention is being paid to the comprehensive use of mineral resources. For example, at the Zyryanov lead and zinc complex in Kazakhstan, only 8 out of 16 components of the ore were recovered in 1973; the remainder went to waste. The Nizhniy Tagil, Magnitogorsk, and Chelyabinsk metallurgical plants smelted in their blast furnaces over 500,000 tons of Kachkanar iron ore concentrate annually without recovering the vanadium contained.[51] This means losses of hundreds of tons of vanadium. The low recovery of metals by copper-producing plants in the Urals resulted to losses of thousands of tons of copper, zinc, and other nonferrous metals and also the large quantity of gold and silver.[52] Tailings of nonferrous concentrating plants in Kazakhstan and central Asia contain up to 35% of the total metal content in the ore.[53]

Poor production planning and utilization of mineral and labor resources also resulted in large losses. Some enterprises produced only products that were heavy and profitable for them, and little attention was paid to consumer interests. As a result, the ferrous industry did not produce about 2.5 million tons of needed rolled metals during the 1971–72 period.[54] Consumer needs for structural and sheet steels of proper quality and thickness were not met. Production of coated sheets was being organized slowly, and thermal treatment of rolled metal and pipe was not sufficiently developed. Requirements of 38 standard specifications were not met by the ferrous industry.[55] The U.S.S.R. Ministry of Ferrous Metallurgy ignored consumers' repeated claims about the need to increase production of some rolled products.[56]

As much as 15 million tons of the 65 millions tons of ferrous metals used annually in the machine building industry, become waste. One-half of this amount goes into shavings. According to Problems of Economics,[57] metal consumption in Soviet machine-building is at least 25% higher than in the United States.

Much metal was overconsumed in the Soviet economy because metallurgical plants often delivered products that did not correspond to consumers' orders. For example, in the first quarter of 1972, the Karaganda metallurgical plant shipped to consumers 433,000 tons of rolled ferrous metals, of which 88,000 tons or 20% were delivered with deviation from the consumers' orders. The Chelyabonsk metallurgical plant delivered to consumers 7,000 tons No. 14 pro-

[45] Work cited in footnote 3.
[46] Kommunist (Communist), Yerevan. Oct. 18, 1973, p. 2.
[47] Planovoye khozyaystvo (Planned Economy), Moscow. No. 11, November 1973, pp. 16–23.
[48] Stal' (Steel), Moscow. No. 12, December 1973, p. 1067.
[49] Stroitel'naya gazeta (Construction Gazette), Moscow. Apr. 29, 1973, p. 3.
[50] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 6, February 1974, p. 24.
[51] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 4. January 1974, p. 10.
[52] Work cited in footnote 50.
[53] Izvestiya vysshikh uchebnykh zavedeniy. Seriya gornyy zhurnal. (Universities' Transactions). Seria Min. J., No. 9, September 1973, p. 124.
[54] Pravda (Moscow). Sept. 27, 1973, p. 2; Dec. 28, 1973, p. 1.
[55] Pod znamenem Leninizma (Under Lenin's Banner), Kiev. Oct. 20, 1973, pp. 47–50.
[56] Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 23, June 1973, p. 7.
[57] Voprosy ekonomiki (Problems of Economics), Moscow. No. 8, August 1973, p. 26.

file instead of the ordered No. 12 profiles, as a result, the consumer overconsumed 1,800 tons of metal.[58]

The large 10-year quantity of unused machines, equipment, and rolled ferrous products, which cost hundreds of millions of rubles, was supposed to be remelted as scrap in 1973.[59]

Construction materials enterprises continued to produce materials and products that did not meet State standards, resulting in an extremely negative effect on the quality of construction.[60]

There are great overconsumption and losses of fuels, metals, and other mineral products in the Soviet economy.[61]

TRADE

Soviet foreign trade is within the State monopoly and administered by the Foreign Trade Ministry. Actual business is conducted through more than 60 foreign trade organizations. The sale of minerals, as well as of other Soviet products, is carried out largely under bilateral trade agreements negotiated on a state-to-state basis.

In the Soviet mineral economy, international trade is given high priority. Since the value and the volume of trade are outlined in the national plans, and since trade is conducted by State enterprises, exports and imports reflect national goals and priorities. There is, therefore, an implied commitment to export to achieve a desired trade balance. Soviet foreign trade continued to be orientated towards the importation of needed machinery and equipment, including complete industrial plants, balanced by exports of minerals. The high priority placed upon achieving the goals may result in commodity sales at below world prices. Domestic consumer demand is a less important motivation in Soviet exports. The U.S.S.R. exports practically nothing that could not easily be consumed in the country.

[58] Planovoye khozyaystvo (Planned Economy), Moscow. No. 5, May 1973, pp. 113–124.
[59] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Feb. 17, 1974, p. 2.
[60] Tsvetnye metally (Nonferrous Metals), Moscow. No. 10, October 1973, p. 4.
[61] Work cited in footnote 58.

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

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum metal:			
Unwrought	405,600	455,400	East Germany 104,500; Hungary 91,000; Czechoslovakia 88,600; Poland 47,500.
Semimanufactures, rolled only	118,500	117,000	East Germany 19,600; Czechoslovakia 14,600; Arab Republic of Egypt 8,145.
Antimony, unwrought	416	105	Mainly to Bulgaria.
Cadmium, unwrought	869	1,338	Netherlands 395; East Germany 211.
Chromium, chromite ore, concentrate thousand tons	1,100	1,100	United States 285; Sweden 127; Japan 122; Poland 118.
Copper and copper alloys:			
Unwrought:			
Unalloyed	173,600	202,100	Netherlands 52,000; Czechoslovakia 35,200; Hungary 29,200.
Alloyed	7,900	7,100	West Germany 5,353; Netherlands 1,455.
Semimanufactures, rolled only:			
Unalloyed	7,900	13,200	Cuba 3,597; Bulgaria 1,004; Poland 881.
Alloyed	9,700	11,600	Bulgaria 1,381; Cuba 1,336; Romania 621.
Iron and steel:			
Iron ore thousand tons	36,500	38,400	Czechoslovakia 11,396; Poland 10,608; Romania 4,528.
Scrap do	1,700	1,600	Italy 472; Japan 297; East Germany 205.
Pig iron do	5,100	5,100	Poland 1,448; Czechoslovakia 801; East Germany 784.
Ferroalloys:			
Ferrochrome	42,300	48,700	NA.
Ferromanganese	124,800	129,700	

See footnotes at end of table.

Table 2.—U.S.S.R.: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Iron and Steel—Continued			
Ferroalloys—Continued			
Ferrosilicon	124,000	139,300	NA.
Ferrovanadium	1,200	1,300	
Silicochrome [1]	3,330	1,585	
Silicomanganese [1]	9,213	9,715	
Other (unspecified)	r 69,157	83,300	
Total	r 374,000	413,600	Czechoslovakia 107,900; Romania 91,500; Hungary 39,700; United Kingdom 37,400.
Ingots and other primary forms thousand tons	1,101	1,086	Romania 286; Arab Republic of Egypt 191; Hungary 183.
Steel semimanufactures:			
Angles, shapes, sections do	1,763	1,754	East Germany 397; Bulgaria 317; Hungary 159; Poland 144.
Wire rod do	485	487	East Germany 146; Romania 75; Hungary 73.
Plate do	2,116	2,029	East Germany 1,036; Czechoslovakia 219.
Sheet:			
Tinplate do	106	94	Bulgaria 38; Cuba 25; East Germany 12.
Other do	838	975	East Germany 495; Poland 139; Hungary 87.
Strip do	r 12	10	Romania 3; Cuba 1.
Railway track materials do	400	403	East Germany 207; Poland 90; Bulgaria 44.
Wheels, tires, axles do	r 71	71	Poland 40; East Germany 26.
Pipes, tubes, fittings do	474	373	East Germany 157; Bulgaria 47; Cuba 37.
Wire do	67	75	Cuba 27; East Germany 15; Bulgaria 8.
Lead, unwrought	93,200	92,600	East Germany 45,000; Czechoslovakia 24,500; Hungary 9,700.
Magnesium metal, unwrought	14,800	19,900	West Germany 6,094; Netherlands 3,391; East Germany 2,955.
Manganese:			
Ore and concentrate:			
Metallurgical grade thousand tons	1,400	1,300	Poland 417; Czechoslovakia 265; East Germany 172.
Battery and chemical grade do	17	14	Netherlands 4; East Germany 2.
Metal [1]	14	--	
Vanadium slag	29,400	37,500	NA.
Zinc, unwrought	136,600	133,100	East Germany 41,500; Czechoslovakia 29,800; Netherlands 28,700.
Other nonferrous metals:			
Unwrought	r 46,307	45,107	NA.
Semimanufactures, rolled:			
Bimetal	2,700	2,600	Mainly to Bulgaria.
Other	1,800	2,300	NA.
NONMETALS			
Abrasives, hard alloys	93	104	Romania 44; Bulgaria 20; Poland 15.
Asbestos thousand tons	433	433	Poland 55; East Germany 49; France 44; Japan 41; India 34.
Cement, hydraulic do	3,400	2,100	Hungary 371; Poland 367; Czechoslovakia 348; Algeria 200.
Clays and clay products:			
Refractory clays and baked slate	42,900	44,500	Poland 35,500; Hungary 8,104.
Refractory products, including magnesite products	144,000	103,800	Bulgaria 22,200; Cuba 16,500; Romania 7,100.
Fertilizer materials:			
Crude phosphatic:			
Apatite ore thousand tons	50	27	All to East Germany
Apatite concentrate do	r 6,018	6,300	Poland 1,199; East Germany 1,164; West Germany 916.
Manufactured:			
Nitrogenous:			
Urea do	254	365	Cuba 75; India 63; Arab Republic of Egypt 37.
Other do	920	1,063	Czechoslovakia 312; Cuba 291; Hungary 110.

See footnotes at end of table.

Table 2.—U.S.S.R.: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Fertilizer Materials—Continued			
Manufactured—Continued			
Phosphatic -- thousand tons --	566	493	Bulgaria 178; Hungary 148; Cuba 126.
Potassic ---------- do ----	3,900	4,100	Poland 1,650; Belgium 390; Hungary 349; Japan 298.
Fluorspar (cryolite only) ----------	5,700	3,200	Hungary 969; Poland 893; Yugoslavia 660; Romania 508.
Graphite[1] ----------	r 2,964	2,605	All to East Germany.
Gypsum[1] ----------	21,200	21,000	All to Finland.
Salt ----------	264,500	275,900	Czechoslovakia 100,700; Hungary 74,200; Denmark 50,600; Finland 41,600.
Sodium and potassium compounds, n.e.s.:			
Caustic soda ----------	40,600	32,900	Cuba 27,800; Arab Republic of Egypt 3,375.
Soda ash ----------	89,600	74,400	Czechoslovakia 23,500; Turkey 18,900; Cuba 12,400.
Sulfur and pyrites:			
Pyrite, gross weight thousand tons --	1,800	1,600	West Germany 528; Italy 393; Yugoslavia 153.
Sulfur, elemental -------- do ----	464	405	Czechoslovakia 135; Cuba 133; Hungary 81.
Sulfuric acid ---------- do ----	211	219	Czechoslovakia 112; East Germany 67; Romania 28.
Talc[1] ----------	6,172	3,977	All to Japan.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black ----------	60,500	60,200	East Germany 18,900; Bulgaria 12,900; Hungary 8,938.
Coal:			
Anthracite ----- thousand tons --	4,300	4,200	France 1,039; Czechoslovakia 411; Belgium 260; Yugoslavia 135.
Bituminous ---------- do ----	20,500	20,200	East Germany 3,818; Japan 2,489; Czechoslovakia 2,446.
Unspecified ---------- do ----	100	--	NA.
Total ---------- do ----	24,900	24,400	
Coke ---------- do ----	4,400	4,500	Romania 1,204; East Germany 1,074; Hungary 629; Finland 589.
Gas, natural ---- million cubic feet --	162,447	179,063	Czechoslovakia 68,415; Austria 57,676; Poland 52,972.
Petroleum:			
Crude -- thousand 42-gallon barrels	549,780	560,070	
Refinery products:			
Gasoline ---------- do ----	34,850	38,250	Czechoslovakia 12.0%; East Germany 10.7%; Poland 10.3%; Finland 8.1%; Italy 7.9%; Bulgaria 7.4%; Cuba 6.6%; West Germany 5.8%; Hungary 5.2%.[2]
Kerosine and jet fuel - do ----	18,759	17,825	
Distillate fuel oil ---- do ----	85,044	97,000	
Residual fuel oil ---- do ----	79,254	73,926	
Lubricants --------- do ----	1,845	1,654	
Other:			
Asphalt and bitumen do ----	218	133	
Paraffin -------- do ----	312	342	
Petroleum coke -- do ----	505	597	
Unspecified ----- do ----	477	--	
Total --------- do ----	221,264	229,727	
Crude chemicals from coal, gas, and oil distillation ------- thousand tons --	434	449	Italy 75; France 70; East Germany 68; West Germany 62.

r Revised. NA Not available.

[1] Data possibly incomplete; total not reported. Totals given represent sum of quantities reported under individual countries.

[2] Details on destination of crude oil and the various refinery products are not reported individually. Total exports of these commodities are reported on a tonnage basis, by destination, but are not convertible to a barrel basis owing to the varying specific gravity of the different commodities that constitute the total, therefore, country detail given under principal destinations heading is based on percentage of the total accounted for by major recipients.

Table 3.—U.S.S.R.: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite ——— thousand tons	r 1,413	1,714	Yugoslavia 794; Greece 441; Guinea 327.
Alumina ——— do	755	698	Hungary 244; United States 243.
Metal and alloys, semimanufactures	1,500	2,800	Austria 1,071; Finland 330; West Germany 279.
Cadmium, primary forms	229	233	Poland 200; North Korea 33.
Copper metal:			
Unwrought, unalloyed	7,400	8,800	Chile 8,000; United Kingdom 80.
Semimanufactures:			
Powder [1]	620	880	All from West Germany.
Rolled:			
Unalloyed	6,700	6,200	Yugoslavia 3,843.
Alloyed	6,400	10,200	Yugoslavia 3,238.
Iron and steel:			
Scrap ——— thousand tons	13	15	All from Mongolia.
Pig iron ——— do	72	158	India 98; North Korea 60.
Ferroalloys ——— do	10	18	Norway 10.
Semimanufactures:			
Pipe ——— do	1,400	1,500	West Germany 661; Japan 140; Romania 133.
Other, rolled only ——— do	2,045	2,603	Japan 288; West Germany 287; Romania 264.
Lead:			
Ore [1]	48,000	39,000	All from Iran.
Metal, unwrought	43,000	50,400	Yugoslavia 16,400; North Korea 9,776; Bulgaria 6,681.
Mercury [1] ——— 76-pound flasks	2,901	1,450	All from People's Republic of China.
Molybdenum, concentrate [1]	200	--	
Tin metal, unwrought ——— long tons	4,331	4,134	United Kingdom 2,008; People's Republic of China 787; Bolivia 651.
Tungsten, concentrate	4,792	5,249	All from People's Republic of China.
Zinc:			
Ore [1]	12,634	24,300	All from Iran.
Concentrate [1]	r 5,465	3,508	All from North Korea.
Metal:			
Unwrought:			
Unalloyed	49,400	50,600	Poland 39,500; North Korea 6,748.
Alloyed	4,000	3,900	Mainly from Poland.
Semimanufactures:			
Dust	1,300	1,100	All from Poland.
Rolled	5,300	6,500	North Korea 4,347; Poland 901.
Other metals, n.e.s.:			
Unwrought	r 3,829	1,197	NA.
Semimanufactures, rolled	955	1,064	NA.
NONMETALS			
Barite	190,100	231,900	Bulgaria 74,300; North Korea 72,100; Yugoslavia 36,800.
Cement, hydraulic ——— thousand tons	371	460	North Korea 428.
Fluorspar	176,200	234,900	Mongolia 96,300; Thailand 52,300; People's Republic of China 40,200.
Magnesite:			
Crude [1]	16,400	26,000	All from North Korea.
Powder	r 375,500	341,800	Do.
Mica	478	539	All from India.
Quartz crystal, optical [1] ——— kilograms	4,000	2,000	All from Switzerland.
Salt [1]	112,600	107,200	All from People's Republic of China.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	164,900	164,800	Italy 80,300; Romania 64,000.
Soda ash	403,100	465,100	Romania 186,000; Belgium 101,000; Poland 66,900.
Caustic potash	9,100	10,300	West Germany 4,700; Czechoslovakia 4,340; East Germany 1,164.
Sulfur	218,500	151,000	Poland 130,800; Canada 20,200.
Talc	53,800	38,600	North Korea 32,000; Bulgaria 6,500.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	3,000	1,000	All from East Germany.
Coal, bituminous ——— thousand tons	8,400	9,700	All from Poland.
Coke ——— do	794	612	Do.
Gas, natural ——— million cubic feet	r 287,306	390,100	Iran 289,474; Afghanistan 100,626.

See footnotes at end of table.

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

Commodity	1971	1972	Principal sources, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum:			
Crude oil			
thousand 42-gallon barrels	r 37,485	57,330	Iraq 30,017; Libya 13,722; Arab Republic of Egypt 7,137; Algeria 4,190.
Refinery products:			
Gasoline ---------- do ----	3,104	2,854	Romania 27.1%; West Germany 1.3%.[2]
Kerosine ---------- do ----	r 2,548	1,335	
Distillate fuel oil ---- do ----	1,352	1,018	
Lubricants ---------- do ----	919	877	
Other:			
Asphalt and bitumen do ----	135	2	
Paraffin ---------- do ----	48	42	
Solvents ---------- do ----	155	174	
Unspecified ----- do ----	3,083	3,484	
Total ---------- do ----	r 11,344	9,786	

r Revised. NA Not available.
[1] Data possibly incomplete; total not reported. Totals given represent sum of quantities reported under individual countries.
[2] Details on origins of various refinery products are not reported individually. Total imports of these commodities are reported on a tonnage basis by destination, but are not converted to a barrel basis owing to the varying specific gravity of the different commodities that constitute the total, therefore, country detail given under principal sources heading is based on percentage of the total accounted for by major recipients.

In the total economy, foreign trade is relatively less important to the U.S.S.R. than to many other industralized nations. However, definite political and economic objectives are sought through trade, and the Soviet Union intends to expand its trading volume. In terms of foreign policy, dependence of some countries upon Soviet trade gives the U.S.S.R. varying degrees of economic influence abroad. Sales and purchases at appropriate places enable the Soviet Union to exert political pressure. Because the U.S.S.R. has a dominant position in the COMECON bloc, the volume of trade it affects is significantly greater than the trade volume of the U.S.S.R. alone.

The Soviet Union uses fuel, metal, and energy exports as a tool to control the economies of the satellites. In Eastern Europe, this control is largely exercised through fuels and energy. Romania is the only country producing moderate quantities of oil; all others are heavily dependent upon liquid fuel imports. The U.S.S.R. controls the metallurgical economies of satellite nations through its exports of coke and ferrous and nonferrous metals.

The plan for the 1971–75 period provides for a 33% to 35% increase on foreign trade, primarily through an expansion of trade with other Communist countries. The average growth rates for 1971–73 were higher than planned. In 1973, the volume of total Soviet trade turnover (exports plus imports) was 31.3 billion rubles, 20.3% over the 1972 level. Exports totaled 15.8 billion rubles, an increase of 3.1 billion rubles over those of 1972, and imports totaled 15.5 billion rubles, an increase of 2.2 billion rubles. Because commodity values rose sharply in 1973, actual physical volume of Soviet trade turnover, according to Soviet sources, rose only 16%. Trade was conducted with more than 100 countries.

Soviet Union trade with Communist countries in 1973 amounted to 18.3 billion rubles (58.5% of total trade), of which 16.9 billion rubles (54.0%) was with COMECON nations; 8.3 billion rubles (26.5%), with developed Western countries; and 4.7 billion rubles (15.0%), with developing countries. In 1973, the share of total Soviet foreign trade with developed Western nations increased 4% over that of 1972. For the first time, trade with two developed Western countries, the United States and West Germany, exceeded 1 billion rubles. Western Europen countries alone accounted for 18% of all Soviet foreign trade, and for about 77% of Soviet trade with the Western developed sector.

The volume of total trade with leading Western developed countries in 1972 and 1973 follows, in million rubles:

Country	1972	1973
West Germany	827	1,210
United States	538	1,161
Japan	816	994
Finland	602	777
France	544	722
United Kingdom	558	715
Italy	468	614
Netherlands	222	356
Belgium	175	354
Sweden	189	232
Austria	73	198

Preliminary Soviet foreign trade figures in 1973 provide abundant evidence of the declining importance of Communist countries in the Soviet external trade. Whereas trade with Communist countries in 1971 represented 65.4% of the total, it was only 58.5% in 1973. Trade with COMECON countries, however, rose 9% over that of 1972.

Soviet trade turnover with COMECON nations in 1972 and 1973 follows, in million rubles:

Country	1972	1973
East Germany	3,705	3,965
Poland	2,803	3,000
Czechoslovakia	2,626	2,760
Bulgaria	2,345	2,555
Hungary	1,882	2,064
Romania	1,053	1,130
Cuba	822	1,110
Mongolia	287	338

Trade with Yugoslavia was 671 million rubles (compared with 569 million in 1972); with North Korea, 357 million rubles, with the People's Republic of China (PRC) 201 million rubles; and with North Vietnam, 180 million rubles (up from 117 million in 1972).

The Soviet Union has signed trade agreements with more than 70 developing countries. The leading countries in 1973 in this group of nations ranked as follows in million rubles:

Country	Million rubles
India	589
Egypt	541
Iraq	332
Iran	275
Turkey	133
Syria	119
Algeria	117

Other developing countries important in trade with the U.S.S.R. are Afghanistan, Brazil, Ghana, Guinea, Libya, Malaysia, Morocco, Nigeria, and Peru. Trade with these countries grew through the expansion of economic and technical assistance.

Qualitatively, there was no significant change in patterns of Soviet mineral trade in 1973 compared with those of 1972. Fuel, mineral raw materials, and metals played the largest role in Soviet exports, representing about 40% of the total official exports during 1973. There was a considerable increase in exports of fuel and power, pig iron, nonferrous metals, and nonmetallic minerals.

Exports of crude oil and petroleum products increased from 107 million tons in 1972 to 118 million tons in 1973. Soviet oil exports to Communist countries accounted for 68 million tons, 14.3 million tons of which went to Czechoslovakia, 13 million to East Germany, 12 million to Poland, 9 million to Bulgaria, 6 million to Hungary, and about 14 million to other Communist countries. In 1973 Soviet exports of crude oil and petroleum products to non-Communist countries were 50 million tons, 10 million tons of which went to Finland, 9 million to Italy, 6 million to West Germany, and 5 million to France.

Soviet exports of natural gas increased from 3.4 billion cubic meters in 1972 to 4.9 billion cubic meters in 1973. Exports of electric power, which went almost entirely to Eastern Europe, rose about 30% (from 7.5 billion to 9.9 billion kilowatt-hours). Exports of coal and coke were at 1972 levels.

In 1973, the Soviet Union was a net exporter of petroleum (about 103 million tons), coal and coke (over 14 million tons), and electric power (about 10 billion kilowatt-hours). It was a net importer of 6.5 billion cubic meters of natural gas.

Compared with 1972, exports of nonferrous metals increased in 1973, as follows, in thousand tons: Copper, from 202 to 238; zinc, from 133 to 146; lead, from 93 to 97; aluminum, from 455 to 518. The U.S.S.R. accounted for approximately 16% of total world exports in aluminum, nearly 8% in copper, and about 10% in zinc and tin. Soviet scrap plays an important part in the total exports, and shipments from the U.S.S.R. are made regularly to Japan, Finland, Sweden, Italy, East Germany,

and Poland. The Soviet Union is expected to increase its exports of fuel and power, nonferrous and rare metals, and diamonds. Exports of gold and platinum-group metals depend on special short-term Soviet economic problems.

The Soviet Union covers nearly 100% of the COMECON nations imports of crude oil, natural gas, pig iron, and power, two-thirds of their petroleum products, rolled ferrous metals, and phosphorous fertilizers, more than three-fifths of coal and manganese ore, and up to 90% of iron ore. The export of Soviet petroleum to COMECON members will rise from 138 million tons during the 1966–70 period to 243 million tons during the 1971–75 years, and the export of natural gas will rise correspondingly from 8 billion cubic meters to more than 30 billion cubic meters.

Heretofore, most of the Soviet mineral trade has been with the Communist bloc, but the U.S.S.R. is now aiming for increased exports to Western countries and especially to the United States. Sales of rare-earth metals and titanium to the United States, for example, may be estimated at $4 million in 1973 and could amount to $6 million in 1974.

There was a considerable increase in imports of machinery and plants, 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 some quantities, mainly from Middle East and North Africa. Natural gas is imported from Iran and Afghanistan.

Trade tables are derived from official statistics of the Ministry of Foreign Trade for 1970, 1971, and 1972. Official detailed figures for 1973 are not yet available, but much the same general pattern can be expected.

COMMODITY REVIEW

METALS

Although the development of ferrous and nonferrous metal industries lagged behind the goals foreseen in the 1971–75 5-year plan, production has continued to grow. Beneficiation and metallurgical facilities continued to experience poor metal recovery, particularly from mixed ores; for example, the nonferrous industry of Kazakhstan recovered only 40% to 70% of the total value of the components from ore.[62] Lead concentrates produced from mixed ores at the Zyryanovsk and Leninogorsk complexes contained about 60% of the lead present in the ore, and zinc concentrate carried only 30% to 50% of the zinc present in these ores. From 80% to 90% of rare and dispersed elements were discarded in tailings in 1972.[63]

There were 60% losses of metals in beneficiation and metallurgical processes of copper pyrite ores and concentrates in the nonferrous industry of Bashniria (southern Urals).[64] During mining, concentration, and metallurgical processing, the Bashkirian nonferrous enterprises lose much zinc, sulfur, and precious metals.[65]

Aluminum.—The Soviet Union, second only to the United States in aluminum production, operated 13 primary reduction plants with a total probable annual capacity of 1.7 million tons by January 1, 1974. Production in 1973 has been estimated at 1,485,000 tons, including 125,000 tons of secondary aluminum. The estimated 8% increase in metal output was due mainly to new production from the Krasnoyorsk, Irkutsk, and Bratsk plants in eastern Siberia. It had been planned to increase aluminum production 10%, but output fell short at the Achinsk and Pavlodar alumina plants. Soviet aluminum production is planned to rise 8.2% in 1974. Exports increased from 368,900 tons in 1970 to 455,400 tons in 1972 and to 518,000 tons in 1973.

Under the present 5-year plan, output in 1975 is scheduled to be 50% to 60% over the 1970 level. It is planned to complete construction of the Bratsk and Krasnoyarsk aluminum plants, to put into operation the first stage of the Regar aluminum plant in Tadzhikistan, and to enlarge facilities at the other aluminum plants during the 1971–75 period. Capital

[62] Tsvetnye metally (Nonferrous Metals), Moscow. No. 10. October 1973. p. 4.
[63] Narodnoye khozaystvo Kazakhstana (National Economy of Kazakhstan). Alma-Ata. No. 3, March 1973. p. 36.
[64] Work cited in footnote 63.
[65] Work cited in footnote 63.

investment in the aluminum industry for the 1971–75 period absorbs about one-third of the total investment in the nonferrous sector. Because of the deficit of high-quality bauxite in the U.S.S.R. and technological problems at the Achinsk and some other alumina plants, it is estimated that Soviet output of primary and secondary aluminum may reach 1.65 million tons by 1975 and 2 million tons by 1980.

The aluminum supply position in 1973 was as follows, in thousand tons:

Production of primary aluminum	1,360
Production of secondary aluminum	125
Imports of aluminum (ingots)	--
Exports of aluminum (ingots)	518
Apparent consumption	967

In the Soviet Union, aluminum is produced more for export than to supply domestic consumption. It has exported more than one-third of its production, more than 400,000 tons, in each of the last 3 years. Soviet aluminum exports are expected to increase from 368,900 tons in 1970 to more than 550,000 tons in 1975 and to about 750,000 tons in 1980.

Construction continued at the Bratsk, Krasnoyarsk, Irkutsk, and Regar primary aluminum plants. Two potlines at the Krasnoyarsk and one each at the Irkutsk (the last potline) and Bratsk aluminum plants were commissioned in 1973. In December 1973, the Krasnoyarsk aluminum works produced its first rolled aluminum, and an induction furnace was installed at the Yerevan aluminum plants to replace a gas-fired unit.

The U.S.S.R. is reportedly planning to establish a vast primary aluminum plant with an annual capacity of 400,000 to 500,000 tons at Kansk in Krasnoyarsk Kray. Construction is to begin during the current 5-year period, with completion scheduled for 1980. The Soviet Union has been negotiating with Péchiney of France, with Industries Corp. of the United States, and with Japanese Government and aluminum industry officials on technology and engineering expertise for the plant, but has not yet awarded any contracts.

In 1973, attention was paid to improving the raw material base and to erecting alumina plants to bridge the gap between alumina and aluminum electrolysis capacity. Serious deficits in alumina production seem probable in the next few years pending the development of the Siberian nepheline-based industry.

The Soviet Union is also seeking to meet this deficit by integrating the aluminum industries of Eastern Europe, and by facilitating projects in non-Communist countries, notably in Greece and Guinea. Meanwhile, the U.S.S.R. continued to import substantial quantities of high-grade bauxite and alumina from Hungary, Yugoslavia, Guinea, and elsewhere. The Almashfyuzite alumina plant in Hungary, which became operational late in 1971, ships a large part of its output to the U.S.S.R. The second alumina plant, the Ajka plant, with an annual capacity of 240,000 tons of alumina, built under a Soviet-Hungarian agreement, was inaugurated on October 26, 1973. By 1975, Soviet imports of alumina from Hungary will have doubled. According to Hungarian plans, 1985 production of bauxite is to be 3 million tons, 1 million tons more than in 1970. Some Hungarian bauxite will be exported to the U.S.S.R.

According to Soviet-Yugoslav trade agreements, the U.S.S.R. will increase imports of bauxite from Yugoslavia from 0.8 million tons in 1971 to 1.2 million tons in 1975. Over the 1976–85 period, Yugoslavia has agreed to supply to the U.S.S.R. 6 million tons of alumina from the Zvornik alumina plant, for which the Soviet Union will supply equipment. Total production from the Zvornik complex will be delivered to the U.S.S.R. over the next 10 years. The Zvornik complex will process about 1.5 million tons of bauxite annually.

Under a new agreement, the U.S.S.R. will increase its assistance to Guinea to develop its bauxite deposits; beginning in 1974, 2.25 million tons of bauxite from the Kindia mine, now under development with the assistance of the Soviet Union, will be delivered annually. The U.S.S.R. has proposed to the Greek Government the construction of a $100 million, 450,000-ton-per-year alumina plant to be 100% Greek owned. The U.S.S.R. would take the entire output for the first 7 years of operation (estimated at 3.15 million tons worth $280 million).

The U.S.S.R. is a large producer of low-grade bauxite, the main source of aluminum in the country, but supplies are insufficient to meet demand, both in quantity and quality, and considerable attention has been given to developing nepheline and alunite. The principal reserves of

presently minable bauxite 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 was the main bauxite- and alumina-producing region in 1973. New facilities for alumina production were put into operation at the Bogoslovsk aluminum plant.

The second largest bauxite- and alumina-producing region was Kazakhstan, with the Pavlodar No. 1 alumina plant among the nation's largest in 1973. Alumina plant No. 2 was under construction. Production of bauxite has begun at the Nizhne-Ashutsk mine in Turgay Area; this mine is the fifth supplier for the Pavlodar alumina plant. It had been planned to increase alumina production in Kazakhstan 6.9% in 1973 over that of 1972, but production fell short at the Pavlodar plant. Completion of development of the Krasnooktyabr'sk and Belinsk open pits in north Kazakhstan and the Iksinskoye in Archangel Region was rescheduled for 1975.

Construction of an aluminum products plant, with a planned annual capacity of 48,000 tons of semifinished products, such as foil, profile aluminum, bars, and tubes, was in progress near Shumen in Bulgaria. Its No. 1 section is to be completed by the end of 1975. Fuel capacity is to be reached 2 years later. It was designed jointly by Soviet and Bulgarian specialists. Most of the equipment and aluminum ingot will be supplied by the U.S.S.R. An aluminum-metal plant was being built at Nachterstadt in East Germany with Soviet assistance and equipment. The U.S.S.R. supplies 70% of the aluminum required by the East Germany economy.

Antimony.—Deposits of antimony occur at Kadamzhay in Kirgizia, Dzhidzhikrut in Tadzhikistan, Turgay in Kazakhstan, and Sarylakh and Tazhdolinsk in Siberia. Kadamzhay remained the principal antimony center of the U.S.S.R. A new mining complex is being established in the Oymyakon Area of the upper Indigarka Valley in East Siberia, where antimony deposits have been discovered. Construction of the concentrator began in 1973.

An experimental rotary furnace for processing oxidized antimony ore has come into operation at the Kadamzhay complex. Construction of the second stage of the Aznob mining and concentrating combine (Dzhidzhikrut complex) was in progress in 1973.

Beryllium.—Production rates for beryl, beryllium alloys, and metal were being increased rapidly. During 1971–73, estimated output rose about 12%. The increase indicated a probable production level of 1,750 tons of beryl (10% to 12% BeO) in 1973.

Bismuth.—As in previous years, bismuth was recovered as a byproduct of lead smelting in Kazakhstan and other areas of the U.S.S.R., from dust and crude lead at the Balkhash and Mednogorsk copper complexes, and from tungsten and molybdenum ores. Facilities for production of bismuth were being installed at the metallurgical plant of the Far Eastern mining and metallurgical complex. Production of bismuth is scheduled to start by the beginning of 1974.

Cadmium.—As in 1972, cadmium was produced in 1973 almost entirely from the zinc sulfide mineral, sphalerite. The Leninogorsk polymetallic complex in Kazakhstan, which produced the first cadmium in 1935 and the first electrolytic cadmium later, continued to be one of the largest producers of the metal. It is planned to obtain a large quantity of cadmium from lead slag.

Chromium.—With an estimated output of 1.9 million tons, the U.S.S.R. continued to be the world's leading producer and exporter of chromite in 1973. Estimated exports totaled 1.2 million tons during the year, with more than three-quarters going to non-Communist countries. Output of chromite is expected to be about 2 million tons by 1975, 14% higher than that of 1970, and to rise to about 2.25 million tons in 1980. Approximately 60% of total production is to be exported.

Chromite ores are located in Kazakhstan and in the Ural Mountains. Gross reserves (measured+indicated+inferred) in place have been estimated at over 100 million tons of ore containing 15% to 63% Cr_2O_3, of which 20 to 25 million tons are measured. The Donskoye mining administration at Khrom-Tau in Aktyubinsk Oblast' of Kazakhstan is the only supplier of high-quality ore in the U.S.S.R. Deposits of chromium ores in the Ural Mountains have a low chromium oxide content (20% to 40%) as well as a low Cr_2O_3-to-FeO ratio.

The grade of most ores is adequate for direct shipping after hand picking. There were two crushing and grinding mills in opeation at Khrom-Tau in 1973. The first

Soviet chromite concentrator, with an annual capacity of 1 million tons of crude ore (300,000 tons of concentrate) was under construction at Donskoye in 1973 and scheduled for completion in 1974.

More than 90% of the chromite mined in the country comes from open pits of the Donskoye mining administration. Development of the Southern open pit, with an annual capacity of 400,000 tons of ore, at the 20 Let Kazakhskoy SSR group of mines, continued and is scheduled for completion in 1974. The open pit is linked to two others, the Northern and the Eastern. Development of the first underground mine, the 40 Let Kazakhskin SSR, with a capacity of 2 million tons of ore per year, began at Donskoye mining administration in December 1973, and is scheduled for completion in 1980.

Cobalt.—In 1973, cobalt was produced at Nozilsk in western Siberia, at Monchegorsk and Pechenga on the Kola Peninsula; in the Urals, at the Yuzhuralnikel', Ufaley, and Rezhsk nickel plants; at Khovu-Aksinsk, in the Tuva Autonomus Republic; and also at some copper plants.

Production facilities at the Khovu-Aksinsk arsenic-cobalt deposits, which were built in 1970, continued to experience ore shortages due to reserve problems. Recovery of cobalt remained low, especially at the Ufaley nickel plant.[66]

Copper.—Production in 1973 was estimated at 850,000 tons, including 150,000 tons of secondary copper. Output of copper may reach 925,000 tons by 1975, rising to 1.2 million tons in 1980. About 40% will come from Kazakhstan and 35% from the Urals. The increase in production depends primarily upon expansion in Kazakhstan and Uzbekinstan, where large-scale mechanized operations are being developed. Exports increased from 123,000 tons in 1970 to 202,000 tons in 1972 and to 238,000 tons in 1973. Copper exports by 1975 are expected to be about 270,000 tons, rising to 400,000 tons in 1980. The copper production facilities at the Dzhezkazgan, Balkhash, Almalyk, and Norilsk complexes and the Central Ural smelter were enlarged in 1973.

Kazakhstan became the main center of Soviet copper production in 1973. By 1975, blister output is to be increased 58%, and refined copper production 77%, over 1970 levels. A large part of this increase will come from completion of the second stage of the Dzhezkazgan complex, the development of the first stage of the No. 65 mine, construction of the No. 2 concentration plant, and completion of the first stage of the No. 3 concentration plant. In 1973, the copper industry of Kazakhstan was well behind production schedules, and failed to meet the goal of an 11.5% increase in production of refined copper over the 1972 level. A major copper smelting complex was put into operation at Dzhezkazgan in 1973. The development of the No. 15 and renovation of the No. 57 mines has lagged 2 years, and the startup of the most important project of the 5-year plan, the No. 65 mine, is being delayed 6 months. "For 5 years, the plan for recovery of metals have not been met. The production cost and losses of copper and lead in concentration are great . . . The plant is poorly supplied with reagents, materials and spare parts. The basic equipment is operating until it is worn out. Schedules for repairs are not met and there are frequent emergencies and idling." [67]

The Krasnoural'sk, Kirovgrad, and Karabash copper smelters in the U.S.S.R.'s second most important copper-producing region, the Northern Urals, are now experiencing a major shortage of concentrates. The existing pyrite deposits no longer meet the needs of the smelters, and concentrates are being shipped from central Asia, the Altay Region, the Caucasus, and other regions. Transportation costs exceed 10 million rubles per year. The disproportion between copper smelting plant requirements and ore mining in the Urals has resulted from a prolonged lag in geological exploration.[68] In order to meet monthly production quotas, copper mines in the Urals often shipped ore mixed with rock to concentration plants, especially at the end of the month.[69]

An incline hoist was put into operation at the Sibay open pit of the Bashkir copper-sulfur complex. The third section of the Uchaly ore-dressing plant in Bashkiria was commissioned in November 1973.

Armenia did not fulfill its quotas for refined copper production in 1973.[70] The

[66] Tsvetnye metally (Nonferrous Metals), Moscow. No. 10, October 1973, p. 78.
[67] Pravda (Moscow). Oct. 22, 1973, p. 2.
[68] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Dec. 28, 1973, p. 2.
[69] Pravda (Moscow). Mar. 23, 1973, p. 2.
[70] Work cited in footnote 22.

Dastakert copper-molybdenum complex is short of ore reserves, and as a result, the actual production of copper and molybdenum concentrates is well below the planned targets.[1]

Facilities for producing copper concentrates were commissioned at the Solnechnyy and Khrustal'nyy tin mining operations in the Soviet Far East. Construction of the first stage of the Madneuli mining and concentrating complex in Georgia, which will produce copper, lead, pyrite, and barite concentrates, was nearing completion. It is planned to commission the second stage in 1976. Renovation and enlargement of electrolytic copper facilities at the Norilsk complex continued in 1973. When renovation is completed, copper production will be increased 12%. According to Soviet sources, a deposit of native copper was discovered at Arylakh near Norilsk in West Siberia. The quantity of copper in this deposit is still to be determined.

The Soviet Union has been negotiating with French, British, and Japanese companies to develop the Udokan copper deposit in East Siberia. At the same time, the U.S.S.R. has offered assistance to India to consider the feasibility of establishing a copper concentrator there.

Gold.—In 1973, the U.S.S.R. was probably the world's second largest producer with an estimated output of 7.1 million ounces. The growth in Soviet gold production reportedly resulted mainly from expansion of placer mining in the northeast of the Asian part of the country. More than 75% 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. Nearly all of the Soviet placer production came from Kolyma, Aldan, Dzhugdzhur, Indigarka, Yana, Chukotka, and the Urals. During the current 5-year plan, production of gold is to be increased in the Soviet Far East, East Siberia, Kazakhstan, Armenia, and Uzbekistan. Gold production is estimated to be 7.5 million ounces in 1975 and 8.6 million ounces in 1980.

It is estimated that the U.S.S.R. sold the equivalent of its annual gold output and provided about 20% of the supply to Western gold markets in 1973. The Soviet Union's exports in 1974–75 will probably be much below the 1972–73 levels.

Potential reserves of gold were estimated at about 200 million ounces in 1970. Measured reserves were reportedly sufficient for a 16- to 17-year operation at current production rates. Extensive prospecting continued in the Asian part of the country. The Far Eastern geological administration organized 30 new surveying, geophysical, and prospecting teams in 1973. The discovery of several vein deposits in Kazakhstan, Armenia, and Uzbekistan was reported in 1973. Several new placer deposits were found at Chunotka and other regions of the Soviet Far East and Yakutia.

Magadan Oblast' is the main production center with 32 placer mines, 21 dredges, and over 500 sand-washing rigs. This oblast' fulfilled its gold production plan in 1973. Good results were achieved by the Bilibinskiy, Polarninskiy, Srednekanskiy and Tenkinskiy mining and concentrating complexes and the Komsomal'skiy and Vostochnyy placer mines, which overfulfilled annual targets.

In Yakutia, the second largest gold-producing region, the Lenzoloto trust was the leading gold-dredging enterprise in the Soviet Union. Amurzoloto administration fulfilled its 3-year (1971–73) gold extraction plan; the best results were achieved by the No. 68 dredge of the Soloveysk placer mine. The Taseyevo gold extraction plant at the Baleyzoloto complex was being renovated; an old mill at this plant was replaced by a new one in 1973. Two others will be replaced in the future. When renovation is completed, its capacity is to be more than doubled.

Industrial development of the Aymanday gold-bearing area in Kazakhstan began in 1973. Sinking of the country's deepest underground gold mine (900 meters deep) at the Bestube gold complex in Tselinograd oblast', Kazakhstan, is scheduled to be completed in 1974. In Armenia, the installation of a concentrator at the Zod complex was completed in 1973.

Iron Ore.—In 1973, 71 underground mines and 62 open pits, with a total capacity of over 245 million tons, produced 216 million tons of usable ore (direct-shipping ores plus concentrates), an increase of 8 million tons over 1972 production. About 81% of production was from open pit operations. Production of usable ore is sched-

[1] Promyshlennost' Armenii (Industry of Armenia), Yerevan. No. 2, February 1973, p. 37.

uled to reach 221 million tons in 1974 and 254 million tons (478 million tons of crude ore) in 1975. To achieve the planned targets, the following capacity increases are to be accomplished during the 1971–75 period: for usable iron ore, 92.3 million tons (192.5 million tons of crude ore); for pelletized concentrate, 32.8 million tons; and for sinter, 21.9 million tons. It is expected to reach the following total capacities by 1975: for usable ore, 276 million tons; for sinter, 160 million tons; and for pelletized concentrate, 47 million tons.

Capital investment in the Soviet iron ore industry for the 1971–75 period has been set at 4.3 billion rubles, 66% more than was invested during the preceding 5-year period. It is planned to increase pellet production from 10.6 million tons in 1970 to 38.3 million tons by 1975. The average iron content of usable ore is to rise from 58.8% in 1970 to 59.8% in 1975. By 1980, the output of crude ore in the U.S.S.R. is planned to reach 550 to 660 million tons. It is estimated that production of usable iron ore will reach 240 million tons in 1975 and 275 million tons in 1980.

Annual production capacity of crude ore was increased 39 million tons (17 million tons of usable ore) in 1973, compared with a planned increase of 48 million tons. The following facilities were commissioned in 1973: the first stage of the Mikhaylov iron ore mining and concentrating complex in Kursh Oblast' and new capacities for iron ore extraction at the Lisakovsk (Kazakhstan), Lebedinsk (Kursk Region), Olenogorsk (Kola Peninsula), Novokrivorzhsk, and Ingulets mining and concentrating complexes in the Ukraine. It is scheduled to increase annual production capacity of crude ore by 36.6 million tons in 1974.

Ninety-one iron ore concentrating plants, 29 of which had sintering and four had pelletizing facilities, produced 134.9 million tons of concentrates, 145.6 million tons of sinter, and 21.4 million tons as pellets in 1973. The average iron content was 59.22% in usable ore (including concentrate) and 32.5% in the ore shipped for upgrading. It was scheduled to reach the following total production in 1974, in million tons: concentrates, 141.9; sinter, 148.6; and pelletized concentrate, 24.2.

Exports of iron ore increased from 36.5 million tons in 1971 to 38.4 million tons in 1972 and to an estimated 40 million tons in 1973. The principal increase was in exports to Bulgaria, Hungary, East Germany, Poland, and Czechoslovakia, which represented about 90% of the total exports. The U.S.S.R. is meeting 85% of the iron ore requirements of the COMECON countries. In the 1966–70 period, Soviet iron ore exports to these countries totaled 72 million tons of iron content. Under the 1971–75 plan, exports are scheduled to reach up to 94 million tons iron content.

According to an October 31, 1973 agreement, Finnish companies will build the Kostamus iron ore complex in Soviet Karelia about 30 kilometers from the Finnish border. This project will be built in three stages and will have an annual capacity of about 8.3 million tons of pellets (24 million tons of crude ore). The first stage will produce about 2.7 million tons of pellets per year and will be completed in 1977–78. The deposit contains an estimated 1.2 to 1.5 billion tons of ore with an average iron content of 31%. Preliminary estimates show that the entire project will cost about $600 million with initial working requirements of about $155 million. The construction will take from 8 to 10 years. 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 Ukraine produced over 55% of Soviet iron ore in 1973, and the plan provides for increased output of 14% during 1971–75. The Krivoy Rog Basin in the Ukraine produced 89% of the Republic's total 1973 output. The first stage of the Lurgi pellet plant at the Northern complex in Krivoy Rog, with an annual capacity of 4 million tons, was constructed and put into operation by Ashmore, Benson, Pease and Co. of Stockton in 1972. The U.S.S.R. plans to expand this plant 8 to 12 million tons per year in units of 4 million tons per year. The Central complex in Krivoy Rog produced approximately 5 million tons of pellets in 1973.

The Urals was the second largest producer, followed by Kazakhstan, Siberia, the Kursk Region, and the Kola Peninsula. The Kachkanar mining complex in the Central Urals reached its planned capacity of 33 million tons of crude ore per year.

Iron ore production in Kazakhstan accounted for over 9% of the total, mainly

from the Sokolovsk-Sarbay combine, with an annual capacity of 26.5 million tons of crude ore (12 million tons of concentrate). The combine has been enlarged and produced over 14 million tons of usable ore in 1973. It is scheduled to reach 15 million tons of usable ore in 1974. With expansions also at the Lisakovsk complex, it is planned to increase production of crude ore in Kazakhstan from 29.2 million tons in 1970 to 48.6 million tons in 1975.

About 33 million tons of crude iron ore (4 million tons more than in 1972) was produced in the Kursk Region in 1973. It is planned to reach 40 million tons by 1975. The second stage of the Lebedinsk complex in the Kursk Region, with the same capacity as the first stage (7.5 million tons of crude ore or 3.35 million tons of concentrate), was commissioned in December 1973. The first stage of the Mikhaylov complex in Kursk Oblast', with an annual capacity of 7.5 million tons of taconite (3 million tons of concentrate), was also put into operation in December 1973.

The No. 8 section of the Olenogorsk concentration plant in Kola Peninsula, with an annual capacity of 240,000 tons of iron concentrate, was put onstream in July 1973. Two new sections at the Dashkesan complex in Azerbaydzhan, with an annual capacity of 0.5 million tons of concentrate, were commissioned in November 1973.

An intensive iron ore exploration program covering many Soviet regions was undertaken in 1973. Several deposits were discovered on the banks of the Angara River in East Siberia and in the Yakut Autonomous Republic.

Iron and Steel.—With a production of 131 million tons in 1973, the Soviet steel industry was second only to that of the United States. Output of pig iron rose 3.6 million tons over the 1972 level; steel increased 5.9 million tons; finished rolled ferrous metal, 3.3 million tons; and steel pipe, 0.8 million tons. Although production increased, a large quantity of steel products was imported from Japan and Western countries.

Production facilities either new, expanded, or renovated, commissioned during the year (in million tons) were as follows: pig iron, 3.7; and semimanufactured ferrous metals, 3.5. The following main facilities were put into operation: new blast furnaces at the Novolinetsk plant and at the Orsk-Khalilovo complex, the first stage of the 3,600 plate mill at the Azovstal' plant, the cold-rolling sheet-metal shop at the Karaganda complex, the transformer steel shop at the Verkh-Isetsk metallurgical plant, and facilities for producing calibrated metal at the Cherepovets steel plant.

In the 1971–75 5-year plan, the following facilities are planned to start operation: 6 blast furnaces, 12 oxygen converters, 15 electric furnaces, and over 35 rolling mills. Plans call for the investment of 17 billion rubles in the ferrous industry in 1971–75, or about 70% more than was invested in the last 1966–70 5-year plan.

The steel industry suffers from technological difficulties and low productivity. In a statement published in the Soviet press, the Central Committee of the Soviet Communist Party confirmed that the automation of the iron and steel industry was running into difficulties.[72] In 1973, return on capital decreased by about 3% compared with 1972. Incomplete utilization of existing capacities and prolongation of construction projects were the principal reasons. New units were slow in attaining capacities because actual conditions of operation did not correspond with designed and planned utilization.[73] According to the Economic Gazette,[74] as of January 1, 1973, 16 blast furnaces, 3 open-hearth shops, and 4 rolling and 5 pipe mills, which were put into operation after 1958, operated below planned capacities.

In 1973, 36 enterprises, operating 137 blast furnaces, produced 95.9 million tons of pig iron, a 3.9% increase over that of 1972. It is planned to produce 99.5 million tons in 1974. Estimated output for 1975 and 1980 is 104 million tons and 125 million tons, respectively. Average blast furnace capacity is reported at 1,174 cubic meters. About half of all blast furnaces used oxygen for enrichment, about 85% of the pig iron is produced by partial use of natural gas and oxygen at 106 blast furnaces.

Crude steel production from 76 metallurgical works increased 4.8% to 131 mil-

[72] Trud (Labor), Moscow. Oct. 27, 1972, p. 2.
[73] Pravda (Moscow). Jan. 16, 1973, p. 3.
Planovoye khozyaystvo (Planned Economy), Moscow. No. 3. March 1972, pp. 79–83.
Sotsialisticheskaya industriya (Socialist Industry), Moscow. Nov. 26, 1972.
[74] Ekonomicheskaya gazeta (Economic Gazette). Moscow. No. 7, February 1973, p. 2.

lion tons in 1973. It is scheduled to produce 135.9 million tons in 1974, and 146 million tons (original planned goal) of crude steel in 1975. Estimated levels for 1975 and 1980 are 140 million tons and 165 million tons, respectively. The share of steel produced in oxygen converters increased from 19.2% in 1971 to 21% in 1972, and to an estimated 22% in 1973.

Planned crude steel production at major metallurgical plants in 1973 was as follows, in million tons:

Plant	Planned 1973
Magnitogorsk	14.5
Krivoy Rog	10.8
Zhdanov, Il'ich	7.1
Nizhniy Tagil	6.4
Cherepovets	6.3
Chelyabinsk	6.2
Zapozhstal'	4.7
Kuznetsk	4.6
Karaganda	4.6
West Siberian	3.4
Other (66 plants)	62.1
Total	130.7

The Soviet Union is investigating and signing contracts for new Western technology and machinery to increase steel output and upgrade steel products. It is planned to build a large joint COMECON steel works in the U.S.S.R., presumably in the Kursk Region, with the assistance of Western companies. At the same time, the Soviet Union is assisting in the construction of iron and steel plants in the following countries: Bulgaria, Poland, Romania, Yugoslavia, North Korea, Egypt, India, Iraq, Algeria, and Turkey.

Lead and Zinc.—With estimated output of primary lead at 470,000 tons, and zinc at 670,000 tons, the U.S.S.R. was the world's second largest producer in 1973. Estimated production of primary metals in 1975 is placed at 700,000 tons for zinc and 500,000 tons for lead; estimated levels for 1980 are 800,000 and 560,000 tons, respectively.

Kazakhstan continued to be the leading lead and zinc producer, and lead and zinc production is to be increased 27.2% and 15.4%, respectively, during 1971–75. It is planned to increase the lead and zinc output at the Mirgaliy, Tekeli, and other mines in 1974–75 and to put into operation the Kargolin mining and concentration complex, Tishinsk underground mine, and the first stage of the Zharem mine in Kazakhstan. The Ust'-Kamenogorsk and Leninogorsk complexes, Chimkent lead plant, and some other lead and zinc plants in this republic continued to experience raw material shortages in 1973.[75] The Chimkent lead plant, which is one of the largest Soviet's lead plant, employed 6 Candidate of Sciences, 240 graduate engineers, and 350 graduate technicians in 1973.[76]

The Novoshirokinsk mine at the Nerchinsk polymetallic complex in Chita Oblast' was under development and scheduled for completion in 1975. This mine is scheduled to double the capacity of the complex. Development of the Nikolayevsk mine at the Sikhali polymetallic complex in Maritime Kray continued. Renovation of the Krasnorechensk concentrator of the Far Eastern metallurgical complex, which processes lead, tin, and zinc ores, was completed in October 1973.

The U.S.S.R. received an order from Bolivia to design and equip a 66,000-ton-per-year zinc plant.

Magnesium.—Five magnesium plants with an estimated combined annual capacity of 65,000 tons produced an estimated 57,000 tons in 1973, about 6% more than in 1972. Deliveries of Soviet magnesium to Western European markets have become more regular over the past 3 years. Exports of metal increased from 14,800 tons in 1971 to 19,900 tons in 1972 and to an estimated 20,000 tons in 1973.

Manganese.—The Soviet manganese industry remained the largest in the world, with an estimated output of marketable ores at 8 million tons. Run-of-mine output in 1973 was about 19.5 million tons, of which over 70% came from the Nikopol' Basin in the Ukraine; next largest was the Chitura Basin in Georgia. Exports of manganese ore increased from 15.8% in 1966 to about 16.3% of total production in 1973. It is planned to mine about 22 million tons of crude ore by 1975. Estimated production levels for 1975 and 1980 are 9 million tons and 11 million tons of marketable ore, respectively.

Two combines, the Ordzhonikidze and Marganets, operate in the Nikopol' manganese basin. There were 18 underground mines, 10 open pits, and 8 concentrators

[75] Kazakhstanskaya pravda (Alma-Ata). July 10, 1973, p. 2.
[76] Kazakhstanskaya pravda, (Alma-Ata). Aug. 8, 1973, p. 2.

in operation in 1973. More than 76% of the ore mined in the Nikopol' Basin was from open pit operations. The ore at this basin averages 26.4% manganese. Of the concentrates, 45% to 48% had a manganese content of over 45%, the balance contained 34%. The No. 6 underground mine at Nikopol' Basin was renovated in 1973; its present annual capacity is 300,000 tons of crude ore, 50,000 more than previously.

The Chiatura Basin in Georgia produced about 2.5 million tons of concentrate from 20 underground and open pit mines and 8 concentrators in 1973. Of the total beneficiated, two-thirds contained 48.7% manganese, and the rest, 25.6% manganese. A new open pit, with an annual capacity of 50,000 tons of ore, was commissioned in this basin in 1973.

Mercury.—Output of mercury was estimated at 52,000 76-pound flasks, and the U.S.S.R. was apparently self-sufficient in 1973. The Khadorkan complex in Kirgizia, the largest Soviet mercury operation, had four mines and a recovery plant in operation in 1973. The Nikitovskiy combine in the Ukraine was the second major producer. Construction continued on the Dzidzhikrutskiy mercury-antimony complex in Tadzhikistan, scheduled for completion in 1975. At the Carpathian mercury complex, a new furnace was installed in 1973.

In 1975, mercury output in Magaden Oblast' is expected to be 32.4% higher than in 1970. It is planned to start development of explored mercury deposits in North Caucasus, at Chukotka in Magadan Oblast', and in other regions of the U.S.S.R.

Molybdenum.—The metal content of molybdenum concentrate output was estimated at 8,500 tons, about 3.7% more than that of 1972. The molybdenum deposits now being exploited are in eight geographical regions. About 50% of production was from copper-molybdenum ores, about 30% was from molybdenite ore, and the remainder came from tungsten-molybdenum and miscellaneous ores.

Armenia is the major producer of concentrate. The Kadzharan copper-molybdenum combine supplied approximately 25% of Soviet molybdenum in 1973. Output of molybdenum concentrate at this combine is to be increased by 1975.

Construction of the Zhireken molybdenum combine in Chita Oblast', completion of which is planned for 1975, proceeded unsatisfactorily. Technical plans for this complex were completed in September 1973. The Eastern mine for producing molybdenum, tungsten, and bismuth was being developed at the Balkhach complex in Kazakhstan. Development of a large open pit at the Tyrny-Auz tungsten and molybdenum complex began in 1973. Plans have been prepared for renovating the Tyrny-Auz concentrator. When the open pit and new concentrator are commissioned, the complex will be able to increase production 70%. A small molybdenum deposit was discovered in Buryat Autonomous Republic in 1973.

Nickel.—With an estimated 135,000 tons of smelter production, 8% more than in 1972, Soviet nickel output was second only to that of Canada. There is a plan to increase production of metal 13.7% in 1974. The centers of production in order of importance, continued to be Norilsk in West Siberia, the southern Urals, and the Kola Peninsula. Of the seven smelters in operation, Norilsk in West Siberia was the most important producer. The Ufaley, Rezh, and Khalilovo smelters in the south Urals were next in importance, followed by the Monchegorsk and Pechenga smelters in the Kola Peninsula, and the Pobuzhsk ferronickel plant in the Ukraine. Production is estimated at a probable 155,000 tons in 1975 and 200,000 tons in 1980. In the future, the Soviet Union will be an important nickel exporter.

The U.S.S.R. has been negotiating with French, British, Finnish, West German, and Japanese companies for joint development of the Buruktal nickel deposit in the southern Urals and for a supply of equipment for a nickel-smelting plant, which is to be built in the Kola Peninsula Region, near Murmansk. At the same time, the Soviet Union has given technical and financial assistance to Cuba to enlarge existing nickel plants and to design two new plants. Assistance has also been given to Yugoslavia for constructing a ferronickel plant in Kosova. Cuba pays and Yugoslavia will pay for these services with nickel. Construction of a new area to handle copper nickel ore from Norilsk at Murmansk port continued in 1973.

Two open pits and one underground

(Komsomol'sk) mine were in operation at the Norilsk sulfide deposits. The third stage of the Komsomol'sk mine was put into operation in January 1973. The Mayak underground mine, the first mine in operation at the Talnakh deposits, produced over a half of the Norilsk output in 1973. Ore at the Oktyabr'sk deposit averages 2.5% nickel. Development of the Oktyabr'sk underground mine began in 1969; the first stage was scheduled for completion in 1974. Construction of a concentrator at the Talnakh-Oktyabr'sk copper and nickel deposits began in August 1973. Development of the Taymyrsk (Glubokiy) mine started in July. 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 is planned to be 60% greater than in 1970. Construction of a new 1-billion-ruble nickel plant at Norilsk continued; the first stage was scheduled for completion in 1974. Autoclaves were to be used there, for the first time in the Soviet Union's nonferrous metallurgical industry.

The Kola ores are mined by both open pit and underground methods, and the Zhdanov complex is the largest operation in the area. A new converter at the Pechenga plant was commissioned in June 1973. Development of an underground mine began at Kola in August 1973. For the first time in the Soviet Union, ore production at this mine will be brought to surface by diesel-powered trucks. The first section of the Pobuzhsk, the Soviet's first ferronickel plant in the Ukraine, was put into operation in January, and the second one, in November 1973. The smelter at the Yuzhuralnikel complex in Orsk, Orenburg Oblast' now has eight renovated converters, and another two were to be renovated in 1974. The capacity of each converter has been increased from 20 to 30 tons.

Platinum.—The U.S.S.R. remained a very important platinum-group-metals producer and exporter, supplying 20% to 25% of international exports of platinum and more than a half of palladium and rhodium. The Soviet Union is steadily expanding its output of platinum-group metals; the estimated output was 2.45 million ounces in 1973, with reserves adequate to maintain current production for many years with increased exports. Production came principally from Norilsk copper-nickel mines, with additional output from the Severonikel and Pechenganikel complexes on the Kola Peninsula and several placer deposits in the Urals.

Almost all the platinum-group metals were produced as byproducts, about 75% coming from Norilsk. In 1975, it is planned to increase production of platinum-group metals at Norilsk 60% over that of 1970. Primary production is forecast to increase at annual rate of 3% to 5%. Production of platinum and platinum-group metals may reach 2.65 million ounces by 1975 and 3.2 million ounces by 1980.

Silver.—Almost all silver was produced as a byproduct of lead, zinc, and copper ores. Production continued to be centered in the Urals, Kazakhstan, East Siberia, the Soviet Far East, and Armenia. In 1973, production of silver increased at the Sikhali complex (one of the largest silver producers) in Maritime Kray, Urals, Kazakhstan, and Armenia. The five mines of the Achisay lead-barite complex in Kazakhstan sent 15,000 to 20,000 tons of ore per day to the Kentau concentrator in 1973. One ton of concentrate, produced by this plant contained about 500 grams of silver. The recovery of silver at beneficiation plants in the Urals ranged from 16% to 50% from complex ores containing 6 to 15 grams of silver per ton.

Tin.—Production of smelter tin, amounting to an estimated 39,000 long tons, was inadequate to meet internal demand, and about 15% of the requirements were imported in 1973. The Soviet Far East, Yakutia, and Transbaykal were main production regions. In 1973, about 30% of the total output was from placer deposits. In the Soviet Northeast, placers accounted for about 75% of this area's output. Deposits of commercial significance are found in Maritime Kray, Magadan Oblast', Khabarovsk Kray, and Yakat A.S.S.R. The Maritime Kray produced the greatest amount of tin in the country in 1973. The Khrustal'nyy complex, which operates both lode and placer deposits, was the largest enterprise in the Far Eastern Tin Trust (Dal'olovo) in Maritime Kray.

A cableway, with the capacity of 250 tons per hour, came into operation to transport tin ore from the Tsentral'nyy

mine to the Khrustal'nyy concentrator in 1973. Development of the Molodezhnyy tin mine in the north of Maritime Kray began in August. It is planned to commission this mine by 1975. According to Soviet sources, construction of the second stage of the Solnechnyy mining and concentrating complex will soon begin; its capacity will be double that of the first stage.

Three known tin refineries were operating in the Soviet Union in 1973: the Novosibirsk, Ryazan', and Podol'sk (near Moscow) tin plants. The Novosibirsk central smelter's 5-year plan (1971–75) envisages a "large" increase in tin output. Concentrates from Siberia and the Soviet Far East were shipped to this plant. It is also planned to increase output of metal at the Sherlova Gora, Ege-Khaya, Leningrad, Sinancha, and other smelters.

Prospecting and exploration for tin deposits, including study of abandoned workings, continued throughout 1973. Promising deposits of tin have been found in the Verkhoyansk Area. The first dredge designed for extracting tin from the bed of the Arctic Ocean is to begin operations in the coastal zone of the Laptev Sea.

Titanium.—Titanium production in 1973 was estimated at 40,000 tons, 8% over that of 1972. The industry continued to be based mainly on Ukrainian and Siberian ilmenite and rutile, and on titaniferrous magnetites and ironstone located in the Central Urals, the Kola Peninsula, and Karelia. Among the most important deposits of titanium ores are the Iksha, Mezhdurechye, Lemnen, Kusa, and Samatkansk. Large amounts of titanium are now sold to the United States and other countries.

Soviet reserves of TiO_2 have been estimated at about 10 million tons, contained in 70 million tons of ore averaging 10% to 20% TiO_2. During the 1971–75 period, a 40% production increase is expected, and exports will be increased significantly. Production is estimated at a probable 45,000 tons in 1975 and 60,000 tons in 1980.

Development continued in the Ukraine, where two mining and concentration complexes, the Verkhnedneprovsk and Irshansk, operated several deposits in 1973. At the Verkhnedneprovsk complex, production of concentrate was to be increased 35% during the 1973–75 period.

Tungsten.—Estimated production of tungsten-in-concentrate increased 2.8% in 1973, with the North Caucasus, Transbaykal, Soviet Far East, Central Asia, and Kazakhstan remaining the principal producing centers. Production of tungsten was insufficient to satisfy growing domestic needs, and one-third of concentrate requirements was imported from the PRC. A new open pit at the Dzhida tungsten-molybdenum complex in Buryat A.S.S.R. was put into operation in January, and the Ingichka concentrator, one of the largest in the Soviet tungsten industry, was commissioned in July 1973. Development of a new open pit at the Tyrny-Auz tungsten-molybdenum complex in North Caucasus started in August 1973.

Vanadium.—The Soviet Union, with large vanadium resources, is becoming an important producer and exporter. The principal sources in 1973 continued to be vanadium-rich slag, a coproduct with iron from the Kachkanar titaniferrous magnetite deposit in the Urals, and iron ore from Lisakovsk (0.6% vanadium) in Kazakhstan. However, rated recovery was not achieved because of metallurgical problems. A new plant for producing ferrovanadium from Urals magnetite ores was under construction at the Serov steel plant in the Urals.

Minor Metals.—The Soviet Union possesses commercial deposits of all those rare metals that have assumed such importance in modern rocketry, aircraft, and atomic energy. Although the U.S.S.R. began production of virtually all the rare metals during the 1959–70 period, extraction of many of them remained low. The most important deposits of rare-metals ore are Kazakhstan, Kola Peninsula, Urals, Ukraine, Norilsk, Transbaykal, Armenia, and the Soviet Far East. The U.S.S.R. has become an important supplier of rare and rare-earth metals to the Western world. The Soviet Union is a leading exporter of semiconductors.

At the Almalyk complex in Uzbekistan, production of indium and rhenium alloys began in December 1973. The latter alloy is obtained from the waste material remaining after processing nonferrous metals. Production of silicon at the Zaporozhye titanium-magnesium plant increased "sev-

eral" percent in 1973. Facilities for producing rhenium at the Dzhezkazgan copper complex in Kazakhstan were under construction, scheduled for completion in 1974.

NONMETALS

The U.S.S.R. produced a variety of nonmetals, but the nonmetal resource position ranges from adequacy of many nonmetals to an apparent shortage of others. Soviet production of barite, fluorspar, talc, and mica remained inadequate to meet requirements despite large reserves and the development of new mines and beneficiation facilities. High-grade barite, fluorspar, talc, and mica continued to be imported.

Asbestos.—In 1973, total output of the 6 grades of asbestos produced by the Soviet Union was estimated at 1.28 million tons, 5% more than in 1972. Production was second only to that of Canada. Exports rose from 346,500 tons in 1969 to 432,700 tons in 1972, and to an estimated 450,000 tons in 1973; approximately two-thirds went to Western markets. In spite of asbestos export expansion in recent years, the domestic asbestos deficit reached 200,000 tons in 1971 and is expected to be about 100,000 tons by 1975.

The 1971–75 5-year plan foresees an increase in new capacities of 605,000 tons by completion of the second stages of the Dzhetygara (400,000-ton capacity) and Tuvaasbest (205,000-ton capacity) combines by 1975. The 1971–75 5-year plan also foresees a rise in production of 563,000 tons by increasing output at Dzhetygara from 259,000 tons in 1970 to 360,000 tons in 1975, at plant No. 6 in the Urals from 320,000 tons to 550,000 tons, and at other facilities in the Urals as well as at the Tuvaasbest combine. Estimated output for 1975 and 1980 is 1.45 million and 1.7 million tons, respectively.

Asbestos industry development was concentrated in the Urals, Kazakhstan, and Tuva A.S.S.R. Output of chrysotile asbestos at the Uralasbest combine (three open pits) was estimated at 915,000 tons. Explored reserves of the 23 deposits at this combine were reported at 38.7 million tons. In Kazakhstan, the first stage of the Dzhetygara asbestos combine produced about 333,000 tons in 1973; a second stage is now rescheduled for completion in 1974–75. The first stage of the Tuvaasbest combine at Ak-Dovurak in Tuva A.S.S.R. produced an estimated 35,000 tons in 1973; the second stage of this combine was also rescheduled for completion in 1974–75.

Under an agreement signed in June 1973, seven COMECON members are to construct an asbestos mining and concentration complex at Kiembay in Orenburg Oblast'. About 24 million tons of ore will be processed to produce 500,000 tons of fiber per year. It is planned to develop the Molodezhnoye and Il'chirsk chrysotile asbestos deposits in Buryat A.S.S.R. in the future.

Barite.—Domestic barite output remained inadequate to meet the demand, and about one-third of demand was met by imports in 1973. The main center of production continued to be the Georigian S.S.R. Some deposits have been developed in West Siberia, the Urals, Kazakhstan, Azerbaydzhan, and Armenia. More than 30% of Soviet barite reserves are located in Georgia, which produced over 70% of the 1973 output. Construction of a 45,000-ton-per-year complex in Khaishi in Svanetia, Georgia, and development of the Zharemsk barite underground mine and open pit in Kazakhstan continued in 1973.

Cement.—Cement output was 109.5 million tons, or about 4.9% over that of 1972. There were about 110 cement plants (including 83 plants under the U.S.S.R. Ministry of Construction Materials) in operation in 1973. Plans called for the construction of 4.23 million tons of new facilities in 1973, but only 3.7 million tons were completed. Production is slated to rise to 114 million tons of cement in 1974 and 125 million tons in 1975. However, it is estimated that production in 1975 will probably be not more than 120 million tons.

Planned production of cement by ministries in 1973 was as follows, in million tons:

Ministry	Planned 1973
Construction materials	100.90
Nonferrous metallurgy	5.60
Ferrous metallurgy	.46
Chemical industry	1.12
Collective farms	.92
Total	109.00

Clays.—*Bentonite.*—Armenia, Tadzhikistan, and Kazakhstan continued to be the principal bentonite production centers in the U.S.S.R. The first stage of the Izhdevan bentonite complex in Armenia was put into operation in November. The complex has two production lines, and the third one will be put into operation in January 1974.

A large deposit of bentonite clay was found at the boundary of the Sampursk and Tokarevsk Regions of the Tambov Oblast'.

Diamond.—Since the discovery of the first kimberlite pipe in northwestern Yakutia in 1954, about 200 kimberlite pipes and dikes have been found in the area, but no more than seven or eight have a diamond content justifying economic exploitation. Production of diamond in this region started at a small concentrator in 1957. On January 1, 1973, the industry consisted of the large mechanized Mirnyy open pit and five concentrators, the Aykhal open pit and one concentrator, the Udachnaya placer mine (near the Arctic Circle) and one concentrator, and the Irelyakh placer mine with two dredges. In 1973, output was estimated at 7.6 million carats of industrial-quality diamond and about 1.9 million carats of gem stones. Small quantities of gem and industrial stones were produced from the Visher River Region in Perm Oblast', western Urals, where four dredges and two separation plants were operated at two placer deposits in 1973.

Output is about 80% industrial stones and 20% gems. Gem stones are being cut at Leningrad, Sverdlovsk, and Smolensk. Sales of cut diamond are rising steadily, and substantial increases are expected in 1975–76. The U.S.S.R. has arranged to market part of its diamond output in Antwerp through a newly formed Soviet-Belgian company.

Construction of the first stage of concentrator able to remain in operation all the year round at Udachnaya complex was completed in June 1973. The General Electric Company assisted the Soviet diamond industry in technology of producing artificial diamonds.

Fertilizer Materials.—Fertilizer production totaled 17.4 million tons in nutrient content, or 72.3 million tons in bulk fertilizer content,[77] an increase of 9% over that of 1972. Nitrogen fertilizers constituted 41%, phosphatic fertilizers 18%, potassium fertilizers 34%, and phosphatic flour 7% of the total. The Soviet mineral fertilizers industry continued to perform below production goals of the 1971–75 5-year plan. Exports increased in 1973, but despite a substantial rise in production and exports, fertilizers were in short supply, and the quality of the product, packing, and true weight of the fertilizers continued to elicit complaints.[78] The average nutrient content of Soviet fertilizers increased from 27.4% in 1965 to 33.6% in 1972. Planned production was not attained at many enterprises. The Rustavi, Navoi, and Uvarovo chemical complexes, together with the Samarkand superphoshate plant, Dzhambul double superphospate plant, the Kingisepp phosphorite complex and others continually fail to meet planned quotas.

The 1971–75 plan envisages output of 80.2 million tons in bulk in 1974 and 90 million tons (22.2 million tons of nutrients) in 1975. Estimated levels for 1975 and 1980 are 85 million tons and 115 million tons, respectively.

New plants and expansions with an annual capacity of 8.9 million tons in bulk were commissioned during the year (planned quota, 9.5 million tons). New facilities for producing mineral fertilizers and also raw materials put into operation included those at the Cherkassy, Nevinomyssk, Rovno, and Sumy chemical complexes, the Kingisepp phosphorite combine, the Almalyk and Cherepovets chemical plants, the Dorogobush nitrogen fertilizer plant, and the Solikamsk potassium complex. The first stage of the No. 3 Berezniki potassium combine, with an annual capacity of 1.7 million tons, was also commissioned in 1973. The 1974 plan envisages commissioning new capacities for the production of 10.5 million tons of mineral fertilizers.

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[77] The average ingredient (nitrogen, phosphorus, and potash) is expressed in terms of Soviet standard units, which are not the same as those used in the United States. 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.

[78] Sotsialisticheskaya industriya (Socialist Industry), Moscow. Apr. 24, 1973, p. 2.
Ekonomicheskaya gazeta (Economic Gazette), Moscow. No. 11, March 1973, p. 2; and No. 19, May 7, 1973, p. 19.

Contacts with Western companies are increasing in scope. The Soviet Union is cooperating with France, West Germany, and other Western countries for the production of chemical products. In September 1973, the Italian firm Montedison signed a contract for the sale of seven chemical plants (valued at 500 million rubles) to the U.S.S.R. A 500,000-ton-per-year sulfate plant, costing $62 million, will be delivered to the U.S.S.R. by the Swedish firm Karlstads' Mekaniska Werkstad.

The U.S.S.R. is to construct a new deep-water port on the Black Sea to handle contracts under a recent U.S.S.R.-Occidental Petroleum 20-year, $8 billion agreement. The Soviet Union is to export fertilizers and chemical plants made by the U.S. company. At the same time, the Soviet Union is supplying equipment for a 500,000-ton-per-year fertilizer plant to be constructed at Korba in India.

Phosphate.—Estimated output of phosphate rock totaled about 53 million tons in 1973, including 31.3 million tons of apatite ore (17.7% P_2O_5) and 21.5 million tons of sedimentary rock (13% P_2O_5). The main centers of phosphate rock output continued to be the "Apatit" complex on the Kola Peninsula, and phosphorite deposits at Karatau in Kazakhstan, Kingisepp in Leningrad Oblast', Egor'evsk and Lopatino in Moscow Oblast', and Upper Kama.

The apatite-nepheline deposits of the Khibiny in the Kola Peninsula provided over 80% of all raw materials for the production of phosphate fertilizers. Mined ore averaging 16% to 21% P_2O_5 is upgraded to 39.4% P_2O_5 with 92% recovery. The "Apatit" complex produced 13 million tons of concentrate (31.3 million tons of ore) in 1973 from four mines and two concentrators. It is planned to produce 13.8 million tons of concentrate (about 35 million tons of ore) in 1974. A new apatite mine at Mount Koashvin was handed over to the "Apatit" complex in 1973. Construction of the Zabaykal'sk mining and concentrating complex in Buryat A.S.S.R. on the basis of the Oshurkovo apatite deposit is scheduled to begin in 1974.

Seven open pits and one underground mine, with a total capacity of about 5.8 million tons of crude ore per year, were in operation in Karatau in 1973. The ore, containing up to 26% P_2O_5, was upgraded to 28.5% P_2O_5, but because of poor technology, only about half of the planned capacity was achieved in 1973. The last section of the crushing and grinding mill is scheduled to be put into operation in 1974. The mill will have a capacity of 4.5 million tons of ore per year. Detailed exploration of the Chiliysk and other phosphate deposits in Aktyubinsk Oblast' of Kazakhstan continued in 1973. A phosphate deposit at Chulak-Say to the northwest of the Aral Sea was discovered in 1973.

Potassium.—The U.S.S.R. is one of the largest potash-producing and potash-consuming countries in the world. Estimated 1973 potash output was 14.5 million tons (41.6% K_2O), more than 11% higher than in 1972. Under the 1971–75 5-year plan, output of potash is 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 1975 and 1980 are 17 million tons and 23 million tons, respectively.

There are four potash-producing centers in the U.S.S.R.: Solikamsk and Berezniki on the western side of the central Urals; Soligorsk in Belorussia; and Stebnikov and Kalush in West Ukraine. Belorussia produced about 50% of the total Soviet output of potassium fertilizers in 1973. The following eight combines were in operation in 1973: Solikamsk, Berezniki Nos. 1 and 2, Soligorsk Nos. 1, 2, and 3, and the first stage of Novo-Stebnikov and Kalush combines. The first stage of the Berezniki No. 3 combine, with an annual capacity of 1.7 million tons of potassium, was completed in December 1973. The second stage of this complex, with an annual capacity of 1.7 to 1.9 million tons, was under construction. Construction of the Berezniki No. 4 combine began in June 1973. Exploration of potash deposits in Kalinigrad Oblast' and other regions continued in 1973.

Nitrogen.—Nitrogen production was expanded from 31.9 million tons (20.5% N) in 1972 to an estimated 34.7 million tons in 1973, 2.8 million tons more than that of 1972. The bulk of the production was in the form of ammonium sulfate and ammonium nitrate fertilizers, although production of urea and liquid fertilizers has increased. Estimated levels of nitrogen production for 1975 and 1980 are 40 million tons (20.5% N) and 54 million tons, respectively.

Fluorspar.—Despite the Soviet Union's

effort to achieve self-sufficiency, the U.S.S.R. remained a net importer of fluorspar with imports from Mongolia, Thailand, and the PRC. Imports of fluorspar increased from 144,700 tons in 1970 to an estimated 250,000 tons in 1973. With an estimated production of 440,000 tons, 2.3% more than in 1972, Soviet consumption of fluorspar in 1973 was at 690,000 tons; the iron and steel industry consumed more than three-quarters of the total.

The Maritime Kray, Chita Oblast', Buryat A.S.S.R., and central Asia were the main production areas in 1973. The first section (three new large mills) of a new production facility at the Yaroslavsky mining and concentrating complex in the Maritime Kray was completed by the end of 1973. The complex exploits one of the richest deposits of fluorspar ore in the U.S.S.R. by the open cast method. The new production facility is to process 345,000 tons of ore per year. Discussions on constructing the Pokrovo-Kireyevo fluorspar complex in the Donets Basin, with an annual capacity of 200,000 tons, continued in 1973. Prospecting of the Naran fluorspar deposit in Buryat A.S.S.R. continued in 1973; it is planned to develop this deposit as a unit of the Kharankoy fluorspar mine, which is now in operation.

Mica.—Output, estimated at 40,000 tons, 2.5% over that of 1972, 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 160 tons in 1968 to 539 tons in 1972 and to an estimated 550 tons in 1973. As in prior years, almost three-quarters of all muscovite mica production continued to come from Mamsko-Chuyskiy Region of Irkutsk Oblast'. Mica is also mined in Yakut A.S.S.R., in the Karelo-Murmansk Region, and elsewhere. The Bol'shoy Severnyy mine was the largest mine in the Mamsk mica trust, and the Irkutsk mica plant was one of the largest enterprises in the country engaged in mica processing.

Salt.—The Donets Basin continued to account for over 40% of the total salt output in 1973. Development of a new mine, with an annual capacity of 2 million tons, in this Region continued in 1973. Salt was also produced in East Siberia, the Urals, West Ukraine, and elsewhere. A new mine, the Tyretskiy mine, was under development in the Salarin Region of Irkutsk Oblast'. Salt was shipped mostly in bulk, causing loading losses, moisture penetration, and contamination in loading and unloading.[79]

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 million tons and 16 million tons, respectively.

Sulfur.—Estimated domestic production of contained sulfur totaled 7.7 million tons, of which 3.5 million tons was recovered from pyrite, 2.30 million tons from native sulfur, and 1.85 million tons as other elemental sulfur. The principal producing centers for native sulfur continued to be Rozdol and Yavorov (West Ukraine); Gaurdak, Shorsu, and others (Central Asia); and Volga group of the Kuybyshev sulfur complex. The Rozdoe chemical complex was the country's major producer of native sulfur and, with the Gaurdak combine, provided the bulk of the country's sulfur requirements. Output of sulfur at Gaurdak complex is to double during the 1971–75 period. A new open pit, the Zapadnyy, at this combine began production in April 1973.

Other sources of sulfur are also receiving attention, including recovery as acid from smelter gases and from oil and natural gas processing. Construction of a new installation, using the Frasch process, to produce 100,000 tons of elemental sulfur per year started at Gaurdak in March 1973. Production of sulfuric acid began at several nonferrous metal smelters in 1973. It is planned to produce 0.5 million tons of sulfur at the Orenburg gas refineries in 1975.

Talc.—Soviet production of talc remained inadequate to meet domestic needs despite large reserves and the development of new mines and beneficiation facilities. High-grade talc continued to be imported from North Korea and Bulgaria. Nearly all the Soviet talc output is concentrated in the Urals, but Ural talc is ferruginous. In 1973, only the Onot deposit in Irkutsk Oblast' produced high-grade talc. The raw material is shipped to the Miass talc mill in the Urals.

[79] Material'no-teknicheskoye/snabzhenye (Material and Technical Supply), Moscow. No. 10, October 1972, p. 17.

The Kirgitey deposit in Krasnoyarsk Kray was the major producer of low-quality talc, followed by the Miass and Shabrovsk deposits in the Urals.

MINERAL FUELS

Production of primary energy derived from fossil fuels, fuelwood, hydroelectric, and nuclear generation rose from 699.1 million tons in standard fuel equivalent in 1960 to 976.6 million tons in 1965, 1,238 million in 1970, and to an estimated 1,431 million tons in 1973. The share of petroleum and natural gas in the total Soviet primary energy production rose from 38% in 1960 to 59% in 1970 and to an estimated 62% in 1973, while that of coal (anthracite, bituminous, and lignite) declined from 53.3% to 35% and 32%, respectively. For a long time, coal has been the major sources of primary energy in the country. In 1973, for the first time, petroleum became the major source of fuel consumed in the U.S.S.R. The output of primary energy (from all sources) in the U.S.S.R. in 1975 is placed at 1,575 million tons of standard fuel. By 1980, Soviet primary energy production (from all sources) is expected to rise to 1,900 million tons.

Total consumption of all types of primary energy in the Soviet Union increased from 645 million tons of standard fuel equivalent in 1960 to 865 million tons in 1965, to 1,085 million tons in 1970, and to an estimated 1,277 million tons in 1973. Total consumption of all types of primary energy in the U.S.S.R. is expected to be equivalent to 1,400 million tons of standard fuel in 1975 and to about 1,700 million tons in 1980.

In 1973, the U.S.S.R. produced 429 million tons of crude oil and gas condensate, 668 million tons of run-of-mine coal and lignite (including 173 million tons of coking coal), and 236 billion cubic meters of natural gas. Increases of 7% for oil and gas condensate, over 5% for gas, and 2% for coal were recorded over 1972 production.

Actual production of crude oil (including gas condensate), natural gas, and run-of-mine coal and lignite in the U.S.S.R. for 1970 and 1973 and estimated for 1974, 1975, and 1980 are as follows:

Commodity	1970	1973	1974	1975	1980
Crude oil, including gas condensate ____ million tons __	353	429	459	480	600
Natural gas _____ billion cubic meters __	200	236	255	275	370
Run-of-mine coal and lignite _____ million tons __	624	668	680	695	770

Soviet long-range forecasting places the demand for raw coal and lignite in the year 1980 at over 800 million tons and in the year 2000 at 1,000 million tons. Coal will be mainly used as fuel for powerplants (up to 60% to 70% of output), as coking coal for ferrous and nonferrous metallurgy and machine construction, and for the chemical industry, as well as household fuels.

Total primary energy balances of the U.S.S.R. for 1972 and 1973 are shown in table 4.

Table 4.—U.S.S.R.: Total primary energy balance for 1972 and 1973
(Million tons of standard fuel equivalent)

	Total primary energy	Coal (lignite, anthracite, bituminous) and coke	Crude oil and petroleum products (including gas condensate)	Natural and associated gas	Peat	Oil shale	Fuelwood	Hydropower	Nuclear power
1972:[1]									
Production	1,369.8	459.8	572.6	264.6	21.2	9.9	25.7	15.1	0.9
Exports	187.6	24.2	156.0	6.5	--	--	--	.9	--
Imports	35.3	9.1	13.0	13.2	--	--	--	--	--
Apparent consumption	1,217.5	444.7	429.6	271.3	21.2	9.9	25.7	14.2	.9
1973:[2]									
Production	1,431.0	466.0	607.0	284.0	21.5	10.0	25.5	15.5	1.5
Exports	202.6	24.2	169.0	8.2	--	--	--	1.2	--
Imports	48.1	9.4	21.0	17.7	--	--	--	--	--
Apparent consumption	1,276.5	451.2	459.0	293.5	21.5	10.0	25.5	14.3	1.5

[1] Production data for 1972 taken from the National Economy of the U.S.S.R. (Moscow), 1973; trade data from Foreign Trade of the U.S.S.R. (Moscow), 1973.
[2] Production data reported in Pravda (Moscow), Jan. 26, 1973, p. 2; and in other Soviet sources; trade data reported in Economic Gazette, No. 15, April 1974, pp. 20–21.

Coal.—In 1973, the U.S.S.R. produced 668 million tons of run-of-mine bituminous coal, anthracite, and lignite, the equivalent of an estimated 382 million tons of clean coal, according to Western practice. The Soviet coal industry employed about 1.2 million "production workers", about 0.6 million "nonproduction workers", 64,000 university graduate engineers (of whom 87 were Doctors of Sciences and 1,317 were Candidate of Sciences), and 148,000 graduate technicians. On the average, there were 60 specialists (mainly mining engineers and geologists) with a university degree, and over 140 graduate technicians for each mine. The coal industry had 36 research and design establishments with a total staff of over 41,000 persons.

The gross production of the Soviet Union's 10 major and numerous minor coalfields amounted to an estimated 434 million tons of bituminous coal, 76 million tons of anthracite, and 158 million tons of brown coal and lignite. About 30% of the total output was surface mined.

According to the estimates made in 1968, official Soviet economically minable reserves of coal and lignite (the so-called balansovye), in place of measured, indicated, and inferred categories, were 523.7 billion tons (including 334.1 billion tons of hard coal and 189.6 billion tons of brown coal and lignite). The composition of the U.S.S.R. coals according to rank is as follows: Anthracite, semianthracite, and lean coals, 10.2%; coking coal, 21%; gas coal, 20.3%; long-flame coal, 10.9%; subbituminous coal, 1.4%; and brown coal and lignite, 36.2%. Thus, over half of the minable reserves consist of anthracite and bituminous coals.

The 1973 production came from about 800 underground mines, with an average annual capacity of 585,000 tons, and 69 open pits, with an average annual output of 2.8 million tons of run-of-mine coal and lignite.

The average ash content of all marketable coal shipped from the mines increased from 19.4% in 1965 to more than 20% in 1973, and some lower grade lignites used in home heating and power generation have been reported to contain as much as 45% ash. The average calorific value of coal dispatched from the mines was about 4,900 kilocalories per kilogram (9,100 Btu per pound).

The average working thickness of coal seams, according to 1973 data, was 1.32 meters. The maximum depth of underground coal production reached 1,150 meters in 1973; the average depth was about 363 meters.

Distribution of coal production by mining methods follows, in percent:

Longwall	85.0
Slicing	8.0
Shield	3.2
Room and pillar	1.7
Other	2.1

In 1973, the average longwall length was 127 meters, and the average rate of advance was 38.7 meters per month. The average capacity of each underground mining section (longwall) was 425 tons of raw coal per day (four 6-hour shifts) in 1973.

Raw coal production by principal basins in 1973 follows, in million tons:

Basin	Total output	Coking coal
Donets	219.4	86.2
Kuznetsk	123.3	51.9
Karaganda	43.3	17.6
Moscow	36.1	--
Pechora	23.0	13.8
Other	222.9	3.5
Total	668.0	173.0

The production of raw coal and lignite is planned to rise to 679 million tons in 1974, 695 million tons in 1975, and 800 to 810 million tons in 1980.

In 1973, the official average monthly productivity (25.4 shifts) of Soviet coal miners was 69.7 tons (52.6 tons per month in underground mines and 362.5 tons per month in surface mines). But these data relate only to "production workers." Official data on the number of "production workers" upon which labor productivity is calculated, amount to only about two-thirds (from 57% to 70%, depending on coal basin) of all workers normally counted in computing labor productivity by the method used in the United Nations Committee for Coal. Further, productivity statistics on the Soviet coal industry are reported for gross production, whereas it is customary elsewhere to measure output and productivity in terms of marketable coal. If the above indices may be taken as reasonably accurate, actual labor productivity in Soviet coal mines is about one-third that of the coal miners of the United Kingdom and West Germany, and nearly one-twelfth of that of the miners in the United States.

Preparation of coal for the market does not play a great role in the industry and is normally restricted to coking coals and coal for export. Practically all Soviet coal requires beneficiation, but of the 668 million tons produced in 1973, preparation plants run by the U.S.S.R. Ministry of Coal Industry processed only 261.5 million tons to produce 148.3 million tons of clean coal.[80] This gives a recovery factor of 0.57, a value that may be used also to calculate equivalent clean coal tonnage. About one-fourth of all the coal beneficiated is treated on delivery to the plants associated with the coking industry of the U.S.S.R. Ministry of Ferrous Metallurgy. According to Soviet sources, 61.4% of coal beneficiated was washed, 16.8% was treated by heavy media, 13% was prepared by pneumatic methods, 8.6% was treated by flotation, and 0.2% was cleaned by other methods. Because Soviet coal preparation facilities are inadequate, losses in fuel efficiency in the overall economy are staggering.

In 1973, about 24.4 million tons of coal and about 4.5 million tons of coke were exported from the U.S.S.R., mainly from the Donets and Kuznetsk Basins. Over one-third of the coal exported and about 1 million tons of coke were shipped to non-Communist countries. Among the major non-Communist markets for Soviet coal, Japan ranks first, followed by Italy, France, and Austria.

The Soviet Union has proposed to supply up to 10 million tons of coal to Japan annually on the condition that Japan provides loans and equipment to help develop a coalfield in the southern region of Yakutia. Discussion by the Joint Japan-Soviet Economic Commission of the development of this coalfield continued in 1973.

Soviet imports of coal and coke increased from 9.7 million tons in 1972 to 10.6 million tons in 1973. Poland is the only exporter of coal and coke to the U.S.S.R.

Natural Gas.—Extraction of usable Soviet gas in 1973 was 236 billion cubic meters, an increase of 6.5% compared with that of 1972, but below the original 5-year plan target of 250 billion cubic meters. Of this quantity, over 99% consisted of natural and associated gas, and about 1% came from gasification of coal and oil shale. About two-thirds of the total was produced in the European part of the U.S.S.R. including nearly one-quarter in the Ukraine. There were about 4,500 producing wells in 1973, but about 20% of them were idle. In 1973, natural gas accounted for 20% of the Soviet fuel production. Although the production of na-

[80] Ugol' (Coal), Moscow. No. 4, April 1974, p. 72.

tural 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 several years, the rate of growth in gas extraction, despite the discovery of large gasfields in West Siberia, the Komi A.S.S.R., Orenburg Oblast', and other regions, has declined somewhat, mainly because of a shortage of pipe and compressors.

The utilization of associated gas increased from 60% in 1970 to 72%, or 12%, in 1973. 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 to over 80%. Until 1974, the utilization 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.

The total length of gas pipelines rose from 78,000 kilometers in 1972 to about 84,000 kilometers at the end of 1973. About 6,000 kilometers of transmission gas pipelines were built. Completed were the 186-kilometer Sredne-Viluysk-Taas-Tumus-Yakutsk line, and a number of new sectors of the Central-Asia-Center, Ukhta-Torzhon, Nadym-Punga, and other gas lines. About 2.7 billion rubles was invested in new construction projects in 1973.

According to the 1974 plan, extraction of natural gas is expected to reach 256.8 billion cubic meters, about 9% more than that of 1973. The extraction of gas condensate is planned at 6.25 million tons. Approximately 5,061 kilometers of gas pipeline, 40 new compressor stations, and 360 new production wells were scheduled to be put into operation in 1974. The 1974 plan envisages about 3 billion rubles of total investments in the development of the Soviet gas industry, or 13% more than in 1973.

The Ukraine is expected to extract 57.5 billion cubic meters of gas in 1974, which is 3.5 billion cubic meters more than specified by the 5-year plan. The Tukmen S.S.R. is expected to extract 37.2 billion cubic meters of gas; the growth of gas extraction will be 10 billion cubic meters. The Shatlykskoye gasfield, the largest in the Republic, is scheduled to be put into operation.

The Uzbek S.S.R. is to extract 36 billion cubic meters of gas in 1974, or 2.5 billion cubic meters more than envisaged by the 5-year plan. The Urtabulak-Mubarekskiy gasfield is scheduled to be put into operation at full capacity. The extraction of natural gas in Tyumen' Oblast' is planned at 23.5 billion cubic meters, or 7 billion cubic meters over that of 1973. New facilities, with an annual capacity of 14 billion cubic meters of gas are scheduled to be completed at the Medvezh'e gasfield. Gas pipelines from the northern part of Tyumen' Oblast' to the Urals and to the center are scheduled to be put into operation.

Gas extraction in Orenburg Oblast' is expected to be 12.6 billion cubic meters, or 9.5 billion cubic meters above the 1973 figure. The first stage of the Orenburg gas-producing plant, with an annual capacity of 15 billion cubic meters, is to be put into operation. The Komi A.S.S.R. is expected to extract 16.3 billion cubic meters of gas, which is 1.3 billion cubic meters more than specified by the 5-year plan.

In 1973, the Soviet Union was a net importer of gas to the extent of 4.6 billion cubic meters, as exports to Poland, Czechoslovakia, Austria, East Germany, and West Germany were exceeded by imports from Iran and Afghanistan. Exports of natural gas from the Ukraine totaled 6.8 billion cubic meters in 1973, a 1.7-billion-cubic-meter increase compared with those in 1972. Soviet imports of natural gas from Afghanistan and Iran increased from 11 billion cubic meters in 1972 to 11.4 billion cubic meters in 1973. Delivery of Soviet gas to East Germany and West Germany began in 1973 after completion of the first 1,050-kilometer-long gas pipeline. Of the 1973 total, about 70% was exported to Communist countries and over 30% to Austria and West Germany. Delivery of Soviet gas to West European countries will continue according to long-term contracts. The construction of the second transit gas pipeline, parallel with the first one, will start in 1974.

The construction of a 162-kilometer pipeline to carry Soviet gas to Finland was completed in December; gas deliveries are due to start in January 1974.

The United States, Japan, and Sweden are currently negotiating with the U.S.S.R.

for supplies of Soviet gas. The U.S.S.R. is negotiating with the Iranian Government on proposals for the construction of a gas pipeline to carry natural gas from Iran to West Europe through the Soviet Union pipeline system.

In 1973, the U.S.S.R. exported about 5 billion cubic meters of natural gas to Poland, Czechoslovakia, and East Germany. It planned to begin deliveries of Soviet gas to Bulgaria in 1974 and to Hungary and Yugoslavia in 1975. The Bulgarian section of the Brotherhood gas pipeline from the Danube to Vratsa was completed in 1973. Construction of the Soviet-Hungarian section of the Brotherhood gas pipeline started in September and is scheduled for completion in 1975.

The Soviet Union has signed intergovernmental agreements with Hungary and Bulgaria concerning their participation in building up gas extraction and transport facilities on Soviet territory.

Petroleum.—Crude oil and gas condensate output in 1973 increased 28.5 million tons, or 7%, to a total of 428.9 million tons, but below the original planned level of 438 million tons. It was a poor year for the Soviet petroleum industry. Over 27% of the total (118 million tons) was exported either as crude or as refinery products. More than one-half of the total exports (68 million tons) were sent to other Communist countries. In recent years, the U.S.S.R. has also begun importing oil from Arab countries. In 1973, Soviet purchases of crude oil amounted to 13.2 million tons, or 5.4 million tons over that of 1972. The Soviet Union is supplying other Communist countries with oil purchased from Arab countries.

In 1973, more than 500 oil and gas condensate fields were in production, with a total of more than 60,000 wells. Oil was produced in a number of separated regions, of which the European U.S.S.R. was the most important. The Volga-Urals Area produced more than one-half of the 1973 total. Production of Asiatic oilfields in West Siberia, Kazakhstan, central Asia, and Sakhalin Island accounted for about one-third of the total; the development of Asiatic oilfields was increasing, particularly in Western Siberia and Kazakhstan. The largest increase in the production of crude oil occurred in Western Siberia, Kazakhstan, Turkmenia, and the Urals-Volga Area. Planned 1973 drilling targets were 10.2 million meters of developmental and exploratory drilling, or 3% more than that drilled in 1972. A total of 3,600 wells was to be placed in production in 1973. In 1973, an investment of 3.5 billion rubles was planned for production facilities and for oilfield exploration.

All three primary methods of crude oil production (flowing, pumping, and gas lifting) were used, and secondary recovery methods (repressuring and water flooding) were employed at many older fields in the U.S.S.R. Primary and secondary recovery of crude oil in place was reported at 41% to 44%. The amount of water injected every year to keep certain oil pressure high is twice the amount of crude produced from those fields.

Production of crude oil and gas condensate is slated to rise to 458.9 million tons (including 8.9 million tons of gas condensate) in 1974 and 505 million tons (including 9 million tons of gas condensate) in 1975. The basic increment in crude oil output is to be secured from the fields in West Siberia and on the Mangyshlak Peninsula in Kazakhstan. These two Regions are expected to provide 75% of the national increment in crude production during 1971–75.

Proved reserves of crude oil in the country are insufficient to provide for a growing oil extraction industry. The rate of incremental growth in oil reserves is lagging behind the rate of growth in crude oil extraction.[81]

There were over 650,000 workers, about 35,000 university graduate engineers, and about 55,000 graduate technicians in the Soviet crude oil-extracting industry in 1973. The total number of workers engaged in drilling reached about one-fifth of all workers in the oil-extracting industry. There were about 60,000 drilling rigs in operation in 1973. Soviet metallurgical plants continued to deliver poor-quality drilling and casing pipes, and steel used in making bits.[82] Because of this and a shortage of pipes, there was a large number of accidents and idle time in the drilling of deep wells.[83] As a result of this, the

[81] Pravda (Moscow). Sept. 3, 1972, p. 1.
[82] Planovoye khozyaystvo (Planned Economy), Moscow. No. 4, April 1973, pp. 15–22.
Rabochaya gazeta (Workers' Gazette), Kiev. July 4, 1973, p. 3.
[83] Neftyanoye khozyaystvo (Oil Economy), Moscow. No. 4, April 1973, pp. 63–66.

U.S.S.R. desires to obtain Western equipment. A $20 million Soviet contract for U.S. petroleum production equipment was awarded in January to TRW Inc. of Oklahoma.

Prospecting for offshore oil started in the Caspian Sea in the thirties, and the first well produced crude in 1949. Since that time, a base for offshore oil extraction was established in the area of Neftyanye Kamni in Azerbaydzhan. In 1973, offshore production in Azerbaydzhan accounted for two-thirds of the Republics crude output. Offshore oil was also produced from several wells in Turmenistan, where several oilfields have been found offshore Turkmenistan recently. It is expected that the offshore oilfields of Azerbaydzhan and Turkmenistan will merge in the open sea in the future. A promising offshore oilfield has been discovered in the western part of the Azov Sea not far from the port of Genichevsk in Kherson Oblast'. The first exploratory well was drilled in the Black Sea in 1973. According to Soviet sources, offshore oilfields are situated not only in the Caspian Sea but also in the Black, Azov, Baltic, and Okhotsk Seas and in the Arctic Ocean. Negotiations on joint exploration of offshore oilfields, adjacent to the Sakhalin Island, between the U.S.S.R. and Western firms continued in 1973.

In the near future, a huge floating drilling rig "Kaspiy," designed in Baku (probably a copy of "Khazard" rig), will become operational. It will be capable of drilling a 6,000-meter well where the depth of the sea is 60 meters. The "Kaspiy" will be the first in a series of 10 such rigs, which will be constructed in the future.

The U.S.S.R. was soliciting bids from Western firms for building oil refineries. On December 7, the Soviet Minister of Foreign Trade signed a contract with French firms for construction of a $200 million petrochemical complex in the U.S.S.R. With the assistance of Western firms, additional facilities at the Omsk, Polotsk, Kherson, Ryazan', Khabarovsk, Ukhta, Kirisha, and Saratov refineries and at the Nizhnekamsk petrochemical complex were put into operation in 1973.

Over one-half of the total tonnage of crude oil and refinery products moved in the U.S.S.R. in 1973 was shipped by rail. The length of trunk crude and product lines, as of January 1, 1973, totaled about 43,000 kilometers, and average distance of pipeline deliveries in 1973 was over 850 kilometers. Only about 70% of total pipeline capacity was utilized. The network of crude oil and petroleum product lines increased an estimated 3,000 kilometers in 1973.

Among the most important pipelines constructed in 1973 were the 2,127-kilometer Nizhnevartovsk (Samotlor)-Ust'-Balyk-Kurgan-Ufa-Almetyevsk, and the first stage (320 kilometers) of the Aleksandrovsk-Anzhero-Sndzhensk-Krasnoyarsk pipeline. The Nizhnevartovsk-Almetyevsk pipeline has provided an outlet for Tyumen' oil to the refineries of the Volga Region and the Center and to the "Druzhba" pipeline system.

The 2,249-kilometer (1,220 millimeter) Samotlor-Kuybyshev crude pipeline was under construction in 1973. This pipeline will be the second one to transport Siberian oil to central districts in the European part of the country.

Soviet exports of crude oil and petroleum products totaled 118 million tons in 1973, a 10% increase over that of 1972, and consisted of about 70% crude oil and 30% oil products. Crude oil and product exports from the U.S.S.R. will continue to grow.

Other Fuels and Energy.—Among Soviet fuels and energy sources of lesser significance in 1973 were hydroelectric power, nuclear energy, oil shale, peat, and fuelwood.

Hydroelectric Power.—The technical potential of hydroelectric power in the U.S.S.R. was placed at 1,721 billion kilowatt-hours per year. In the overall energy economy, however, water power is of relatively small significance. Hydroelectric power supplied about 15% of all electric power (915 billion kilowatt-hours) generated in 1973.

At the beginning of 1973, the total capacity of Soviet electric powerplants reached 186.2 million kilowatts, of which 34.8 million kilowatts represented hydroelectric 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.

Exports of electric power rose from 39 million kilowatt-hours in 1961 to 7.5 billion kilowatt-hours in 1972 and to 9.9 billion kilowatt-hours in 1973. The Soviet

Union is the only important exporter of electricity among the COMECON countries. Smaller amounts of electric power are exported to the free world, mainly to Finland.

Nuclear Power.—The total installed capacity of all four Soviet nuclear powerplants was 1,810 megawatts, or about 1% of the capacity of all electric powerplants in the country on January 1, 1973, (Novo-Voronezh, four reactors, total capacity 1,455 megawatts; Beloyarsk, two reactors 300 megawatts; Melekess, one reactor, 50 megawatts; and Obninsk, one reactor, 5 megawatts). In 1973, the following nuclear powerplants were put into operation: The first stage (one reactor) at the Kola Peninsula, with a capacity of 440 megawatts, commissioned on July 3; the first stage (one reactor) of the Shevchenko plant[84] in Kazakhstan, with a capacity of 350 megawatts, commissioned on July 16; the first stage of the Bilibino (one reactor), with a capacity of 12 megawatts, completed on December 31. Therefore, the total capacity of all seven Soviet nuclear powerplants was 2,412 megawatts, or over 1% of the capacity of all electric powerplants in the U.S.S.R. on January 1, 1974.

In 1973, Soviet nuclear powerplants generated about 11,700 million kilowatt-hours (60% more than in 1972), or about 1.3% of all electric power supplied in 1973. It planned to generate 16,100 million kilowatt-hours in 1974 and 25,000 million kilowatt-hours in 1975. Several nuclear powerplants were under construction in 1973, and two of those scheduled for completion in 1974–75.

Oil Shale.—Estimated production totaled 30.5 million tons in 1973, an increase of 4% over 1972. The output of oil shale may possibly reach 32 million tons in 1974 and about 33 million tons in 1975. The main center of production, as in prior years, was the Estonian S.S.R., where output totaled over 25 million tons in 1973 and was expected to be 26.7 million tons in 1974. Over two-thirds of the extracted shale in the U.S.S.R. is burned at thermal electric powerplants. The remainder is processed into furnace oil, gasoline, fuel gas, phenols, and aromatic hydrocarbons. Oil shale is also used in communal everyday needs. The world's biggest powerplant in Tallin fueled by oil shale has reached a capacity of 1,600,000 kilowatts.

The fourth section of the Narva shale mine, with an annual capacity of 0.9 million tons, was commissioned on January 11; this mine, with a total capacity of 3.5 million tons per year, began operating at full capacity in December. It has been decided to begin exploitation of the middle-Dnepr oil shale deposit, which has been estimated to contain over 3 billion tons of oil shale.

Peat.—Soviet gross reserves of peat were increased between 1955 and 1970 from about 20 billion to 25 billion tons of standard fuel equivalent. However, about 11% of today's minable reserves are located in the Central European part of the U.S.S.R., Belorussia, the Baltic States, and the Ukraine Regions, which produced over 80% of the national output in 1973. It is planned to increase production of fuel peat in the R.S.F.S.R. from 43.4 million tons in 1970 to 60 million tons in 1975. In 1973, approximately 60 million tons of fuel peat was produced in the U.S.S.R. The extraction of fuel peat may reach 70 million tons in 1980.

There were 79 electric powerplants with a total capacity of 3,740 megawatts, fueled by peat, in operation in the U.S.S.R. in 1973. Fuel peat is also used in domestic heating.

[84] The first dual-purpose nuclear powerplant, using a sodium-cooled fast reactor with a designed capacity of 150 megawatts and a desalination capacity of 120,000 cubic meters per day of fresh water.

The Mineral Industry of the United Kingdom

By Horace T. Reno [1]

The United Kingdom began 1973 with a booming economy which faded in the last half of the year due to labor and material shortages. During the last 13 weeks of the year, approximately one-third of its industrial plants were idled by labor troubles. In the first part of 1973, the gross national product (GNP) was growing at an annual rate of 6%, and less than 600,000 people were unemployed. However, the high rate of economic activity culminated in excessive demand and put upward pressure on prices. Over the year, retail prices rose 9%, food prices rose 20%, and prices on imported items for direct consumption rose 18%. Wages, moderated by stages 1 and 2 of the wage-price programs, increased slowly until October when stage 3 established higher limits including many special provisions which allowed increases over the limits. Wages for the year rose 14%, part of which was caused by upward job mobility resulting from a tight labor market.

Despite the high level of industrial activity and wage-price programs, the steel industry was plagued throughout the year by labor troubles. Industrial disputes between the National Union of Mineworkers and the National Coal Board, and the Electrical Power Engineers Association and the Central Electricity Generating Board at the beginning of stage 3 marked the end of the 1972–73 boom. In the last 13 weeks of the year, industrial power was limited to 60% of normal, miners refused to work overtime, and the electrical engineers refused to work on standby duties or outside regular working hours.

In 1973, the United Kingdom had a visible trade deficit of $5,700 million which was partially offset by an invisible trade surplus of $2,200 million resulting in a net deficit for the year estimated at $3,500 million. The pound sterling was freed from Government control in June 1972 and its value in 1973 in relation to the U.S. dollar ranged between $2.32 and $2.58. At the end of December, a pound sterling was valued at US$2.32.[2]

The United Kingdom, Denmark, and Ireland joined the European Community (EC) on January 1, 1973. The Community's goal is creation of a full economic and monetary union through common policies, programs, laws, and regulations. It was designed to combine the total economic resources of its members in an economic union wherein goods, persons, services, and capital could move freely and where common policies would prevail for foreign trade, agriculture, and transportation. Membership in the EC presented the United Kingdom with an almost unlimited opportunity for trade in iron and steel and other industrial materials because of the high level of industrial activity throughout all of Western Europe. However, its own booming economy and high demand in the first part of the year and its inability to produce in the last part of the year prevented its taking full advantage of membership.

[1] Physical scientist, Division of Ferrous Metals—Mineral Supply.

[2] Where necessary, values have been converted from United Kingdom pounds (UK£) to U.S. dollars at the rate of UK£1=US$2.40.

PRODUCTION

Production indexes for the mining and quarrying, and manufacturing branches of the mineral industry were as follows (1970=100):

	1972 r	1973
Mining and quarrying	84.0	93.5
Manufacturing:		
Ferrous metals	86.7	92.1
Nonferrous metals	95.7	106.0
Bricks, pottery, glass, etc	114.1	125.1
Chemicals	108.2	122.3
Coal and petroleum products	102.6	110.0
All industry	102.1	110.1

r Revised.

Source: Central Statistical Office (London). Monthly Digest of Statistics. No. 339, March 1974, pp. 50–53.

Table 1.—United Kingdom: Production of mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Aluminum:			
Alumina	99	116	97
Metal:			
Primary	119	171	252
Secondary	189	197	210
Antimony, primary smelter e metric tons	4,800	7,200	7,800
Cadmium metal, including secondary do	262	240	314
Copper:			
Ore and concentrate, metal content do	--	--	459
Refined:			
Primary do	49,516	59,579	75,858
Secondary do	138,070	121,132	108,479
Iron and steel:			
Iron ore	10,228	9,048	7,105
Pig iron	15,268	15,164	16,679
Ferroalloys, blast furnace:			
Ferromanganese	135	141	156
Spiegeleisen	18	11	15
Total	153	152	171
Steel, crude	24,174	25,321	26,649
Steel semimanufactures:			
Sections	5,167	5,188	6,029
Wire rods	1,465	1,451	1,790
Plates and sheets	8,742	9,226	9,638
Strip	1,411	1,490	1,757
Pipe, tube and stock	720	813	840
Railway track material	307	246	255
Other rolled [1]	1,265	1,343	1,052
Castings and forgings	393	349	350
Total	19,470	20,106	21,711
Lead:			
Mine output, metal content [2] metric tons	4,973	4,500	e 4,900
Metal:			
Bullion, from imported ores and concentrates do	38,628	25,052	30,306
Refined:			
Primary [3] do	120,821	121,000	120,117
Secondary [4] do	142,771	149,621	145,009
Total do	263,592	270,621	265,126
Magnesium metal, including secondary do	2,500	2,700	3,100
Nickel metal, refined, including ferronickel do	38,700	31,900	36,800
Tin:			
Mine output, metal content long tons	1,787	3,274	3,723
Metal:			
Primary do	22,787	20,996	17,391
Secondary do	2,035	4,892	2,586
Tungsten, mine output, metal content metric tons	5	2	--
Zinc:			
Ore and concentrate, metal content do	--	--	2,909
Smelter do	116,464	73,826	83,860

See footnotes at end of table.

Table 1.—United Kingdom: Production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
NONMETALS			
Barite and witherite	22	16	e 20
Bromine ——metric tons	23,800	30,000	30,600
Calcite	28	20	12
Cement, hydraulic	17,697	18,048	19,986
Chalk [5]	17,758	19,491	23,232
Clays:			
Fire clay	2,230	2,282	1,733
Fuller's earth [e]	180	180	180
Kaolin (china clay)	2,736	3,005	3,409
Potters' and ball clay	732	687	35,956
Other, including clay shale	31,680	32,162	
Diatomite ——metric tons	14,559	9,000	4,000
Feldspar (china stone) ——do	62,861	53,000	49,000
Fertilizers, manufactured: [6]			
Nitrogenous (N content)	748	772	751
Phosphatic (P_2O_5 content)	540	441	467
Other, gross weight	3,005	2,953	2,786
Fluorspar: [7]			
Acid grade	144	141	e 160
Metallurgical grade	63	57	e 73
Ungraded	4	1	--
Total	211	199	233
Gypsum and anhydrite	4,173	4,164	4,208
Refractory products: [8]			
Bricks	1,119	936	NA
Cement	69	41	NA
Other	74	122	NA
Salt:			
Rock	1,807	1,178	1,121
Brine	e 7,400	e 7,600	1,643
Other			5,754
Stone, sand and gravel:			
Chert and flint	16	(9)	141
Igneous rock and perlite	37,327	40,753	48,991
Limestone and dolomite, including marble	94,459	95,516	105,909
Sandstone, including ganister	11,734	12,243	16,830
Slate	60	59	64
Sand and gravel:			
Building sand	19,700	21,300	
Concrete sand	33,300	33,200	136,000
Gravel	58,800	62,900	
Silica refractory and molding sands	5,645	5,478	6,384
Strontium minerals ——metric tons	9,700	4,400	4,338
Sulfur:			
Elemental	44	41	28
Sulfuric acid	3,459	3,449	3,886
Talc, soapstone, pyrophyllite ——metric tons	12,100	16,100	20,333
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	218	204	218
Coal:			
Anthracite	4,124	3,114	3,354
Bituminous	142,979	116,403	128,600
Other	2,300	2,300	e 2,300
Coke:			
Metallurgical	15,368	13,412	14,794
Gashouse	769	224	193
Breeze, all types	1,654	1,239	1,148
Fuel briquets, all grades	1,360	1,253	1,185
Gas:			
Manufactured [10] ——million therms	1,365	963	e 950
Natural ——million cubic feet	655,758	948,352	e 982,900
Natural gas liquids ——thousand 42-gallon barrels	1,226	2,157	2,698
Petroleum:			
Crude ——do	606	[11] 2,628	[11] 3,936
Refinery products:			
Gasoline:			
Aviation ——do	524	271	560
Motor ——do	106,479	115,914	126,210
Jet fuel ——do	30,650	36,585	38,920
Kerosine ——do	19,675	20,517	21,042
Distillate fuel oil ——do	182,435	190,508	207,790

See footnotes at end of table.

Table 1.—United Kingdom: Production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Residual fuel oil ——thousand 42-gallon barrels	287,664	273,203	280,021
Lubricants ——do	10,004	9,328	10,334
Other ——do	84,213	85,416	101,752
Refinery fuel and losses ——do	45,103	60,776	56,311
Total ——do	766,747	792,518	842,940

e Estimate. p Preliminary. NA Not available.
1 Includes wheels, centers, tires, axles, and semimanufactures for sale.
2 May include some zinc.
3 Lead refined from imported bullion.
4 Lead refined from scrap materials and domestic ores.
5 Includes chert and flint in 1972.
6 Year ending May 31 of that stated.
7 Includes fluorspar recovered from old mine dumps.
8 Consists of bricks, retorts, molds, and other refractory products made from clays, silica, siliceous material, magnesite, alumina, and chrome materials.
9 Included in figure for chalk in 1972.
10 Gas made at gasworks plus purchased coke oven and refinery gas.
11 Includes condensate.

TRADE

Trade in mineral commodities in 1973 accounted for approximately 15% of the value of all exports and 23% of the value of all imports by the United Kingdom. A trade deficit of approximately $8.2 billion could be attributed to mineral commodities. Compared with that of 1972, the value of United Kingdom total trade increased by approximately $11.3 billion in imports and $6.5 billion in exports.

Approximate values of major mineral commodities traded in 1973 follow:

Commodity	Value (million dollars) Exports	Imports
Petroleum, crude	59	3,216
Diamond, gem	1,908	1,742
Iron and steel	1,039	1 1,262
Copper	370	815
Refined gold bullion	1,489	1,059
Petroleum products	758	826
Silver and platinum-group metals 1	427	90
Aluminum	1,071	1 277
Nickel	181	1 178
Lead and zinc	87	1 257
Tin	84	1 91

1 Including ores and concentrates.

Source: Overseas Trade Accounts of the United Kingdom, December 1973.

Table 2.—United Kingdom: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Bauxite and concentrate	142	447	NA.
Oxide and hydroxide	18,739	19,333	NA.
Metal, including alloys:			
Scrap	2,084	2,994	West Germany 908.
Unwrought	43,195	84,962	United States 18,279; West Germany 13,701; Canada 10,174.
Semimanufactures	32,247	35,383	Ireland 4,318; West Germany 1,716; Switzerland 1,306.
Antimony metal 1	300	500	NA.
Arsenic trioxide, pentoxide and acids value, thousands	$138	$202	NA.
Beryllium metal, including alloys, all forms	31	10	NA.
Bismuth metal, including alloys 1	243	308	NA.
Cadmium metal, including scrap	200	190	NA.
Chromium:			
Chromite	33	769	NA.
Oxide and hydroxide —value, thousands	$812	$1,252	NA.
Metal, including alloys, all forms 1	r 1,300	1,700	NA.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Cobalt:			
Oxide and hydroxide	381	342	Poland 97.
Metal, including matte, speiss, etc.[1]	200	400	NA.
Columbium and tantalum metal, including alloys, all forms, tantalum	7	8	NA.
Copper:			
Ore and concentrate	--	2,178	NA.
Metal, including alloys:			
Scrap	1,565	2,170	Belgium 638.
Unwrought	68,295	64,254	West Germany 16,114; Italy 14,090; Netherlands 7,986.
Semimanufactures	105,564	97,174	Switzerland 15,014; Poland 11,001; Ireland 7,899.
Gold, unworked or partly worked:			
Bullion, refined ----thousand troy ounces	20,041	14,706	NA.
Other ----do----	245	97	NA.
Iron and steel:			
Ore and concentrate, except roasted pyrite	93	81	NA.
Metal:			
Scrap ----thousand tons	1,024	1,091	Spain 671; Netherlands 80; Belgium 72.
Pig iron, ferroalloys, and similar materials ----do----	55	49	West Germany 8; Sweden 5; Italy 4.
Steel, primary forms ----do----	444	455	Spain 154; United States 123; Italy 34.
Semimanufactures:			
Bars, rods, angles, shapes, sections:			
Wire rod ----do----	321	315	United States 128; India 21; Greece 19.
Other bars and rods --do----	479	438	United States 163; Canada 25; West Germany 24.
Angles, shapes, sections do----	554	473	United States 192; Canada 34; Ireland 22.
Universals, plates and sheets:			
Universals and heavy plates, uncoated ----do----	452	473	United States 130; Spain 57; India 57.
Medium plates and sheets, uncoated ----do----	64	102	India 17; Norway 6; Sweden 5.
Light plates and sheets, uncoated ----do----	968	949	United States 173; Spain 140; India 84.
Tinned plates and sheets do----	355	320	United States 47; India 28; Argentina 27.
Other coated plates and sheets ----do----	254	263	Norway 39; United States 21; Finland 20.
Hoop and strip ----do----	160	125	India 19; Finland 10; United States 9.
Rails and accessories -----do----	220	119	France 42; Italy 15; Angola 8.
Wire ----do----	109	99	Canada 18; United States 17; Ireland 7.
Tubes, pipes, fittings -----do----	624	537	United States 65; Netherlands 38; Sweden 43.
Castings and forgings, rough do----	r 43	35	Sweden 9; United States 4; West Germany 3.
Total ----do----	r 4,603	4,248	
Lead:			
Ore and concentrates	6,131	5,835	Belgium 5,769.
Oxides	6,329	481,959	Ireland 129,423.
Metal, including alloys:			
Scrap	196	550	NA.
Unwrought	151,571	147,340	West Germany 32,621; Netherlands 15,033; United States 13,720.
Semimanufactures	2,619	2,323	NA.
Magnesium metal, including alloys:			
Scrap	12	50	NA.
Unwrought	668	1,522	West Germany 351; France 192; United States 144.
Semimanufactures	232	217	NA.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Manganese:			
Ore and concentrates	2,375	2,543	NA.
Oxides	485	1,883	NA.
Mercury—76 pound flasks	1,552	2,071	NA.
Molybdenum metal, including alloys, all forms	41	57	NA.
Nickel:			
Matte, speiss, and similar materials	3,309	2,680	Italy 2,092; West Germany 300.
Metal, including alloys:			
Scrap	1,946	2,640	United States 914; West Germany 469.
Unwrought	31,696	33,342	West Germany 6,756; France 5,339; Belgium 4,119.
Semimanufactures	12,139	12,073	United States 2,492; France 972; Japan 900.
Platinum-group metals and silver:			
Ore and concentrate—value, thousands	--	$460	NA.
Waste and sweepings—do	$1,672	$265	West Germany $127; Belgium $96.
Metals, including alloys:			
Platinum group—thousand troy ounces	r 1,122	1,665	United States 596; Japan 228; West Germany 158.
Silver:			
Refined—do	38,625	84,455	NA.
Unrefined—do	16	--	
Other—do	10,448	11,127	NA.
Tin:			
Ore and concentrate—long tons	664	31	NA.
Oxides—do	290	412	NA.
Metal, including alloys:			
Scrap—do	28	23	NA.
Unwrought—do	11,698	15,304	Netherlands 4,325; West Germany 1,527; Poland 1,435.
Semimanufactures—do	828	879	Norway 428; Sweden 63.
Titanium oxides	15,895	10,939	Netherlands 1,855; France 1,124; Switzerland 629.
Tungsten:			
Ore and concentrate	1,057	398	Netherlands 93; West Germany 86; Poland 47.
Metal, including alloys, all forms	98	111	Netherlands 35.
Uranium and thorium, including alloys, all forms—kilograms	--	600	NA.
Zinc:			
Ore and concentrate	--	5,837	NA.
Oxide and peroxide	5,636	7,046	Belgium 1,441.
Metal, including alloys:			
Scrap	1,311	1,017	NA.
Unwrought	11,099	15,820	Ireland 4,425; United States 3,014.
Semimanufactures	6,355	7,457	Denmark 1,427.
Other:			
Ore and concentrate:			
Of molybdenum, tantalum, titanium, vanadium, zirconium	546	1,302	Japan 251; U.S.S.R. 26.
Of base metals, n.e.s.—value, thousands	$442	$202	Japan $9.
Ash and residue containing nonferrous metals	43,032	21,942	Belgium 6,498; Canada 5,471; Netherlands 3,993.
Oxides, hydroxides and peroxides of metals, n.e.s—value, thousands	$13,016	$11,215	United States $2,393; Netherlands $1,578; West Germany $1,322.
Metals including alloys, all forms:			
Metalloids, n.e.s—do	$2,111	$1,803	France $54.
Alkali, alkaline earth and rare-earth metals	1,181	305	NA.
Pyrophoric alloys	88	53	NA.
Base metals, including alloys, all forms, n.e.s	1,376	1,360	NA.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	8,989	7,786	United States 2,245; Austria 650.
Dust and powder of precious and semiprecious stones—value, thousands	$8,649	$5,786	Netherlands $1,374; France $878; Japan $737.
Grinding and polishing wheels and stones	6,069	6,369	Sweden 970; West Germany 470; Poland 451.
Asbestos, crude a waste	2,522	3,710	NA.
Barite and witherite	1,737	1,488	NA.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Boric oxide and acid	107	143	NA.
Cement ——thousand tons	747	793	United States 447; Ivory Coast 104; Canary Islands 41.
Chalk	25,155	32,917	NA.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s ——thousand tons	2,387	2,509	Italy 387; West Germany 384; Finland 281.
Products:			
Refractory (including nonclay brick) ——do	228	249	India 27; Sweden 25; Netherlands 17.
Nonrefractory ——do	82	84	United States 17; Canada 11; Australia 10.
Cryolite and chiolite	40	12	NA.
Diamond, all grades ——value, millions	$969	$1,071	Switzerland $262; Belgium $250; United States $220.
Diatomite and other infusorial earth	4,878	3,676	NA.
Feldspar and fluorspar	72,759	70,883	Norway 16,022; Canada 10,811; Netherlands 6,041.
Fertilizer materials:			
Crude:			
Nitrogenous	77	--	NA.
Phosphatic	3,384	103	NA.
Potassic	r 27	139	NA.
Other	1,013	234	NA.
Manufactured:			
Nitrogenous ——value, thousands	$2,575	$5,610	Ireland $2,045.
Phosphatic	33,013	57,290	Ireland 16,599; West Germany 14,829.
Potassic	1,487	2,822	NA.
Other, including mixed	57,864	105,176	Ireland 60,816; Portugal 16,966.
Graphite, natural	2,736	1,909	NA.
Gypsum and plasters	12,364	11,137	NA.
Lime	r 37,638	42,216	Nigeria 7,029.
Magnesite	4,489	3,261	Ireland 725.
Mica:			
Crude, including splittings and waste	7,575	12,337	West Germany 1,222.
Worked, including agglomerated splittings	153	154	NA.
Pigments, mineral:			
Natural, crude	2,799	1,651	NA.
Iron oxides, processed	9,383	9,000	United States 2,143.
Precious and semiprecous stones, except diamond:			
Natural ——value, thousands	$19,818	$19,724	Switzerland $4,504; France $2,999; India $2,844.
Manufactured ——do	$179	$141	NA.
Salt ——thousand tons	472	421	Sweden 133; Nigeria 92; Ireland 41.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	122,469	176,591	Canada 20,602; Finland 11,465; Ireland 9,769.
Caustic potash, sodic and potassic peroxides	620	814	NA.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	10,813	10,489	West Germany 5,264.
Worked	3,707	4,074	NA.
Dolomite, chiefly refractory grade	1,319	24,750	NA.
Gravel and crushed rock --thousand tons	2,920	3,863	Netherlands 1,595; France 1,274; Belgium 481.
Limestone (except dimension)	292,631	41,739	Norway 362.
Quartz and quartzite	481	259	NA.
Sand, excluding metal bearing	38,741	56,772	Ireland 17,437.
Strontium minerals, celestite [1]	5,635	4,300	NA.
Sulfur:			
Elemental:			
Other than colloidal	2,258	2,073	NA.
Colloidal	121	142	NA.
Sulfur dioxide ——value	$15,313	$16,437	NA.
Sulfuric acid	10,289	19,069	NA.
Talc, steatite, soapstone, pyrophyllite	2,472	1,729	NA.
Other nonmetals, n.e.s.:			
Crude	242,573	472,672	West Germany 23,195; France 3,736; Spain 616.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Other nonmetals, n.e.s—Continued			
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture	121,528	127,782	West Germany 117,853.
Slag and ash, n.e.s	31,125	1,573	NA.
Oxides and hydroxides of magnesium, strontium, barium	34,327	15,893	Netherlands 3,209; France 2,658; West Germany 2,097.
Halogens, other than chlorine	2,068	1,529	NA.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	53,983	102,573	Hong Kong 3,661; Netherlands 2,938; France 2,732.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	8,636	3,665	NA.
Carbon black	43,090	43,197	Spain 6,532; Ireland 5,642; France 5,281.
Coal and briquets:			
Anthracite and bituminous coal thousand tons	2,695	1,749	West Germany 1,005; France 391; Ireland 95.
Briquets of anthracite and bituminous coal do	135	124	Norway 115.
Lignite and lignite briquets	76	390	NA.
Coke and semicoke thousand tons	r 613	382	Norway 187; Sweden 145; West Germany 27.
Gas, manufactured	50	16	NA.
Hydrogen and rare gases	774	963	NA.
Peat, including peat briquets and litter	536	500	NA.
Petroleum:			
Crude and partly refined:			
Crude thousand 42-gallon barrels	10,535	21,398	Ireland 9,449; Belgium 2,137; Italy 2,110.
Partly refined do	2,376	2,784	Netherlands 1,398; Sweden 603; West Germany 56.
Refinery products:			
Gasoline (including natural) do	r 15,803	17,670	Sweden 4,416; Ireland 2,954; Denmark 2,835.
Kerosine and jet fuel do	r 9,353	9,231	Ireland 2,567; Norway 2,087; Netherlands 1,399.
Distillate fuel oil do	r 45,808	45,183	Sweden 16,667; Denmark 11,991; Norway 3,864.
Residual fuel oil do	r 41,296	37,024	Denmark 10,451; Ireland 8,739; Sweden 7,922.
Lubricants do	r 5,164	5,209	Sweden 575; Belgium 454; Netherlands 424.
Mineral jelly and wax do	65	36	NA.
Other:			
Nonlubricating oils, n.e.s. do	278	345	Australia 62; Republic of South Africa 62; West Germany 54.
Liquefied petroleum gas do	1,437	1,569	Netherlands 426; Portugal 233; Belgium 79.
Pitch, pitch coke, and petroleum coke do	1,709	1,280	Norway 438; Italy 193; Netherlands 128.
Bitumen and other residues, and bituminous mixtures, n.e.s do	400	731	Ireland 371; West Germany 6.
Total do	121,313	118,278	
Mineral tar and other coal-, petroleum-, or gas-derived crude cheimcals value, thousands	$8,655	$6,988	Netherlands $1,026; United States $695; France $596.

r Revised. NA Not available.

[1] Source: Institute of Geological Sciences (London). United Kingdom Mineral Statistics 1973. Her Majesty's Stationery Office, 1973, 91 pp.

Source: Unless otherwise specified, official United Kingdom export returns.

Table 3.—United Kingdom: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite and concentrate ---thousand tons---	447	319	Ghana 220; Greece 60; Austria 9.
Oxide and hydroxide ---do---	272	315	Jamaica 299; West Germany 5; Austria 3.
Metal, including alloys:			
Scrap ---do---	12	14	NA.
Unwrought ---do---	270	267	Norway 127; Canada 74; Ghana 15.
Semimanufactures ---do---	80	86	Norway 18; Belgium 14; United States 14.
Arsenic trioxide, pentoxide and acids [1]	3,900	2,800	NA.
Beryllium metal, including alloys, all forms	4	6	United States 5.
Bismuth metal, including alloys, all forms [1]	332	531	NA.
Cadmium metal, including alloys, all forms [1]	864	1,377	NA.
Chromium:			
Chromite ---thousand tons---	207	77	Republic of South Africa 48; Philippines 25.
Oxide and hydroxide ---value, thousands---	$607	$754	West Germany $237.
Cobalt:			
Oxide and hydroxide	983	732	Mainly from Canada.
Metal, including alloys, all forms [1]	r 2,000	1,300	NA.
Columbium and tantalum, tantalum metal, including alloys, all forms	17	27	United States 22.
Copper:			
Ore and concentrate	r 2,791	57	All from Australia.
Matte	880	300	All from United States.
Metal, including alloys:			
Scrap	11,473	17,716	Chile 11,591; Ireland 1,682; United States 1,057.
Unwrought	399,887	448,752	Zambia 128,474; Canada 107,441; Chile 68,233.
Semimanufactures	11,800	24,093	Finland 3,385; West Germany 3,338; Sweden 2,719.
Gold, unworked or partly worked:			
Bullion:			
Refined ---thousand troy ounces---	r 31,205	19,073	NA.
Unrefined ---do---	r 991	392	NA.
Other ---do---	12	70	NA.
Iron and steel:			
Ore and concentrate, except roasted pyrite thousand tons---	17,473	17,351	Canada 3,762; Sweden 3,698; Brazil 1,958.
Roasted pyrite ---do---	282	361	Sweden 251; Greece 26.
Metal:			
Scrap ---do---	294	40	United States 22; Netherlands 12.
Pig iron, including cast iron, sponge, powder and shot ---do---	r 161	199	East Germany 45; Norway 38; Canada 26.
Ferroalloys:			
Ferromanganese ---do---	78	92	Norway 52; Republic of South Africa 28; Sweden 4.
Other ---do---	197	218	NA.
Steel, primary forms ---do---	609	482	Spain 170; U.S.S.R. 69; Japan 63.
Semimanufactures:			
Bars, rods, angles, shapes, sections:			
Wire rods ---do---	r 58	96	Sweden 17; Spain 15; Norway 6.
Other bars and rods ---do---	346	531	Netherlands 117; Sweden 86; Norway 77.
Angles, shapes, sections---do---	66	142	Belgium 26; Sweden 16; France 6.
Universals, plates and sheets:			
Heavy and medium plates and sheets, uncoated ---do---	133	315	Japan 72; Sweden 51; West Germany 40.
Light plates and sheets, uncoated ---do---	418	652	Netherlands 163; Belgium 118; West Germany 117.
Tinned plates and sheets ---do---	65	48	Netherlands 27; West Germany 7; Belgium 3.
Other coated plates and sheets ---do---	74	142	Belgium 42; Japan 24; Canada 20.
Hoop and strip ---do---	50	70	West Germany 18; Belgium 12; Netherlands 8.
Rails and accessories ---do---	1	(2)	NA.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Semimanufactures—Continued			
Wire ---thousand tons--	13	13	Sweden 3; Austria 3; Belgium 2.
Tubes, pipes, fittings ---do---	217	190	Japan 66; West Germany 33; Sweden 22.
Castings and forgings, rough---do---	4	4	West Germany 1.
Total ---do---	r 1,445	2,203	
Lead:			
Ore and concentrates ---do---	75	29	Peru 17; Canada 9.
Oxides	362	12,321	NA.
Metal, including alloys:			
Scrap	2,776	3,034	Belgium 287.
Unwrought ---thousand tons--	231	207	Australia 153; Canada 47.
Semimanufactures	934	1,126	Netherlands 113.
Magnesium metal, including alloys:			
Scrap	930	1,379	NA.
Unwrought	4,312	5,198	Norway 1,927; Canada 1,008; U.S.S.R. 528.
Semimanufactures	81	340	NA.
Manganese:			
Ore and concentrates ---thousand tons--	429	361	Brazil 125; Republic of South Africa 106; Ghana 75.
Oxides	3,982	4,733	Japan 3,992.
Metal	2,300	3,100	NA.
Mercury ---76-pound flasks--	12,318	22,784	Netherlands 4,081; Italy 3,214; Canada 1,445.
Molybdenum:			
Ore and concentrate	7,824	9,051	NA.
Metal, including alloys, all forms	120	162	Austria 119.
Nickel:			
Matte, speiss, and similar materials	75,194	60,390	Canada 60,318.
Metal, including alloys:			
Scrap	2,858	2,696	Netherlands 934; Belgium 314; United States 261.
Unwrought	46,030	17,964	Canada 8,427; Australia 3,538; Norway 2,806.
Semimanufactures	3,369	3,075	United States 1,477; West Germany 545.
Platinum-group metals and silver:			
Ore and concentrate ---value, thousands--	$110,352	$63,678	NA.
Waste and sweepings ---do---	$31,300	$25,662	Republic of South Africa $6,098; United States $5,765; Canada $2,635.
Metals, including alloys: Platinum group—thousand troy ounces--	r 148	316	U.S.S.R. 141; Republic of South Africa 97; United States 30.
Silver:			
Refined ---do---	16,410	12,654	NA.
Unrefined ---do---	r 15,497	3,402	NA.
Other ---do---	608	577	NA.
Selenium, elemental	140	175	NA.
Silicon, elemental	14,647	16,277	NA.
Tin:			
Ore and concentrate ---long tons--	58,801	57,947	Bolivia 39,753; Australia 5,143; Argentina 4,648.
Oxides ---do---	1	2	NA.
Metals, including alloys:			
Scrap ---do---	821	2,375	United States 975.
Unwrought and semimanufactures ---do---	7,934	6,421	Nigeria 5,047; Malaysia 603; Netherlands 323.
Titanium:			
Ore and concentrate:			
Ilmenite ---thousand tons--	361	297	NA.
Other ---do---	36	49	NA.
Oxides ---do---	3	4	West Germany 2.
Metal, including alloys, all forms ---do---	1	--	
Tungsten:			
Ore and concentrate	7,145	6,486	Bolivia 1,482; Thailand 973; Netherlands 959.
Metals, including alloys, all forms	94	81	United States 12; Sweden 3.
Uranium and thorium:			
Ore and concentrate	221	788	NA.
Metals, including alloys, all forms	(2)	2	NA.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Zinc:			
Ore and concentrate ——thousand tons	292	110	Australia 448; Canada 274; Ireland 227.
Oxide and peroxide	975	1,866	NA.
Metal, including alloys:			
Scrap and blue powder	807	3,369	NA.
Unwrought ——thousand tons	174	231	Canada 66; Australia 41; Norway 17.
Semimanufactures	587	729	NA.
Zirconium:			
Ore and concentrate	r 39,900	36,500	NA.
Metal, including alloys, all forms	100	--	
Other:			
Ore and concentrate of tantalum and vanadium	1,881	2,295	NA.
Ash and residue containing nonferrous metals	65,274	83,694	Canada 44,811; United States 8,176; Sweden 6,354.
Oxides, hydroxides and peroxides of metals, n.e.s ——value, thousands	$22,503	$25,611	United States $5,607; Netherlands $4,875; Trinidad and Tobago $4,360.
Metals, including alloys, all forms:			
Metalloids, n.e.s ——do	$25,479	$34,538	NA.
Alkali, alkaline earth and rare-earth metals	20	84	NA.
Pyrophoric alloys	33	27	NA.
Base metals, including alloys, all forms, n.e.s	3,043	4,862	NA.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc. thousand tons	151	192	Italy 154; Turkey 22; United States 2.
Dust and powder of precious and semi-precious stones ——value, thousands	$919	$787	NA.
Grinding and polishing wheels and stones	2,200	2,383	West Germany 315; Netherlands 265; Switzerland 247.
Asbestos ——thousand tons	168	150	Canada 93; Republic of South Africa 30; Swaziland 16.
Barite and witherite ——do	60	59	Morocco 33.
Boron materials:			
Borax	12,300	10,100	NA.
Oxide and acid	7,393	5,685	NA.
Bromine	1,841	1,773	NA.
Cement ——thousand tons	114	137	Ireland 116; West Germany 2.
Chalk	406	449	NA.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s ——thousand tons	155	108	United States 57; Republic of South Africa 21; France 6.
Products:			
Refractory (including nonclay brick)	81,330	80,569	Austria 19,467; Denmark 14,200; Ireland 11,124.
Nonrefractory	15,116	125,155	Portugal 2,989; Italy 2,977; West Germany 1,901.
Cryolite and chiolite	3,194	2,979	All from Denmark.
Diamond, all grades ——value, millions	$1,005	$1,141	NA.
Diatomite and other infusorial earth	15,964	12,059	United States 3,615.
Feldspar and fluorspar ——thousand tons	182	170	Norway 127; Finland 27; Canada 11.
Fertilizer materials:			
Crude:			
Nitrogenous ——do	12	10	Mainly from Chile.
Phosphatic ——do	1,729	1,665	Morocco 1,239; Senegal 246; Tunisia 103.
Potassic ——do	35	38	East Germany 24.
Manufactured:			
Nitrogenous ——do	328	[3] 236	NA.
Phosphatic:			
Thomas (basic) slag	76,696	85,917	Belgium 72,444.
Other	45,121	39,693	Portugal 21,759; France 9,447; Belgium 5,141.
Potassic ——thousand tons	874	724	East Germany 253; U.S.S.R. 103; France 86.
Other, including mixed ——do	231	377	Netherlands 145; West Germany 58; Ireland 40.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Graphite, natural	10,196	9,440	Malagasy Republic 4,283.
Gypsum and plasters ---thousand tons--	136	144	Ireland 122; France 20.
Iodine	844	594	NA.
Lime	3,988	1,042	NA.
Magnesite ---thousand tons--	129	89	Spain 37; Greece 28; People's Republic of China 7.
Mica:			
Crude, including splittings and waste	14,862	7,444	Republic of South Africa 4,426; India 413; United States 123.
Worked, including agglomerated splittings	230	294	Belgium 221; India 27.
Pigments, mineral:			
Natural, crude	5,776	4,475	NA.
Iron oxides, processed	19,819	21,096	West Germany 18,083; France 1,365; United States 404.
Precious and semiprecious stones, except diamond:			
Natural ---value, thousands--	$24,797	$20,457	Switzerland $5,520; United States $3,316; West Germany $1,972.
Manufactured ---do---	$314	$615	NA.
Pyrite (gross weight) ---thousand tons--	214	133	Cyprus 47; U.S.S.R. 39; Norway 25.
Salt and brine ---do---	126	22	West Germany 8; Italy 6.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	5,110	4,839	NA.
Caustic potash, sodic and potassic peroxides	2,847	2,972	France 956.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	15,497	15,463	Italy 13,562.
Slate	408	502	NA.
Other	13,224	16,307	Republic of South Africa 4,632; Sweden 4,523.
Worked:			
Slate	261	644	NA.
Paving and flagstone	16,390	14,413	Portugal 14,170.
Other	7,942	10,895	Italy 4,190; India 2,840.
Dolomite, chiefly refractory grade	24,173	27,852	Spain 19,360.
Gravel and crushed rock --thousand tons--	188	197	Ireland 82; Italy 35; Norway 33.
Limestone (except dimension)	5,588	19,729	NA.
Quartz and quartzite	11,707	9,273	Brazil 189.
Sand, excluding metal bearing thousand tons--	171	161	Belgium 123.
Sulfur:			
Elemental:			
Other than colloidal ---do---	966	1,039	France 370; Poland 291; Mexico 174.
Colloidal	1,899	1,712	NA.
Sulfur dioxide ---value--	--	$42,266	NA.
Sulfuric acid ---thousand tons--	196	163	NA.
Talc, steatite, soapstone, pyrophyllite	57,267	55,595	Norway 17,973; People's Republic of China 11,332; France 11,056.
Other nonmetals, n.e.s:			
Crude:			
Meerschaum, amber, jet	5,859	10,576	Spain 10,468.
Other ---thousand tons--	363	357	Italy 82; Norway 69; United States 66.
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture	14,066	7,382	NA.
Slag and ash, n.e.s	5,035	14,752	Netherlands 7,699.
Oxides and hydroxides of magnesium, strontium and barium	26,125	18,196	Italy 12,655; United States 4,248.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	26,956	36,709	Belgium 17,135; Ireland 9,820; France 2,723.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	42,106	42,325	Trinidad and Tobago 30,307; United States 2,892.
Carbon black and gas carbon:			
Carbon black	8,888	7,928	United States 1,913; West Germany 1,759; Netherlands 1,648.
Gas carbon	--	511	NA.
Coal and briquets:			
Anthracite and bituminous thousand tons--	4,241	4,998	United States 2,575; Australia 1,076; Poland 670.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Coal and briquets—Continued			
Briquets of anthracite and bituminous coal ---thousand tons--	307	313	France 159; West Germany 101; Netherlands 42.
Lignite and lignite briquets	--	203	NA.
Coke and semicoke ---thousand tons--	36	106	United States 40; Belgium 8.
Hydrogen and rare gases	1,904	1,793	Belgium 1,033; United States 61.
Peat, including peat briquets and litter thousand tons--	97	119	Ireland 112.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels--	r 811,485	793,097	Saudi Arabia 155,774; Kuwait 147,274; Libya 113,745.
Refinery products:			
Gasoline (including natural) --do----	r 59,316	48,539	Netherlands 11,920; Italy 10,534; Belgium 5,091.
Kerosine and jet fuel ---do----	r 11,820	11,670	Netherlands 6,919; Belgium 1,597; Italy 1,462.
Distillate fuel oil ---do----	r 16,419	15,185	Netherlands 4,846; Belgium 2,787; Italy 2,154.
Residual fuel oil ---do----	r 54,425	64,539	Netherlands 36,403; Italy 9,017; Ireland 3,950.
Lubricants ---do----	r 3,566	3,816	Netherlands Antilles 955; United States 867; Netherlands 590.
Mineral jelly and wax ---do----	r 1,159	972	Netherlands Antilles 624; Venezuela 67; United States 46.
Other:			
Nonlubricating oils, n.e.s --do----	290	537	West Germany 166; Netherlands 105; Sweden 30.
Liquefied petroleum gas ---do----	10,119	10,115	Algeria 6,846; Sweden 893; Netherlands 724.
Pitch, pitch coke, and petroleum coke ---do----	641	3,748	West Germany 2,605; United States 431; Belgium 426.
Bitumen and other residues and bituminous mixtures, n.e.s ---do----	770	1,433	Belgium 787; Netherlands 598; United States 9.
Total ---do----	r 158,525	160,554	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals value, thousands--	$17,176	$12,694	United States $4,612; Netherlands $2,308; Belgium $1,155.

r Revised. NA Not available.

[1] Source: Institute of Geological Sciences (London). United Kingdom Mineral Statistics 1973. Her Majesty's Stationery Office, 1973, 91 pp.

[2] Less than ½ unit.

[3] Excludes ammonium sulfate valued at $3,343,694.

Source: Unless otherwise specified, official United Kingdom import returns.

COMMODITY REVIEW

METALS

Aluminum.—Primary aluminum production in the United Kingdom in 1973 was 47% more than was produced in 1972. Output increased rapidly at the three new smelters constructed since 1969. The Invergordon and Anglesey smelters reached full capacity output in the latter part of the year. However, the Lynemouth smelter was held back by problems in its generating plant which had not yet been solved at yearend. Imports of bauxite in 1973, essentially all from Ghana, totaled almost 300,000 tons, 6% less than in 1972. Imports of aluminum and its alloys, wrought and unwrought, totaled 382,000 tons, 8% more than was imported in 1972. The pattern of aluminum consumption in 1973 changed slightly from that of 1972, reflecting growth principally in packaging and easy-open beverage cans, and higher prices for steel and soft wood, which encouraged use of aluminum in the housing industry. Vehicles received 26% of the total aluminum consumed, electrical engineering received 11%, building construction 8%, and packaging 7%; the remainder was distributed among the mechanical engineering, chemical and

fruit processing, the iron and steel industries, miscellaneous uses, and direct exports.

Iron and Steel.—The British iron and steel industry produced 26.65 million tons of raw steel in 1973, 5% more than in 1972. This increase was made despite a cutback in production owing to a shortage of coal and transportation problems the latter part of the year.

The British Steel Corp. (BSC) had its first year of profitable operation in its 6 years of existence, although operations were seriously interrupted by major strikes, and price controls forced the corporation to sell major products at 15% to 25% below prices for comparable items in other European countries.

Markets for all types of finished steel in the United Kingdom were exceptionally strong throughout the year and the standard 8% import tax on a number of steel products was waived because of serious supply shortages. In view of the strong market, home deliveries increased 14% compared with those in 1972, exports of steel products were 9% less, and imports were 6% higher.

BSC and the independent steelmakers of Great Britain became members of the European Coal and Steel Community on January 1. Under Community regulations, governments cannot subsidize their steel industries, but the United Kingdom was allowed until April 20, 1973 to withdraw its support and permit prices to reflect a nonsubsidized operation. British steel prices were increased an average of 9½%, effective May 1. Nevertheless, British steel remained the least expensive in the world.

BSC's Anchor project, the largest of five planned expansion projects to rationalize operations, was commissioned. The project planned to add ore preparation, basic oxygen steelmaking furnaces, and steel forming facilities to the existing Appleby Frodingham and Redborn steelworks at Scunthorpe to provide a complex capable of producing approximately 40% of the total crude steel to be produced by BSC's general steels division.

The Anchor project includes the Immingham ore terminal which will dock 65,000 to 70,000 ton ore carriers and store individual ores, fines, and concentrates separately. Ore from the terminal will be transferred in 1,600-ton trains to a new ore preparation plant at Anchor, where foreign ores will be blended with domestic ore to make chemically uniform sintering plant feed containing approximately 54% iron. The four "Queen" blast furnaces at the Appleby Frodingham works and the three blast furnaces at the Redborn works will provide the hot metal needed for the new basic oxygen steelmaking plant. The oxygen plant, one of the largest in Europe, will have three 300-ton basic oxygen furnaces (BOF) and a capacity to produce 4.4 million tons of steel annually, using 72% hot metal and 28% scrap. Approximately 1.1 million tons of the output will go to a continuous casting plant which will provide the feed for a heavy plate mill. The casting plant is to be equipped with two slab castings machines, each capable of producing slabs from 1 to 2 meters wide and 180 to 300 millimeters thick in 40 to 60 minutes. New bloom and billet mills and a medium section mill, supplementing the existing facilities at Appleby Frodingham and Redborn, were part of the project. With the Anchor project, the complex will be known as the Appleby Frodingham steelworks. It will be Britain's busiest and most modern steelworks for the next decade at least.

Among other major expansion developments, the ore terminal and stockyard at Redcar were completed at Teesside. The terminal received a 100,000-ton cargo of iron ore pellets in September. In the second phase of expansion at Teesside, a contract was signed to construct a battery of 66 coke ovens with capacity of 1 million tons per year. The ovens are to be charged with preheated coal through a pipeline, a method intended to eliminate fume and improve throughput.

In contrary moves to rationalize operations, BSC reached agreement with Guest, Keen and Nettlefords Limited, to sell back the Brymbo steel plant for $50 million. Guest, Keen and Nettlefords owned the Brymbo plant before the industry was nationalized in 1966. Under the agreement, BSC will purchase Dowlais, Ltd., a Guest, Keen and Nettlefords' subsidiary, which operates foundries at Merthyr, Tydfil, and Cardiff in Wales. According to BSC officials, the extensive iron and steel industry rationalization plans in both the public and private sectors of the steel industry were virtually completed in 1973.

Independent steel producers of Great Britain have been restricted by the position and policies of the BSC and its treat-

ment by the Government. Political indecision has prevented rational planning by the independents because they did not know whether they would remain as operators of private properties or be brought into the nationalized combine. Nevertheless, the private sector of the steel industry has grown and prospered since 1967. Production of high-speed and tool steels was entirely in the private sector in 1973; BSC relinquished its interest in these steels in 1972. The nature of the private sector has made it the leader in developing iron and steel scrap supplies and alternate sources of iron raw materials. Moreover, steelmakers in the private sector took the lead in investigating direct reduction and pelletization of iron ore for use principally in electric arc furnaces.[3]

Iron Ore.—The domestic iron ore industry continued to be phased out. Production in 1973 was 21% less than in 1972. Domestic ores provided approximately one-fourth of the total ore consumed, measured by gross weight. Measured by iron content, however, the total supplied by domestic ores was less than half that. Apparently the pattern of iron ore supply has stabilized as Canada, Sweden, Brazil, Mauritania, and Venezuela, in that order, were again the principal suppliers of iron ore imports.

The energy shortage and the restricted supply of liquid fuels, electricity, and natural gas upset the pattern of decreasing energy use per unit of pig iron and per unit of steel which prevailed through most of the last decade when domestic iron ore first began to be supplanted by higher grade imported ore. The sinter to pig iron ratio in 1973 was 1.06:1 compared with 1.20:1 in 1972, and the pig iron to scrap ratio used in steelmaking was 1.14:1 compared with 1.05:1 in 1972.

Iron and Steel Scrap.—The United Kingdom has controlled exports of ferrous scrap since 1939. These controls have been relaxed from time to time, but effective February 1, 1973, the latest regulations barred all ferrous scrap exports except the lowest 15 grades.

BSC decided to end the 35-year-old arrangement by which the steel industry bought scrap almost entirely from 700 or so members of the British Scrap Federation according to an agreed schedule of prices. The agreement was ended June 1, 1973, reportedly due to pressure from the Common Market.

The embargo tended to hold prices down but the end of the scrap agreement freed the industry to sell on the world market where prices were higher than in the United Kingdom. However, the Government imposed a general price freeze which kept prices constant through November. At yearend, the pricing of scrap iron and steel had not yet stabilized.

Lead and Zinc.—Domestic mine production of lead was not significant in 1973. Refined lead produced from primary materials totaled 120,117 tons and that produced from scrap totaled 145,009 tons; the total refined lead production was 265,126 tons compared with 270,621 tons refined in 1972. Imports of lead ore and concentrate totaled 39,140 tons in 1973, 35% more than was imported in 1972. Zinc ore and concentrate imported for consumption in the United Kingdom totaled 140,950 tons, 28% more than was imported in 1972. As in the past, Peru, Australia, and the Irish Republic were the principal suppliers.

The Canadian mining and smelting company, Cominco, Ltd., studied the economic feasibility of building a 100,000-ton-per-year electrolytic zinc plant at Durham, northeast England, on the seacoast just north of the River Tees. The proposed plant would be designed for eventual expansion to 200,000 tons per year, would produce 175,000 tons of sulfuric acid annually, and would double that quantity when expanded.[4]

The London Metal Exchange (LME) restricted short-term sales of zinc on November 15 and after that would not accept purchase orders other than those necessary to cover short positions. The LME action was in response to a sharp rise in cash prices for zinc and a serious near-term shortage.

Tin.—The tin mining industry of the United Kingdom received a setback when the Pendarves tin mine which began operations in 1971 was placed in receivership. However, overall the industry's operations were satisfactory as it produced 3,723 long tons of tin-in-concentrates, 10% more than it produced in 1972. Production of refined tin was down 17% as refineries produced only 17,391 tons from primary and 2,586 tons from secondary materials compared with the 20,996 tons from primary and

[3] Steel Times. BISPA-The Private Sector Reports. V. 202, No. 3, March 1974, pp. 218–240.
[4] Mining Magazine. U.K. Electrolytic Zinc Plant. V. 129, No. 4, October 1973, p. 307.

4,892 tons from secondary materials they produced in 1972.

Consolidated Tin Smelters Limited announced voluntary liquidation of the Williams, Harvey & Co. Ltd. smelter, as a result of continuing monetary losses. Operations at the smelter continued throughout the year but efforts to locate a new operator failed. The smelter, which was built at a cost of $14.7 million 4 years ago, was unable to operate at a profit because of high transportation costs and difficulty of processing Bolivian concentrates, its principal source of feed. Capper Pass & Son Ltd. agreed to process the Bolivian concentrates at its north Ferriby, Yorkshire, smelter which was designed principally to treat these concentrates.

South Crofty Limited, a wholly owned subsidiary of St. Piran Mining Co., purchased the Pendarves tin mine which had been in receivership since early in the year. Operations of the Pendarves mine will be integrated with those of South Crofty. The spare capacity of the South Crofty mill could be used to treat Pendarves ores.

Wheal Jane Limited, a subsidiary of Consolidated Gold Fields, Limited, deepened and re-equipped its Clemow shaft at the Wheal Jane mine.

Cornwall Tin & Mining Corp. arranged financing to bring its Mount Wellington property next to the Wheal Jane mine into production. The Wellington property has indicated reserves of more than 5 million tons, averaging 1.37% tin associated with copper and zinc.

NONMETALS

Barite.—The need for barite drilling mud for petroleum exploration in the North Sea stimulated the United Kingdom barite industry. At least two companies were actively exploring for barite with a view to developing a low-cost mining operation to supply the drilling market.[5] There are a number of grinding plants in the United Kingdom whose sources of material are Morocco, Spain, Greece, Turkey, Peru, and, of course, mines in the United Kingdom. This segment of the barite industry expanded during the year. Aberdeen Barites Co., Ltd., installed a grinding mill at Aberdeen, and Anchor drilling fluids division, Maritime Drilling Services, Ltd., planned to construct a new grinding mill at Dundee, both in Scotland.

Fluorspar.—Exploration for fluorspar in the United Kingdom in 1973 continued at the high level of 1972. However, none of the large comprehensive exploration projects conducted by Exsud Ltd., a United Kingdom subsidiary of South American Consolidated Enterprises, Aluminum Co. of America, (Alcoa), and Reynolds Metal Co. of the United States, and Acmin Exploration Ltd., Ataka and Co. Ltd., and Imperial Chemical Industries Ltd. (ICI) reported significant success. Exploration was active in both the Southern and Northern Pennine ore fields. Swiss Aluminium Ltd. (Alusuisse) opened various old mines and Fergusson Wild, a member of the William Baird group, opened the Stanhopeburn mine in the northern area.[6]

Potash.—Cleveland Potash Ltd. reported that the service shaft being sunk at its Boulby mine in Yorkshire had reached the potash horizon. The Boulby mine is in an area from which Yorkshire Potash Ltd., a subsidiary of RTZ, and Whitby Potash Ltd. withdrew after finding the potash ore body more complex than first indicated.

Sand and Gravel.—The Institute of Geologic Sciences expressed concern about sand and gravel reserves in the United Kingdom. Approximately 2.5 billion tons have been produced and much of the remaining known reserve is inaccessible. The Institute's principal concern was in the growth of the consumption rate. In 1955 annual production was 60 million tons; in 1973 it was 142 million tons. The problem may be critical in areas of concentrated population. New buildings on land surrounding London have covered 20,000 hectares which contain approximately 1 billion tons of sand and gravel. A government consultive committee suggested use of suitable materials other than natural sand and gravel. One material considered was pulverized ash from coal-fired power stations.

MINERAL FUELS

Coal.—Labor problems continued to plagued the coal producing industry although labor was granted an average pay increase of 20% in February 1972. The coal mining unions continued to plead for exception to wage price controls under stage 2 and 3, and in the last 7 weeks of the

[5] Bly, R.P. Barites in Petroleum Exploration. Industrial Minerals. No. 71, August 1973, pp. 7–23.

[6] Hodge, B.L. World Fluorspar Developments. Part 1, Industrial Minerals, Western Europe. No. 68, May 1973, pp. 17–18.

year refused to work overtime. The unions rejected a pay, fringe-benefit package which could have resulted in a 16½% overall increase in wages. At yearend the labor question had not been resolved.

With the coal miners refusing to work overtime, coal reserves above ground were depleted at such a rate that the Government put most industrial plants on a 3-day work week and asked household consumers to limit their use of electricity. After December 17, large continuous process industries were limited to 65% of normal electric power consumption.

The coal industry also had serious financial problems which stemmed from both labor troubles and price controls. Following the Government's massive monetary support plan announced in 1972, it passed the Coal Industry Act of 1973 which, among other things (1) reduced the book value of the National Coal Board's Assets; (2) provided government grants for social costs and extended the redundant mine workers payment plan; (3) granted financial assistance to meet the cost of extra coal burned at power stations; (4) granted up to £210 million over 3 years to help the Coal Board moderate contraction of the industry; (5) granted funds to cover coking coal production and cost of stocking coal and coke above a certain level, up to the total limit of £85 million over 3 years; and (6) revised provisions as to the Board's and its wholly owned subsidiaries borrowing powers not to exceed £550 million, which can be raised by executive order to £700 million and permitted an accumulated deficit not to exceed £50 million or £100 million by executive order.

Despite internal troubles, foreign trade in coal in 1973 improved over that of 1972. The industry exported 2.7 million tons valued at $32.5 million compared with exports of 1.7 million tons valued at $25.2 million in 1972, and it imported only 1.7 million tons valued at $51.2 million compared with imports of 5 million tons in 1972 valued at $127.4 million. However, the difference in value of both exports and imports was modified by changes in the value of the British pound in relation to the U.S. dollar.

The coal industry seemed to be working its way slowly towards solution of its problems. Productivity and efficiency were increasing. In the last 10 years, output per man-shift at all collieries increased from an average of 32 hundred weight to an average of 46 hundred weight per man-shift. The accident rate at National Coal Board Mines was slightly improved during 1972–73 compared with 1971–72. However, the fatality rate increased from 0.10 per 100,000 man-shifts in 1971–72 to 0.13 per 1,000 man-shifts in 1972–73. The operating loss in 1971–72 was £1.32 per ton while it was only £0.68 per ton in 1972–73. The National Coal Board expended £2.7 million on mining research and development during 1972–73. Most of the research was directed toward improvements in operations at the coal mining face by extending mechanization and eliminating manual work; away from the face by extending transportation facilities to provide more working time at the face and to minimize materials-handling underground.

Petroleum.—A new oilfield in the North Sea, approximately 2 miles east of an earlier discovery was announced by the Halibut group of the United States, British, and Canadian oil companies. The new find confirmed the Thistle Field as having commercial potential and capable of producing in excess of 100,000 barrels per day. The Thistle Field is in the proximity of the Dunlin and Brent Fields which enhances the proposed Brent pipeline to the Shetland Islands.

North Sea oil resources assumed even more significance to the United Kingdom as the Middle East War cut back Arab oil production and a worldwide energy shortage developed. One assessment of likely progress in exploiting the North Sea cited anticipated production to satisfy 20% of the British demand by 1975 and 80% of the demand by 1985.

The Government was active in encouraging development of a domestic oil industry. A council for the development of oil for Scotland was formed to stimulate rapid exploitation of the North Sea in the interest of the United Kingdom as a whole. The Department of Trade and Industry issued guidelines for grants to reduce the cost of credit, for financing purchase of United Kingdom goods and services to companies developing oil and gas resources in the United Kingdom Continental Shelf.[7]

A pipeline from the Ekofisk oilfields in the Norwegian sector of the North Sea to

[7] Department of Trade and Industry, Offshore Supplies Office (London). Offshore Supplies Interest Relief Grants, a Guide for Industry. SWIP 4QJ, Oct. 31, 1973, 6 pp. (4 annexes).

the terminal at Teesside, England, was in the final stages of installation at yearend.

The British Government considered imposing taxes on North Sea oil in response to criticism of its past liberal licensing practices. Inasmuch as the Government was actively attempting to stimulate the North Sea industry and the industry probably will not generate any profits until well into 1975, the Government was in no hurry.

One of the most significant industrial expansion programs undertaken in the United Kingdom in the years since World War II has been that associated with the oil refining industry. In 1947 the annual refining capacity was only 2½ million tons, but at the beginning of 1973 capacity was an estimated 124 million tons; in fact, the growth in refining capacity has exceeded the rate of growth in oil consumption. Therefore, the oil refining industry is well equipped to process all domestic oil production.

The worldwide petroleum shortage was felt in the United Kingdom by the middle of the year. Under a contingency plan the Government distributed oil rationing coupons to all post offices. Controls on exports of gasoline and fuel oils were established on November 12, and the Government informed oil companies doing business in the United Kingdom that the total value of oil exports to countries outside the EC must not exceed the levels of November–December 1972. On November 19 the Government announced mandatory allocation of petroleum products. The petroleum shortage was underscored by the labor problems in the coal industry. At yearend all Government action stemming from the energy crisis was still in force.

The Mineral Industry of Venezuela

By Ronald F. Balazik [1]

The total value of Venezuela's mineral industry production rose to a record high during 1973. Approximately 93% of the crude mineral output value was accounted for by the petroleum and natural gas industry, which also provided about two-thirds of the Government's ordinary revenues and over 90% of the country's total export receipts. About 6% of Venezuela's crude mineral production value was accounted for by iron ore.

During 1973, Venezuela remained the world's third leading petroleum-exporting country, after Saudi Arabia and Iran. Venezuela also retained fifth place among the world's crude-oil-producing nations, following the United States, Saudi Arabia, Iran, and the Soviet Union.

The price of Venezuelan crude oil rose substantially in 1973. Tax reference values, which are used to calculate taxes on petroleum exports, increased 8 times during the year from an average of about $3 per barrel of crude oil to nearly $14.[2] The estimated average delivered cost of Venezuelan crude on the U.S. east coast increased less dramatically but was over $9 per barrel at yearend.

During national elections in December 1973, both major political parties endorsed in principle the concept by which foreign-owned petroleum industry assets would revert to government ownership before 1980. Most concession contracts are scheduled to terminate in 1983–84. The defeated Social Christian Party announced at yearend that it would introduce a congressional bill in 1974 calling for early reversion of foreign-owned petroleum properties.

A new government organization, the Hydrocarbons and Petrochemical Research Foundation (INVEPET), was established by executive decree in August 1973. The foundation was created to carry out technical research in the petroleum and petrochemical industries, train personnel for such industries, and supply technical information and advice required by various government departments.

In 1973, Venezuela became a member of the Andean Pact, a common market agreement between Bolivia, Chile, Colombia, Ecuador, and Peru. Several provisions of the pact have significant implication for Venezuela's mineral industry. Import and export taxes on products such as mineral fertilizers and petrochemicals may be adjusted under the new tariff regulations of the pact. Also, foreign-owned companies are subject to a provision of the pact that limits profit remittances to 14% of invested capital.

Early in 1973, Venezuela began technical exchange programs with Argentina designed to provide mutual assistance in petroleum research activities. Similar programs were established with Chile, Colombia, and Peru in the mining sector. Negotiations were also initiated with Bolivia to begin a technical exchange program in metallurgy.

Venezuelan and Colombian diplomats met in Rome during 1973 to negotiate long-standing disputes between the two countries concerning delimitation of international boundaries in the potentially oil-rich Gulf of Venezuela. Although some points of agreement were reached, settlement of the dispute was not achieved. Additional talks were scheduled to open in Caracas late in the year and reports indicate that the dispute could be placed before the

[1] Geographer, Division of Fossil Fuels—Mineral Supply.

[2] Where necessary, values have been converted from Bolivars (Bs) to U.S. dollars at the rate of Bs 4.50=US$1.00.

Court of International Justice for arbitration.

Representatives of Venezuela and the Netherlands Antilles also met during 1973 to determine offshore boundaries between the two nations. Impetus for the meetings reportedly arose from Venezuelan Government plans to conduct offshore surveys for petroleum in disputed areas. Venezuela's claims for a 12-mile territorial limit are within 3 nautical miles of the Netherlands Antilles.

During 1973, the Ministry of Mines and Hydrocarbons authorized Scintrex Ltd., a Canadian-based firm, to conduct a $570,000 exploration program for base metals in southeastern Venezuela. The program consisted of airborne and ground surveys in a 3,000-square-kilometer area of dense jungle. Exploration was scheduled for completion by yearend.

PRODUCTION

The output of nearly all mineral fuels, particularly coal, which attained a record high, registered increases during 1973. Output levels in other sectors of Venezuela's mineral industry varied. Iron ore production reached an alltime high, but steel and gold output declined.

Table 1.—Venezuela: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]		1971	1972	1973 [p]
METALS				
Aluminum, unalloyed ingot		22,400	23,300	24,000
Gold, mine output	troy ounces	18,567	20,355	19,020
Iron and steel:				
Iron ore and concentrate	thousand tons	[r] 20,240	18,499	23,110
Pig iron	do	515	537	546
Crude steel	do	924	1,127	1,063
NONMETALS				
Cement, hydraulic	do	2,800	2,982	3,413
Diamond:				
Gem:	carats	113,700	139,600	315,100
Industrial	do	385,300	316,700	463,100
Total	do	499,000	456,300	778,200
Fertilizer materials:				
Crude, phosphate rock, marketable		26,000	30,000	30,000
Manufactured, nitrogenous, gross weight		134,189	218,189	233,865
Gypsum [e]		100,000	100,000	100,000
Salt, all types [e]		260,000	260,000	260,000
MINERAL FUELS AND RELATED MATERIALS				
Carbon black [e]		7,500	7,500	8,000
Coal, bituminous		43,400	39,900	49,600
Gas, natural:				
Gross production	million cubic feet	1,680,252	1,625,196	1,745,726
Marketable production	do	368,230	387,723	459,943
Natural gas liquids:				
Condensate	thousand 42-gallon barrels	1,710	1,435	1,174
Natural gasoline	do	5,898	7,244	7,952
Liquefied petroleum gas	do	16,392	20,819	23,382
Total	do	24,000	29,498	32,508
Petroleum:				
Crude	do	1,295,406	1,178,487	1,228,594
Refinery products: [2]				
Aviation gasoline	do	214	194	213
Motor gasoline	do	27,625	30,635	32,030
Naphtha	do	40,393	35,747	37,125
Jet fuel	do	15,485	13,820	16,400
Kerosine	do	4,338	4,163	5,632
Distillate fuel oil	do	57,829	54,156	58,308
Residual fuel oil	do	284,145	248,244	304,229
Liquefied petroleum gas	do	3,569	3,772	3,563
Lubricants	do	3,855	3,641	4,308
Asphalt and bitumen	do	5,970	7,587	5,258
Refinery gas [3]	do	6,026	7,556	7,166
Other	do	3,087	3,148	2,610
Total	do	452,536	412,663	476,842

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

[1] In addition to the commodities listed, lime, sand, gravel, clays, and stone are produced, but information is inadequate to make reliable estimates of output levels.

[2] Includes refinery fuels.

[3] Liquid equivalent.

TRADE

Exports of mineral commodities, particularly crude oil and petroleum products, dominated Venezuela's foreign trade during 1973. The United States was the principal destination of direct petroleum shipments, followed by the Netherlands Antilles. However, almost all of the petroleum shipments to the latter country consisted of crude and unfinished oils destined for processing and export. The processing is completed at two refineries owned by the parent companies of Creole Petroleum Corp. and Shell de Venezuela, Ltd., Venezuela's two largest crude oil producers. In a sense, these refineries are integral parts of Venezuela's petroleum industry.

Exports of crude petroleum and petroleum products from Venezuela, including shipments from the Netherlands Antilles that originated in Venezuela, are shown below by principal areas of destination during 1971–73.

Destination	Exports (thousand 42-gallon barrels)		
	1971	1972	1973
Western Hemisphere:			
Canada	156,042	152,124	136,915
Puerto Rico	89,499	97,864	93,005
Trinidad and Tobago	26,215	14,533	12,933
United States	559,193	543,775	656,609
Other	172,078	160,932	160,872
Total Western Hemisphere	1,003,027	969,228	1,060,334
Eastern Hemisphere:			
Western Europe:			
European Community (EC)	55,901	49,014	48,559
Spain	13,926	12,854	10,476
United Kingdom	75,997	49,103	41,516
Other	28,329	25,339	19,681
Subtotal	174,153	136,310	120,232
Other Eastern Hemisphere	20,861	23,186	50,975
Total Eastern Hemisphere	195,014	159,496	171,207
Grand total	1,198,041	1,128,724	1,231,541

Source: Ministerio de Minas e Hidrocarburos. Memoria y Cuenta, Año 1971, 1972, 1973. Caracas, Venezuela, March 1972, March 1973, and March 1974.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum metal, including alloys:			
Unwrought	10,594	NA	NA.
Semimanufactures	514	NA	NA.
Copper metal, including alloys:			
Scrap	--	NA	NA.
Semimanufactures	9	NA	NA.
Iron and steel:			
Ore and concentrate thousand tons	19,162	[2]16,912	United States 11,101; [3] West Germany 2,605; [3] United Kingdom 1,555; [3] Italy 1,493; [3] France 158. [3]
Metal:			
Pig iron, ferroalloys, similar materials	--		
Steel, primary forms	84,545		
Semimanufactures	4,982		
Zinc metal, including alloys:			
Unwrought	222		
Semimanufactures	68		
NONMETALS			
Barite and witherite	138		
Cement, hydraulic	311,865		
Clays and clay products (including all refractory brick):			
Crude clays:			
Bentonite	2		
Kaolin	102		
Other	249		
Products:			
Nonrefractory	83		
Refractory	160		
Gypsum and plasters	21,950	NA	NA.
Lime	7		
Magnesite	--		
Precious and semiprecious stones, except diamond kilograms	165		
Salt	56,253		
Stone, sand and gravel:			
Dimension stone	r 1,017		
Crushed and broken stone for cement and lime manufacture	4,500		
Sand	1,280		
Sulfur:			
Elemental	84,903		
Sulfuric acid	1,200		
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	760		
Coal and coke, including briquets	--		
Natural gas liquids:			
Natural gasoline thousand 42-gallon barrels	4,608		
Liquefied petroleum gas do	12,440	21,806	NA.
Petroleum:			
Crude and partly refined do	884,575	780,471	Netherlands Antilles 234,523; United States (including Puerto Rico) 207,614; Canada 118,718; United Kingdom 40,822.
Refinery products:			
Gasoline do	1,639	1,712	France 568; Spain 210; United Kingdom 204; Netherlands 191.
Naphtha do	35,875	29,214	United States (including Puerto Rico) 24,417; Netherlands Antilles 2,006; Ecuador 1,635.
Jet fuel do	13,353	10,983	United States (including Puerto Rico) 8,667; Canada 1,053; Netherlands Antilles 211.
Distillate fuel oil do	34,168	34,248	United States (including Puerto Rico) 13,816; Canada 7,041; Netherlands Antilles 2,214.

See footnote at end of table.

Table 2.—Venezuela: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products—Continued			
Residual fuel oil ___ thousand 42-gallon barrels __	267,852	266,318	United States (including Puerto Rico) 208,126; Canada 11,493; Netherlands Antilles 10,398.
Lubricants _____ do ____	2,833	2,721	United Kingdom 1,388; Sweden 438; Peru 171; Malaysia and Singapore 156.
Asphalt _____ do ____	3,492	4,722	United States 4,176; Canada 215; Nigeria 90.
Other _____ do ____	2,112	2,373	Brazil 585; Argentina 509; Mexico 448.

r Revised. NA Not available.

[1] All 1971 data except that on crude oil and petroleum refinery products was derived from official Venezuelan export statistics; all data (1971 and 1972) for crude oil petroleum refinery products was derived from Ministerio de Minas e Hidrocarburos. Memoria y Cuenta 1972, pp. 8–400. Source of other figures are separately footnoted.

[2] Sum of recorded receipts by trading partner countries listed under "Principal destinations, 1972."

[3] Derived from import statistics of listed country.

Table 3.—Venezuela: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Oxide (alumina) and hydroxide ___	31,015	28,664	United States 18,284; Jamaica 9,368.
Metal, including alloys:			
Unwrought _____	38	60	United States 32; United Kingdom 26.
Semimanufactures _____	3,420	3,417	United States 1,806; West Germany 435; France 238.
Antimony metal, including alloys, all forms _____	50	128	United States 94; Netherlands 11.
Arsenic trioxide, pentoxide, acids ____	74	39	West Germany 14; People's Republic of China 11.
Chromite _____	6,972	5,569	All from United States.
Copper:			
Copper sulfate _____	209	121	Belgium-Luxembourg 54; West Germany 28; U.S.S.R. 20.
Metal, including alloys:			
Scrap _____	54	--	
Unwrought _____	724	265	United States 106; Belgium-Luxembourg 100.
Semimanufactures _____	6,986	10,471	United States 3,652; Canada 2,121; Belgium-Luxembourg 1,161.
Gold metal, worked or partly worked troy ounces __	2,347	3,633	West Germany 1,318; United States 772; Switzerland 772.
Iron and steel:			
Ore and concentrate _____	30	85	Mainly from United States.
Metal:			
Scrap _____	202,406	292,437	United States 264,538.
Pig iron, ferralloys, similar materials _____	16,722	33,602	Brazil 15,567; Czechoslovakia 10,171; Norway 2,714.
Steel, primary forms _____	9,824	1,014	Japan 283; West Germany 277; United States 261.
Semimanufactures:			
Bars, rods, angles, shapes, sections _____	34,193	42,556	West Germany 14,668; Belgium-Luxembourg 11,615; United States 6,587.
Universals, plates, sheets:			
Uncoated _____	317,200	367,872	Japan 290,429; West Germany 28,602; United States 27,351.
Coated _____	105,392	133,364	Japan 72,327; France 28,507; Canada 10,422.
Hoop and strip _____	3,493	3,923	Japan 1,869; United States 548; United Kingdom 488.
Rails and accessories _____	2,621	3,201	Mainly from United States.
Wire _____	39,863	60,592	United States 40,803; Japan 11,376; West Germany 4,010.
Tubes, pipes, fittings ____	r 75,762	33,021	United States 17,579; Japan 6,236; United Kingdom 1,986.
Other _____	1,846	2,055	United States 1,038; Canada 275; Mexico 257.

See footnote at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Lead metal, including alloys, all forms	4,142	3,646	Mexico 2,275; United States 390; Peru 364.
Mercury 76-pound flasks	207	156	Mexico 55; West Germany 44; United States 34.
Nickel metal, including alloys, all forms	95	113	United States 46; Canada 31; West Germany 19.
Platinum-group metals, including alloys, all forms troy ounces	3,022	2,604	United States 1,286; United Kingdom 772.
Silver metal, including alloys do	193,708	393,975	West Germany 139,438; United States 137,155; Italy 73,529.
Tin metal, including alloys, all forms long tons	183	207	United Kingdom 70; United States 33; Brazil 25.
Titanium oxide	6,303	6,320	United Kingdom 2,847; Belgium-Luxembourg 1,483; Finland 688.
Zinc:			
Unwrought	9,727	11,062	Mexico 3,102; Canada 2,850; Belgium-Luxembourg 2,254; France 1,445.
Semimanufactures	189	557	Japan 390; United States 88; Belgium-Luxembourg 70.
Other:			
Ore and concentrate	400	443	Mainly from United States.
Ash and residue containing nonferrous metals	31	2,714	United States 1,158; Panamá 766; Barbados 145.
Metals, including alloys, all forms	274	243	United States 170; Norway 45.
NONMETALS			
Abrasives, natural, n.e.s:			
Pumice, emery, natural corundum, etc	444	633	United States 235; West Germany 190; Austria 183.
Grinding and polishing wheels and stones	548	510	United States 130; Switzerland 101; Norway 92; Italy 82.
Asbestos	8,022	6,692	Canada 4,202; Africa (country not specified) 2,362.
Barite	8,929	29,463	Peru 11,548; United Kingdom 10,363; Brazil 7,541.
Boron materials, salts	1,674	1,734	Belgium-Luxembourg 576; United Kingdom 557; United States 543.
Cement	1,062	1,245	West Germany 650; France 298; United States 286.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s:			
Bentonite	11,774	11,128	Mainly from United States.
Fuller's earth	176	92	United Kingdom 54; West Germany 25; United States 12.
Kaolin	8,882	10,311	United States 8,095; United Kingdom 1,793.
Other clays and earth	12,446	14,575	United States 6,871; Guyana 5,841; United Kingdom 1,633.
Products:			
Refractory (including nonclay brick)	3,150	1,666	United States 1,354.
Nonrefractory	463	891	Italy 310; Colombia 270; Spain 164.
Cryolite and chiolite	631	1,386	United States 1,062; Italy 310.
Diamond, industrial thousand carats	5,050	65	United States 45; Spain 20.
Diatomite and other infusorial earth	2,373	2,553	United States 1,428; Mexico 996.
Feldspar	1,366	680	United States 587; Mexico 92.
Fertilizer materials, manufactured:			
Nitrogenous	121,523	71,644	Belgium-Luxembourg 25,180; West Germany 17,366; Netherlands 15,050.
Phosphatic	19,153	--	
Potassic	32,396	8,799	France 4,400; United States 4,399.
Other, including mixed	5,007	52	Mainly from France.
Fluorspar	4,293	725	Colombia 503; Mexico 121.
Graphite, natural	242	251	United States 226.
Gypsum and plasters	357	429	West Germany 189; United States 129; United Kingdom 102.
Iodine	5	5	United Kingdom 1; West Germany 1.
Lime	16	(1)	All from United States.
Magnesite	285	6	All from Austria.

See footnote at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Mica:			
Crude, including splittings and waste	385	479	Mainly from United States.
Worked, including agglomerated splittings	15	4	United States 1; Italy 1.
Pigments, mineral:			
Natural, crude kilograms	1,237	47,484	United States 42,678; Spain 2,520.
Iron oxides, processed	149	372	United Kingdom 271; United States 49; Spain 43.
Precious and semiprecious stones, except diamond, natural and synthetic:			
Uncut kilograms	13	191	Brazil 107; West Germany 25.
Cut do	309	359	West Germany 71; Italy 42; Colombia 35.
Salt	32	39	United States 30; West Germany 8.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	28,558	27,514	United States 25,495; Netherlands 2,007.
Caustic potash, sodic and potassic peroxides	38,184	42,294	Mainly from United States.
Stone, sand and gravel:			
Dimension, crude and worked	5,189	4,029	Italy 2,219; Norway 752; Portugal 478.
Gravel and crushed stone	43,976	42,662	Mainly from United States.
Quartz	233	19	Netherlands 6; West Germany 5.
Sand	1,641	429	France 288; United States 86; Sweden 47.
Sulfur:			
Elemental:			
Other than colloidal	15	30	All from Belgium-Luxembourg.
Colloidal	22,838	801	Belgium-Luxembourg 416; United States 266.
Sulfuric acid	43	10,357	Mainly from United States.
Talc and steatite	7,904	7,309	United States 4,209; Italy 1,731.
Other nonmetals, n.e.s.:			
Crude:			
Vermiculite	488	426	Unitel States 336; Africa (country not specified) 90.
Mineral substance, n.e.s	2,318	1,116	United States 499; Mexico 253; Japan 214.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	2,921	1,368	United States 727; Japan 316; Spain 144.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	50	14	United States 12; West Germany 2.
Carbon black	658	597	United States 345; Japan 139; Canada 81.
Coal, all grades, including briquets	74,815	180,587	Japan 167,689; United States 12,639.
Coke and semicoke of coal and lignite	157,626	170,806	Norway 64,992; Australia 47,344; United States 25,393.
Natural gas liquids:			
Natural gasoline 42-gallon barrels	961	162	All from United Kingdom.
Other do	r 28	58	Sweden 26; Netherlands 19.
Petroleum:			
Crude and partly refined do	r 11	(1)	All from United States.
Refinery products:			
Gasoline do	45,815	43,092	United States 35,895; United Kingdom 6,731.
Kerosine do	r 856	765	Netherlands 396; United States 369.
Jet fuel do	--	(1)	All from United States.
Distillate fuel oil do	--	(1)	Do.
Lubricants do	39,520	40,793	United States 33,200.
Other:			
Mineral jelly and was (including petrolatum) do	32,031	41,538	United States 17,269; Colombia 15,740.
Solvents do	157,661	11,993	Mainly from United States.
Unspecified do	78,694	157,145	United States 142,381; Netherlands 11,171.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	10,976	16,129	United States 10,840; Colombia 4,030.

r Revised.
1 Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—During 1973, Venezuela's only operating aluminum smelter, located at Mantanzas near Puerto Ordaz in the Guyana District, doubled its capacity to 50,000 tons per year. The plant is operated by Aluminio del Caroni, S.A. (ALCASA), equally owned by Reynolds Metals Co. and Corporación Venezolana de Guyana (CVG), a government entity. Plans call for eventual expansion to 200,000 tons per year, with power for the expansion coming from a CVG hydroelectric plant under construction at Guri on the Caroni River. Mitsubishi Aluminum Co. Ltd. and Mitsubishi Corp., of Japan, were planning to invest in the expansion program.

Also in 1973, CVG formed a joint concern with three Japanese firms to build and operate Venezuela's second aluminum smelter, a 75,000-ton-per-year facility in the vicinity of Puerto Ordaz. CVG holds a 20% interest in the joint concern, which is known as Industrial Venezolana de Aluminio C.A. The Japanese partners are Kobe Steel Ltd., 35%; Showa Denko Co. Ltd., 35%; and Marubeni Corp., 10%. Construction was scheduled to begin by yearend with initial production expected by 1977. The Aluminum Company of America (Alcoa) has provisionally agreed to supply the plant with alumina at a rate of 30,000 tons per year for 30 years. The entire output of aluminum ingot will be exported to Japan. Continued expansion of facilities is scheduled to increase annual production to 150,000 tons by 1979. Power is to be supplied by the hydroelectric plant under construction at Guri. Cost of the smelter is estimated at $180 million.

At yearend, ALCASA and several affiliates of the Mitsubishi and Sumitomo companies in Japan were planning the construction of a third aluminum smelter in Venezuela. The proposed facility, which is to be located adjacent to the existing ALCASA smelter, has a projected annual capacity of 280,000 tons per year and is scheduled for completion by 1977. ALCASA will own 50% of the smelter and receive half of the metal produced. Power for the plant, estimated to cost $300 million, will come from CVG's Guri hydroelectric project.

Gold.—In 1973 Compañia General de Mineria de Venezuela (MINERVEN), a joint-venture company owned by CVG and private investors, formulated plans to expand production at its El Callao gold mine in Bolivar state. The El Callao properties were once the site of large-scale gold mining before rising costs halted significant activity in the early 1950's. The planned rehabilitation program, scheduled for completion in 1976, will raise milling capacity fourfold to 700 tons per day at a cost of about $9.5 million. Design, supply, and management contracts for the project, which includes new skip-winding equipment and a concentrator, were awarded to Head Wrightson, of Great Britain. Gold will be recovered by cyanidation and amalgamation with an expected yield of 22 grams per ton.

Nord Resources Corp., a U.S. firm, announced in 1973 that it had exercised its exploration option at the Nueva Corazon de Jesus gold property in the El Dorado District of Venezuela. The option involves mining rights to 455 hectares, and the company has applied for 8 additional concessions totaling about 3,600 hectares. Prospecting in the initial concession area has indicated the existance of a gold-bearing quartz and quartz-aplite vein 275 meters in strike length and about one-half meter in average width. The vein has been opened by three prospect shafts, each 45 meters deep. Assays taken across the vein show an average grade of 1.5 ounces per ton. Nord was scheduled to have a 50-ton-per-day mill begin operating in 1974 to evaluate gold recovery from the vein.

Iron and Steel.—Venezuela's iron ore production rose 25% to a record output of 23.1 million tons in 1973. This growth reflected increased demand for iron ore by foreign markets.

Almost all of Venezuela's iron ore output was produced by the Orinoco Mining Co. (a subsidiary of the United States Steel Corp.), which accounted for 81%, and Iron Mines Co. of Venezuela (a subsidiary of Bethlehem Steel Corp.), which accounted for 18%. The remaining output was produced at the San Isidro deposits near Ciudad Piar. Nearly all of the output was exported, primarily to the United

States, which received 63% of the shipments. Domestic consumption was accounted for by Siderúrgica del Orinoco S.A. (SIDOR), a subsidiary of CVG, which obtains the bulk of its iron ore supply from the San Isidro deposits.

During 1973, work was begun in Bolivar state on the world's first commercial iron ore reduction plant utilizing a new process developed by Exxon Research and Engineering Co. The process produces prereduced iron from high-grade iron ore fines in a fluid-bed process using a gaseous reducing agent. The reduced particles are normally compacted into uniform, high-density briquets for direct use in steelmaking furnaces. The plant will have an annual output of 400,000 tons, and was scheduled for completion by mid-1975 at a cost of $20 million to $50 million. Plant operations will be directed by FIOR de Venezuela, which is owned by CVG, the Luken Steel Co. (United States), and private Venezuelan interests. Arthur G. McKee and Co. (United States) will design and build the plant.

In October 1973, following several test runs, the Orinoco Mining Co. inaugurated its 1-million-ton-per-year iron ore briquetting plant at Puerto Ordaz. Built at a cost of $100 million, the plant upgrades ore to an 86.5% iron content. The plant was inaugurated along with a new iron ore crushing, drying, and screening complex that was completed in September 1973 at a cost of $25 million. The facility is designed to produce 1.5-inch, high-quality blast furnace feed and sinter feed at an annual rate of up to 14 million tons.

During 1973, CVG formulated plans to construct an iron ore reduction plant with a capacity of 400,000 tons per year. Discussions concerning construction of the plant were initiated with Finsider, an Italian firm, but no final agreements were reached by yearend. Cost of the plant is estimated to be $27 million.

Venezuela's entire production of pig iron in 1973 was accounted for by SIDOR, which also produced the bulk of the country's crude steel. The only other producer of crude steel in the country was Siderúrgica Venezolana S.A. (SIVENSA), a private firm.

Nickel.—Negotiations for the development of the nickel deposits at Loma de Hierro in the states of Aragua and Miranda reached an impasse in 1973 after the Venezuelan Congress declined to take action on a bill authorizing the project. The development scheme submitted to the Congress would have been carried out by a joint venture entity in which the Government owned 51% interest and Société Le Nickel (France) held the remaining 49% share. Several U.S. firms indicated a renewed interest in the deposits following the congressional rejection of Le Nickel's development proposal. Reserves at Loma de Hierro have been estimated at 38 million tons (dry) of laterite and serpentine ores with an average nickel content of 1.6%.

NONMETALS

Cement.—Venezuela's largest cement producer, C.A. Venezolana de Cementos, virtually completed construction of its fourth cement plant in 1973. The plant is automated and will have an annual output of 5 million barrels when fully operational. Up to half of this annual capacity is destined for export to the United States under a long-term contract with the Ideal Cement Co.

Fertilizer Materials.—The first ammonia and urea plants completed at the El Tablazo petrochemical complex came onstream in June 1973. At yearend, a second ammonia plant was beginning production, and another urea plant was nearly completed. These plants comprise a $200 million petrochemical fertilizer project designed to produce 594,000 tons of ammonia and 792,000 tons of urea annually.

The plants are operated by Venezolana de Nitrógen (NITROVEN), a joint-venture firm owned 50% by Instituto Venezolano de Petroquimica (I.V.P.), a government entity; 40% by International Development and Investment, a U.S. and European consortuim; and 10% by Petroquímica del Atlantico of Colombia. All production is scheduled for foreign markets and exports were underway by yearend. Shipments have been contracted for the United States, Brazil, Mexico, and the People's Republic of China.

Planning for an additional ammonia production facility at El Tablazo also was underway during 1973. The plant will have a capacity of 600,000 tons per year, all for export, and was scheduled for completion in late 1975. Plant operations are to be

conducted by Maramonia C.A., a joint-venture company composed of I.V.P. (51%) and Grupo Internacional Transammonia de U.S.A. (49%).

Work continued on a sodium tripolyphosphate plant at the Morón petrochemical complex during 1973. The plant has a planned capacity of 20,000 tons and was scheduled to be onstream by early 1975. Total cost of this I.V.P. facility is estimated at $5 million.

Silicon.—Negotiations to build a 30,000-ton-per-year silicon plant were conducted in 1973 by the Government and Sumitomo Shoji Kaisha (Japan). Full output was scheduled for mid-1975, but an additional 30,000- to 35,000-kilowatt-ampere furnace will be added to raise the annual production rate to 50,000 tons by 1977. Venezuela's domestic market reportedly will be given priority over the Japanese for the silicon produced.

MINERAL FUELS

Coal.—Coal production increased 24% in 1973 to 49,600 tons, the largest annual coal output in Venezuelan history. All production was from the state of Táchira, and nearly three-fourths of the total was accounted for by one company, C. A. Minas de Carbón de Lobatera.

During 1973, the Government continued to prepare for the development of the Guasare coal deposits in the state of Zulia. Corporación Desarrollo de la Region Zuliana (CORPOZULIA), a state concern, held negotiations with private interests (probably British) to form an equal investment partnership for development of the deposits, principally for export. The Government estimated that the deposits have an export potential of 6 million tons per year. Development is expected to take 3 years and cost approximately $4.5 million.

Also during 1973, the Comptroller General's office canceled a contract with private Venezuelan, British, and Spanish interests that were planning to reopen the Naricual coal mines near Puerto La Cruz. Plans had called for developing the mines to an annual output of at least 450,000 tons, primarily to supply SIDOR's iron and steel plant at Ciudad Guayana. At yearend, the Government was proceeding with alternate plans to reactivate the mines.

Petroleum and Natural Gas.—In response to increased prices and demand, Venezuelan crude oil production reversed a 2-year decline and rose 4% to 3,366,011 barrels per day in 1973. Medium crudes (22.1° to 30° API) accounted for approximately 53% of total output; light crudes (over 30° API), 26%; and heavy crudes (under 22.1° API), 21%.

Natural gas production, almost 99% from oilfields, increased over 7% to 4,783 million cubic feet per day during 1973. The output of natural gas liquids rose more than 10%, principally from natural gas processing facilities in the Lake Maracaibo area.

Table 4.—Venezuela: Salient statistics of the petroleum and natural gas industry

	1971	1972	1973[p]
Crude oil:			
Production ____ thousand 42-gallon barrels __	1,295,406	1,178,487	1,228,594
Processed at refineries ____ do ____	454,799	411,828	474,387
Exports [1] ____ do ____	844,575	780,471	775,092
Natural gas:			
Production ____ million cubic feet __	1,680,252	1,625,196	1,745,726
Sales ____ do ____	134,480	[r]150,513	194,656
Producers' fuel ____ do ____	196,281	[r]185,828	204,509
Shrinkage due to extraction of natural gas liquids ____ do ____	37,469	[r]51,383	60,777
Field injection ____ do ____	741,121	724,452	769,514
Flared or otherwise lost ____ do ____	570,901	513,021	516,270
Natural gas liquids:			
Production ____ thousand 42-gallon barrels __	24,000	29,498	32,508
Exports ____ do ____	17,048	21,806	25,811
Refinery products:			
Refinery output [2] ____ do ____	452,536	412,663	476,842
Consumption ____ do ____	57,768	[r]65,081	71,622
International bunkers ____ do ____	19,196	[r]18,400	20,180
Exports ____ do ____	361,324	352,291	392,168

[p] Preliminary. [r] Revised.
[1] Includes refined or partly refined products blended with crude oil.
[2] Includes refinery fuel.

Source: Ministerio de Minas e Hidrocarburos. Memoria y Cuenta, Año 1971, 1972, 1973. Caracas, Venezuela, March 1972, March 1973, and March 1974.

Proved reserves of crude oil increased by about 24 million barrels to a reported total of 13,947 million barrels at yearend 1973. As of the same date, natural gas reserves totaled 40,105 billion cubic feet, approximately 1 billion cubic feet more than the revised 1972 yearend figure. The increase in both oil and gas reserves resulted primarily from the upward revision of the quantities recoverable from producing fields. Almost 97% of total proved gas reserves at the end of 1973 was accounted for by dissolved and associated gas; the remainder was nonassociated.

Geophysical exploration, exploration development, and injection drilling activities during 1973 follow:

	1971	1972	1973
Geophysical exploration:			
Gravimetric and magnetic surveying ____ party months___	0.3	3.0	--
Seismic surveying ____ do ____	23.3	33.0	28.8
Structural drilling ____ do ____	9.7	5.2	8.1
Total ____ do ____	33.3	41.2	36.9
Drilling:			
Wells drilled:			
Exploratory:			
Oil [1] ____ number___	137	117	103
Dry ____ do ____	29	53	45
Total exploratory wells ____ do ____	166	170	148
Development:			
Oil ____ do ____	424	318	261
Dry ____ do ____	12	11	12
Total development wells ____ do ____	436	329	273
Injection ____ do ____	2	27	7
Total wells drilled ____ do ____	604	526	428
Footage drilled ____ thousand feet __	4,115	3,585	3,281

[1] May include wells in which both crude oil and nonassociated natural gas were discovered in separate zones.

Source: Ministerio de Minas e Hidrocarburos. Memoria y Cuenta, Año 1971, 1972, and 1973. Caracas, Venezuela, March 1972, March 1973, and March 1974.

The Ministry of Mines and Corporación Venezolano de Petróleo (C.V.P.), the Government oil company, began expanded exploration of the Orinoco heavy-oil belt during 1973. Seismic surveys were continued, and a drilling program of 200 stratigraphic wells was initiated to define the amounts and types of oil present in the belt. By yearend, 16 wells had been completed, and planning for 32 more was underway for 1974. In addition, the Government reportedly held preliminary discussions with foreign interests concerning mutual development of the belt, which is estimated to contain 700 billion barrels of oil. Early surveys indicate reserves of 6° to 14° gravity oil, which contains over 4% sulfur and are highly laden with vanadium (450 parts per million) and nickel. Pay zones are in sand reservoirs from 1,000 to 4,000 feet deep, and generally have an average thickness that exceeds 300 feet. However, only about 10% of the reserves are recoverable with present technologies. Although increasing oil prices may encourage earlier development, production is not planned before 1980.

C.V.P. continued offshore exploration programs in several areas during 1973. Rowan Companies Inc., a U.S. drilling firm under contract to C.V.P., made at least one oil find in the La Vela embayment east of the Paraguana Penisula. The Government estimated that the La Vela exploration area contains reserves of 1.5 billion barrels of light oil. C.V.P. also solicited bids in 1973 to drill offshore in the Gulfo Triste of eastern Venezuela. Five wells are to be drilled in water depths of 100 feet to 225 feet.

A 3-year oil exploration program in the southern part of Lake Maracaibo continued during 1973. The program began in 1971 when C.V.P. granted service contracts for five 50,000-hectare concession blocks to Occidental Petroleum Corp., Shell Sur del Lago, C.A. (SURCO), and Mobil de Maracaibo. SURCO and Mobil resumed drilling activities with little success following suspension of exploration in late 1972. However, Occidental announced two potentially commercial oil and gas finds. One of the discoveries was made at 18,020 feet, the deepest strike in Venezuela. Preparations for drilling to determine the commercial value of the two finds were underway at yearend.

The capacity of natural gas injection facilities increased 125 million cubic feet per day to a total of 3,932 million cubic feet per day in 1973. Gas injection during the year was at a daily average rate of 2,156 million cubic feet. Water injection capacity rose 154,500 barrels per day to a total of 2,994,000 barrels per day by yearend 1973, and the average injection rate during the year was 2,108,000 barrels per day.

C.V.P. awarded design and supervisor contracts during 1973 for a planned liquefied natural gas (LNG) plant at Punta de Palmas near Maracaibo. Companies selected to submit design plans for plant facilities included Procon Inc. (United States), and a Venezuelan firm. Another U.S. company, John J. McMullen Associates, Inc., was hired as a consultant to advise C.V.P. on matters concerning the proposed transportation of LNG to the United States. Plans called for the plant to liquefy more than 600 million cubic feet of gas per day; the gas is presently being flared. Production principally was intended for export, but also was to include approximately 35,000 barrels per day of byproducts for the El Tablazo petrochemical complex. The project was scheduled for completion by 1977 at a cost of about $300 million, including construction of a sea terminal. The Ministry of finance introduced a public credit bill in Congress to finance construction of the project and to purchase or lease three methane tankers. However, financial support for the project was jeopardized at yearend after Congress adjourned without passing the bill.

C.V.P. continued construction of an $11 million liquefied petroleum gas (LPG) plant at El Tablazo during 1973. The plant was scheduled to produce a small initial output of butane, propane, and gasoline by yearend. Plans call for a total annual production of 75,000 barrels per day by 1978.

The total length of crude oil and natural gas pipelines in service increased 30 and 79 kilometers, respectively, during 1973, but refined product lines remained the same length. Data on the length of pipelines in operation at yearend 1973 follow:

Type of line	Total length (kilometers)
Crude oil:	
Trunk	3,359
Secondary	2,846
Total crude oil	6,205
Refined products	512
Natural gas	2,979
Grand total	9,696

Source: Ministerio de Minas e Hidrocarburos. Memoria y Cuenta, Año 1973. Caracas, Venezuela, March 1974.

During 1973, the Ministry of Mines and Hydrocarbons initiated a study to establish, a nationwide multipipeline network for refined petroleum products. The study was given impetus by a law enacted in June 1973, which reserved for C.V.P. the sole authority to supply refined products for domestic markets.

A total of 16 petroleum tanker terminals were active in the exportation of crude oil and refinery products during 1973. Of these, the three operated by Creole Petroleum Corp. accounted for 43% of all shipments, and the three operated by Cia. Shell de Venezuela, Ltd. loaded 30%.

Venezuela's first two government-owned oil tankers, the *Independencia I* and *Independenica II,* were launched in Italy during 1973. Each tanker has a capacity of 37,000 cubic meters of crude oil or refined products and cost $14.5 million. C.V.P. owns the tankers and plans to build or buy seven 60,000- to 80,000-ton tankers in the next 5 years at a cost of $110 million. Prior to the purchase of the two new tankers, all 12 Venezuelan-flag tankers were owned by Exxon Corp. and Shell Oil Corp. The new tankers are part of a 15-year program developed under the country's new merchant marine law which seeks a 50% share of the oil export transportation business. The law sets no timetables, but calls for an initial step in which 10% of oil exports are hauled by Venezuelan-registered tankers that are at least 80% Venezuelan-owned. Completion of the plan would raise present tanker fleet tonnage 1.5 million tons.

Several petrochemical projects in addition to those previously noted under "Fertilizer Materials" were planned, under construction, or completed during 1973. A 12,000-ton-per-year polystyrene plant operated by Estireno del Zulia C.A. (ESTIZULIA) began limited production in April at El Tablazo. ESTIZULIA is comprised of Group del Zulia C.A., a group of local investors (37.5%); I.V.P. (37.5%); and Dart Drugs Inc., of the United States (25%). Over 90% of the plant's output is destined for domestic use.

Construction continued at El Tablazo on an olefins plant and a chloro-soda plant, both scheduled to be onstream by mid-1974. The olefins plant, 90% complete by yearend, is designed to produce ethylene and propylene at an annual rate of 150,000 tons and 94,000 tons, respectively. The chloro-soda plant is to have an annual capacity of 35,000 tons of chlorine and 39,200 tons of caustic soda. I.V.P. and other government agencies have borne the entire cost of these facilities.

Ground breaking for a low-density polyethylene plant at El Tablazo occured in September 1973. The plant is designed to produce 50,000 tons per year and was scheduled to be completed by early 1975. Plant operations will be the responsibility of Polimeros del Lago (POLILAGO), a consortuim of Grupo Zuliano (30%), Ethylene Plastique (30%), and I.V.P. (40%). Plans also called for a high-density polyethylene installation, but the particulars of the venture were not announced.

Two other projects for El Tablazo were in the planning stage during 1973. The first, a polyvinyl chloride resins plant, was designed by a French subsidiary of Badger Co., of Cambridge, Mass. The facility has a planned annual capacity of 45,000 tons and was scheduled for completion by early 1976. Plant operations will be carried out by Plásticos Petroqúimica, C.A., a joint venture firm owned by I.V.P. (59%), B. F. Goodrich Co. (25%), and Empresa Nacional de Salinas (16%). The second planned project is a facility to produce 178,000 tons of methanol and 95,000 tons of polyisoprene annually. Owner of the plant will be Elastomeros Internacionales C.A. (ELASIN), an equal partnership of I.V.P. and Grupo del Centro C.A. The plant is to be built at a cost of $100 million.

Over 60% of all infrastructure facilities at El Tablazo was completed by yearend 1973. Three loading docks, one for LPG, and a facility for passenger launches were completed. A 15-megawatt generator was operating by yearend at the power and

steam-generating plant, which is being installed by the state power agency. The plant is designed to have a total output of 110 megawatts and was planned for completion in 1974. The waste disposal system and the water, gas, and liquids distribution systems are completed but were not fully operational.

At the Morón petrochemical complex, four facilities in addition to those noted under "Fertilizer Materials" were planned or under construction during 1973. Construction continued on a 6,000-ton-per-year flouromethane plant to be operated by Productos Halogenos de Venezuela, C.A. (PRODUVEN), partly owned by I.V.P. Project completion was scheduled for late 1974.

An aluminum sulfate plant with an annual capacity of 25,000 tons was also under construction at Morón in 1973. The installation is owned by Ferro-Aluminio C.A. (FERRALCA, C.A.), a firm with I.V.P. as a 55% partner and Grupo Hurtado with the remaining 45% share. Construction was scheduled to be finished by late 1974.

The projects planned for Morón included a 20,000-ton-per-year ethylene and propylene glycoles plant (I.V.P. and Corporación Industrial Montana) and a 20,000-ton-per-year solprene-butadiene and polybutadiene plant (I.V.P. and others to be selected). Both plants were scheduled to be completed by late 1975.

Table 5.—Venezuela: Distribution of landholdings, crude oil production, and refining capacity, in 1973, by company

Company	Principal ownership or affiliation	Nationality of ownership	Concessions [1] and assignations [2] as of Dec. 31, 1973 (hectares)	Crude oil production (thousand 42-gallon barrels)	Refining capacity as of Dec. 31, 1973 (thousand 42-gallon barrels daily)
PRIVATE					
Amoco Venezuelan Oil Co	Standard Oil Co. (Indiana).	United States	5,500	11,224	--
Caracas Petroleum, S.A.	Ultramar Co., Ltd.	British	27,712	3,872	--
Charter Venezuelan Petroleum Co.	Charter Oil Co	United States	7,000	5,342	--
Chevron Oil Co. de Venezuela, S.A.	Standard Oil Co. of Calif.	do	77,863	16,798	62
Cia. Shell de Venezuela, Ltd	Royal Dutch/ Shell Group.	British/Dutch	295,680	289,313	404
Continental Oil Co. of Venezuela.	Continental Oil Co.	United States	797	4,213	--
Coro Petroleum Co	Texaco, Inc	do	55,865	2,278	--
Creole Petroleum Corp	Exxon Corp	do	580,262	553,010	740
International Petroleum (Venezuela), Ltd.	do	do	6,133	--	--
Mene Grande Oil Co., C.A.	Gulf Oil Corp	do	593,748	152,883	--
Mito Juan Concesionaria de Hidrocarburos, C.A.	Venezuelan investors.	Venezuelan	33,775	1,159	--
Mobil Oil de Venezuela	Mobil Oil Corp	United States	144,054	29,362	106
Phillips Petroleum Co	Phillips Petroleum Co.	do	39,447	16,597	4
Sinclair Venezuela Oil Co	Atlantic Richfield Co.	do	39,082	10,111	45
Sociedad Anónima Petrolera Las Mercedes.	Texaco, Inc., and Ultramar Co., Ltd.	United States/ British.	89,209	704	--
Talón Petroleum Co., C. A.	Kirby Petroleum Co.	United States	60,167	1,204	--
Texaco Maracaibo, Inc	Texaco Inc	do	3,147	19,743	--
Texas Petroleum Co	do	do	109,907	15,195	10
Venezuelan Atlantic Refining Co.	Atlantic Richfield Co.	do	19,337	734	--
Venezulean Gulf Refining Co	Gulf Oil Corp	do	--	--	159
Venezuelan Sun Oil Co	Sun Oil Co	do	20,000	64,748	--
Total private companies			2,208,685	1,198,490	1,530
VENEZUELAN GOVERNMENT					
Corporación Venezolana de Petróles (C.V.P.)			1,179,338	30,104	25
Grand total			3,388,023	1,228,594	1,555

[1] To private companies.
[2] To the Government.
Source: Ministerio de Minas e Hidrocarburos. Memoria y Cuenta. Año 1973, Caracas, Venezuela, March 1974.

The Mineral Industry of Yugoslavia

By Roman V. Sondermayer [1]

During 1973 Yugoslavia remained one of the leading European producers of nonferrous ores and metals. Bauxite, copper, byproduct gold, selenium, germanium, lead, zinc, bismuth, cadmium, silver, mercury, barite, feldspar, cement, coal, petroleum, and pyrite were among the more important minerals produced in the country. However, only bauxite, copper, lead, zinc, and mercury were of world significance. Iron and steel output continued below demand. Consequently, imports of large quantities of iron and steel semimanufactures were required. Crude oil output was minor by world standards and was inadequate to meet demand. About 63% of refinery throughput was imported. Coal production, mostly lignite and brown coal, increased in 1973. However, imports of high-rank coals and coke remained a necessity. A power shortage adversely influenced mineral production during 1973.

There was a number of new mineral developments during 1973. Construction started on alumina plants at Obrovac in Dalmatia and at Vlasenica in Bosnia, and on a new aluminum plant at Mostar. Production started at an aluminum plant at Sibenik. A new lead and zinc smelter went onstream at Titov Veles in Macedonia. Renovation of some iron and steel plants continued. Organization of an enterprise to construct a new Adriatic-Central Europe trunk pipeline was completed. Construction started on a natural gas distributing pipeline system in Serbia. New cement plants were under construction at Kosjerić in Serbia, and at Lukavac and Kakanj in Bosnia. A construction contract for the first nuclear powerplant in the country, located at Krsko, was awarded to Westinghouse Electric Corp. of the United States.

PRODUCTION

Mineral producers continued to direct their efforts toward renovation of existing facilities and construction of new plants. Although investments in building new facilities, and expanding and renovating existing processing facilites were predominant, a shift in the channeling of available capital toward mine expansion was apparent. Shortages of ores and concentrates forced the change. Mechanization and automation in both mining and processing continued during 1973.

Labor shortages continued in mines. Working conditions and low pay were cited as the main reasons for labor desertion from mines.

Modern and efficient methods prevailed in petroleum exploration, production, and refining. All three primary methods of oil production—flowing, pumping, and gas lift—were used; dual completion was used at some wells, and secondary recovery at some older fields. Chemical and hydraulic methods for stimulating gas and oil production were everyday practices in the oilfields of Yugoslavia during 1973.

[1] Physical scientist, Division of Nonferrous Metals—Mineral Supply.

Table 1.—Yugoslavia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Aluminum:			
Bauxite, gross weight ---thousand tons--	1,958	2,197	2,167
Alumina, gross weight	123,370	126,027	[e] 175,000
Ingot, including secondary	46,584	72,716	90,845
Antimony:			
Mine output, metal content	2,002	1,975	[e] 1,700
Metal (regulus)	1,381	1,744	1,999
Bismuth, smelter output	92	89	55
Cadmium, smelter output [e]	140	140	150
Chromium, chromite, gross weight	34,319	28,137	3,760
Copper:			
Mine output, metal content	94,392	103,133	[e] 123,000
Blister:			
Primary	111,304	149,047	[e] 154,000
Secondary	1,937	1,464	[e] 1,500
Refined (electrolytic):			
Primary	90,501	128,611	133,659
Secondary	2,075	1,363	3,811
Gold ---troy ounces--	123,780	136,898	145,000
Iron and steel:			
Iron ore, gross weight ---thousand tons--	3,724	3,960	4,760
Pig iron ---do---	1,514	1,819	1,955
Ferroalloys ---do---	116	131	154
Crude steel ---do---	2,453	2,588	2,676
Semimanufactures ---do---	[r] 1,855	1,920	2,042
Lead:			
Mine output, metal content	124,347	120,173	[e] 124,000
Metal:			
Smelter, crude, including secondary	118,748	102,164	[e] 114,000
Refined, including secondary	99,139	87,496	98,033
Manganese ore and concentrate, gross weight	16,113	15,340	9,718
Mercury ---76-pound flasks--	16,593	16,419	15,606
Selenium, elemental ---kilograms--	24,320	40,880	[e] 42,500
Silver, refined, including secondary ---thousand troy ounces--	3,354	3,582	4,302
Zinc:			
Mine output, metal content	98,694	96,731	[e] 100,000
Smelter, including secondary	53,109	48,641	55,176
NONMETALS			
Asbestos	15,432	11,040	9,391
Barite	64,690	70,528	[e] 75,000
Cement, hydraulic ---thousand tons--	4,954	5,571	6,206
Clays:			
Crude fire clay	282,503	335,604	NA
Calcined fire clay	69,726	95,750	NA
Feldspar, crude	53,617	48,335	[e] 50,000
Fertilizer materials, manufactured:			
Nitrogenous:			
Gross weight [2] ---thousand tons--	1,316	1,371	1,381
Nitrogen content ---do---	263	274	276
Phosphatic:			
Gross weight [2] ---do---	834	798	963
Phosphorus pentoxide content ---do---	138	132	159
Gypsum:			
Crude	250,241	270,532	[e] 280,000
Calcined	76,564	82,064	[e] 85,000
Lime:			
Quicklime ---thousand tons--	1,070	1,128	1,858
Hydrated ---do---	521	585	
Magnesite:			
Crude	492,716	421,674	384,000
Sintered	202,231	149,335	169,709
Caustic calcined	9,685	5,145	NA
Mica, all grades	554	126	[e] 150
Pyrite concentrate:			
Gross weight	[r] 276,084	230,806	217,000
Sulfur content [e]	[r] 115,600	96,900	91,100
Quartz, quartzite, glass sand	1,065	1,114	NA
Salt:			
Marine	53,715	8,654	[e] 50,000
From brine	[3] 212,013	[3] 180,206	[e] 196,000
Rock	85,531	79,346	[e] 85,000
Total	351,259	268,206	331,000
Sand and gravel (except glass sand) ---thousand cubic meters--	8,457	9,493	NA
Stone (except quartz and quartzite):			
Dimension:			
Crude:			
Ornamental ---do---	42	42	NA
Other ---do---	7	12	NA

See footnotes at end of table.

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

Commodity [1]	1971	1972	1973 [p]
NONMETALS—Continued			
Stone (except quartz and quartzite)—Continued			
Dimension—Continued			
Crude—Continued			
Partly worked facing ---thousand square meters--	529	629	549
Cobblestones, curbstones, and other --thousand cubic meters--	55	46	NA
Crushed and broken, n.e.s ---do---	6,782	6,636	NA
Milled marble and other, n.e.s ---do---	2,608	2,596	NA
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	15,685	13,035	[e] 14,000
Coal:			
Bituminous ---thousand tons--	707	599	576
Brown ---do---	9,333	9,184	9,145
Lignite ---do---	20,862	21,157	22,729
Total ---do---	30,902	30,940	32,450
Coke:			
Metallurgical ---do---	1,229	1,226	[e] 1,263
Breeze ---do---	68	72	[e] 75
Total ---do---	1,297	1,298	1,338
Fuel briquets, all grades	26,526	7,063	NA
Gas:			
Manufactured (city gas only) ---million cubic feet--	5,961	6,697	[e] 7,000
Natural, gross production ---do---	40,647	43,861	46,933
Natural gas liquids and liquefied petroleum gas: [4]			
Propane and butane ---thousand 42-gallon barrels--	[r] 1,216	2,278	[e] 2,300
Natural gasoline and pentane ---do---	238	237	[e] 250
Petroleum:			
Crude oil:			
As reported ---thousand tons--	2,961	3,200	3,332
Converted ---thousand 42-gallon barrels--	21,932	23,702	24,680
Refinery products: [5]			
Gasoline ---do---	12,512	11,849	12,988
Jet fuel ---do---	1,634	1,617	2,009
Kerosine ---do---	81	73	
Distillate fuel oil ---do---	19,881	18,613	19,083
Residual fuel oil ---do---	19,514	19,907	23,177
Lubricants ---do---	[r] 799	856	865
Asphalt and bitumen ---do---	2,279	2,228	1,976
Other ---do---	[r] 152	3,757	[e] 6,902
Refinery fuel and losses ---do---	[r] 2,274	3,209	
Total ---do---	59,126	62,109	[e] 67,000

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

[1] In addition to the commodities listed, germanium, clays (bentonite, kaolin, and common) and diatomite are also produced, and tellurium may be recovered as a copper refining byproduct, but output is not reported and available information is inadequate to make reliable estimates of output levels.

[2] Figure reported as gross weight is apparently a derived equivalent figure rather than an actual measured weight. In the case of nitrogenous fertilizers it is the theoretical weight of material containing 20% nitrogen that would be equivalent to the nitrogen content of all fertilizers produced, and in the case of phosphatic fertilizers it is the theoretical weight of material containing 16.5% P_2O_5 that would be equivalent to the P_2O_5 content of all fertilizers produced.

[3] Includes vacuum salt.

[4] Apparently includes both natural gas liquids derived from gasfields and gas associated with oil as well as liquefied petroleum gas from petroleum refineries.

[5] Liquefied petroleum gas produced from refineries is reported under natural gas liquids (together with those materials actually derived from natural gas) and is also included here among refinery fuels and losses. The manner in which data is presented in available sources precludes avoiding this double counting.

TRADE

During 1972, the latest year for which data are available, Yugoslavia's mineral trade was diversified and many commodities were exported to and imported from a large number of countries. Exports consisted mostly of nonferrous metals and products, and European countries were again the principal purchaser. Imports included bituminous coal, crude oil, and iron and steel semimanufactured products. The largest source of mineral imports remained the U.S.S.R.

Table 2.—Yugoslavia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Bauxite and concentrates thousand tons	1,883	1,813	U.S.S.R. 774; West Germany 320; Italy 282; Romania 201; Czechoslovakia 155.
Oxide and hydroxide	23,761	23,328	Czechoslovakia 17,712; Austria 5,450.
Metal, including alloys:			
Scrap	4,742	6,534	Italy 4,571; West Germany 1,824.
Unwrought	13,203	30,759	Japan 9,927; Italy 5,534; West Germany 3,006; Argentina 2,600; Hungary 2,450.
Semimanufactures	30,564	36,364	Poland 5,790; United States 5,712; Bulgaria 4,957.
Antimony regulus	1,500	1,315	U.S.S.R. 906; Netherlands 170; United States 85.
Arsenic, trioxide	81	--	
Bismuth, including alloys, all forms	11	79	West Germany 50; United Kingdom 29.
Cadmium, all forms	--	171	Netherlands 59; United Kingdom 50; Italy 22; West Germany 22.
Chromium, chromite concentrates	11,582	7,583	Czechoslovakia 6,968.
Copper including alloys:			
Scrap	249	645	Italy 644.
Unwrought	46,296	90,338	United States 34,254; United Kingdom 30,300; France 10,075.
Semimanufactures	57,451	45,248	United States 8,354; U.S.S.R. 6,927; United Kingdom 6,696.
Iron and steel:			
Ores and concentrates except roasted pyrites	121,041	--	
Roasted pyrites	63	1,783	All to Austria.
Scrap	22,723	17,699	Italy 12,160; West Germany 5,212.
Pig iron, ferroalloys, and similar materials	42,666	176,552	U.S.S.R. 48,393; Poland 27,778; Austria 22,627.
Steel, primary forms	1,754	4,563	Italy 2,532; Japan 1,966.
Semimanufactures:			
Bars, rods, angles, shapes, sections	86,075	116,762	U.S.S.R. 63,140; Bulgaria 14,346; Romania 13,773.
Universals, plates, sheets	36,888	65,789	Austria 15,829; Italy 8,946; India 8,815.
Hoop and strip	2,167	9,095	Italy 7,946; Romania 1,117.
Rails and accessories	45,312	46,684	Romania 39,580; Bulgaria 5,332.
Wire (excluding wire rods)	327	387	People's Republic of China 178; Italy 173.
Tubes, pipes, fittings	76,916	87,113	East Germany 23,761; Switzerland 10,112; Romania 8,825.
Castings and forgings, rough	8,391	12,934	Poland 3,325; East Germany 3,160; Hungary 2,358.
Total	256,076	338,764	
Lead:			
Ores and concentrates	12,580	21,890	Greece 14,378; West Germany 7,126.
Oxides	50	574	West Germany 200; Italy 163; Czechoslovakia 132.
Metal, including alloys:			
Unwrought	50,553	39,782	U.S.S.R. 16,590; Czechoslovakia 5,553; Greece 4,257.
Semimanufactures	222	1,115	Italy 362; France 286; Bulgaria 170.
Mercury 76-pound flasks	r 14,301	13,678	United States 9,845; Greece 1,248; United Kingdom 902.
Nickel, including alloys, all forms	143	13	All to Italy.
Platinum-group metals, including alloys, all forms, palladium troy ounces	514	(1)	NA.
Selenium, elemental kilograms	30,212	40,890	United Kingdom 26,500; West Germany 12,390; Greece 2,000.
Silicon	6,786	13,892	Japan 5,649; U.S.S.R. 2,558; United Kingdom 1,804.
Silver, including alloys thousand troy ounces	2,904	2,736	West Germany 1,751; United Kingdom 676.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Tin, including alloys, all forms _long tons__	(1)	127	United States 43; Austria 35; West Germany 28.
Uranium, ores and concentrates	NA	791	All to Hungary.
Zinc:			
Ores and concentrates	57,782	49,735	Bulgaria 42,356; West Germany 5,264.
Oxide	625	1,516	Hungary 775; Italy 560; Czechoslovakia 150.
Metal, including alloys:			
Unwrought	20,179	22,288	Czechoslovakia 15,787; Italy 3,623; United States 1,567.
Semimanufactures	9,445	10,182	West Germany 4,952; Czechoslovakia 2,085; France 1,176.
Other: Ash and residue containing nonferrous metals	6,635	8,411	Italy 5,142; West Germany 2,150; Austria 906.
NONMETALS			
Abrasives, natural, grinding and polishing wheels and stones	1,491	2,030	Poland 1,336; Hungary 169; Italy 157.
Asbestos	1,403	974	West Germany 557; Albania 400.
Barite and witherite	46,176	51,816	U.S.S.R. 37,542; Hungary 11,403; Albania 1,222.
Cement, hydraulic	9,374	20,886	Uganda 10,000; Italy 3,123; United States 2,800.
Chalk	6	23	Czechoslovakia 16; East Germany 7.
Clays and clay products:			
Crude:			
Bentonite	23,413	18,056	Poland 8,725; East Germany 6,434; Italy 1,210.
Fire	25,323	26,541	Hungary 11,226; Romania 6,990; Italy 5,336.
Kaolin	169	353	All to Italy.
Other	1,963	6,941	Italy 3,259; Romania 2,533; Greece 1,149.
Products (including all refractory brick):			
Refractory	71,440	74,047	West Germany 28,652; Romania 15,626; Poland 12,020.
Nonrefractory	1,246	307	Czechoslovakia 77; Syria 77; Albania 57.
Diatomaceous earth	244	--	
Feldspar	17,348	13,166	Hungary 3,621; East Germany 3,610; Czechoslovakia 2,863.
Fertilizer materials, manufactured:			
Nitrogenous	42,136	48,328	West Germany 43,555.
Phosphatic	97,491	177,489	U.S.S.R. 94,558; Hungary 45,281; Bulgaria 37,611.
Other, including mixed	231,469	241,027	Hungary 88,409; West Germany 69,062; Italy 38,775.
Ammonia	1	--	
Gypsum and plaster	186	180	Hungary 104; Libya 76.
Iodine	2	--	
Lime	155	--	
Magnesite:			
Raw (including ground)	928	418	Italy 304; West Germany 96.
Calcined	359	125	Bulgaria 66; Italy 39; West Germany 20.
Sintered	42,328	19,411	Poland 9,310; Italy 7,336; West Germany 1,309.
Pigments, mineral, natural crude	3	--	
Pyrites, gross weight	78,384	22,534	West Germany 9,825; Italy 8,373; Czechoslovakia 4,336.
Salt	50	610	Nigeria 560; Hungary 50.
Sodium and potassium compounds, n.e.s	7,879	5,883	Czechoslovakia 3,346; Italy 1,581; Pakistan 610.
Stone, sand and gravel:			
Dimension, crude, partly worked	81,491	77,989	Italy 59,780; Czechoslovakia 5,654.
Gravel and crushed stone	3,210	43	West Germany 29; East Germany 14.
Limestone	252	274	Hungary 184; Cuba 57.
Quartz and quartzite (including silex)	13,871	22,109	West Germany 14,606; Austria 4,712; United Kingdom 880.
Sand, excluding metal bearing	215	650	Greece 201; Libya 137; Italy 120; West Germany 102.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Sulfur:			
Elemental, all forms	2,265	1,391	Romania 1,323.
Sulfur dioxide	62	--	
Sulfuric acid	27,316	14,506	Italy 8,636; Greece 2,683; Turkey 1,356.
Talc, steatite, soapstone, pyrophyllite	344	--	
Other:			
Slag, dross, and similar waste not metal-bearing:			
From iron and steel manufacture	29	969	Albania 689; Italy 280.
Slag and ash, n.e.s	191	3,786	Italy 2,342; Austria 967.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black and gas carbon:			
Carbon black	325	175	Poland 155; West Germany 20.
Gas carbon	18	--	
Coal:			
Bituminous coal	3,840	163	Austria 143.
Coal dust	13,740	929	All to Austria.
Brown coal	108,832	180,333	Austria 178,959.
Lignite	105,872	409,341	Austria 350,397; Italy 52,844.
Coke and semicoke	279,897	--	
Peat and peat briquets	--	30	All to Italy.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	1,385	777	Austria 732; Italy 43.
Refinery products:			
Gasoline (including natural)-do	9,272	132	Switzerland 91; Italy 33.
Kerosine and jet fuel-do	138	108	United Kingdom 58; West Germany 18; Panama 17.
Distillate fuel oil-do	730	206	East Germany 26; Israel 22; Norway 15; Panama 7; Sweden 6.
Residual fuel oil-do	814	387	Israel 109; Greece 80; Norway 57; Liberia 35; Brazil 20.
Lubricants-do	43	47	Czechoslovakia 40.
Other-do	191	641	Austria 321; United Kingdom 40; West Germany 17; Denmark 15.
Total-do	11,188	1,521	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	840	809	Romania 643; Czechoslovakia 92; Austria 52.

r Revised. NA Not available.
1 Less than ½ unit.

Table 3.—Yugoslavia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite and concentrate thousand tons	246	166	Australia 148; Guyana 10; Greece 8.
Oxide and hydroxide	1,019	40,361	Guyana 35,221; Greece 4,000.
Metal, including alloys:			
Scrap	586	--	
Unwrought	38,805	45,872	U.S.S.R. 31,013; Poland 5,047; Bulgaria 4,799.
Semimanufactures	15,105	13,226	West Germany 4,538; Italy 2,009; U.S.S.R. 1,477.
Antimony:			
Ore and concentrate	87	1,383	Austria 540; Zambia 461; Turkey 381.
Metal, including alloys, all forms	71	191	West Germany 69; Austria 60; United Kingdom 55.
Arsenic:			
Oxide	85	17	West Germany 15; Netherlands 2.
Metal and alloys, all forms	18	15	West Germany 9; Sweden 6.
Beryllium including alloys, all forms kilograms	161	38	West Germany 27; United States 11.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Bismuth, including alloys, all forms	13	22	West Germany 21.
Cadmium ---kilograms	61,428	2	All from Switzerland.
Chromium:			
Chromite, gross weight	86,163	58,660	Albania 54,298; Iran 3,723.
Oxide, hydroxide and chromic acid anhydrous	1,203	772	U.S.S.R. 413; West Germany 217.
Metal, including alloys, all forms kilograms	10,000	1,039	Austria 512; West Germany 452.
Cobalt:			
Oxide and hydroxide	72	102	Austria 65; Netherlands 17.
Metal, including alloys, all forms	46	37	Belgium 29; Switzerland 4.
Columbium and tantalum, tantalum, including alloys, all forms --kilograms	--	124	West Germany 103.
Copper:			
Ore and concentrates	--	61,911	Philippines 57,935; Chile 3,975.
Metal, including alloys:			
Scrap	1,060	2	All from Austria.
Unwrought:			
Blister and other unrefined unalloyed	19,045	25,636	Zambia 8,760; United Kingdom 6,795; Chile 6,556.
Refined and alloys	45,695	49,674	United Kingdom 35,184; Zambia 11,020; Chile 1,695.
Semimanufactures	18,101	17,595	Chile 5,948; U.S.S.R. 4,963; West Germany 2,676.
Germanium, including alloys, all forms kilograms	--	1	All from Belgium.
Iron and steel:			
Ore and concentrate	194,978	282,709	India 216,273; U.S.S.R. 66,421.
Scrap	260,625	261,706	U.S.S.R. 82.184; Switzerland 63,196; Hungary 37,942.
Pig iron, including cast iron	203,690	95,985	U.S.S.R. 41.001; Czechoslovakia 21,220; Algeria 15,000; India 9,975.
Sponge iron, powder and shot	1,671	1,826	Sweden 1,254.
Ferroalloys:			
Ferromanganese	1,190	1,540	United Kingdom 768; Italy 520.
Other	4,638	3,520	West Germany 1,932; Austria 405; Switzerland 387; United Kingdom 357.
Steel, primary forms:			
Blooms, billets, slabs	264,935	165,114	U.S.S.R 56,822; Czechoslovakia 36,231.
Coils for rerolling	184,810	158,376	U.S.S.R. 106,592; Czechoslovakia 25,630; Bulgaria 11,577.
Steel semimanufactures:			
Bars, rods, angles, shapes, and sections	418,680	366,174	Czechoslovakia 88,884; Romania 63,764; U.S.S.R. 61,696; Bulgaria 41,770; Poland 39,584.
Universals, plates and sheets	505,978	462,727	Japan 132.829; West Germany 83.099; France 39,321; Greece 35,507.
Hoop and strip	75,399	79,596	West Germany 16,600; U.S.S.R. 15,773; Czechoslovakia 9,026; Greece 8,022.
Rails and accessories	3,824	1,993	West Germanv 1,020; Austria 515; U.S.S.R. 252.
Wire	31,474	24,548	West Germany 13,175; Poland 3,211; Austria 2,404.
Tubes, pipes, fittings	83,790	79,394	East Germany 16,880; West Germany 16,229; Romania 9,015.
Castings and forgings, rough	648	1,297	Czechoslovakia 314; Italy 304; West Germany 271.
Total	1,119,793	1,015,729	
Lead:			
Ores and concentrates	454	3,048	Canada 1,914; Morocco 1,133.
Oxides	661	622	West Germany 395; Austria 210.
Metal, including alloys:			
Unwrought	11,457	5,804	Bulgaria 3,273; West Germany 824; United Kingdom 525.
Semimanufactures	125	36	West Germany 34.
Magnesium, including alloys, all forms	515	581	U.S.S.R. 255; West Germany 188.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Manganese:			
Ores and concentrates	43,054	58,699	U.S.S.R. 26,165; Brazil 11,278; Gabon 11,192; United States 9,635.
Oxides	405	2,538	United States 1,016; U.S.S.R. 950; Japan 235.
Metal, including alloys, unwrought	175	103	West Germany 97; Switzerland 5.
Molybdenum, including alloys, all forms kilograms	21,224	130,158	Austria 127,623; Sweden 1,014; Italy 1,000.
Nickel metal, including alloys:			
Unwrought	1,853	507	Netherlands 198; Switzerland 61; Austria 58; U.S.S.R. 58.
Semimanufactures		610	West Germany 468; Italy 100; Netherlands 34.
Platinum group:			
Platinum, all forms troy ounces	1,865	2,595	United Kingdom 1,340; Italy 643.
Palladium, all forms do	16,075	46,427	U.S.S.R. 45,195.
Rhodium do	--	356	All from Italy.
Selenium, elemental kilograms	1,163	450	All from West Germany.
Silver, all forms thousand troy ounces	973	1,029	Switzerland 358; West Germany 267; Austria 163; United Kingdom 136.
Tellurium, elemental kilograms	250	495	West Germany 390; United Kingdom 105.
Tin:			
Oxides long tons	23	26	West Germany 20; Italy 6.
Metal, including alloys:			
Scrap do	1,055	120	All from Hungary.
Unwrought do	874	715	United Kingdom 490.
Semimanufactures do	35	111	Japan 52; West Germany 42.
Titanium:			
Ore and concentrate	1,874	2,637	Australia 2,597; Albania 20; West Germany 20.
Oxides	5,267	5,308	West Germany 1,782; United Kingdom 1,319; Switzerland 1,268.
Metal, including alloys, all forms kilograms	6,298	2,158	United Kingdom 1,138; Switzerland 750.
Tungsten, including alloys, all forms do	20,094	59,315	Sweden 31,458; Netherlands 13,394.
Uranium and thorium metal, including alloys, all forms do	331	(1)	NA.
Zinc:			
Ores and concentrates	--	6,250	All from Mexico.
Oxides	1	177	West Germany 140; United States 17; Switzerland 16.
Metal, including alloys:			
Scrap and blue powder	70	2	All from Denmark.
Unwrought	19,581	23,619	Zambia 12,727.
Semimanufactures	1,252	689	All from West Germany.
Zirconium, including alloys, all forms kilograms	8,731	5,617	Austria 4,500; West Germany 1,061.
Other:			
Ores and concentrates	6	887	Australia 564; Turkey 151.
Ash and residue containing nonferrous metals	454	309	Austria 268; Netherlands 41.
Oxides, hydroxides and peroxide of metals, n.e.s	463	654	West Germany 362; Switzerland 72; Netherlands 63.
Metal, including alloys	14	37	Netherlands 20; West Germany 9.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	608	1,061	Italy 530; Denmark 207.
Grinding and polishing wheels and stones	1,491	68	West Germany 28; Italy 24.
Asbestos	38,678	43,282	U.S.S.R. 26,534; Canada 8,032; Botswana 7,320.
Barite and witherite	449	607	West Germany 439; Czechoslovakia 100.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Boron materials:			
Crude, natural borates	5,907	11,832	All from United States.
Oxide and acid	1,158	(1)	NA.
Bromine ----kilograms--	149	3,094	Austria 2,982.
Cement:			
Portland ----thousand tons--	1,094	590	Romania 149; U.S.S.R. 148; Italy 117; Bulgaria 75.
Other ----do----	301	302	Italy 157; Turkey 68; Greece 40; Austria 35.
Chalk	1,064	1,083	Switzerland 500; East Germany 305; France 120; West Germany 106.
Clays and clay products:			
Crude, n.e.s.:			
Bentonite	50	33	Austria 23; Hungary 5; United Kingdom 5.
Fire (including calcined)	20,703	10,645	Czechoslovakia 9,798; Poland 603.
Fuller's earth, dinas, chamotte	3,406	3,428	West Germany 1,640.
Kaolin	36,066	38,330	Czechoslovakia 17,430; East Germany 8,674; Greece 6,440.
Other	2,634	2,501	Czechoslovakia 1,643; Poland 390; West Germany 358.
Products:			
Refractory (including nonclay bricks)	18,766	17,973	West Germany 7,051; East Germany 1,921; Italy 1,566; United Kingdom 1,133.
Nonrefractory	822,908	237,586	Romania 101,937; Italy 55,678; Bulgaria 31,400.
Diamond, all grades ----thousand carats--	r 118	228	U.S.S.R. 76; Switzerland 42; United Kingdom 34; West Germany 33.
Diatomite and other infusorial earth	1,194	2,585	Austria 1,239; Czechoslovakia 671; Hungary 187.
Fertilizer materials:			
Crude:			
Phosphatic	769,537	1,062,337	Morocco 875,610; Tunisia 70,163; Israel 53,662; Jordan 44,277.
Potassic	3,052	--	
Manufactured:			
Nitrogenous	107,214	151,121	U.S.S.R. 75,156; Poland 39,089; Bulgaria 28,971.
Phosphatic:			
Thomas slag	4,148	--	
Other	12,967	38,989	Morocco 20,000; Tunisia 13,800.
Potassic	343,711	375,270	East Germany 191,420; U.S.S.R. 178,987.
Other, including mixed	18	10	Netherlands 8; Switzerland 2.
Ammonia	35,905	28,374	Austria 12,876; Hungary 11,042.
Fluorspar and cryolite	1,194	4,948	East Germany 4,343; West Germany 444.
Graphite, natural	1,943	2,045	Austria 1,324; U.S.S.R. 381; West Germany 183.
Gypsum and plaster	36,403	558	Italy 557.
Iodine ----kilograms--	24,437	7,750	Poland 2,900; West Germany 2,200; France 1,500; Italy 1,000.
Lime	35,930	13,236	Italy 6,260; Bulgaria 3,764; Romania 2,764.
Magnesite	7,976	585	West Germany 304; Austria 243.
Mica:			
Crude, including splittings and waste	158	192	West Germany 57; Norway 47; Austria 36.
Worked, including agglomerated splittings	103	77	Czechoslovakia 20; Switzerland 19; India 16.
Pigments, mineral:			
Natural, crude	6	6	All from Hungary.
Iron oxides, processed	1,389	1,844	West Germany 1,268; Spain 210; Switzerland 209.
Precious and semiprecious stones except diamond ----kilograms--	663	103	India 47; West Germany 21; France 12.
Pyrite (gross weight)	186,980	108,562	All from U.S.S.R.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Quartz, piezoelectric ----------kilograms--	963	1,062	United States 800; West Germany 250.
Salt ----------	119,179	71,610	Romania 65,588.
Sodium and potassium compounds, n.e.s.:			
Caustic soda ----------	38,456	75,773	West Germany 29,716; Italy 28,035; France 9,462.
Caustic potash, sodic and potassic peroxides ----------	1,705	2,487	East Germany 1,846; West Germany 256.
Stone, sand and gravel:			
Dolomite, chiefly refractory grade ---	5,679	5,997	Italy 5,418; Austria 265.
Gravel and crushed rock ----------	149,149	91,793	Hungary 80,576; Austria 10,896.
Limestone, except dimension ---------	10,080	11,513	Hungary 11,512.
Quartz and quartzite ----------	14,709	11,158	Hungary 4,938; West Germany 3,962; Greece 1,785.
Sand, excluding metal bearing --------	88,564	69,571	Italy 32,094; Hungary 26,705; Netherlands 3,666.
Dimension:			
Crude and partly worked --------	3,625	1,699	Italy 1,303; West Germany 302.
Worked ----------	6,162	1,938	Italy 1,810.
Sulfur:			
Elemental, all forms ----------	20,879	33,186	Poland 16,258; West Germany 13,294.
Sulfuric acid ----------	1,014	9,649	Bulgaria 4,180; West Germany 2,994; Hungary 1,830.
Talc and related materials ----------	1,517	1,610	Italy 943; India 200; Austria 140.
Other nonmetals, n.e.s.:			
Meerschaum ----------	--	66	U.S.S.R. 56; Italy 10.
Other crude ----------	79	4,819	Greece 2,750; Hungary 1,639.
Slag, dross, and similar waste, not metal bearing ----------	150,238	173,268	Italy 172,925.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural ----------	7,851	6,674	Albania 2,683; Czechoslovakia 1,635; Romania 1,504.
Carbon black and gas carbon ----------	5,499	4,531	West Germany 2,494; Italy 1,421.
Coal:			
Anthracite and bituminous thousand tons--	1,972	1,884	U.S.S.R. 1,075; Czechoslovakia 597; United States 123.
Brown coal and briquets ----------	--	276	Bulgaria 247; West Germany 29.
Coke and semicoke -------thousand tons--	280	302	U.S.S.R 96; Poland 57; Italy 56; Czechoslovakia 32.
Hydrogen, helium, and rare gases kilograms--	108,735	214,289	Italy 206,626.
Peat, including briquets and litter --------	3,624	3,879	Poland 2,835; Hungary 720.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels--	36,504	31,317	Iran 13,637; U.S.S.R. 12,278; Iraq 5,114.
Refinery products:			
Gasoline, including natural --do----	207	146	United Kingdom 99.
Kerosine and jet fuel -------do----	81	57	U.S.S.R. 56.
Distillate fuel oil ----------do----	3,872	3,122	U.S.S.R. 2,013; Romania 889.
Residual fuel oil ----------do----	2,067	3,195	U.S.S.R. 2,658.
Lubricants ----------do----	392	336	Hungary 92; United States 55; United Kingdom 42; Italy 38.
Mineral jelly and wax -------do----	51	27	Hungary 7; East Germany 7; West Germany 6.
Other ----------do----	742	886	Albania 298; U.S.S.R. 221; United States 168; Czechoslovakia 127.
Total ----------do----	7,412	7,769	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ----------	2,376	3,273	Italy 3,023.

r Revised. NA Not available.
1 Less than ½ unit.

COMMODITY REVIEW

METALS

Aluminum.—During 1973 programs continued on converting the country's aluminum industry from a producer and exporter of bauxite to a processor of bauxite and exporter of aluminum metal. During the year, about 20% of the bauxite production was used in the country. Domestic production of aluminum metal was inadequate to meet demand, and imports were necessary.

Expansion of bauxite mines, planning for new alumina plants at Vlasenica, Bosnia, and Obrovac, Dalmatia, completion of the aluminum plants at Šibenik, and continuation of construction of alumina and aluminum plant at Mostar were the most significant events of the aluminum industry.

Project Vlasenica, which includes expansion of the Vlasenica bauxite mines and construction of a 600,000-ton-per-year alumina plant, moved from planning to preliminary preparation of the construction site. Karakaj, a small locality near Zvornik, Bosnia, was selected as the site of the alumina plant. According to plans, the alumina plant should start processing 1.5 million tons of bauxite and yield 600,000 tons of alumina in 1976. Total cost for the project was planned at $200 million, of which the U.S.S.R. will finance about $130 million, mostly for Soviet equipment and "know-how." After completion, during a 10-year period, most of the alumina from the Vlasenica plant will be shipped to the U.S.S.R. for repayment of the $130 million credit.

During the winter of 1973, construction began on a new 300,000-ton-per-year alumina plant at Obrovac, Dalmatia. The Chemo-Komplex of Hungary will partially finance the total project cost of $80 million. Equipment for the plant will be purchased in East Germany and Hungary. About half of the alumina output will be delivered to the Šibenik aluminum plant for processing, and the rest will be available for export until a new aluminum electrolytic plant is built in Obrovac. At yearend the Obrovac aluminum plant was one item in a long range plan for the economic development of Dalmatia.

Construction continued on a 260,000-per-ton-year alumina plant at Mostar, Hercegovina. This plant was scheduled to start production in 1974. While this construction continued, work started on a new 85,000-ton-per-year aluminum plant nearby. When this aluminum plant is completed, Mostar will have an integrated installation from bauxite to aluminum metal. Foreign and domestic financing was secured at yearend.

The new Šibenik aluminum plant went onstream in summer 1973. Initial annual capacity of 75,000 tons of aluminum will be increased to 110,000 tons in 1976 when all construction was planned for completion. Swiss Aluminium Ltd. (Alusuisse) of Switzerland provided the expertise, and East Germany financed a large part of the project. East Germany's loan will be repayed with deliveries of aluminum metal.

The Titograd alumina and aluminum plant continued production during 1973. Shortages of electric power slowed substantially the output of aluminum metal, which adversely affected the financial position of the enterprise. The management concluded an agreement with the Italian company, Temko of Turin, for construction of an aluminum rolling mill with an annual capacity of 15,000 tons of semimanufactured products.

Copper.—In spite of higher production of copper metal, which reached an alltime high during 1973, domestic output was below demand and imports of copper metal were substantial. Shortages of electric power, felt in other parts of the country, were not severe at Bor, the site of the country's only copper smelter and copper electrolytic plant.

Geologists from the Bor complex conducted exploration of the Veliki Krivelj copper deposit during 1973. Results led to a decision to start constructing a copper mine and auxiliary facilities at Veliki Krivelj in 1974. When fully completed in 1982, Veliki Krivelj will have an annual capacity of 63,000 tons of copper plus gold, silver, selenium, and molybdenum. Preliminary estimated costs were reported at $150 million. Foreign credits should cover most of the investment.

Further exploration of the Bučim copper deposit in Macedonia proved substantial copper reserves. Plans were made to start a mine and beneficiation plant in the

area. When completed in 1977, the copper mine and the beneficiation plant will have an annual capacity of 3.7 million tons of ore. Reportedly, reserves in the area are large enough to sustain this rate of annual production for 22 years.

Iron and Steel.—The renovation and expansion of the iron and steel industry of Yugoslavia continued during 1973. Domestic output of iron and steel products was inadequate to meet demand, and imports of iron and steel semimanufactures were by value one of the largest import items. Exports were insignificant by world standards. Shortages of electric power slowed production at ferroalloy and steel plants during the last part of the year.

A new 30,000-ton-per-year ferrosilicon furnace started operation at the Šegunovci ferroalloy plant in Macedonia. The capacity of the new furnace is 5,000 tons higher than the total capacity of six furnaces presently in operation.

Another ferrosilicon furnace went onstream at Jajce in Bosnia. Capacities of this addition were not disclosed.

The first stage of a renovation and expansion program continued at the Zenica iron and steel complex. According to plans, production of steel should increase from about 1 million tons in 1973 to 2.5 million tons in 1975. In addition, new rolling, forging, and other auxiliary installations were scheduled for completion by 1975. Construction continued on a new 350,000-ton-per-year wire rolling mill at Zenica. This construction was partly financed by the U.S. Export-Import Bank. United States Steel Corp., Pittsburgh, Pa., will supply technology and equipment for the plant.

The Jasenice iron and steel plant, located in Slovenia, received a $24 million loan from the Export-Import Bank. The loan will be used for construction of new production capacities for stainless, silicon, and soft steel sheets. The bulk of the new equipment will be supplied by United States companies. When the plant is completed by 1976, it will be producing 115,000 tons of sheet per year, mainly for the automobile and household appliances industries.

The Sisak iron and steel works at Sisak, Dalmatia, completed a second phase of reconstruction during the year. With new continuous casting facilities operational, steel ingot capacity reached 335,000 tons and seamless pipe capacity reached 140,000 tons.

At the Smederevo iron and steel plant in Smederevo, Serbia, construction and expansion continued. The first phase of the second stage of the plan for the Smederevo plant, carried out by the U.S.S.R. which built the plant, should bring annual capacity to 1.7 million tons of steel by 1976. According to agreements with the U.S.S.R., the second phase of the program was scheduled for completion between 1980 and 1985. Steel capacity then should reach 3 million tons per year.

At the Skopje iron and steel works in Skopje, Macedonia, planning continued for expansion. Plans call for project completion by 1978 when the steel-producing capacity should reach 2 million tons per year. The U.S.S.R. will finance part of this project.

At the Boris Kidric iron and steel works in Nikšić, Montenegro, renovation and expansion continued. During the year domestic and foreign financing was assured. When work on the plant is completed in 1977, annual capacity will be increased from 130,000 tons in 1973 to 360,000 tons.

Construction started for a new 15,000-ton-per-year welded pipe plant at Derventa, Bosnia. This plant was built by the Udruzena Metalna Industrija (UNIS) and will employ 150 workers. Construction costs of about $4.9 million were financed by local banks and UNIS.

Lead and Zinc.—Commissioning of a new smelter at Titov Veles in Macedonia, renovation of the lead and zinc mine at Stari Trg, near Zvečan, and startup of beneficiation plants at Kriva Feja and Leposavci were the most significant events related to the lead and zinc industry of Yugoslavia during the year. Delays in commissioning of certain mines and beneficiation plants created a gap between mining and smelting capacities, making imports of concentrates necessary.

The new lead and zinc smelter at Zletovo started production in the summer of 1973. The new facility consists of a sinter plant, a sulfuric acid plant, an Imperial Smelting Furnace (ISF), and a lead and zinc refinery. The ISF, with a hearth of 17.2 square meters, has an annual capacity of 100,000 tons, comprising 65,000 tons of zinc and 35,000 tons of lead. Exact figures

on output of byproducts were not available. However, based on information on ores smelted at Titov Veles, the plant should produce about 250 tons of cadmium, 13 tons of silver, and 2,800 tons of copper matte. Initial output is expected to be about 35% of installed capacity. The new installation employed about 700 persons during 1973. Lack of experienced technical personnel caused startup problems. All production from this smelter was intended for export. The 120,000-ton-per-year sulfuric acid plant became operational early in the year, when sintering facilities went to regular production.

Construction of two lead and zinc concentrators, one at Kriva Feja, Serbia, and the other at Leposavci, Serbia, was completed during 1973. The Kriva Feja plant will process about 345,000 tons of ore per year and the concentrates should contain 21,000 tons of zinc, 16,000 tons of lead, 85 tons of cadmium, and 5 tons of silver. The plant will process ores from the nearby Blagodat mine. The output will be shipped to Trepča's smelter at Zvečan for further processing. The Leposavci beneficiation plant, with an annual capacity of 300,000 tons of ore, will treat ores from the Kopaonik mines. Concentrates will be smelted at Zvečan.

Renovation of the Stari Trg mine and the Kopaonik mines, and development of mines at Blagodat, Žute Prline, Koponič, and Crnac, all in Serbia, and at Mojkovac in Montenegro continued during 1973. All these activities were part of Trepča Enterprise efforts to increase lead and zinc mine capacity in the country.

Nickel.—All necessary arrangements for domestic and foreign financing of the Ržanovo nickel project near Kavadarci, Macedonia, were completed during 1973. Plans call for mine development, a 64,000-ton-per-year ferronickel plant, and auxiliary installations. Initial production was scheduled for 1979. According to reports, about 24 million tons of nickel-bearing ore, with an average nickel count of 0.9%, were discovered and confirmed in the area.

Titanium.—A new 25,000-ton-per-year titanium oxide plant at Celje started production in July. The plant is a joint venture between Yugoslavia's Cinkarna of Celje and East Germany's Vereinigung Volkseigener Betriebe, Lacke, und Farben, of Berlin. The Yugoslav partner holds a 51% interest in the venture, and the rest is held by the partner from East Germany. The plant employed 200 persons. Seven days after startup, a fire destroyed the electrofilters and a large part of the upper section of the plant. Reports indicated that 6 to 8 months will be required to repair damages and return to production.

Uranium.—Exploration and development of uranium resources became more intensive because Yugoslavia entered the age of nuclear generation of electric power by awarding a contract for construction of its first nuclear powerplant at Krško. The focal point remained the uranium deposit at Žirovski Vrh in Slovenia. In addition to several hundred drill holes that covered an area of 120 square kilometers, approximately 5 kilometers of drift were driven through the deposit. According to plans, the mine will supply ore for a concentrator of 300-ton-per-year capacity to be built at the minesite. Reserves at Žirovski Vrh are adequate to support production at this rate for a period of 15 years.

NONMETALS

During 1973 extraction of nonmetallics stagnated and financial losses increased.[2] Cement and magnesite were the most successful segments of the industry.

The raw material base for a strong nonmetals industry exists in the country. However, because of adverse financial regulations, renovation of mines was behind schedule; in most mines equipment was outdated, and in some of them nonexistent.[3] Toward the end of the year, some corrective measures (financial assistance) were undertaken by the Government with an aim to stimulate nonmetals production.

Asbestos.—Domestic output was below demand, and imports were necessary. Asbestos mines remained in a difficult financial position, and labor problems affected production.

To improve the producers' position and to stimulate asbestos output, the Executive Council of the Republic of Serbia decided to use emergency funds and to repay debts incurred at the Korlače and Stragari mines amounting to $202,000. Fur-

[2] Ekonomaska Politika (Belgrade, Yugoslavia). Produzuje se stagnacija ekstaktivne industrije nematala (Stagnation of Nonmetals Extractive Industry Continues). Sept. 3, 1973, p. 31.

[3] Petkovic, Milos. Potcenjen ili neprocenjen potencijal (Undervalued or Underestimated Potential). Provredni Pregled, Belgrade, Yugoslavia, May 22, 1973, p. 3.

thermore, asbestos producers were relieved of paying 20% of total value of new investments out of their own funds. In addition, the Government recommended that state-owned banks postpone collection of some outstanding debts and urged that a new loan, totaling $558,000, be granted to asbestos mines for new equipment.

Cement.—Cement was the principal nonmetallic produced in the country. Although the country had a fairly well developed cement industry and ample reserves of raw materials, domestic output did not meet demand, and imports were a necessity. To solve the problem of cement shortages, industry and the State Governments continued to develop additional cement capacity. Accordingly at Beočia and Novi Popovac in Serbia, Podsused near Zagreb in Dalmatia, and Usje in Macedonia, renovation of plants was under way. Construction of new cement plants continued at Kosjerič in Serbia and at Lukavac and Kakanj in Bosnia, and new plants in Ostružnica, Serbia, and Našice, Croatia, were on the drawing boards at yearend. When these projects are completed, Yugoslavia will have about 2.5 million tons of additional cement-producing capacity per year.

Feldspar.—Based on large reserves of pegamatite in the Vidovača Mountain area of Toplica, Serbia, preparation started for construction of new facilities for the annual production of 50,000 tons of feldspar, 36,000 tons of quartz, and 14,000 tons of mica. About 60% of this output will be exported.

Lime.—During 1973 financing of the lime plant at Doboj-Severlije was assured. The Jugobanka, one of the major banks in the country, will extend credit amounting to one-third of total construction costs. Furthermore, this bank will guarantee repayment of any foreign loan that might be extended to the Zenica iron and steel works, the main investor for the Doboj-Ševerlije lime plant. Reports on the plant's annual capacity were conflicting and ranged from 220,000 to 270,000 tons.

Magnesite.—A new magnesite mine, beneficiation plants, and sintering facilities were commissioned during 1973. Domestic supply was adequate to meet demand, and some magnesite was exported.

A new 20,000-ton-per-year magnesite mine started production at Blatnica, near Teslič, Bosnia. The mine employed 70 workers, mostly former employees of a nearby, recently closed lignite mine. Development of the new mine was financed by Vatrostalna, an enterprise for production of refractories in Zenica, Bosnia. At yearend, proven reserves at Blatnica were reported at 300,000 tons of magnesite. Based on results of preliminary exploration, the vicinity of Blatnica may contain 1.8 million tons of magnesite.

A new magnesite separation plant went onstream at the Strezovci mine. This plant has a capacity of 49 tons of ore per hour. To secure continuous feed to the plant, five power shovels and five dump trucks were purchased. All magnesite will be delivered to Magnohrom of Kraljevo, the largest producer of refractories in Yugoslavia.

Another separation plant went onstream at the Sŭmadija mine at Trbušani, near Čačak. The plant has a capacity of 140,000 tons of ore per year and is located near the Brezak pit of Trbušani mine. An output increase of 30% is expected at the Šumadija mine because lower grade ore can be mined without restrictions.

At Kosovska Kamenica, Serbia, a new 40,000-ton-per-year sintering plant started production. Investment for the plant amounted to the equivalent of $3.2 million. Magnohrom financed the project and will purchase all the sintered magnesite from this plant.

At Busovača, Bosnia, a new furnace for production of sintered magnesite was fired. Vatrostalna was the investor. Capacity data were not available.

Stone.—About 3.8 million cubic yards of ornamental stone was discovered on the slopes of Stara Planina, a mountain near Knjaževac, Serbia. A development investment of about $2 million, not secured at yearend, would be necessary.

MINERAL FUELS

During 1973 coal continued as the principal source of energy in Yugoslavia. However, crude oil and natural gas again increased their combined share of the total energy input, accounting for 40%, the highest ever for these two fuels. Domestic output of high-rank coals and liquid hydrocarbons was below demand, and imports of bituminous coal, coke, and crude oil were essential. Exports of both solid and liquid fuels were nominal.

Most of Yugoslavia's coal production, which increased during 1973, consisted of low-rank coals. Approximately 2.5 million tons of bituminous coal and coke were imported to assure adequate supply.

A second series of offshore drilling in the Yugoslav part of the Adriatic started in the spring of 1973. Petroleum output from domestic fields was higher by 3.75%, compared with 1972, and provided 36.7% of the country's refinery throughput of 9.0 million tons (180,000 barrels per day). Petroleum refineries operated at 70% of installed capacity during the year. Yugoslav oil enterprises signed an agreement for construction of a trunk pipeline from the Adriatic to the Hungarian border.

Although production and consumption of natural gas increased, a lack of large gas pipeline systems hampered greater use of natural gas. To increase this use of natural gas, the authorities of Serbia prepared a plan for a gas distribution network for Vojvodina and Serbia proper and secured its financing.

As a result of the continuing shortage of electricity, Yugoslavia entered the nuclear field for production of electric power. During 1973 Yugoslav authorities awarded a contract for construction of a 615 megawatts nuclear powerplant (pressurized water reactor) to Westinghouse Electric Corp. The plant will be located near Krsko in the Dalmatian-Slovenian State border area. Total value of the contract exceeds $200 million. In addition to construction costs, this price includes expenses for initial nuclear fuel loading. Completion of the plant was scheduled for late 1978. Plans also call for the construction of several thermal powerplants (Kostolac, Plevlje, Banovici, and Obrenovac). These plants will use lignite and will be located near lignite mines.

Coal.—The coal industry faced labor shortages and lack of funds as in 1972. However, increased energy consumption and irregular crude oil supply stabilized demand for domestic coal throughout the year. Brown coal and lignite comprised the bulk (98.2%) of the country's coal output. During 1973 most coal industry activities were concentrated in the following large coal basins: Kolubara, Kosovo, Kostolac, and Aleksinac in Serbia, and the Banovići-Kreka and Central Bosnian mines in Bosnia and Hercegovina.

Difficulties with foreign crude oil supply made Yugoslav authorities revert to coal, the most abundant energy source in the country. Coal-related projects, delayed in the past, have been given attention, and most of the financial means were secured. In the Kostolac coal basin, Serbia, the development of an opencast mine continued. When the new mine is completed in 1977 it will produce 2 million tons of lignite per year. Equipment for this new mine was ordered in East Germany.

In the Kolubara lignite basin, located about 30 miles west of Belgrade, prepation for a new opencast lignite mine, named Tamnava, continued during 1973. The general mine plan was reviewed, and at yearend it was submitted to authorities for approval by the Kolubara Basin management. The mine will produce 24 million tons per year from about 700 million tons of recoverable reserves. Employment will total about 1,200 workers, and the mine will be operational between 1978 and 1980. The Obrenovac thermal electric plant will use most of the lignite produced at Tamnava.

A plan was approved for a new opencast mine in the brown coal field near Banovici in Bosnia. It will have a capacity of 1.8 million tons of coal, which will be consumed at a nearby new thermal powerplant.

A work stoppage closed the lignite mine at Velenje in Slovenia for several days. Miners' pay was the principal cause for the strike.

Coke demand was higher than domestic production during 1973, and coke imports were essential to assure continuous operation of the iron and steel industry. As the first step toward self-sufficiency, construction of a fourth coke battery at the Lukavac coke plant near Tuzla in Bosnia, continued during 1973. In addition, plans for construction of a new coking plant at Bakar on the Adriatic coast were under review by Croatian state authorities. The plant capacity was reported at 850,000 tons. Later its capacity may be expanded to 1.7 million tons of coke per year. This location was chosen so that the bulk of transportation would be by sea. The plant as Sisak in Dalmatia and steel plants in Slovenia will be the principal users of coke from Bakar.

Petroleum and Gas.—Accelerated production from the Beničanci Field in Dalmatia

and from the Kelebija and Velebit Fields in Vojvodina, Serbia, increased Yugoslavia's domestic output of crude oil to an alltime high of 3.3 million metric tons (about 66,000 barrels per day) in 1973. Other highlights of the petroleum industry included expansion of the refinery near Novi Sad, planning for a gas pipeline network in Serbia, and a major trunk pipeline for crude oil through Dalmatia. Industrija Nafte (INA) headquartered in Zagreb, Dalmatia, and Naftagas in Novi Sad, Vojvodina, remained the only producers and the most important refiners of crude oil in the country.

Exploration and Development.—Exploration and development for natural gas and crude oil was carried out by INA in Dalmatia and by Naftagas in Serbia. In addition, a new company, Jugopetrol-Adriatric-Kotor, a joint venture between United States companies, Buttes Gas & Oil Co. and Challenger Oil and Gas Co., and an enterprise from Yugoslavia, Jugopetrol-Kotor conducted seismic exploration for hydrocarbons in the Adriatic Sea offshore from Montenegro. During 1973 INA and Naftagas drilled approximately 260,000 meters with 21 drilling rigs.

INA was the largest producer of crude oil in the country, accounting for 72.2% of the total output. In addition to exploration and development drilling in the Pannonian Basin, Dalmatia, where most of the production originated, INA again started drilling offshore in the northern part of the Adriatic Sea. Four offshore wells were drilled with Neptune, a French drill rig owned by Société de Forages en Mer, Neptune. Gas was discovered 120 kilometers west of the city of Zadar. After Neptune completed its contract and moved elsewhere, INA hired a floating drill rig from Norway late in the year. The new rig was scheduled to start operation in December and confirm discoveries and sizes of natural gasfields discovered by Neptune. At yearend INA announced that permanent production platforms will be constructed by the end of 1975 if the drilling confirms the existence of a sizable natural gasfield.

Inland, INA drillers discovered crude oil and natural gas at Bokšić, Ladislavci, Koška, and Crnac in eastern Slavania. At yearend, drilling was underway to delineate the newly discovered fields, where most pay zones were at depths ranging from 1,800 to 1,900 meters.

Naftagas drilled for natural gas and crude oil in the northeastern part of the country. Preliminary results of production test evaluations indicated existence of new oilfields and gasfields at Bočar, Šajan, Novo Miloševo, Padej, and Banatski Arandjelovac.

Jugopetrol-Kotor, a Yugoslav enterprise for the distribution of petroleum refinery products in Montenegro, Buttes Gas & Oil Co., and Challenger Oil and Gas Co., a wholly owned subsidiary of Global Marine Inc., both from the United States, signed a 30-year joint-venture agreement for oil exploration and development in Montenegro. The participants created Jugopetrol-Adriatic-Kotor. This new organization is the first petroleum exploration and development joint venture entered into by a Yugoslav socialistic enterprise and foreign privately owned companies. Jugopetrol-Adriatic-Kotor will be 51% owned by the Yugloslavian partner and 49% will be shared equally by both partners from the United States. The total acreage covered by the contract was approximately 1 million acres and included the entire offshore section of Montenegro. Within 14 months, after seismic surveys are completed an exploratory well will be drilled. Assuming discovery, further exploration and development will continue during the remainder of the 30-year contract.

Refineries.—Six state-owned refineries processed a total of 9 million tons of crude oil during 1973 and operated at 70% of installed capacity. Imported crude petroleum accounted for 63.3% of the total throughput. INA managed refineries at Rijeka, Sisak, and Lendava. Naftagas operated refineries in Novi Sad and Pančevo. Energoinvest of Sarajevo, operated the refinery at Bosanki Brod after acquiring Hena, the former operator of the refinery.

Expansion continued at the refinery near Novi Sad. According to reports, annual crude oil throughput capacity should double and reach 1.3 million tons by 1975 when the expansion is expected to be completed.

A new organization, Sernim of Koper, started preliminary planning for a new petroleum refinery near Koper in Slovenia. The new refinery would process crude oil for use in a new nearby powerplant and throughout the State of Slovenia. Prelimi-

nary plans call for a capacity of 3 million tons of crude oil per year. Financing and government approval were necessary before starting.

Pipelines.—After a long public debate, three large Yugoslav enterprises, INA, Energoinvest, and Naftagas, signed an agreement for joint construction of a crude oil pipeline, 700 kilometers long, valued at $220 million. The pipeline will start at Omišalj, on the island of Krk in the north Adriatic, where a new port will be built, and will lead to refineries at Rijeka, Sisak, Bosanki Brod, Novi Sad, and Pančevo, with a branch to the Hungarian border and to Lendava. The pipeline will have an annual capacity of 34 million tons, of which 10 million tons are reserved for INA's refineries; 5 million tons for the Energoinvest refinery; 9 million tons for Naftagas refineries; and 10 million tons for users in Hungary and Czechoslovakia. A joint enterprise will be formed to carry out the project, which was to be operational in 1976. A committee was formed for financial and technical preparations. The main task of the committee was to start preparations for securing domestic and foreign financing. Negotiations with Czechoslovakia and Hungary on financing and pipeline use were near conclusion at yearend. In addition, financial assistance for the pipeline was sought in some of the petroleum producing countries. At yearend detailed financial and technical arrangements for the project were not finalized.

Naftagas secured $130 million in domestic and foreign financing for a natural gas distributing pipeline system in Serbia, and started preliminary work to implement the project. The World Bank granted a $59 million loan, at 7.25% interest for 20 years, for the pipeline. The new system includes about 775 miles of pipeline, field gas compressors, a gas treatment plant, an automatic central dispatch center, and a control system. About half of the natural gas for this pipeline will be supplied from domestic fields in Serbia, and the remainder will be imported from the U.S.S.R., through Hungary. Completion of the system in 1976 will increase the natural gas distributing capacity of Naftagas to 88,000 million cubic feet per year.

About 50 localities in Serbia will be served by the system and 145 major industrial facilities will start using natural gas for energy supply. Approximately 71 kilometers of the pipeline will be constructed in Belgrade, where the use of natural gas replacing wood and coal for household heating was expected to reduce air pollution.

The Mineral Industry of Zaire

By Harold J. Schroeder [1]

Zaire continued to be the largest producer of cobalt and industrial diamond in the world and ranked sixth in mine production of copper. Most of Zaire's exports by value and nearly half of governmental revenues were derived from production of mineral commodities. Shaba Province in southeastern Zaire was the leading mineral-producing region and accounted for all of the copper, zinc, manganese, coal, by-product cobalt, cadmium, and germanium output. Kivu Province was the center of columbium-tantalum, gold, tin, and tungsten mining, and Kasai Province was the location of diamond mining.

Announced expansion plans would increase copper and associated cobalt production about 65% by 1980. However, until expected completion in 1977 of a high-voltage, direct-current transmission line from new generating capacity at Inga on the lower Zaire River to Shaba Province, there may be a critical energy shortage that could curtail output. Another important mineral development was the discovery of two offshore oilfields between 1970 and 1973 and the announced intention to commence production in 1975 at the rate of 25,000 barrels per day.

PRODUCTION AND TRADE

Mine production of copper continued an upward trend, increasing 12% to a record 488,300 tons in 1973. Other important mineral commodities with mine production increases were cobalt 15% and silver 6%. Production decreases were recorded for coal 10%, diamond 3%, gold 4%, manganese 10%, tin 13% and zinc 11%. Details of mineral production are shown in table 1. Export data are shown in table 2. The import data that appeared in the 1972 chapter are the most recent official information available.

[1] Physical scientist, Division of Nonferrous Metals—Mineral Supply.

Table 1.—Zaire: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
METALS			
Beryllium, beryl concentrate, gross weight	76	e 70	e 70
Cadmium, smelter production	r 262	296	278
Cobalt:			
Mine output, metal content	14,518	13,112	15,082
Refinery production	14,518	13,043	15,052
Columbium-tantalum concentrate	r 119	100	46
Copper:			
Mine output, metal content	407,064	437,250	488,349
Blister and leach cathodes	404,600	428,200	460,479
Refined	207,842	216,300	223,557
Germanium, content of concentrates, kilograms	53,133	e 53,000	e 53,000
Gold [1], troy ounces	r 174,513	139,019	133,521
Manganese ore and concentrate, gross weight	r 329,066	369,481	333,963
Rare-earth metals, monazite concentrate, gross weight	r 180	225	229
Silver, thousand troy ounces	r 1,534	1,889	1,995
Tin:			
Mine output, metal content, long tons	r 6,354	5,799	5,048
Smelter, primary e, do	r 1,329	1,378	1,138
Tungsten, mine output, metal content	321	287	242
Zinc:			
Mine output, metal content	r 109,200	99,817	88,434
Metal, primary, electrolytic	r 62,673	66,654	67,746
NONMETALS			
Cement, hydraulic, thousand tons	455	476	e 471
Diamond:			
Gem, thousand carats	r 1,274	1,339	1,294
Industrial, do	r 11,468	12,051	11,646
Total, do	r 12,742	13,390	12,940
Lime	NA	NA	e 150
Stone, not further identified, thousand tons	NA	NA	e 750
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous, do	r 119	128	115
Petroleum refinery products:			
Gasoline, thousand 42-gallon barrels	925	945	947
Kerosine and jet fuel, do	553	594	563
Distillate fuel oil, do	1,235	1,343	1,333
Residual fuel oil, do	1,970	2,248	2,165
Other, liquefied petroleum gas, do	17	--	25
Refinery fuel and losses, do	264	301	298
Total, do	4,964	5,431	5,331

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

[1] Excludes gold recovered from blister copper.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972 [2]
Cadmium metal, unwrought	[3] 205	[3] 299	Belgium-Luxembourg 229; France 43; West Germany 27.
Cobalt metal, unwrought	[3] 14,551	[3] 17,474	Belgium-Luxembourg 12,842; [4] United States 2,306; Japan 1,847; West Germany 318; France 161.
Copper metal, unalloyed:			
Unrefined	[5] 207,000	[5] 210,000	Belgium-Luxembourg 199,900; [5] France 8,900.[5]
Refined	[5] 198,700	[5] 214,700	Belgium-Luxembourg 57,500; [5] Italy 45,400; [5] France 24,300; [5] West Germany 11,900; [5] Japan 9,900.[5]
Manganese ore	[3] 230,093	[3] 270,137	United States 136,000; [6] Belgium-Luxembourg 133,278; West Germany 353; Italy 306; Japan 200.
Tin ore and concentrate ____long tons__	[7] 4,997	[3] 9,129	All to Belgium-Luxembourg.
Zinc:			
Ore and concentrate	[8] 49,999	[3] 38,535	Do.
Metal, unwrought	[3] 31,186	[3] 43,536	United States 20,312; Belgium-Luxembourg 12,021; West Germany 5,000; Italy 4,048; Netherlands 1,300; France 855.

[1] Because official export statistics of Zaire are not available for any year subsequent to 1970, this table has been compiled from a variety of sources, chiefly the import statistics of trading partner countries and the publication Metal Statistics, 1963–73, issued by Metallgesellschaft Aktiengesellschaft of Frankfurt am Main, Fed. Rep. of Germany. Therefore, this table covers only major mineral commodity exports from Zaire. One major export, that of diamond, could not be compiled owing to the fact that trading partner import statistics do not clearly show receipts of diamond from Zaire in quantitative units. Virtually all of the nation's diamond output is exported, chiefly to the United Kingdom and Belgium, from which countries the stones are distributed to other nations.

[2] Source: Unless otherwise noted, import statistics of trading partner countries.

[3] Sum of detail reported by trading partner countries listed under "Principal destinations."

[4] Reported in source as from undisclosed destinations, but believed to be largely, if not entirely, from Zaire.

[5] Source: Metal Statistics.

[6] Approximate; only a portion of the 252,740 tons reported in U.S. import statistics as being received from Zaire actually originated in that country.

[7] Import statistics of Belgium-Luxembourg and the Netherlands.

[8] Import statistics of Belgium-Luxembourg and France.

COMMODITY REVIEW

METALS

Cobalt, Copper, Zinc, and Associated Metals.—All of the copper, cobalt, and zinc production was from mines in Shaba Province operated by the nationalized company, La Générale des Carrières et des Mines du Zaire (Gécamines) and by Société de Développement Industriel et Minière du Zaire (Sodimiza). Expansion projects planned by the two operating companies and entry into production by a third company would result in a planned copper output in excess of 800,000 tons by 1980 in comparison with the 488,300 tons achieved in 1973. The Gécamines complex includes three underground and six open pit mines with associated concentrators, and metallurgical plants at Lubumbashi, Shituru, and Karanda. From the sale of metals in 1973 Gécamines received approximately $890 million from which the Zairian Government gained $250 million in tax revenues.

Copper output of Gécamines advanced 8% to 460,700 tons, the realization of a 5-year expansion goal a year ahead of schedule. Byproduct gold and silver were recovered during metallurgical processing of copper concentrates. The company also produced 15,000 tons of cobalt as a coproduct, principally from its western group of mines, and 153,000 tons of zinc in concentrates from the Kipushi mine with associated quantities of cadmium and germanium. An affiliated company, Société Metallurgique de Kolwezi (SMK) produced 67,750 tons of electrolytic zinc and another affiliate, Société Generale Industrielle et Chimique de Likasi (SOGECHIM) produced 123,350 tons of sulfuric acid from zinc roaster gases for use in the copper industry. Roasted and unroasted zinc con-

centrates that were in excess of the needs of the electrolytic zinc plant were available for export. In November 1973 SMK and SOGECHIM were absorbed into the Gécamines organization.

Gécamines has embarked upon a $250 million expansion plan to increase production to 570,000 tons of copper and 18,000 tons of cobalt by 1978. An additional expansion to 600,000 tons of copper by 1980 is contemplated. This plan includes construction of two new open pit mines, Dikuluwe and Mashamba, a new concentrator, a flash smelting plant, and an electrolytic refinery, all located near Kolwezi. One objective of the expansion plan is to refine 75% of its copper production by 1977, compared with the current 50% level. A longer term goal is to refine all copper produced in Zaire at refineries located in that country.

Sodimiza completed the first full year of production at its underground copper mine at Musoshi in Shaba Province and produced 71,300 tons of concentrate with an average copper content of 38%. All of the concentrate was exported via Lobito, Angola, for smelting and refining in Japan. Operations during 1973 were hampered by technical difficulties with the result that output was about 70% of rated capacity. The Zairian Government ownership of Sodimiza was increased from 15% to 20% in late 1973 with the remainder owned by a consortium of six Japanese companies, with the Nippon Mining Co. having the largest interest.

Development of a second copper mine at Kinsenda was continued by Sodimiza. The Kinsenda deposit is a relatively high-grade, 4% copper content, ore body but has a complex mode of deposition. A precise production schedule has not been decided upon but the company expects Kinsenda to eventually produce as much copper as the Musoshi mine. Sodimiza conducted exploration at two other sites, Mokambo and Kilela-Balanda, where copper deposits have been discovered. All of the mining and exploration activities are contained in a 36,000-square-kilometer concession in southeastern Shaba near the Zambian border. Under the terms of the agreement this concession will be reduced by 50% during 1974 and an additional 50% of the remainder in 1975.

Société Minière de Tenke-Fungurume (SMTF), an international consortium formed in 1970, has an agreement with the Government of Zaire to develop known copper-cobalt deposits in the Tenke-Fungurume area of Shaba. Ownership of the consortium is as follows: the Zaire Government, 20%; Amoco Minerals Co., 28%; Charter Consolidated Ltd. of London, 28%; Mitsui & Co. Ltd., 14%; Omnium des Mines S.A. of France, 3.5%; Bureau de Recherches Géologiques et Minières (BRGM) of Paris, 3.5%; and Leon Tempelsman & Son, Inc., of New York, 3%.

Exploration in the 1,425-square-kilometer concession to better define known mineralization was completed in May 1973. Evaluation of the 389 completed boreholes, with a combined length of 50,200 meters, resulted in estimated reserves of 47.5 million tons of ore containing 5.4% copper and 0.42% cobalt. Exploitation of the deposits will initially be by open pit mining, leaching of the oxidized and roasted sulfide copper minerals, solvent extraction of copper from the leach solutions, and eventual recovery of the copper by electrowinning. Production is expected to begin in 1977 to coincide with availability of electrical power from the Inga-Shaba high-voltage transmission line. It is envisaged that production will begin at the rate of 130,000 tons of copper per year and after a period of 8 years, by which time the ores will be mainly sulfide, increase to 150,000 tons per year. Capital expenditures, including funds for the required infrastructure, have been estimated at between $500 million and $600 million.

Société Internationale des Mines du Zaire (SIMZ) with identical ownership and management as SMTF was formed in 1970 to undertake a program of systematic exploration in a 30,000-square-kilometer concession in Shaba. There are no known deposits in this zone, and in accordance with the agreement, in March 1973 SIMZ surrendered half of the original concession area. The remaining 15,000 square kilometers were further reduced to 5,000 square kilometers in October 1973.

Columbium-Tantalum, Gold, Tin, and Tungsten.—Syndicat Minière de l'Etain (SYMETAIN) is Zaire's largest producer of tin and a major producer of tungsten. Its main production areas are at Kalima and Punia in the Maniema District of Kivu Province.

Cobelmine-Zaire (Cobelmine), a subsidiary of Compagnie Belge d'Enterprises

Minières, operated concessions in Kivu Province owned by five smaller mining companies. These companies were Compagnie Minière des Grand Lacs (MGL), Kinoretain, Kindamines, Minerga, and Miluba. Cobelmine's production in 1973 included 32,000 troy ounces of gold, 2,589 tons of tin concentrate, and quantities of columbium-tantalum and tungsten concentrates.

Philipp Brothers Sobaki (Phibraki), Bukavu, Kivu Province, produced 84 tons of concentrate from a mixed cassiterite/columbium-tantalum ore. Kivumines, owned by the Belgian company Sobaki and the U.S. company Engelhard Minerals & Chemicals Corp. (Philipp Brothers Div.) produced 605 long tons of tin concentrate and 144 tons of tungsten concentrate from mines in Kivu Province. Somikubi, owned by Kivumines and MGL, produced 27 long tons of tin concentrate from deposits near Lukoma.

A plan has been agreed upon to consolidate the major mining companies in Kivu Province into one operating company. If the merger is successful it is expected to achieve improved operating efficiency and to promote an increase in mining activity. Plans are for Cobelmine to assume administration of Kivumines, Phibraki, and Somikubi during 1974. It is expected that SYMETAIN will be merged into the group during 1975. A significant participation by the Zairian Government is also expected. The name proposed for the merged firms was Société Minière et Industrielle du Kivu (Sominki).

In north-central Shaba Province, Zaire-Etain, owned equally by the Government and Compagnie Géologique et Minière des Ingenieurs et Industriels Belges (GEOMINES), produced 1,187 long tons of 70% tin concentrate and 35 tons of byproduct columbium-tantalum. The ore is mined from four open pits along an ore zone about 5 kilometers long and 100 to 400 meters wide. Electric furnaces smelt the concentrate to tin ingots which are transported by road, barge, and rail to the Angolan port of Lobito.

Manganese.—Société Minière de Kisenge (SMK) operated three open pit manganese mines at Kisenge near the Angolan border. Most of the output was a manganese oxide product containing 48% to 55% manganese and 270,000 tons was exported in 1973. Since May 1973 a manganese carbonate product containing 35% manganese was produced and 10,000 tons was exported. Beceka-Manganese of Belgium owned a majority of SMK shares until November 1972 when the operation was nationalized. However, the precise status after nationalization has not been clarified and Beceka-Manganese continued management and marketing functions.

NONMETALS

Cement.—Ciments et Materiaux de Construction du Shaba (Cimshaba) and Société des Ciments du Congo (CICO) operated cement plants and produced a total of 471,000 tons of cement compared with 476,000 tons in 1972.

Diamond.—Production of diamond was 12.9 million carats compared with 13.4 million carats in 1972. Société Minière de Bakwanga (MIBA), located at Mbuji Mayi, East Kasai region, was the principal producer of diamond, mostly of industrial quality. In a November 30 address to the National Legislative Council, President Mobutu announced the intention of the Government of Zaire to take over operations of the MIBA diamond mines. Details of the change in ownership were unavailable.

MINERAL FUELS

Coal.—La Société des Charbonnages de la Luena operated a coal mine about 45 miles northwest of Lubudi in southwest Shaba. Production was 115,110 tons, a 10% decline and well below the peak production of 429,000 tons in 1955. Output has declined since 1955 largely owing to development of hydroelectric power in the region and electrification of the railroads. Also Luena coal is not suitable for coking and coal for that purpose was imported. Principal consumers of Luena coal were Gécamines (55%) and Cimenteries de Lubudi (38%). In connection with Gécamines expansion plans a new Lurgi coal gasification plant will increase demand for Luena coal.

Petroleum.—Two offshore oilfields are planned to be brought into production in 1975 by a group comprised of Gulf Oil Zaire with a 50% equity, and a Belgium firm Ste. du Littoral Zairois Soliza with a 17.2% equity. Initial production will be 25,000 barrels per day. Discovery wells were drilled in one structure in 1970 and in another structure in 1973. About $25 million was expended in exploration and appraisal of the offshore area through 1973.

An estimated $30 million to $35 million will be invested in 1974 and 1975 before the start of production.

Texaco Inc. and Royal Dutch/Shell Group (Shell) are equal partners in oil and gas exploration in a concession area of 136 million acres in the central basin. The Government of Zaire has reserved the right to participate in the project at a later date.

The Government, in partnership with Italy's Ente Nazionale Idrocarburi (ENI), operates a 16,000-barrel-per-day-capacity refinery at Moanda. Crude petroleum imports from Iran, Saudi Arabia, and Nigeria totaled 14,325 barrels daily. Petroleum product imports were reported at 2,750 barrels per day. In December the Government nationalized the marketing facilities of Mobil Oil Co., Texaco Inc., Petrofina, S.A., and Shell, placing marketing operations under control of the Ministry of Energy.

The Mineral Industry of Zambia

By Gertrude N. Greenspoon [1]

The economic situation in Zambia in 1973 was overshadowed by the border closure with Southern Rhodesia on January 8. Despite this disruption in the flow of Zambia's exports and imports, foreign trade for the year was not greatly reduced. Copper exports, the principal trade commodity, reached 700,000 tons. Imports were restricted in the first half of 1973 until alternate trade routes were developed by expanding road service to Dar es Salaam, Tanzania, and Mombasa, Kenya, and the use of rail service to Lobito, Angola. The sharp increase in the price of copper more than offset the loss incurred from the interruption of mining industry supplies and the increase in some transportation costs.

Preliminary data indicated that the gross domestic product (GDP) in 1973 was K1,352 million,[2] about 11% more than that of 1972. However, the effects of the border closure on imported supplies for the mining and other industries caused shortages in some consumer goods in the first half of 1973. As a result, the rate of inflation increased and prices rose about 10% in 1973.

In 1970, the Zambian Government acquired a 51% interest in Roan Consolidated Mines, Ltd. (RCM) and in Nchanga Consolidated Copper Mines, Ltd. (NCCM), and issued negotiable external bonds redeemable over periods of 8 and 12 years, respectively. On August 31, 1973, the Government announced measures that in effect completed government control over the copper industry. Salient features of the new measures follow: (1) Redemption of the outstanding bonds, (2) cancellation of the management and marketing contracts held by the private companies, (3) establishment of a copper marketing company owned wholly by the Government, (4) application of normal tax provisions and exchange control regulations to RCM and NCCM, and (5) continuation of the private companies as minority shareholders.

On September 12, Zambia Copper Investments, Ltd. (ZCI), which held the 49% interest in NCCM, received payment for the bonds due in 1982. On September 21, the 1978 bonds were paid to the holders of the 49% interest in RCM—RST International, Inc., ZCI, and the public.

A new company, Metal Marketing Corp. (Zambia) Ltd., was formed on September 25. The company, under the office of the Ministry of Mines and Mining Development, will deal in copper and other minerals.

Efforts to lessen Zambia's dependence on copper as the main source of national income continued throughout 1973. Through Mindeco Small Mines, Ltd., a 100% subsidiary of Mindeco, Ltd., a new feldspar and fluorspar mine was under development near Kariba. Production from this operation will supply raw materials for the proposed glass plant at Kapiri Mposhi.

Another project was the reopening of the gold mine once known as Dunrobin. The mine was closed in 1941 after producing for 11 years. It was to be renamed Luwiri and was scheduled for production in the first quarter of 1975. Mindeco estimated that the ore reserves totaled about 50,000 tons.

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[1] Mineral specialist, Division of Nonferrous Metals—Mineral Supply.

[2] Because of fluctuating exchange rates, a meaningful conversion to U.S. currency is impractical. At yearend, however, the exchange rate was one Zambia kwacha (K) = US$1.56.

PRODUCTION

The value of mineral production totaled K783.0 million in 1973, a 49% increase over that of 1972, and 3% more than the 1969 record high. Mine and smelter outputs decreased 2% and 1%, respectively, from those of 1972, but production of refined copper rose 4%. Electrolytic zinc production fell 4%, refined lead output decreased 3%, and production of cobalt metal fell 6%. The upward trend in coal production since 1958 continued in 1973 and output registered a slight increase.

Table 1.—Zambia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1971	1972	1973 [p]
METALS			
Beryl, gross weight	NA	[2] 187	[e] 200
Cadmium metal	[r] 5	16	16
Cobalt:			
Mine output, metal content	2,080	2,053	1,944
Metal	2,079	2,055	1,929
Copper:			
Mine output, metal content of concentrate	651,396	717,700	706,574
Blister and anodes, copper content	643,674	697,289	688,576
Refined	534,339	615,222	638,509
Gold [3] troy ounces	9,866	[e] 11,400	[e] 11,500
Lead:			
Mine output, lead content	33,900	31,400	25,300
Smelter (refined)	27,700	25,900	25,000
Silver [4] thousand troy ounces	1,266	[r e] 1,400	[e] 1,400
Tin, concentrate, gross weight long tons	[e] 6	7	7
Zinc:			
Mine output, zinc content	68,900	70,500	73,200
Smelter (electrolytic)	57,000	55,900	53,500
NONMETALS			
Amethyst kilograms	93,417	46,125	79,090
Cement, hydraulic thousand tons	[r] 470	485	412
Lime, hydraulic and quick [e] do	104	104	110
Stone:			
Limestone do	874	1,001	978
Phyllite do	73	85	67
Talc	713	4,521	1,331
MINERAL FUELS AND RELATED MATERIALS			
Coal, bituminous thousand tons	812	937	940

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

[1] In addition to the commodities listed, selenium and tellurium occur as minor components of copper ore mined, and a part of the total of these metals mined may be recovered in Zambian smelting and refining operations, but production is not reported and available information is inadequate for the formulation of reliable estimates. Manganese ore was known to have been mined in 1973 and may have been mined in 1971 and 1972 as well, but output was not quantitatively reported and no basis for estimation exists. In 1970, the last year for which manganese ore production was reported, 6,081 tons was produced.

[2] Includes emerald.

[3] Chiefly contained in blister copper, refinery muds, and electrolytic copper.

[4] Refined silver and silver contained in blister copper, refinery muds, and electrolytic copper.

TRADE

Zambia's trade surplus improved substantially in 1972 over that in 1971, the lowest since 1964. The surplus recorded in 1972 totaled K137.9 million compared with K85.9 million in 1971, an increase of 61%. Exports for 1973 were expected to reach K755 million, chiefly because of the high copper price in the last quarter of 1973. Copper prices averaged K712 per ton in early 1973 and reached a record of K1,750 per ton on December 5. Although imports were increasing in the last quarter 1973, they were expected to reach K340 million, 16% below 1971 and the lowest in 3 years. Thus, a trade surplus if K415 million was anticipated for 1973.

In 1972, exports were valued at K541.7 million. Copper continued as the principal exchange earner, accounting for K490.9 million, or 91% of total exports. Japan was the major export market for the third consecutive year.

Imports in 1972 were valued at K403.9 million. Mineral commodities accounted for K34.8 million, of which K26.6 million was for mineral fuels. Import data by commodity in the 1972 chapter are the latest available.

The value of total trade and mineral trade, in million dollars (1972 values converted at the yearend exchange rate), was as follows:

	Mineral commodity trade	Total commodity trade
Exports:		
1970	r 985.0	r 1,000.9
1971	r 658.6	r 679.2
1972	813.5	845.1
Imports:		
1970	r 56.6	477.0
1971	r 55.8	r 559.0
1972	54.3	630.1

r Revised.

Table 2.—Zambia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum metal, scrap	4	NA	
Cadmium metal, unwrought	--	NA	
Cobalt metal, unwrought	1,189	NA	United States 485.[1]
Copper:			
Ore and concentrate, copper content	--	[2] 10,000	All to Republic of South Africa.[2]
Sludge, gross weight	82	NA	
Slimes, gross weight	56	NA	
Other copper-bearing residues, gross weight	1,997	NA	
Metal:			
Unrefined:			
Anodes	1,199	NA	
Blister	98,678	[3] 87,588	Japan 55,232; [3] United Kingdom 15,517; [3] Yugoslavia 7,166.[3]
Refined:			
Wire bar	494,654	[3] 622,875	United Kingdom 125,782; [3] Japan 108,679; [3] Italy 87,007; [3] France 71,780; [3] West Germany 62,511; [3] Brazil 47,068; [3] India 29,770.[3]
Cathode	37,804		
Iron and steel semimanufactures, including ferroalloys	19	NA	
Lead:			
Oxide	438	NA	
Metal, unwrought	23,895	[3] 25,300	Italy 5,879.[1]
Silver, unwrought ----troy ounces	93,816	NA	
Zinc metal, unwrought	49,453	[3] 59,500	Yugoslavia 12,727; [1] United Kingdom 10,572; [1] Italy 3,468.[1]
NONMETALS			
Cement, hydraulic	6,227	NA	
Fertilizers, nitrogenous	20	NA	
Lime	344	NA	
Magnesite	2	NA	
Precious and semiprecious stones, except diamond ----value, thousands	$1,106	NA	
Talc	471	NA	

NA Not available.
[1] Source: Official import statistics of listed recipient country.
[2] Source: World Bureau of Metal Statistics. World Metal Statistics. February 1975, 109 pp.
[3] Source: Metallgesellschaft Aktiengesellschaft. Metal Statistics 1963–73. Frankfurt am Main, 1974, 332 pp.

COMMODITY REVIEW

METALS

Copper.—Mine and smelter production of copper in 1973 were slightly below those in 1972, but output of refined copper registered a 4% increase.

RCM produced 278,700 tons of copper in the year ended June 30, 1973, compared with 242,800 tons in the same period of 1972. The 15% increase reflects production from the Baluba mine, which began in January, and continued recovery from the 1970 cave-in at Mufulira. However, production was adversely affected by poor ground conditions at the Luanshya mine and from mining lower grade ore at Chibuluma. Copper production consisted of

242,700 tons of wirebars, 32,400 tons of cathodes, and 3,600 tons of leach cathodes.

A record high output of cathodes and wirebars was achieved at the Ndola Copper Refinery. Cathodes produced totaled 133,200 tons (121,000 tons in 1972) and the casting plant produced 156,600 tons of wirebars (133,600 tons in 1972).

Ore production at the Mufulira mine totaled 6.37 million tons averaging 2.18% copper (5.12 million tons averaging 2.12% copper in 1972). Smelter production, including that derived from concentrates and smelting ore from other RCM mines, totaled 156,800 tons (143,900 tons in 1972). Production of wirebars totaled 132,200 tons.

At Luanshya, 6.49 million tons of ore (6.26 million tons in 1972) including 256,000 tons from Baluba was produced. Smelter production totaled 117,500 tons (110,200 tons in 1972). A total of 1.84 million tons of ore (1.46 million tons in 1972) was treated at the Mufulira and Chambishi concentrators and the leach plant. Cobalt hydroxide and solution containing 789 tons of cobalt was produced from Chibuluma and Baluba concentrates.

A total of 693,000 tons of ore averaging 3.57% copper and 0.16% cobalt was produced at Chibuluma. The Kalengwa mine produced 309,000 tons of ore compared with 241,000 tons produced in 1972. Copper contained in ore and concentrate totaled 13,600 tons.

At Luanshya, expansion of the concentrator to treat the ore from the Baluba mine was nearing completion; the mine began production in January. At Mufulira, the new tankhouse resulted in refining capacity of 235,000 tons per year. An additional 20,000 tons annually is anticipated when periodic-current-reversal facilities are installed.

Ore reserve data for the RCM group at the end of June 1973 follow:

Mine	Ore (thousand metric tons)	Copper, percent
Mufulira	137,106	3.18
Luanshya	127,788	2.64
Chambishi	43,916	2.92
Chibuluma	8,870	4.78
Kalengwa	1,300	7.70

NCCM produced 440,000 tons of copper in the year ended March 31, 1973, compared with 401,300 tons in the same period of 1972. A total of 5.5 million tons of ore was produced by the Rokana Div., of which 55% was from the Mindola ore body. Smelter output was 308,900 tons and refinery production totaled 315,900 tons. At Bwana Mkubwa, 949,800 tons of ore was produced. The concentrator treated 670,800 tons of ore and produced 79,500 tons of concentrates averaging 19% copper. Copper contained in concentrates totaled 15,100 tons.

At the Chingola Div., 10 million tons of ore was produced. Nearly 7 million tons came from open pit operations (Nchanga, Chingola, River Lode, Mimbula, and Fitula); the remainder was from the Lower and Upper underground mines. The Chingola concentrator treated 8.5 million tons of ore and produced 259,000 tons of copper-in-concentrates. The Konkola concentrator treated 1.4 million tons of Chingola ore, and produced 45,200 tons of sulfide concentrates containing 49.74% copper and 117,600 tons of oxide concentrates averaging 14.65% copper.

Ore mined and treated at the Konkola operation totaled 1.7 million tons of ore and yielded 51,100 tons of copper-in-concentrate.

At the Chingola Div., the second stage of the tailings leach plant was expected to be operational about yearend 1973 and full production was expected to be achieved by mid-1974. Expansion of the Mindola North open pit at Rokana was completed, and other open pits were under development. The new oxide concentrator to treat ores from the open pit mines was nearly completed, and the third acid plant and gas-collection system was on schedule for operation in stages over the next 3 years.

Ore reserve data for the NCCM group at yearend 1972 follow:

Mine	Ore (thousand metric tons)	Copper, percent
Chingola	237,081	3.69
Bancroft (Konkola)	124,880	3.56
Nkana (Rokana)	123,246	2.52
Kansanshi (Konkola)	6,482	3.44
Bwana Mkubwa (Rokana)	4,248	3.38

Lead and Zinc.—In the year ended March 31, 1973, the Broken Hill Div. of NCCM produced 354,600 tons of lead-zinc ore, nearly 20% more than in 1972. The flota-

tion plant treated 354,500 tons of ore containing 11.1% lead and 21.8% zinc, and produced 27,800 tons of lead concentrate averaging 42.7% lead, and 35,900 tons of zinc concentrate averaging 58.5% zinc. Production of lead and zinc totaled 27,400 tons and 55,500 tons, respectively. Proved reserves at the Broken Hill Div. at the end of 1972 were 2.3 million tons averaging 23.5% zinc and 10.4% lead; indicated reserves were 1 million tons containing 24.4% zinc and 12% lead.

Installation of two Waelz kilns and a deleading kiln was proceeding on schedule. Operation of the new plant was expected to begin in early 1975. In addition to treating dump materials from Broken Hill, the Waelz kilns were expected to treat ore from the Star Zinc mine, scheduled to begin production in 1975.

Other Metals.—Copper sludges and slimes from Zambia's electrolytic refineries are currently shipped out of the country for recovery of gold, silver, selenium, and some copper. Plans were made during the year to build a plant in Zambia to recover these byproducts. The plant will cost about K3.6 million and will be located near the Ndola Copper Refinery. Operations were expected to begin in 1976; the plant will treat 1,300 to 1,500 tons of anode slimes annually.

NONMETALS

A K10 million lime plant was brought into operation by Ndola Lime Co. The plant is an integrated crushing, screening, conveying and lime burning rotary kiln, and can produce 200,000 tons of lime annually. Development of the lime industry in Zambia has grown with the copper mining industry, which now receives all its requirements from local sources.

MINERAL FUELS

Coal.—The only producer of coal in Zambia is Maamba Collieries, Ltd., operating an open pit mine in the Southern Province. In 1973, washed coal production was hampered by plant breakdowns, but total output was slightly above that of 1972. Demand for coal was strong despite the startup of the Indeni oil refinery and the conversion of some copper plants and other coal users to heavy fuel oil. Delays in hydroelectric generating projects and the lack of rainfall resulted in increased demand from thermal power stations.

At the Broken Hill Div. of NCCM, construction of a coke plant using Maamba coal was planned. The plant will produce 100,000 tons of coke from 140,000 tons of coal per year.

The Mineral Industry of the Islands of the Caribbean

By Staff, Bureau of Mines

CONTENTS

BAHAMAS [1]

During 1973, Marcona Corp. signed a lease for the aragonite mining facilities of Ocean Trading Corp., a subsidiary of the Dillingham Corp. of Hawaii. The lease gives the new subsidiary, Marcona Ocean Industries Ltd., 13 years to operate present holdings and an option to buy all assets which may include up to 100,000 million tons of aragonite. Marcona Corp. hopes to expand the aragonite market with the introduction of its patented beach restoration process.

A new oil transshipment terminal at South Riding Point on Grand Bahama Island neared completion during 1973. Tankers will be docked at an artificial sea island constructed in 100 feet of water, 4,000 feet from shore. Initially, oil will be transferred from tankers of up to 350,000-deadweight-ton capacity to smaller tankers for shipment to the U.S. east coast. Ballast water from tankers will be pumped ashore to recover oil and treated for eventual return to the sea. Sea water quality may be a critical concern, in that two major Bahamian industries are beach resorts and aragonite mining.

The terminal will be owned by the Bahamian Government through Bahamas Industrial Co., Ltd., which leased the facility for 20 years to Burmah Oil Bahamas, Ltd., a wholly-owned subsidiary of Burmah Oil Tankers, Ltd., which is the shipping arm of The Burmah Oil Co., Ltd., of London. The facility's first major long-term contract for oil transshipment was signed by Shell Oil Co. even though it's own transshipment facilities at Curaçao will handle tankers up to 500,000 deadweight-tons.

Kardar Canadian Oils Ltd. is planning an oil refinery on Grand Bahamas Island which should have a capacity around 200,000 barrels per day. Thyssen Stahlunion of West Germany is engineering and constructing the plant.

The Freeport refinery on Grand Bahama Island, owned by Bahamas Oil Refinery Co. (BORCO), a subsidiary of New England Petroleum Corp. (65%) and Standard Oil Co. of California (35%), completed its planned expansion from 250,000 to 500,000 barrels per day. A 60,000-barrel-per-day desulfurization plant was under construction at yearend. Most of BORCO's output is exported to the United States.

The production of mineral commodities in the Bahamas is shown in table 1.

[1] Prepared by Daniel C. Adkins, geologist, Division of Fossil Fuels—Mineral Supply.

Table 1.—Islands of the Caribbean: Production of mineral commodities

Area, commodity, and unit of measure [1]	1971	1972	1973 [p]
ANTIGUA [2]			
Petroleum refinery products: [3]			
Gasoline ---- thousand 42-gallon barrels	[e] 680	[e] 680	495
Jet fuel and kerosine ---- do	[e] 543	[e] 543	407
Distillate fuel oil ---- do	[e] 746	[e] 746	773
Residual fuel oil ---- do	[e] 2,664	[e] 2,664	2,450
Other, including refinery fuel and losses ---- do	[e] 267	[e] 267	717
Total ---- do	[e] 4,900	[e] 4,900	4,842
Sand and gravel ---- thousand metric tons	NA	25	23
Stone, crushed ---- thousand cubic meters	29	55	45
BAHAMAS [2]			
Cement, hydraulic ---- thousand metric tons	831	986	953
Petroleum refinery products:			
Jet fuel ---- thousand 42-gallon barrels	10,228	12,115	12,191
Distillate fuel oil ---- do	10,242	11,200	19,126
Residual fuel oil ---- do	42,267	45,713	53,582
Other ---- do	10,913	11,419	14,879
Refinery fuel and losses ---- do	3,000	1,354	4,563
Total ---- do	76,650	81,801	104,341
Salt ---- thousand metric tons	1,213	809	1,121
Stone:			
Aragonite ---- do	[4] 762	NA	917
Limestone ---- do	NA	1,207	1,269
BARBADOS [2]			
Gas, natural:			
Gross production ----million cubic feet	129	123	108
Marketed production ---- do	106	85	114
Petroleum refinery products:			
Gasoline ---- thousand 42-gallon barrels	301	321	333
Kerosine ---- do	92	95	77
Distillate fuel oil ---- do	219	225	402
Residual fuel oil ---- do	228	243	223
Other ---- do	34	41	28
Refinery fuel and losses ---- do	46	49	39
Total ---- do	920	974	1,102
CUBA [2 5]			
Cement, hydraulic ---- thousand metric tons	1,088	1,474	[e] 1,500
Chromite [e] ---- do	20	20	20
Cobalt [e] ---- metric tons	1,500	1,500	1,600
Copper, mine output, metal content [e] ---- do	3,000	3,000	5,000
Iron and steel, crude steel [e] ---- thousand metric tons	140	140	140
Nickel: [e]			
Mine output (content of oxide and sulfide) metric tons	[r] 35,000	[r] 32,000	32,000
Smelter [6] ---- do	32,000	32,000	32,000
Petroleum: [3]			
Crude ---- thousand 42-gallon barrels	[r] 785	778	NA
Refinery products:			
Gasoline ---- do	[r] 5,049	[e] 4,930	NA
Kerosine ---- do	[r] 3,402	3,426	NA
Distillate fuel oil ---- do	[r] 4,916	[e] 4,260	NA
Residual fuel oil ---- do	[r] 16,364	17,309	NA
Lubricating oil ---- do	707	777	NA
Other:			
Liquefied petroleum gas ---- do	[r] 684	777	NA
Unspecified [e] ---- do	[r] 4,627	7,336	NA
Total [e] ---- do	[r] 35,749	38,815	NA
DOMINICA [2]			
Pumice used for aggregate ---- metric tons	[e] 62,000	77,111	113,398
DOMINICAN REPUBLIC [2]			
Aluminum, bauxite, dry equivalent, gross weight [7] thousand metric tons	[r] 1,088	1,035	1,145
Cement, hydraulic ---- do	[r] 596	677	680
Copper, mine output, metal content [e 8] ---- metric tons	450	450	450
Gypsum ---- thousand metric tons	248	[r e] 248	229
Marble ---- cubic feet	6,413	NA	NA
Nickel, content of ferronickel product ---- metric tons	200	17,400	33,150
Petroleum refinery products:			
Gasoline ---- 42-gallon barrels	--	--	1,945
Jet fuel ---- do	--	--	335
Distillate fuel oil ---- do	--	--	1,074

See footnotes at end of table.

Table 1.—Islands of the Caribbean: Production of mineral commodities—Continued

Area, commodity, and unit of measure[1]	1971	1972	1973 p
DOMINICAN REPUBLIC [2]—Continued			
Petroleum refinery products—Continued			
Residual fuel oil ---- 42-gallon barrels	--	--	1,443
Other, liquefied petroleum gas ---- do	--	--	356
Refinery fuel and losses ---- do	--	--	582
Total ---- do	--	--	5,735
Salt ---- metric tons	38,555	e 39,000	e 39,000
Stone, limestone (excluding that for cement) [7] thousand metric tons	NA	52	118
GUADELOUPE			
Clays ---- metric tons	NA	NA	1,000
Pumice, tuff (pozzolanic) ---- do	e44,000	e 44,000	160,000
Stone, sand and gravel:			
Stone, crushed and broken ---- do	NA	NA	420,000
Limestone ---- do	NA	NA	975,000
Sand ---- do	NA	NA	238,000
HAITI [2 9]			
Aluminum, bauxite, dried, gross weight thousand metric tons	643	687	648
Cement, hydraulic ---- do	72	81	108
Copper, mine output metal content ---- metric tons	6,622	--	--
Gold, mine output, metal content ---- troy ounces	e 3,000	--	--
Silver, mine output, metal content thousand troy ounces	e 17	--	--
Stone, crushed ---- thousand metric tons	NA	NA	73
JAMAICA			
Aluminum:			
Bauxite, dry equivalent of crude ore, gross weight do	r 12,440	12,543	13,600
Alumina (exports) ---- do	1,812	2,136	2,416
Cement, hydraulic ---- do	r 424	417	403
Clays for cement e ---- do	150	150	140
Gypsum ---- do	309	10 441	10 357
Lime ---- do	137	166	218
Petroleum refinery products:			
Gasoline ---- thousand 42-gallon barrels	1,247	2,345	2,155
Kerosine ---- do	1,319	528	735
Jet fuel ---- do		792	527
Distillate fuel oil ---- do	2,042	2,062	1,981
Residual fuel oil ---- do	5,467	5,851	6,067
Other:			
Liquefied petroleum gas ---- do	345	337	279
Unspecified ---- do			150
Refinery fuel and losses ---- do	335	596	181
Total ---- do	10,755	12,511	12,075
Sand and gravel:			
Sand:			
Glass ---- thousand metric tons	14	25	28
Common ---- thousand cubic meters	NA	900	NA
Gravel ---- do	NA	e 70	NA
Stone:			
Limestone for cement and lime thousand metric tons	494	e 500	e 520
Marble ---- metric tons	2,604	NA	NA
MARTINIQUE			
Clays [11] ---- thousand metric tons	NA	r e 30	30
Petroleum refinery products: [3 12]			
Gasoline ---- thousand 42-gallon barrels	e 340	e 272	951
Kerosine ---- do	e 465	e 326	164
Jet fuel ---- do			556
Distillate fuel oil ---- do	e 149	e 134	361
Residual fuel oil ---- do	e 400	e 373	1,321
Other, liquefied petroleum gas ---- do	e 58	81	176
Total ---- do	e 1,412	e 1,186	3,529
Pumice [11] ---- thousand metric tons	e 18	e 18	151
Salt e [11] ---- do	300	300	300
Stone, sand and gravel:			
Stone, crushed and broken [11] ---- do	NA	e 650	932
Sand [11] ---- do	NA	e 50	19
MONTSERRAT			
Sand and gravel, natural ---- cubic meters	NA	NA	433,025

See footnotes at end of table.

Table 1.—Islands of the Caribbean: Production of mineral commodities—Continued

Area, commodity, and unit of measure [1]	1971	1972	1973 [p]
NETHERLANDS ANTILLES [2]			
Fertilizer materials:			
Phosphatic, crude phosphate rock [11] thousand metric tons	[r] 156	111	92
Nitrogenous, manufactured (sales) [11] do	NA	112	NA
Petroleum refinery products:			
Gasoline:			
Aviation thousand 42-gallon barrels	2,114	4,438	548
Motor do	27,964	24,175	36,063
Jet fuel do	12,877	24,865	13,542
Kerosine do	14,045	15,403	12,848
Distillate fuel oil do	25,208	21,480	30,295
Residual fuel oil do	159,545	165,983	202,165
Lubricants do	2,519	6,234	3,212
Other do	25,060	7,863	30,995
Refinery fuel and losses do	15,842	10,363	9,154
Total do	285,174	280,804	338,822
Stone, limestone metric tons	975	NA	NA
Sulfur, elemental do	26,000	74,000	72,000
ST. VINCENT			
Sand do	NA	[e] 31,000	NA
Stone, crushed do	NA	[e] 25,000	NA
TRINIDAD AND TOBAGO			
Asphalt, natural thousand metric tons	124	115	NA
Cement, hydraulic do	256	287	263
Clays:			
Argillite thousand cubic meters	169	NA	155
Other do	78	96	NA
Fertilizer materials, manufactured, nitrogenous thousand metric tons	578	640	400
Gas, natural:			
Gross production million cubic feet	109,814	104,307	119,979
Marketed production do	65,074	67,150	69,502
Gypsum metric tons	271	--	--
Natural gas liquids thousand 42-gallon barrels	141	137	79
Petroleum:			
Crude do	[r] 47,148	51,719	60,666
Refinery products:			
Gasoline:			
Aviation do	210	227	231
Other do	22,928	20,145	19,600
Jet fuel do	11,526	9,451	8,353
Kerosine do	5,782	6,766	7,757
Distillate fuel oil do	18,728	13,769	15,347
Residual fuel oil do	79,272	85,197	81,820
Lubricants do	1,270	1,241	942
Other:			
Liquefied petroleum gas do	1,787	1,942	350
Unspecified do			1,410
Refinery fuel and losses do	4,045	5,536	5,877
Total do	145,548	144,274	141,687
Sand and gravel:			
Pitch sand thousand cubic meters	20	24	26
Other sand and gravel do	173	664	109
Stone:			
Diorite do	28	2	NA
Limestone (for cement) do	379	441	337
Porcellanite do	32	9	NA
Sulfur, elemental, byproduct [e] metric tons	[r] 4,200	4,200	4,000

[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 produce crude construction materials (clays, sand, gravel, and stone) but output is not reported and available information is inadequate to make reliable estimates of output levels.

[2] In addition to the commodities listed, mineral commodity output may also include crude construction materials (clays, sand, gravel, and lime) other than those listed (if any), but data on such production are not collected and available information is inadequate to make reliable estimates of output levels.

[3] Official figures are not available; data on products listed individually are converted to barrels from metric tons given in: United Nations, World Energy Supplies 1969–72, Statistical Papers, Series J, No. 17, New York, 1974; total is estimated from crude oil production and imports reported in the same source; other products derived by subtraction.

[4] Of total output, a large part in each year was used locally for fill, with only a small part of the total exported for agricultural use. Exports totaled 121,926 tons in 1971.

[5] 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.
[6] Includes nickel content of nickel oxide and nickel fonte in addition to metallic nickel and ferronickel.
[7] Export figure; production unknown.
[8] Inadvertently reported in thousand metric tons in previous edition; figures presented therein actually were metric tons.
[9] Salt presumably also is produced, but output is not reported and information is inadequate to make reliable estimates of output levels.
[10] Figure represents local sales and exports.
[11] Inadvertently reported in metric tons in previous edition; figures presented therein actually were thousand metric tons.
[12] No data included for refinery fuel and losses.

Table 2.—Bahamas: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, including alloys, all forms	1	1
Copper metal, including alloys, all forms	16	2
Iron and steel:		
Ore and concentrate	97	--
Metal:		
Scrap	142	234
Semimanufactures	15	9
Lead, including alloys, all forms	2	1
Other:		
Ore and concentrate of base metals, n.e.s	1	203
Metals, including alloys, all forms	533	2,679
NONMETALS		
Cement, other than building materials	800,142	879,010
Clays and clay products (including all refractory brick) -- value --	(1)	--
Fertilizer materials	(2)	(2)
Salt	1,058,986	907,885
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	1	--
Worked -- value --	$1,675	--
Gravel	46	--
Sand	12,193	--
Other, building materials of cement -- value --	$20,845	$15,722
MINERAL FUELS AND RELATED MATERIALS		
Petroleum:		
Crude and partly refined -- thousand 42-gallon barrels --	(2)	2,047
Refinery products:		
Gasoline:		
Motor -- do --	10,457	3,985
Aviation -- do --	1	8
Kerosine -- do --	458	150
Jet fuel -- do --	4,940	1,895
Distillate fuel oil -- do --	7,560	4,663
Residual fuel oil -- do --	10,487	3,334
Lubricants -- do --	(2)	(2)
Other, liquefied petroleum gas -- do --	--	(2)

[1] Less than $1,000.
[2] Less than ½ unit.

Table 3.—Bahamas: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity		1971	1972
METALS			
Aluminum metal, including alloys:			
Unwrought		11	5
Semimanufactures		314	171
Copper, including alloys, all forms		50	30
Iron and steel:			
Ore and concentrate		7,530	--
Metal:			
Scrap		48	4
Steel, primary forms [1]		6	147
Semimanufactures:			
Bars, rods, angles, shapes, sections		33,086	7,147
Universals, plates, sheets		3,507	8,923
Hoop and strip		296	66
Rails and accessories		98	11
Wire		27	1,664
Tubes, pipes, fittings		23,900	14,440
Castings and forgings, rough		1,945	1,522
Lead, including alloys, all forms		40	9
Platinum-group metals and silver	troy ounces	7,627	3,500
Tin, including alloys, all forms	long tons	788	938
Uranium and thorium, including alloys, all forms		1	(2)
Zinc, including alloys, all forms		5	1
Other:			
Nonferrous metal scrap		1	--
Nonferrous base metals, including alloys, all forms		6	5
NONMETALS			
Abrasives, natural, n.e.s		(2)	24
Cement		39,385	69,868
Clays and clay products (including all refractory brick)		249	327
Diamond, gem, not set or strung	value	(3)	(3)
Fertilizer materials:			
Crude		r 2,428	1,857
Manufactured		r 1,869	2,192
Ammonia		230	255
Lime		682	278
Precious and semiprecious stones, except diamond	value	r $8,589	(3)
Salt		72,162	24,283
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked		r 238,305	147,765
Worked	value	$63,277	$96,782
Gravel and crushed rock		r 49,230	72,243
Limestone		10	4
Sand		92,421	125,109
Other crude nonmetals, n.e.s		11	3
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural		15,179	186
Coal and coke, including briquets		1,196	173
Petroleum:			
Crude and partly refined	thousand 42-gallon barrels	r 21,438	11,893
Refinery products:			
Gasoline:			
Motor	do	598	511
Aviation	do	136	50
Kerosine, including white spirit	do	280	129
Jet fuel	do	(2)	7
Distillate fuel oil	do	1,106	492
Residual fuel oil	do	8,506	3,768
Lubricants	do	18	19
Other:			
Liquefied petroleum gas	do	126	135
Mineral jelly and wax	do	(2)	(2)
Pitch	do	(2)	(2)
Bituminous mixtures, n.e.s	value	$49,515	$53,531
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	do	$33,223	$26,962

r Revised.
[1] Includes small quantity of pig iron.
[2] Less than ½ unit.
[3] Less than $1,000.

BARBADOS [2]

General Crude Oil Co. of Houston, Tex., continued as the sole oil concessionaire in Barbados during 1973, holding exploration and development rights to about 270 square miles of onshore and offshore territory. The concession rights are scheduled to expire in July 1974. Petroleum production by General Crude during 1973 reportedly amounted to approximately 100 barrels per day.

An engineering study was prepared in 1973 to determine the value of additional development drilling by General Crude. The first drilling activity during the year commenced in mid-December. A marine seismic survey also was conducted during 1973.

The only refinery in Barbados, owned by a Mobil Oil Corp. affiliate, had an average throughput of about 2,750 barrels per day. Virtually all of the petroleum processed by the facility came from Venezuela and was reexported.

The production of mineral commodities in Barbados is shown in table 1.

[2] Prepared by Ronald F. Balazik, geographer, Division of Fossil Fuels—Mineral Supply.

Table 4.—Barbados: Exports and reexports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, including alloys, unwrought and semimanufactures	60	36
Copper metal, including alloys, unwrought and semimanufactures	4	4
Iron and steel:		
Scrap	[1] 96	49
Pig iron, ferroalloys, similar materials	(2)	61
Steel, primary forms	4	1
Semimanufactures	1,219	310
Lead metal, including alloys, unwrought and semimanufactures	[r] 74	3
Tin metal, including alloys, unwrought and semimanufactures long tons	(2)	(2)
Zinc metal, including alloys, unwrought and semimanufactures	(2)	--
Other, scrap of all nonferrous metals	[1] 69	481
NONMETALS		
Cement	46	8
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	[1] 1	(2)
Products:		
Refractory (including nonclay brick)	1	(2)
Nonrefractory	[r] 340	544
Diatomite and other infusorial earth	[1] (2)	(2)
Fertilizer materials	1	3
Lime	10,924	7,210
Salt	[1] 36	3
Sodium and potassium compounds, n.e.s	4	1
Stone, sand and gravel:		
Dimension stone:		
Crude	[1] (2)	34
Worked	5	95
Gravel and crushed stone	NA	159
Sand, excluding metal bearing	[1] 2	--
Sulfuric acid	1	(2)
Other crude nonmetals, n.e.s	[1] 5	2
MINERAL FUELS AND RELATED MATERIALS		
Coal, all grades, excluding briquets	10	22
Peat and briquets	--	1
Petroleum refinery products:		
Gasoline thousand 42-gallon barrels	13	7
Jet fuel do	456	446
Kerosine do	(2)	81
Distillate fuel oil do	368	396
Residual fuel oil do	575	527
Lubricants do	1	1
Other do	1	4

[r] Revised. NA Not available.
[1] Partial figure.
[2] Less than ½ unit.

Table 5.—Barbados: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, including alloys, unwrought and semimanufactures	139	293
Cobalt oxides and hydroxides	(1)	1
Copper metal, including alloys, unwrought and semimanufactures	43	47
Iron and steel:		
Ore and concentrate	130	--
Scrap	86	89
Pig iron, ferroalloys, similar material	44	17
Steel, primary forms	128	67
Semimanufactures	8,099	13,192
Lead:		
Oxides	19	12
Metal, including alloys, unwrought and semimanufactures	85	70
Mercury 76-pound flasks	(1)	(1)
Nickel metal, including alloys, unwrought and semimanufactures	(1)	(1)
Silver metal, including alloys troy ounces	9,483	6,769
Tin metal, including alloys, unwrought and semimanufactures long tons	158	439
Titanium oxides	169	174
Zinc:		
Oxides	32	33
Metal, including alloys, unwrought and semimanufactures	52	37
Other:		
Ores and concentrates of nonferrous metals, not further identified	33	--
Scrap of all nonferrous metals	79	11
Metals and alloys, n.e.s., all forms	1	(1)
NONMETALS		
Abrasives:		
Natural, n.e.s	(1)	(1)
Grinding and polishing wheels and stones	6	4
Asbestos	4	(1)
Cement	56,240	55,856
Chalk	1	3
Clays and clay products (including all refractory brick):		
Crude, n.e.s	15	26
Products:		
Refractory (including nonclay brick)	20	157
Nonrefractory	430	656
Diatomite and other infusorial earth	21	34
Fertilizer materials:		
Manufactured:		
Nitrogenous	971	3,474
Phosphatic	411	39
Potassic	1	3
Other, including mixed	10,225	12,207
Ammonia	12	22
Graphite, natural	(1)	--
Lime	165	190
Mica, crude and worked	1	(1)
Pigments, mineral, iron oxides, processed	5	18
Salt	2,098	2,215
Sodium and potassium compounds, n.e.s.:		
Caustic soda	153	202
Caustic potash, sodic and potassic peroxides	10	(1)
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	r 58	20
Worked	20	51
Gravel and crushed rock	186	198
Sand, excluding metal bearing	24	6
Sulfuric acid	71	75
Other nonmetals, n.e.s.:		
Quartz, mica, feldspar, etc	41	28
Other	55	110
Building materials of asphalt, asbestos and fiber cement, unfired nonmetals, n.e.s	1,264	1,188
MINERAL FUELS AND RELATED MATERIALS		
Asphalt, natural	r 5	74
Carbon black	(1)	--
Coal, including briquets, all grades	167	125
Coke and semicoke	33	72
Hydrogen and rare gases	6	1
Peat and briquets	12	9

See footnotes at end of table.

Table 5.—Barbados: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity		1971	1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum:			
Crude	thousand 42-gallon barrels	454	691
Refinery products:			
Gasoline	do	79	144
Jet fuel	do	347	482
Kerosine	do	13	80
Distillate fuel oil	do	454	231
Residual fuel oil	do	712	298
Lubricants	do	12	12
Other:			
Liquefied petroleum gas	do	56	90
Unspecified	do	1	3
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals		2	23

r Revised.
1 Less than ½ unit.

BERMUDA [3]

Continued expansion of the construction industry in 1973 led to increased output of aggregates such as sand, crushed limestone, and dimension stone. As in past years, mineral production in Bermuda in 1973 consisted of small quantities of sand, dimension limestone, and crushed limestone. Production of crushed limestone totals about 50,000 tons per year. The great bulk of the output is used as aggregate in asphalt mixes; the remainder is used in paving and concrete construction units such as blocks and curbing. Imports consisted principally of petroleum refinery products, precious metals and construction aggregates. The latest available statistics on foreign trade in selected mineral commodities are given in the 1972 Minerals Yearbook.

CUBA [4]

Estimates of Cuban mineral production are shown in table 1. First-hand information on the Cuban mineral industry was not availble to the Bureau of Mines, and the following items are from published accounts.

In December 1972, Cuba and the U.S.S.R. signed five economic agreements, which among other things, provided for quadrupling Cuban nickel production over the next 10 or 12 years. Cuba also signed new trade agreements with Czechoslovakia and Hungary which provided for increased exports of Cuban nickel, copper, and chrome ores to these countries.

COMMODITY REVIEW

Fertilizers.—With U.S.S.R. aid, Cuba has greatly expanded its fertilizer industry since the early 1960's. The facilities at Matanzas were modernized and currently produce 145,000 tons per year, and new plants were built at Felton (350,000-ton-per-year capacity), Nuevitas (235,000-ton-per-year capacity), and Santa Lucia (320,000-ton-per-year capacity). A new facility being constructed at Cienfuegos will produce 465,000 tons per year and bring total Cuban fertilizer production to about 1.5 million tons per year. Present consumption of fertilizers in Cuba was reported to be about 550,000 tons per year.[5]

Nickel.—Output remained about the same as in 1972, at 32,000 tons. As part of a new economic pact, the U.S.S.R. agreed to pay $2.27 per pound for Cuban nickel for the next 7 years, a price which was about 40% above the current world price. It was further provided that the Nicaro and Moa Bay plants would be modernized and the mining bases expanded, that by

[3] Prepared by Harold J. Drake, physical scientist, Division of Nonmetallic Minerals—Mineral Supply.
[4] Prepared by William C. Butterman, physical scientist, Division of Nonferrous Metals—Mineral Supply.
[5] European Chemical News. Cuba Boosts Fertilizer Output. V. 23, No. 578, Apr. 6, 1973, p. 8.

1976 construction would begin on a new 30,000-metric-ton-per-year mining-metallurgical complex at Punta Gorda in Oriente Province, and that Cuban nickel production would eventually be further expanded to 126,000 tons per year. If this is accomplished, nickel will probably replace sugar as Cuba's most important export.[6]

Table 6.—Cuba: Selected mineral commodity imports from U.S.S.R.[1]
(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, including alloys, all forms	5,311	5,680
Copper metal, including alloys, all forms	4,857	5,683
Iron and steel:	89,500	89,100
Pig iron	2,900	3,300
Ferroalloys	191,100	202,000
Steel semimanufactures	1,200	1,212
Lead metal, including alloys, all forms	500	500
Zinc metal, including alloys, all forms		
NONMETALS		
Asbestos	10,800	12,300
Cement, hydraulic	144,000	52,000
Fertilizer materials:		
Nitrogenous:	65,900	74,500
Urea	258,800	290,900
Other manufactured	77,000	126,200
Phosphatic	61,200	128,900
Potassic	15,200	16,500
Refractory materials		
Sodium compounds n.e.s.:	33,600	27,800
Caustic soda	16,300	12,400
Soda ash	141,300	132,900
Sulfur		
MINERAL FUELS AND RELATED MATERIALS		
Carbon black	3,818	2,635
Coal:		
Anthracite thousand tons	45	34
Bituminous do	33	22
Coke do	54	57
Petroleum, crude oil and refinery products do	6,444	7,025

[1] Soviet exports to Cuba reported in Vneshnyaya Torgoviya S.S.S.R. za 1972 god (Foreign Trade of the U.S.S.R. for 1972), Moscow, 1973, 318 pp.

DOMINICAN REPUBLIC [7]

Falconbridge Dominicana C. por A. (Falcondo) operated its ferronickel plant at Bonao at about 80% of its design capacity of 63 million pounds of nickel in ferronickel per year. Achievement of design throughput was delayed due to a warranty inspection of three turbine generators, the installation of improved metal handling facilities, and the completion of modifications to the ore preparation circuit. In 1973 the company mined about 1.4 million dry tons of ore, and at yearend iron ore reserves were estimated at 64.2 million dry tons grading 1.58% nickel.

The only bauxite mining in the Dominican Republic was by the Aluminum Company of America (Alcoa). During the year 1.1 million dry tons of bauxite were exported to the United States. Yearend reserves of bauxite were estimated around 20 million tons, grading from 43% to 50% Al_2O_3.

Rosario Dominicana, S.A. (Rosario), began excavation and site preparation for the mine buildings at its Pueblo Viejo gold-silver property. Rosario planned to increase the plant throughput from 6,000 tons of ore per day to 8,000 tons per day. Due to the 33% increase in the capacity of the mine's facilities, metal output would be 350,000 ounces per year of gold and 1.5 million ounces per year of silver.

Design engineering for the mill, cyanide plant, and ancillary facilities are being carried out by Fluor Utah, Inc. Completion of the Pueblo Viejo project and initial mine output is scheduled for 1974. First

[6] Metal Bulletin. Cuban Nickel: One to Watch. No. 5784, Mar. 16, 1973, p. 14.
[7] Prepared by E. Chin, physical scientist, Division of Nonferrous Metals—Mineral Supply.

stage of mining operations involves working of the oxide ore body by open pit methods. Pit design is being planned by Western Knapp Engineering Division of Arthur G. McKee Co.

Cementos Nacionales, S.A., announced the construction of a cement plant near the port of San Pedro de Macoris, about 70 kilometers from Santo Domingo. The International Finance Corporation, a member of the World Bank, approved a loan of $7.38 million toward the $34.5 million project which is scheduled for completion late 1975.

Hanson-Rodriguez, S.A., completed feasibility studies for four proposed dams to be built in the Cibao Valley. The Hatillo and Rencom Dams are scheduled for construction first, around early 1974. A summary of these projects is as follows:

Project name	River	Height (meters)	Reservoir water volume (million cubic meters)	Estimated cost (million dollars)	Purpose
Alto Yuna Dam	Yuna	92	110	40	Irrigation and power generaton.
Hatillo Dam	do	40	750	30	Irrigation, water supply, and power generaton.
Rayacanes Dam	Damu	44	25	23	Water supply and power generaton.
Rencom Dam	Jima	50	75	10	Irrigation, water supply, and power generaton.

Table 7.—Dominican Republic: Exports of mineral commodities [1]
(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum: Bauxite ore and concentrate, gross weight	1,311,288	1,227,053	All to United States.
Copper metal, scrap	388	529	Do.
Iron and steel, ferronickel	466	41,668	Netherlands 32,244; United States 9,424.
Lead metal, scrap	508	--	
Other nonferrous metals, scrap value, thousands	$23	--	
NONMETALS			
Fertilizer materials, manufactured: Nitrogenous do	$105	--	
Mixed	1,139	--	
Gypsum and plasters value, thousands	$476	$371	All to United States.
Sand	2,074	--	

[1] Source: For bauxite and ferronickel—Banco Central de la Republica Dominicana, Boletin Mensual. V. 25, No. 12, December 1972; for all other commodities—import statistics of selected partner countries.

Table 8.—Dominican Republic: Apparent imports of mineral commodities [1]
(Metric tons unless otherwise specified)

Commodity		1971	1972
METALS			
Aluminum metal, unwrought and semimanufactures		2,328	2,290
Copper metal, unwrought and semimanufactures		795	1,281
Iron and steel:			
Pig iron and ferroalloys		482	268
Steel ingots and equivalent, primary forms		45,793	3,529
Semimanufactures		66,381	59,197
Lead metal, unwrought and semimanufactures		217	48
Nickel metal, unwrought and semimanufactures		6	--
Tin metal, unwrought and semimanufactures	long tons	9	--
Zinc metal, unwrought and semimanufactures		790	--
NONMETALS			
Abrasives, natural, grinding wheels and stones	value, thousands	$60	--
Asbestos		634	2,260
Cement, hydraulic		56,657	86,322
Clays and clay products:			
Crude clay		1,197	--
Clay products:			
Nonrefractory	value, thousands	$297	$437
Refractory	do	$1,156	$999
Diamond, gem	do	$43	--
Diatomite		182	--
Fertilizer materials:			
Crude, phosphatic		5,010	--
Manufactured:			
Nitrogenous		57,760	75,411
Phosphatic		6,207	11,417
Potassic		12,840	11,124
Mixed		16,705	13,135
Magnesite	value, thousands	$61	--
Stone, sand and gravel:			
Dimension stone, worked		7	--
Industrial and construction stone:			
Calcareous		867	NA
Gravel and crushed, n.e.s		299	NA
Other crude nonmetals	value, thousands	$82	--
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline	thousand 42-gallon barrels	1,951	2,203
Jet fuel	do	361	279
Kerosine	do		145
Distillate fuel oil	do	1,099	1,143
Residual fuel oil	do	3,129	3,511
Lubricants	do	41	155
Other	do	387	2,998
Total	do	6,968	10,434

NA Not available.
[1] Source: Petroleum data—U.S. Bureau of Mines. International Petroleum Annual, 1972, March 1974, 30 pp; all other figures—official trade returns of selected trading partner countries.

Three decrees enacted by the President of the Dominican Republic established four official mining reserves and reserved exploration rights for the Government. The four reserves, located in Cordillera Central, were Las Canitas, Netta, Cerro Guano, and Jayaco. Provisions of the law reserving exploration rights for the Government included:

Article 1. Those areas of the country having mineral deposits in which, for the moment, no real exploration work has begun, and, having been given as concessions by the appropriate authority, excepting those concessions where deposits of oil and its byproducts, hydrocarbons and other similar fuels, are found, are declared official mining reserves. Consequently all exploration concessions and their extensions and transfer permits issued by the Secretariat of State for Industry and Commerce, within said areas, are hereby cancelled.

Article 2. All the mining deposits in the country will, in the future, be explored at the expense of the state and, in cases in which these investigations yield satisfactory results, concessions will be awarded through a bidding process to those individuals or organizations who offer the most favorable terms to the state.

HAITI [8]

The principal mining activity in Haiti in 1973 centered on the production of bauxite. During the year, 648,173 tons of bauxite was mined by Reynolds Haitian Mines, S.A. Total exports of bauxite were 770,438 tons; and the entire quantity was exported to the United States. Cement production was 108,000 tons with only a small quantity exported to Puerto Rico.

No mine production of copper was reported in 1973.

Other mineral output in 1973 included clays, lime, salt, sand, and gravel. However, data on the output of these commodities were inadequate to make reliable estimates of annual production.

[8] Prepared by E. Chin, physical scientist, Division of Nonferrous Metals—Mineral Supply.

Table 9.—Haiti: Exports of mineral commodities [1]
(Metric tons)

Commodity	1971	1972	Principal destinations, 1972
Aluminum:			
Bauxite	752,413	770,439	All to United States.
Metal, semimanufactures	(2)		
Cement		907	All to Puerto Rico.
Copper, ore and concentrate	6,500	1,400	All to Japan.
Metal, unspecified	3	42	Puerto Rico 33; United States 8.

[1] Years ended September 30 of those stated.
[2] Less than ½ unit.

Table 10.—Haiti: Imports of mineral commodities [1]
(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum metal, all forms	172	320	Austria 217; West Germany 46; United States 32.
Copper metal, all forms	21	18	Japan 9; United States 5; United Kingdom 4.
Iron and steel:			
Scrap	50	20	United States 14; West Germany 3; Bahamas 2.
Semimanufactures [2]	7,463	12,360	Belgium 4,640; France 2,331; Japan 2,285.
Lead metal, all forms	6	1	All from United States.
Nickel metal, kilograms	171	89	All from United Kingdom.
Platinum-group metals, troy ounces	98	64	All from United States.
Silver metal, do	r 64	643	Do.
Tin metal, all forms, long tons	411	377	Mainly from United States.
Zinc	(3)	1	Do.
Other:			
Base metals, n.e.s., kilograms	683	456	All from United States.
Scrap of nonferrous metals	7	20	United States 14; West Germany 3; Bahamas 2.
NONMETALS			
Abrasives, natural, grinding and polishing wheels and stones, kilograms	2,618	1,615	West Germany 431; United States 428; Austria 407.
Cement	474	620	Denmark 445; United States 122; France 27.
Clays:			
Crude	63	129	Mexico 86; United States 25; West Germany 18.
Manufactured products	209	376	Japan 126; United Kingdom 65; United States 65.
Diamond, industrial [4], kilograms	388	451	United States 330; West Germany 121.
Fertilizers:			
Crude:			
Phosphatic	33	37	West Germany 30; United States 7.
Potassic	54	17	France 14; West Germany 3.
Manufactured, nitrogenous	--	249	Jamaica 90; Dominican Republic 80; Netherlands 49.

See footnotes at end of table.

Table 10.—Haiti: Imports of mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Graphite, natural ____ kilograms	r 44	607	West Germany 510; United States 97.
Mica, worked and unworked, including splittings and waste	--	6	Brazil 3; United States 2; Puerto Rico 1.
Pigments, mineral, natural	71	73	West Germany 39; United States 10; Belgium 10.
Precious and semiprecious stones, except diamond, including synthetic ___ value	$2,354	$10,280	All from United States.
Salt	40	108	Mainly from United States.
Stone, sand and gravel:			
Sand and gravel, including crushed quartz	10	7	United States 5; West Germany 2.
Stone:			
Dimension, worked and partly worked	r (3)	8	United States 5; West Germany 2.
Industrial, except dimension	13	21	West Germany 11; United States 9.
Limestone	48	57	Dominican Republic 27; Panamá 27; United States 2.
Other:			
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	420	389	Belgium 364; United Kingdom 24.
Nonmetallic minerals, worked and unworked, n.e.s	164	137	United States 61; West Germany 40; Netherlands 26.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural	299	290	United States 248; West Germany 34.
Coal, coke, agglomerates	36	1	All from United States.
Petroleum refinery products:			
Gasoline, thousand 42-gallon barrels	78	72	Curacao 71.
Kerosine ____ do	7	12	Curacao 12.
Distillate fuel oil ____ do	472	517	Curacao 366; Honduras 99; Jamaica 35.
Lubricants ____ do	14	15	United States 5; Curacao 4; Trinidad 3; Jamaica 1.
Other:			
Liquefied petroleum gas ____ do	8	12	Panamá 10; Canada 1; United States 1.
Mineral waxes ____ do	1	2	West Germany 1; United States 1.
Bituminous mixtures, n.e.s ____ do	(3)	(3)	Mainly from United States.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	5	2	United States 1; United Kingdom 1.

r Revised.
[1] Years ended September 30 of those stated.
[2] Includes small quantities of pig iron, ferroalloys, and crude steel.
[3] Less than ½ unit.
[4] May include a substantial portion of stone other than diamond.

JAMAICA [9]

Jamaica ranked second among the bauxite producing countries of the world. It was also the fourth largest producer of alumina, the intermediate product in the production of aluminum from bauxite. Alumina and bauxite together accounted for about two-thirds of the total value of all Jamaican exports. Bauxite and alumina were produced by subsidiaries of six aluminum companies based in the United States and Canada. These companies have invested a reported $800 million in Jamaican operations since 1943. Commercial production of bauxite and alumina began in 1952.

During 1973 Jamaican bauxite was exported by Kaiser Bauxite Co., Reynolds Jamaica Mines, Ltd., and Alcoa Minerals of Jamaica, Inc. Production by Kaiser was interrupted for half of September because of a dispute over a labor contract. Reynolds was reportedly expanding bauxite capacity from 2.5 million to 3.25 million tons per year.

The producers of alumina in Jamaica are shown in the following tabulation:

[9] Prepared by Horace F. Kurtz, industry economist, Division of Nonferrous Metals—Mineral Supply.

Company and plant location	Yearend capacity (thousand metric tons)	Ownership
Alcan Jamaica Ltd.:		Alcan Aluminium Ltd., 100%.
Ewarton, St. Catherine	566	
Kirkvine, Manchester	558	
Alcoa Minerals of Jamaica, Inc.:		Aluminum Co. of America, 100%.
Woodside, Clarendon	500	
Alumina Partners of Jamaica, Ltd.:		
Nain, St. Elizabeth	1,179	Reynolds Metals Co., 36.8%, Anaconda Aluminum Co., 36.8%, Kaiser Aluminum & Chemical Corp., 26.4%.
Revere Jamaica Alumina, Ltd.:		Revere Copper & Brass, Inc., 100%.
Maggotty, St. Elizabeth	200	
Total	3,003	

Alcoa's new alumina plant was reported to have reached capacity production, but operating difficulties were encountered at the new plants operated by Alumina Partners of Jamaica, Ltd. (Alpart), and Revere Jamaica Alumina, Ltd.

Limestone, Jamaica's most abundant mineral, was quarried throughout the island for use as an aggregate in construction and was used in making cement and lime. Cement production declined about 6% during the year although the value of output remained above $7 million. Lime production, mainly for use in making alumina, increased sharply to about 218,000 tons. Gypsum production, most of which was exported, declined to 357,000 tons.

Esso West Indies, Ltd., operated the only petroleum refinery in Jamaica. The plant, located at Kingston, used imported crude oil. Preparation continued for the construction of a refinery at Luana Point, St. Elizabeth Parish, by a joint venture of the Government and the Moratti Group of Italy.

Table 11.—Jamaica: Exports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1972	Principal destinations, 1972
METALS		
Aluminum:		
Bauxite and concentrates thousand tons	7,162	All to United States.
Alumina do	2,136	United States 681; Norway 599; United Kingdom 318; Canada 206.
Metal, including alloys, unwrought and semimanufactures	1,030	United States 451; Barbados 192; Trinidad and Tobago 176.
Copper metal, including alloys, unwrought and semimanufactures	87	United States 84.
Iron and steel semimanufactures	42,039	Trinidad and Tobago 39,697; St. Lucia 1,016.
Lead metal and alloys, unwrought and semimanufactures	122	Netherlands 78.
Tin metal and alloys, unwrought and semimanufactures long tons	(1)	All to Puerto Rico.
Zinc metal and alloys, unwrought and semimanufactures	20	Turks and Caicos Islands 8.
Other and unspecified nonferrous metals:		
Scrap of all nonferrous metals	2,526	United States 1,738; West Germany 558.
Unwrought and semimanufactures	43	All to Japan.
NONMETALS		
Abrasives, grinding and polishing wheels and stones	(1)	Mainly to Cayman Islands.
Cement, hydraulic	2,455	Turks and Caicos Islands, 1,778; British Honduras 466; Cayman Islands 211.
Fertilizer materials, manufactured, all types	225	Trinidad and Tobago 79; United States 40.

See footnote at end of table.

Table 11.—Jamaica: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1972	Principal destinations, 1972
NONMETALS—Continued		
Lime	1,034	Barbados 838; St. Kitts, Nevis and Anguilla 152.
Mica, crude and manufactured	59	All to United States.
Salt	796	Guyana 494; Bermuda 208; Cayman Islands 88.
Stone, sand and gravel:		
Dimension stone, crude and worked	(1)	Mainly to Cayman Islands.
Gravel and crushed stone	(1)	All to Cayman Islands.
Industrial, n.e.s	417,566	United States 417,052.
Sulfur, sulfuric acid	577	Guyana 541.
Other, crude nonmetallic minerals, n.e.s	50	United States 46.
MINERAL FUELS AND RELATED MATERIALS		
Petroleum:		
Crude oil thousand 42-gallon barrels	29	All to Bahamas.
Refinery products:		
Gasoline do	624	Bahamas 343; British Honduras 133; Bermuda 113.
Jet fuel and kerosine do	65	British Honduras 61.
Distillate fuel oil do	679	Bahamas 377; British Honduras 206; Haiti 39.
Residual fuel oil do	121	All to United States.
Lubricants do	225	British Honduras 72; Cayman Islands 20; Surinam 18.
Other:		
Butane and propane do	(1)	All to Cayman Islands.
Paraffin wax do	(1)	All to British Honduras.
Asphalt do	4	Netherlands Antilles 2.

[1] Less than ½ unit.

Table 12.—Jamaica: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1972
METALS	
Aluminum:	
Bauxite	(1)
Alumina	(1)
Metal and alloys, unwrought and semimanufactures	11,429
Copper metal and alloys, unwrought and semimanufactures	941
Iron and steel:	
Iron ore and concentrate	(1)
Pig iron and ferroalloys	450
Semimanufactures	196,157
Lead:	
Ore and concentrate	(1)
Metal and alloys, unwrought and semimanufactures	322
Manganese ore and concentrate	162
Nickel metal and alloys, unwrought and semimanufactures	8
Platinum-group metals, unwrought and semimanufactures value, thousands	$3
Silver metal, unwrought and semimanufactures do	$371
Tin metal and alloys, unwrought and semimanufactures long tons	3,704
Zinc:	
Ore and concentrate	10
Metal and alloys, unwrought and semimanufactures	958
Other:	
Ore and concentrate of metals, n.e.s	2
Scrap of nonferrous metals, not further described	10
Nonferrous metals, n.e.s., unwrought and semimanufactures	8
NONMETALS	
Abrasives, natural:	
Crude, including industrial diamond	531
Grinding and polishing wheels and stones	35
Asbestos, crude washed or ground	756
Cement, hydraulic	3,015
Clays and clay products:	
Crude	1,075
Clay products: [2]	
Nonrefractory	12,085
Refractory	3,838
Feldspar, fluorspar, cryolite, chiolite	222

See footnotes at end of table.

Table 12.—Jamaica: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity		1972
NONMETALS—Continued		
Fertilizer materials:		
Crude:		
Nitrogenous		131
Phosphatic		4
Potassic		1
Manufactured:		
Nitrogenous		31,422
Phosphatic		5,366
Potassic		12,526
Mixed		13,838
Ammonia		85
Lime		4
Graphite, natural		567
Magnesite, crude		13
Mica:		
Crude		192
Worked		20
Precious and semiprecious stones	value, thousands	$63
Salt		10,456
Sodium compounds, n.e.s.:		
Sodium carbonate		4,966
Sodium hydroxide		55,016
Stone, sand and gravel:		
Dimension stone		369
Gravel and crushed stone		2,364
Sand, including ground quartz		167
Stone for industrial use, n.e.s		906,109
Sulfur:		
Elemental		3,874
Sulfur dioxide		(1)
Sulfuric acid		46
Other, crude nonmetals, n.e.s		665
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural		1,181
Coal		73
Coke		861
Fuel briquets (coal, lignite, coke and/or peat)		447
Petroleum:		
Crude	thousand 42-gallon barrels	10,046
Refinery products:		
Gasoline	do	600
Jet fuel and kerosine	do	13
Distillate fuel oil	do	522
Residual fuel oil	do	5,831
Lubricants	do	163
Other:		
Liquefied petroleum gas	do	36
Petroleum jelly and wax	do	6
Asphalt, bitumen, pitch and resin	do	18
Petroleum coke	do	(1)
Total	do	7,189

[1] Less than ½ unit.
[2] Excludes products not reported in terms of weight but valued at $777,552.

MARTINIQUE [10]

Mineral production in Martinique in 1973 consisted of construction aggregates, clays, marine salt, fertilizers, cement, and petroleum refinery products. Production of crushed stone in 1973 totaled 932,000 tons; salt, 300,000 tons; and pumice, 151,351 tons. Small tonnages of clay and sand were also produced. No official statistics were reported on the output of fertilizer and cement. The oil refinery on Martinique, completed in January 1971, operated at near capacity in 1973. Petroleum refinery output consisted principally of 1,321,000 barrels of residual fuel oil, 951,193 barrels of gasoline, 556,341 barrels of jet fuel, and 360,951 barrels of distillate fuel oil. Output of kerosine and liquefied petroleum gas was also high.

[10] Prepared by Harold J. Drake, physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

NETHERLANDS ANTILLES [11]

With the completion of a new oil transshipment terminal at Bullen Bay on the Island of Curaçao, the Netherlands Antilles will become one of the world's largest petroleum transshipment centers. The islands are especially suited for this type of facility because the shoreline drops off quickly allowing one pier to reach a depth of 110 feet, only 360 feet from shore. Steady trade winds from the north leave the sea on the leeward side gentle and the island has not been struck by a hurricane since 1877. Another advantage for tankers is the port of Willemstad's ship repair facility with a drydock that can receive 120,000 deadweight-ton vessels.

The terminal at Bullen Bay on Curaçao, owned by Curaçao Oil Terminal N.V., a subsidiary of Shell International Petroleum Co., Ltd. (55%) and Shell Curaçao N.V. (45%), has scheduled its initial opening in mid-1974 and full operation a year later. The terminal will eventually be able to blend and transship 800,000 barrels per day and have a storage capacity of almost 16 million barrels. Most transshiped oil will be from the Persian Gulf and West Africa even though Shell's refinery receives 40% of its feedstocks from Venezuela.

Early in 1973, Shell Curaçao N.V. refinery completed its expansion from 360,000 barrels per day to 425,000 barrels per day with the addition of a 175,000-barrel-per-day crude oil distillation unit. Environmental protection measures were also added that include process water recycling, a 125-meter stack, and extensive use of air coolers to minimize cooling water use.

The Lago Oil and Transport Co. Ltd., a subsidiary of Standard Oil Co. of N.J., neared completion of a second 100,000-barrel-per-day hydrodesulfurization unit to its 500,000-barrel-per-day refinery on Aruba.

Netherlands Antilles became involved in a dispute over coastal demarcation lines when Venezuela claimed a 12-mile offshore limit. The island of Aruba is only 15 miles from the Venezuelan coast. Netherlands Antilles wants equidistant recognition as provided by the Geneva Convention in 1958. The disputed area may contain oil and natural gas.

The production of mineral comodities in the Netherlands Antilles is shown in table 1.

[11] Prepared by Daniel C. Adkins, geologist, Division of Fossil Fuels—Mineral Supply.

Table 13.—Netherlands Antilles: Foreign trade in petroleum and petroleum refinery products
(Thousand 42-gallon barrels)

Commodity	1971	1972
EXPORTS		
Crude oil	--	169
Petroleum refinery products:		
Gasoline, aviation	1,818	3,800
Gasoline, other	16,372	12,579
Jet fuel	13,813	19,278
Kerosine and white spirit	12,999	13,352
Distillate fuel oil	23,259	18,096
Residual fuel oil	150,456	153,101
Lubricants	2,360	5,935
Other	28,977	9,778
Total	250,054	235,919
IMPORTS		
Crude oil	274,266	261,141
Petroleum refinery products:		
Gasoline, all grades	1,818	2,100
Jet fuel and kerosine	104	211
Distillate fuel oil	1,280	2,214
Residual fuel oil	3,286	10,398
Lubricants	352	7
Other	5,643	2,017
Total	12,483	16,947

TRINIDAD AND TOBAGO [12]

Petroleum production and refining continued to dominate the mineral industry of Trinidad and Tobago in 1973. The petroleum industry accounted for over one-fourth of the gross national product, about one-third of government revenues, and most of the country's export receipts.

COMMODITY REVIEW

Aluminum.—During 1973, the Government developed plans for an international Caribbean aluminum industry in association with Jamaica and Guyana. Plans call for construction of an aluminum smelter, equally owned by the three countries, at Point Lisas in southern Trinidad. The smelter was designed to produce 200,000 tons of aluminum annually beginning in 1979 with construction planned to commence in 1976. Alumina from both Jamaica and Guyana is to supply the facility, which will be the first aluminum smelter to be owned by any Caribbean nation.

Petroleum and Natural Gas.—As a result of increased drilling activity, crude oil production rose 17% in 1973. Total production, two-thirds from offshore fields, averaged about 166,208 barrels per day. Amoco Trinidad Oil Co. Ltd. was the country's largest producer.

A total of 209 wells were drilled during 1973, 14 more than in the previous year. This total included 175 oil wells and 10 gas wells. According to industry data, 15 exploratory wells were drilled and 60 wells were in offshore areas. Total footage drilled during the year increased nearly 14%, to 955,622 feet. Also in 1973, Texaco Trinidad Inc. successfully introduced foam as a drilling fluid and Shell Trinidad Ltd. resumed drilling operations after a pause of almost 2 years.

During 1973, the Government and a consortium comprised of Trinidad–Tesoro Petroleum Co. Ltd., Shell Trinidad Ltd., and Texaco Trinidad Inc. had nearly finalized the terms of an exploration and production license covering 187,000 acres off the east coast of Trinidad. The Texaco and Shell interests each hold a 37.5% share of the concession while the remainder is owned by Trinidad–Tesoro, a 50–50 partnership between the Government and private concerns. The concession area, known as the L-Block, is adjacent to oil and gasfields already under exploration and development by Amoco. Texaco will be the sole operator in the area.

Several offshore drilling operations during 1973 were significant. Amoco discovered a new oilfield (East Mayaro) and established extensions of the Saaman oilfield as well as two offshore gas structures. Amoco–Trinmar completed drilling operations from a 12-well fixed platform in its Soldado Field in the Gulf of Paria. In addition, Trinidad–Tesoro nearly completed the first-stage development of its Galeota Field off southeastern Trinidad.

In December 1973, Amoco operations suffered a disastrous blowout that claimed three lives. The accident occured on the drillship *Mariner I*, west of the Texaco-Shell-Tesoro L-Block.

At yearend 1973, the Government for the first time invited bidders to submit proposals for production-sharing contracts in lieu of standard exploration and production licenses. The offer is applicable to 1.8 million acres off the eastern and western coasts of Trinidad. Bidders for the traditional type of license must provide the Government with the option of 35% "carried participation", which can be gradually increased to 51% as production grows.

During 1973, the Government evaluated several natural gas projects but did not announce any final decisions by yearend. The most notable project was a proposal to liquify 450 million cubic feet of natural gas for export to the United States. Other proposals calling for the utilization of natural gas included fertilizer plants, petrochemical plants, a steel pelletizing mill, a cement plant, and aluminum smelters.

The Government nearly completed arrangements by yearend 1973 for the installation of a gas pipeline from offshore fields off eastern Trinidad to Point Lisas for a planned 400,000-ton-per-year ammonia plant. Trinidad Nitrogen Ltd., a joint concern shared by the Government and W. R. Grace and Co., has begun to award construction contracts for the project.

By yearend 1973, Texaco had almost finished construction of its single buoy

[12] Prepared by Ronald F. Balazik, geographer, Division of Fossil Fuels—Mineral Supply.

mooring terminal, the largest such facility ever built in the Western Hemisphere. The new terminal, located off southeastern Trinidad, features a 36-foot, triple-intake unit that is capable of handling up to three streams simultaneously. Fluids are pumped through three pipelines (two 20-inch lines and one 16-inch line) to an artificial island and then to shore via a 1-mile, 50-inch line, the largest diameter offshore pipeline ever constructed in Latin America.

At yearend 1973, the Government was formulating plans for financial participation in a 355,000-barrel-per-day refinery proposed by Texaco. Moreover, the Government was participating in negotiations for Middle East financing of an additional planned refinery. Also at yearend, the new 70,000-barrel-per-day desulfurization unit at Texaco's Pointe-a-Pierre refinery was nearly operational.

There were several additional developments late in 1973. Deminex of West Germany and AGIPS.p.A., of Italy were awarded two concessions covering 161 square miles off the coast of northern Trinidad. In October, Trinidad–Tesoro announced that future increases in the price of its crude would be related to changes in tax reference values posted by Venezuela for its oil. Also, Trinidad–Tesoro had arranged an 8-year $20 million loan with several world banks to finance its expanding operations, which included plans to drill up to 100 wells in its 600-acre Los Bajos tract acquired from Shell.

The production of mineral commodities in Trinidad and Tobago is shown in table 1.

Table 14.—Trinidad and Tobago: Exports and reexports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, including alloys, all forms	56	66
Copper metal, including alloys, all forms	239	214
Iron and steel:		
Scrap	4,263	11,609
Steel, primary forms	11	11
Semimanufactures	680	461
Lead:		
Ore	98	288
Metal, including alloys, all forms	77	32
Silver metal, including alloys, troy ounces	--	1,116
Zinc metal, including alloys, all forms	2	(1)
Other:		
Scrap, nonferrous metals	171	293
Base metals including alloys, all forms	r 51	2
NONMETALS		
Barite	1,539	--
Cement, hydraulic [2]	r 37	(1)
Clays and products (including all refractory brick)	r 1,394	1,558
Fertilizer materials manufactured:		
Nitrogenous	85,670	60,367
Other	2,886	44
Lime	5,702	395
Precious stones, cut, carats	467	1,555
Salt	51	294
Sodium and potassium compounds	r 27	9
Stone, sand and gravel:		
Dimension stone:		
Crude	5	2
Worked	37	2
Gravel and crushed stone	235	30
Sand	312	239
Sulfur:		
Elemental, all forms	(1)	(1)
Sulfuric acid, including oleum	293	294
Other nonmetals, n.e.s.:		
Crude	74	151
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	879	578
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	50,775	45,496
Coal, coke, peat	4	(1)
Petroleum:		
Crude and partly refined, thousand 42-gallon barrels	6,998	14,427

See footnotes at end of table.

Table 14.—Trinidad and Tobago: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity		1971	1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum—Continued			
Refinery products:			
Gasoline	thousand 42-gallon barrels	21,176	19,399
Jet fuel	do	5,613	6,507
Kerosine	do	11,386	8,877
Distillate fuel oil	do	13,402	13,769
Residual fuel oil	do	73,441	85,197
Lubricants	do	2,492	1,241
Other	do	1,438	1,942
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals		171,682	167,552

r Revised.
[1] Less than ½ unit.
[2] Based on incomplete information from official trade publications. Complete data on cement exports not available through Trinidad and Tobago Government.

Table 15.—Trinidad and Tobago: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Bauxite and concentrate	94	--
Metal, including alloys, all forms	510	719
Arsenic and compounds	5	16
Copper:		
Copper sulfate	12	4
Metal, including alloys, all forms	535	580
Iron and steel:		
Scrap	469	405
Pig iron, ferroalloys, similar materials	5	1
Steel, primary forms	381	602
Semimanufactures:		
Bars, rods, angles, shapes, sections	14,994	19,096
Universals, plates, sheets	17,113	25,628
Hoop and strip	256	1,178
Rails and accessories	19	17
Wire	2,440	4,572
Tubes, pipes, fittings	63,909	25,530
Castings and forgings	25	107
Lead:		
Ore and concentrate	20	10
Metal, including alloys, all forms	442	652
Magnesium metal, including alloys, all forms	2	--
Nickel metal, including alloys, all forms	12	6
Platinum-group metals and silver:		
Metals, including alloys:		
Platinum group (troy ounces)	9	37
Silver (do)	108,229	257,702
Tin metal, including alloys, all forms (long tons)	30	39
Zinc metal, including alloys, all forms	100	292
Other:		
Ore and concentrate	1	--
Scrap, nonferrous metals	(1)	5
Metals, including alloys, all forms	7	22
NONMETALS		
Abrasives, natural, n.e.s	37	36
Aluminum sulfate	1,407	1,879
Barite and witherite	13,731	31,975
Cement	8,033	10,124
Clays and clay products (including all refractory brick):		
Crude clay, n.e.s	782	1,310
Products	4,023	4,152
Feldspar	1,013	676
Fertilizer materials:		
Crude	118	5
Manufactured:		
Nitrogenous	644	344
Phosphatic	1,226	748
Potassic	3,692	3,759
Other, including mixed	2,138	2,151
Lime	496	9
Magnesite	--	10
Mica, all forms	44	47

See footnotes at end of table.

Table 15.—Trinidad and Tobago: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972
NONMETALS—Continued		
Pigments, mineral	22	56
Precious and semiprecious stones, cut and uncut ____ troy ounces	709	1
Salt	11,586	12,452
Sodium and potassium compounds, n.e.s.:		
Sodium hydroxide	11,139	4,833
Potassium hydroxide, sodium and potassium peroxide	1,997	2,995
Stone, sand and gravel:		
Dimension stone:		
Crude	23,955	16,836
Worked	35	17
Gravel and crushed stone	406	407
Sand	75	378
Sulfur:		
Elemental	15,276	18,897
Sulfuric acid	48	1,862
Other nonmetals, n.e.s.:		
Crude	536	1,189
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	872	1,360
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	--	20
Coal, coke, briquets	200	407
Petroleum: [2]		
Crude and partly refined ____ thousand 42-gallon barrels	106,869	107,214
Refinery products:		
Gasoline ____ do ____	161	198
Kerosine and jet fuel ____ do ____	203	--
Distillate fuel oil ____ do ____	55	86
Residual fuel oil ____ do ____	180	73
Lubricants ____ do ____	76	67
Liquefied petroleum gas [3] ____ do ____	3	14
Other ____ do ____	25	1,942
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	133	57

[1] Less than ½ unit.
[2] Data from International Petroleum Annual 1972, U.S. Bureau of Mines, unless otherwise specified.
[3] Government of Trinidad and Tobago, Ministry of Petroleum and Mines.
Source: Unless otherwise specified Government of Trinidad and Tobago, Central Statistical Office, Overseas Trade. Part A, Port of Spain, 1971 and 1972, 413 pp.

The Mineral Industry of Central America Areas

By Herbert R. Babitzke [1] and Burton E. Ashley [2]

CONTENTS

BELIZE (FORMERLY BRITISH HONDURAS)

Value of mineral production in 1973 was $3.4 million (B$1=US$0.60). Sand and gravel, most of which was used by the Belize Public Works Department, accounted for 50% of the total value of Belize mineral production. Limestone, most of which was used by the Belize Construction Company, accounted for 47% of the value of minerals produced. The remainder of the mineral output consisted of 16,800 cubic meters of marl that was used by the Belize Public Works Department.

The major construction activity in 1973 was the resurfacing of the highway between Belize City and the new capital, Belmopan.

Two U.S. oil companies have been analyzing offshore seismic work. Anschutz Overseas Corp. of Denver, Colo., drilled a number of test wells but no commercially attractive oil reserves were reported.

Belize proposed a 19.3-kilometer territorial sea at the Law of the Sea Conference. If this proposal is accepted, licenses for mineral exploitation will be granted only after an agreement is reached with the Government of Belize.

[1] Physical scientist, Division of Nonferrous Metals—Mineral Supply.
[2] Physical scientist, Division of Nonferrous Metals—Mineral Supply (retired).

Table 1.—Central America Areas: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
BELIZE			
Limestone e	268,900	276,000	245,000
Marl e	90,000	180,000	26,000
Sand and gravel e	220,000	303,000	393,000
COSTA RICA			
Cement	212,532	260,537	268,566
Diatomite e	21,000	21,000	30,000
Fertilizer materials, manufactured:			
Nitrogenous, gross weight	57,149	47,620	42,006
Mixed and unspecified, gross weight	69,256	56,735	57,490
Gold—troy ounces	r e 7,500	r e 7,800	7,806
Iron and steel: Magnetite sand, gross weight	--	--	e 2,000
Lime e	11,000	11,500	12,850
Petroleum refinery products:			
Gasoline—thousand 42-gallon barrels	694	666	690
Kerosine—do	164	167	180
Distillate fuel oil—do	1,266	1,323	1,213
Residual fuel oil—do	858	748	776
Liquefied petroleum gas—do	2	--	--
Pumice—cubic meters	--	--	2,115
Salt, marine	10,950	11,497	13,000
Silver—troy ounces	--	--	290
Stone, sand and gravel:			
Limestone and other calcareous material e	391,000	401,210	408,000
Marble—cubic meters	--	--	1,099
Marine shell—do	--	--	5,000
Sand and gravel	e 141,000	157,850	181,528
Other	500,000	550,000	632,500
EL SALVADOR			
Aluminum metal, semimanufactures	970	1,089	1,694
Cement	167,000	217,830	236,330
Fertilizers, manufactured	e 95,901	86,000	82,033
Gold, fine—troy ounces	3,503	2,861	5,233
Gypsum e	6,000	6,000	6,000
Iron and steel, steel semimanufactures	17,443	22,292	27,764
Petroleum refinery products:			
Gasoline—thousand 42-gallon barrels	784	800	919
Kerosine—do	258	250	384
Jet fuel 1—do	81	78	--
Distillate fuel oil—do	935	830	1,141
Residual fuel oil—do	931	1,121	1,378
Liquefied petroleum gas—do	173	203	213
Asphalt—do	--	--	125
Refinery fuel and losses—do	204	198	236
Salt	30,432	29,325	35,131
Silver, fine—troy ounces	215,210	177,144	122,677
Stone, limestone and seashells	275,800	341,273	e 350,000
GUATEMALA			
Antimony, mine output, metal content	1,771	1,177	1,745
Cadmium (contained in zinc concentrates)	1	(2)	2
Cement—thousand tons	227	264	310
Feldspar e	2,500	2,000	2,000
Gypsum e	7,900	r 8,000	8,000
Lead:			
Mine output, metal content	e 500	138	102
Metal, including secondary	90	22	65
Lime e	22,000	r 23,000	23,000
Mica	--	r e 2,400	e 2,500
Petroleum refinery products:			
Gasoline—thousand 42-gallon barrels	1,512	1,629	1,781
Kerosine and jet fuel—do	670	734	759
Distillate fuel oil—do	r 1,567	1,787	2,007
Residual fuel oil—do	r 1,775	1,903	2,074
Liquefied petroleum gas—do	114	126	111
Other—do	--	4	2
Refinery fuel and losses—do	NA	227	261
Quartz	NA	e 18,000	e 18,000
Stone, sand and gravel, crushed and broken:			
Limestone—thousand tons	NA	e 600	e 600
Other (volcanic ash)	NA	e 54,000	e 55,000
Tungsten, concentrate (W content)	40	8	158
Zinc, mine output, metal content	506	308	280

See footnotes at end of table.

Table 1.—Central America Areas: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973 p
HONDURAS			
Antimony, mine output, metal content	146	30	48
Cadmium, mine output, metal content	1	244	120
Cement	162,000	194,014	236,000
Gold, troy ounces	2,701	2,021	795
Gypsum	e 10,000	15,806	13,979
Lead, mine output, metal content	17,967	20,724	18,544
Petroleum refinery products:			
Gasoline, thousand 42-gallon barrels	692	712	727
Jet fuel, do.	66	64	71
Kerosine, do.	238	252	250
Distillate fuel oil, do.	1,208	1,178	1,248
Residual fuel oil, do.	1,852	1,784	1,875
Liquefied petroleum gas, do.	70	90	102
Refinery fuel and losses, do.	88	74	235
Total, do.	4,214	4,154	4,508
Salt e	27,000	27,000	32,000
Silver, thousand troy ounces	3,642	3,595	3,152
Stone, crushed and broken	NA	303,524	350,000
Zinc, mine output, metal content	22,894	23,295	19,669
NICARAGUA			
Cement	73,795	119,000	176,417
Copper, mine output, metal content	5,808	2,788	1,401
Gold, mine output, metal content, troy ounces	123,359	110,672	85,051
Gypsum and anhydrite, crude	25,210	26,000	e 35,000
Lead, ore and concentrate, metal content	671	4,281	1,396
Petroleum refinery products:			
Gasoline, thousand 42-gallon barrels	890	945	1,198
Kerosine and jet fuel, do.	222	251	290
Distillate fuel oil, do.	968	845	1,065
Residual fuel oil, do.	1,105	1,134	1,137
Liquefied petroleum gas, do.	140	151	160
Other, do.	--	--	57
Refinery fuel and losses, do.	88	229	247
Salt, marine	18,000	r e 15,000	e 10,000
Silver, mine output, troy ounces	269,775	476,717	180,157
Zinc, ore and concentrate, metal content	4,056	17,495	11,147
PANAMÁ			
Cement	191,869	271,000	434,137
Clays and clay products:			
Crude clays, n.e.s	(3)	e 94,850	237,218
Products	(3)	e 20,000	93,073
Iron and steel: Magnetite sands, gross weight	300,000	77,074	NA
Lime, thousand cubic meters	2,294	--	NA
Petroleum refinery products:			
Gasoline, thousand 42-gallon barrels	3,012	3,063	1,278
Kerosine and jet fuel, do.	2,776	2,941	4,380
Distillate fuel oil, do.	2,527	5,398	6,570
Residual fuel oil, do.	17,396	15,070	14,600
Other, do.	1,251	857	2,774
Refinery fuel and losses, do.	1,873	1,007	NA
Salt	7,886	10,978	20,455
Stone, sand and gravel:			
Limestone, thousand cubic meters	4,129	(4)	5 8
Other, do.	r 703	r e 1,703	2,007

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

1 Sales.

2 Less than ½ unit.

3 Data not reported in gravimetric units but in volumetric units of 114,683 cubic meters of crude clays and 152,911 cubic meters of clay products.

4 Data for 1972 not reported in volumetric units but in gravimetric units of an estimated 189,700 metric tons.

5 Figure excludes 355,830 metric tons of limestone used for cement.

COSTA RICA

Renewed interest in gold prospecting and mining may result in increased development of that industry in the country. Two companies are presently active in hard-rock gold mining. Of importance to gold miners was a change in the law which allowed sales of gold on the world market at the best price obtainable rather than to the Central Bank.

Evidence of Costa Rica's potential as a gold producer can be found in the Central Bank's display of pre-Columbian gold artifacts, which were collected from sites within the country.

Two large projects were being considered which would be of importance to Costa Rica's growth prospects and balance of payments. The first was the construction of a 500-megawatt hydroelectric plant on the River Arenal (Guanacaste), which would supply the necessary power for an aluminum smelter to be built at San Isidro del General. The other project involved construction of a second oil refinery near the existing one at Puerto Limón.

Table 2.—Costa Rica: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum metal including alloys, unwrought and semimanufactures	67	63	El Salvador 22; Panamá 18; Guatemala 17.
Iron and steel including alloys, all forms	10,150	11,301	Nicaragua 6,286; Panamá 2,232.
Other:			
Ore and concentrate of nonferrous base metals	47	--	
Nonferrous base metals including alloys, all forms, n.e.s.[1]	26	15	All to Nicaragua.
NONMETALS			
Abrasives, natural, n.e.s	r 122	61	Do.
Cement	--	1,294	All to Panamá.
Clays and clay products, including nonclay refractory brick	134	120	Nicaragua 69; Honduras 31.
Diatomite and other infusorial earth	58	--	
Fertilizer materials, manufactured:			
Nitrogenous	38,923	24,682	Mexico 10,553; Nicaragua 5,367; Guatemala 3,760.
Other, including mixed	23,049	52,443	Panamá 17,772; Nicaragua 13,398; Mexico 11,310.
Lime	--	121	Mainly to Panamá.
Pigments, mineral, crude	14	--	
Salt	10	2	All to Nicaragua.
Stone, sand and gravel:			
Dimension stone	290	1,054	Mainly to Panamá.
Other	49	118	All to Panamá.
Sulfur, sulfuric acid	--	1	All to Nicaragua.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products:			
Gasoline--thousand 42-gallon barrels	(2)	(2)	All to bunkers.
Kerosine ---do---	(2)	(2)	Do.
Distillate fuel oil ---do---	682	196	Bunkers 154; Panamá 42.
Lubricants ---do---	1	(2)	Mainly to bunkers.
Total ---do---	683	196	

r Revised.
[1] May include aluminum scrap.
[2] Less than ½ unit.

Table 3.—Costa Rica: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS [1]			
Aluminum metal, unwrought and semimanufactures	1,387	1,989	United States 601; Panamá 394; El Salvador 297.
Copper:			
Copper sulfate	20	13	United States 8; United Kingdom 3.
Metal, unwrought and semimanufactures	554	854	Mexico 647; Japan 140.
Iron and steel:			
Pig iron, ferroalloys, and similar materials	101	71	Mainly from West Germany.
Steel, primary forms	12,529	23,703	Venezuela 8,000; United States 4,851; Belgium-Luxembourg 4,161.
Semimanufactures	r 67,610	75,419	Mainly from Japan.
Lead metal, including alloys, unwrought and semimanufactures	106	94	West Germany 49; Nicaragua 20.
Nickel metal, including alloys, unwrought and semimanufactures	7	4	United Kingdom 1; West Germany 1.
Platinum-group metals, including alloys, all forms ——troy ounces	6,109	7,491	All from United States.
Silver, including alloys, all forms ——do	24,820	41,217	Mainly from United States.
Tin metal, including alloys, unwrought and semimanufactures ——long tons	20	13	Japan 6; United States 3.
Zinc metal, including alloys, unwrought and semimanufactures	1,409	2,518	Mexico 1,689; Canada 601.
Other:			
Ores and concentrates of nonferrous base metals	375	608	Mexico 572.
Waste and scrap of nonferrous base metals	7	12	Nicaragua 11.
Pyrophoric alloys	21	(2)	Mainly from West Germany.
Nonferrous base metals, including alloys, unwrought and semimanufactures, n.e.s	8	18	United States 16.
NONMETALS			
Abrasives, natural, n.e.s	r 56	49	West Germany 15; United States 12; Italy 5.
Asbestos	673	822	Mainly from Canada.
Boron materials, oxide and acid	20	49	Mainly from United States.
Cement	4,871	3,347	Japan 2,047; Belgium-Luxembourg 746.
Clays and clay products (including all refractory brick):			
Crude	901	1,354	United States 867; United Kingdom 447.
Products	2,862	2,003	Mainly from Nicaragua.
Diamond, industrial only ——carats	155,000	90,000	All from United States.
Diatomite and other infusorial earth	276	386	Mainly from Mexico.
Feldspar, fluorspar, and cryolite	96	290	United States 244; Nicaragua 44.
Fertilizer materials:			
Crude, phosphatic and potassic	(2)	5,359	Mainly from United States.
Manufactured:			
Nitrogenous	83,406	86,500	United States 43,989; Mexico 15,742.
Phosphatic	r 19,742	29,432	Mainly from United States.
Potassic	37,127	43,337	Do.
Other, including mixed	20,124	11,506	United States 4,983; Netherlands 4,213.
Graphite, natural	1	2	All from United States and United Kingdom.
Gypsum and anhydrite	r 8,075	11,761	Mainly from Nicaragua.
Lime	397	470	Do.
Mica, all forms	1	2	Mainly from United States.
Precious and semiprecious stones including gem diamond ——kilograms	103	43	West Germany 32; Switzerland 11.
Salt and brine	9,960	9,961	Mainly from Nicaragua.
Sodium compounds, n.e.s., sodium hydroxide	2,917	3,840	Do.

See footnotes at end of table.

Table 3.—Costa Rica: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Stone, sand and gravel:			
Dimension and construction stone, crude and worked:			
Alabaster	--	14	All from Nicaragua.
Marble	120	133	Italy 76; Guatemala 47.
Slate	6	23	All from Italy.
Other	22	71	Mainly from Nicaragua.
Industrial stone	71	7	France 5; United States 2.
Sand, gravel, and crushed rock, n.e.s	41	299	Mexico 238; United States 53.
Sulfur:			
Elemental, all forms	106	11	United States 9; West Germany 2.
Sulfur dioxide	4	(2)	Mainly from United States.
Sulfuric acid	260	234	Mainly from El Salvador.
Talc and related materials	351	392	Italy 264; United States 71.
Other crude nonmetals, n.e.s	9	5	United Kingdom 4; United States 1.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black and gas carbon	1,361	1,379	Mexico 597; Colombia 483; United States 204.
Coal and coke, including briquets	306	303	West Germany 120; Colombia 111; Netherlands 58.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	r 2,908	2,694	All from Venezuela.
Refinery products:			
Gasoline ---do---	r 216	268	Panama 173; Netherlands Antilles 68.
Kerosine ---do---	r 73	62	Netherlands Antilles 35; United States 17; Panamá 10.
Distillate fuel oil ---do---	r 504	389	Venezuela 184; Netherlands Antilles 128; Panamá 52.
Lubricants ---do---	r 88	104	United States 38; Netherlands Antilles 27.
Other:			
Liquefied petroleum gas ---do---	81	99	Panamá 46; Nicaragua 40.
Naphtha ---do---	--	(2)	Mainly from United States.
Paraffin ---do---	15	20	West Germany 7; United States 7; Japan 5.
Petrolatum ---do---	2	2	Mainly from United States and Netherlands.
Unspecified ---do---	123	245	Mainly from United States.
Total ---do---	1,102	1,189	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	936	1,041	United States 861; Netherlands Antilles 175.

r Revised.

[1] Metal oxides and hydroxides excluded as they were reported inseparably from metal salts and other compounds.

[2] Less than ½ unit.

COMMODITY REVIEW

Metals.—*Aluminum and Bauxite.*—Plans for the establishment of an aluminum smelter in Costa Rica were revived. It was estimated that $300 million would be required for a hydroelectric powerplant at Boruca, $100 million for the development of bauxite deposits, and $100 million for a semifabricating plant. No details on financing of the smelter itself were released. Construction of the complex was scheduled to start in 1974 and production by 1981.

Since 1956 several U.S. companies have investigated Costa Rica's bauxite deposits which are principally in the region south of San Isidro del General. In 1959 Alcoa Costa Rica Inc. reported the discovery of 150 million tons of bauxite, grading an average of 35% alumina, in the Valle del General Region, south of San Jose.

Copper.—Tormex Mining Developers Ltd., embarked on a detailed program of investigation on a concession covering an area of 84 square kilometers containing strong indications of porphyry copper.

Gold.—Cia. Minera del Guanacaste[3] was working the Tres Hermanos gold property near Las Juntas, approximately 90 kilometers northwest of San Jose. The ore was being processed by the use of stamp bat-

[3] The Northern Miner. Sept. 19, 1973. V. 59, No. 26, p. 17.

teries and mercury amalgamation while a 50-ton ball mill, flotation cells, and other modern equipment were being installed.

Bulora Corp.,[4] a Canadian concern, was reopening a previously worked property known as the El Libano mine. Sampling was conducted over about 1,100 meters of underground workings. Three veins, the Pochota, the Molina, and the connecting cross vein, the Fortuna, appeared to control the mineralization. A modern cyanide process plant with a 100-ton-per-day capacity was to be initially installed. The plant is designed for future expansion to 200 tons per day.

Preliminary work revealed indicated and inferred reserves of 161,000 tons of ore grading 0.84 ounce of gold and 0.88 ounce of silver per ton; this amount of ore was regarded as sufficient to run the mill for 5 years, while more ore was being developed. The mine is situated about 11 kilometers from Tilaran, which, in turn, is some 120 kilometers northwest of San Jose.

Canada Costa Rica mines was negotiating for installation of a monitor on a placer gold property said to contain about 300,000 cubic meters of workable material.

Tormex Mining Developers Ltd.,[5] executed an option agreement with Canadian Barranca Corp. Ltd. concerning the latter's wholly-owned subsidiary, Minera Macacona. Under the option, Tormex was to make certain exploration expenditures on the Esparta gold prospect. If all of the option terms are completed by Tormex, Macacona will bring the property into production by mid-1977. Tormex was to provide financing and in return receive 75% of the issued shares.

On the west coast of Costa Rica, Chemalloy Minerals Ltd., a Canadian company, started exploratory drilling of gold placer deposits. Surface sampling was reported to have indicated values equivalent to $2.50 per cubic meter. on the basis of gold at $100 per ounce. Chemalloy Minerals estimated that placer mining costs at the site would probably be in the region of $1 per cubic meter. Three privately owned Swiss and American groups were participating in the venture.

Mineral Fuels.—The construction of a second oil refinery near the existing one at Puerto Lemón will require an investment of $200 million, of which $100 million would be provided by Venezuela. Venezuela would also provide the crude oil. The refinery was planned to have a capacity of 200,000 barrels per day and more than half would be exported outside the Central America Areas.

Costa Rica's existing refinery was acquired by the Government, and although action was taken to ensure a crude oil supply, the high cost of crude oil was expected to add to inflationary pressures.

EL SALVADOR

The El Salvadoran Government, with aid from the United Nations Special Fund, was engaged in a program of mineral exploration in various parts of the country. The most favorable regions are located in the San Ramon and Jocoro areas, where gold and silver deposits have been found. Similar mineralized veins have been located in the Casimiro Region.

Indications were that prospects for the development of a mining industry remain very limited, but the rise in the price of gold should encourage investigation of the country's gold potential.

In view of the oil crisis and an increase in import costs, an energy policy became increasingly important. Hydroelectric and geothermal power was being developed so that by 1980 El Salvador will no longer need oil for generating electricity.

A major hydroelectric plant was to be built in El Salvador. The construction program, scheduled for completion in late 1976, features the Cerrón Grande Dam, a zoned rockfill embankment with a 4-gated concrete spillway.

[4] The Northern Miner. Aug. 23, 1973. V. 59, No. 23, pp. 1 and 6.
[5] Mining Journal. Feb. 2, 1973. V. 280, No. 7172, p. 95.

Table 4.—El Salvador: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1970	1971
METALS		
Aluminum metal and alloys, all forms	960	951
Copper metal and alloys, all forms	1	NA
Iron and steel, metal ingots and semimanufactures	13,438	12,045
Silver metal, including alloys ---troy ounces	137,669	(1)
Tin metal and alloys, all forms ---long tons	4	NA
Zinc metal and alloys, all forms	(2)	NA
Other nonferrous metals	220	NA
NONMETALS		
Cement	12,905	5,437
Clays and products	42	NA
Fertilizer materials, crude and manufactured	36,965	38,552
Lime	26	NA
Salt	11,061	9,677
Sodium compounds	73	NA
Stone, sand and gravel	940	NA
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products ---thousand 42-gallon barrels	45	36

NA Not available.
[1] Quantity for 1971 was not reported. Value given for 1970 is $247,000 and for 1971 is $280,000.
[2] Less than ½ unit.

Table 5.—El Salvador: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1970	1971
METALS		
Aluminum metal, including alloys:		
Unwrought	921	688
Semimanufactures	1,295	1,451
Copper:		
Copper sulfate	6	NA
Metal, including alloys, all forms	1,245	1,316
Iron and steel metal:		
Scrap	301	NA
Pig iron, ferroalloys and similar materials	103	NA
Steel, primary forms	21,635	35,954
Semimanufactures	24,448	33,242
Other	7	NA
Lead metal, including alloys, all forms	287	329
Nickel metal, including alloys, all forms	1	NA
Platinum-group metals	514	NA
Silver metal, including alloys	2,122	NA
Tin metal, including alloys, all forms ---long tons	25	NA
Zinc metal, including alloys, all forms	479	523
Other:		
Ore and concentrate	1	NA
Ash and residue containing nonferrous metals	9	NA
Base metals, including alloys, n.e.s	1	NA
NONMETALS		
Abrasives, natural	8	NA
Asbestos	963	1,326
Boron materials, oxide and acid	6	NA
Cement	16,576	6,331
Clays and products (including all refractory brick):		
Crude:		
Kaolin	949	1,432
Other	146	
Products	1,432	1,270
Diamond, industrial ---carats	110,000	NA
Diatomite and other infusorial earth	319	NA
Feldspar and fluorspar	39	NA
Fertilizer materials, crude and manufactured:		
Nitrogenous	170,692	177,454
Phosphatic	11,628	34,412
Potassic	3,564	8,822
Other, including mixed	53,407	55,145
Graphite, natural	1	NA
Gypsum and plasters	93	NA

See footnotes at end of table.

Table 5.—El Salvador: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1970	1971
NONMETALS—Continued			
Lime		2,050	NA
Mica, all forms		2	NA
Precious and semiprecious stones, except diamond	kilograms	129	NA
Salt (excluding brine)		76	NA
Sodium and potassium compounds, n.e.s		4,831	NA
Stone, sand and gravel:			
Dimension stone		3,560	
Gravel and crushed rock		27	7,913
Other		1,007	
Sulfur, elemental, all forms		2,600	4,302
Talc, soapstone, and pyrophyllite		129	NA
Other nonmetals, n.e.s		216	NA
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural		5,509	8,404
Coal and coke including briquets		324	NA
Natural gas liquids	thousand 42-gallon barrels	43	NA
Petroleum:			
Crude and partly refined	do	1,623	3,231
Refinery products:			
Gasoline	do	66	56
Kerosine	do	230	16
Gas oil, diesel oil	do	(1)	NA
Lubricants	do	54	31
Other:			
Mineral jelly and wax	do	18	15
Bitumen and other residues	do	45	NA
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals		44	2,109

NA Not available.
[1] Less than ½ unit.

COMMODITY REVIEW

Metals.—*Gold.*—Metallurgical Association of Colorado, Inc., signed a contract to manage and provide technical personnel for operation of the San Sebastian gold mine near Santa Rosa de Lima. It was planned to treat 100 tons of ore per day following investment of $2 million. The company employs about 200 people.

The only significant mining enterprise was the small silver-gold property operated by an El Salvador subsidiary of Canadian Javelin Ltd. (CJL). The San Cristobal mine was treating over 100 tons of ore per day, averaging 10 ounces of silver per ton and 0.15 ounce of gold per ton. Ore reserves have been estimated to be about 120,000 tons.

Nonmetals.—*Cement.*—Cemento Maya, S.A. de C.V., was building a plant to produce 240,000 tons of cement clinker annually in the Metapan District. The total investment of $15 million was provided by local investors and the Instituto Salvadoreño de Fomento Industrial (INSAFI). Aplicaciones Tecnicas Industriales, S.A., of Spain was the contractor for plant and equipment and technical advice. It was expected that production would commence at yearend 1975, or in early 1976.

Mineral Fuels.—*Petroleum.*—Refineria Petrolera Agajutla, S.A., resumed full production in January after a fire the previous October which had resulted in suspension of all operations for 22 days. Temporary equipment was installed. The refinery shutdown and gradual resumption of full production resulted in lesser imports of crude oil, but increased imports of some refined products. Large imports of diesel fuel were necessary from November 1972 through April 1973 to operate two generators which consumed 241,000 gallons per day. A drought during that period curtailed generation of hydropower. The company built an asphalt plant with a daily capacity of 30,000 gallons; it was expected that a small quantity would be exported to Guatemala. A second refinery was to be installed, and the possibility of undertaking offshore exploration for oil was under consideration.

GUATEMALA

The Congress approved legislation creating a tax-free industrial zone at the Atlantic port of Santo Tomas de Castilla; the purpose was to attract light industry, drawback, and other investment opportunities in Guatemala. The free zone encompassed 50 hectares with the property ceded to a new semiautonomous agency. The general supervision of the agency was to be under the Ministry of Finance, but the agency had full authority to contract its own obligations. The Board of Directors was to consist of two representatives each from the private sector, from the Chamber of Commerce, and from industry, and three public members of which one each would be chosen from the Ministry of Finance, the Santo Tomas Port Authority, and the Municipality of Puerto Barrios.

The legislation charges the Free Zone Agency with the promotion and development of investment activities and the construction of office space, factories, and warehouses for rental to investors moving into the zone. All entities operating in the zone must pay for any services received; 47% of the income was to go for operating costs, 25% to the national government, 3% to the Municipality of Puerto Barrios, and the rest to reserves.

All material, equipment, machinery, fuel, and lubricants brought into the zone were to be tax and duty free. Exports of products were to be free of tax, except for those entering Guatemala upon which duties were to be collected based on the percentage of contained foreign raw material.

Selected papers on the geology of Guatemala were published during the year.[6]

[6] Anderson, T. H., B. Burkart, R. E. Clemons, O. H. Bohnenberger, and D. N. Blount. Geology of the Western Altos Cuchumatanes, Northwestern Guatemala. Bull. Geol. Soc. of America, v. 84, No. 3, March 1973, pp. 805–826.

Burkart, B., R. E. Clemons, and D. C. Crane. Mesozoic and Cenozoic Stratigraphy of Southeastern Guatemala. AAPG Bull., v. 57, No. 1, January 1973, pp. 63–73.

Thurmond, J. T., and N. Dary. The Cuidad Real Fauna of Pleistocene Mammals From the Highlands of Guatemala. Program with abs. of 22d Ann. Meeting, Southeastern Section of Geol. Soc. of America, v. 5, No. 5, February 1973, p. 445.

Table 6.—Guatemala: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	Principal destinations, 1971
Cement	5,072	El Salvador 4,822.
Copper ore and concentrate	1,171	United States 1,165.
Iron and steel semimanufactures	11,054	El Salvador 6,906; Nicaragua 1,894; Honduras 997.
Petroleum refinery products:		
Distillate fuel oil ----thousand 42-gallon barrels	35	NA.
Unspecified ----do----	4	NA.
Stone, sand and gravel	12,469	El Salvador 11,232.
Nonferrous metal scrap	546	NA.

NA Not available.

Table 7.—Guatemala: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	Principal sources, 1971
METALS		
Aluminum metal, including alloys, all forms	1,374	El Salvador 703; Japan 218; West Germany 198.
Copper:		
Ore and concentrate	1,290	United States 752.
Metal, including alloys, all forms	428	United States 206; Mexico 82.
Iron and steel:		
Steel, primary forms	19,847	Belgium-Luxembourg 7,875; France 6,606; West Germany 2,552
Semimanufactures:		
Bars, rods, angles, shapes, and sections	16,140	El Salvador 8,061; Belgium-Luxembourg 4,326; Japan 1,473.
Universals, plates, and sheets	39,444	Japan 30,702; United States 5,711; Costa Rica 1,121.
Hoop and strip	904	NA.
Wire	5,649	West Germany 2,516; United States 666; El Salvador 663; Japan 645.
Tubes, pipes, and fittings	3,386	United States 1,442; United Kingdom 925; Japan 350.
Other	NA	
Zinc metal, including alloys, all forms	2,754	Mexico 1,722; Japan 901.
NONMETALS		
Asbestos	674	Mainly from Canada.
Clays and products:		
Crude	1,761	NA.
Products	1,606	United States 619; Nicaragua 373.
Fertilizer materials, manufactured	114,652	El Salvador 33,930; West Germany 23,121; United States 20,475.
Salt	8,659	El Salvador 8,339.
MINERAL FUELS AND RELATED MATERIALS		
Petroleum:		
Crude—thousand 42-gallon barrels	2,678	All from Venezuela.
Refinery products:		
Gasoline—do	184	Netherlands Antilles 179.
Kerosine—do	64	Netherlands Antilles 28; United States 26.
Lubricants—do	72	United States 32; Netherlands Antilles 16; El Salvador 12.
Other:		
Liquefied petroleum gas—do	176	El Salvador 83; United States 48; Venezuela 34.
Mineral jelly and wax—do	47	United States 45.
Unspecified—do	123	Venezuela 105.

NA Not available.

COMMODITY REVIEW

Metals.—*Copper, Lead, and Zinc.*—The 39.9-square-kilometer mineral concession held by Minas de Oriente, S.A., (controlled by Minnesota Mining & Manufacturing Co.) was optioned to Tormex Mining Developers, Ltd. About $1.5 million was spent by Oriente in prospecting five lead-zinc-silver-copper areas. It was thought that of the five prospects, three could be mined by open pit methods.

From work done to mid-1973, zone 1 had indicated reserves of 1 million tons grading 7% zinc, 2.5% lead, 0.5% copper, and 2.5 ounces of silver per ton. Two other zones were also appraised and reportedly showed some promise.

Mining and milling equipment had arrived at dockside at yearend for overland transportation to the Oxec copper property in northeastern Guatemala, being developed by Basic Resources International Ltd. Underground mine development continued during the year. Reserves have been previously reported at 1.3 million tons of ore, averaging 2.6% copper. It was reported that Rio Tinto-Patino, S.A., had agreed to purchase copper concentrates under a 10-year agreement at prices based on London Metal Exchange quotations.

Iron and Steel.—After a ban of more than 10 years, an Executive Decree of June 12, 1973, authorized sale of government-owned ferrous scrap for domestic use or export.

The scrap was owned by the highway department and the national railways and therefore it belonged to the Government. The stockpile was reported to contain between 300,000 and 400,000 tons of scrap, of which about a 10% reserve was to be withheld for emergency domestic use. Bids were to be solicited later in the year.

Exports of nonferrous scrap were not controlled by the Government.

Nickel.—The International Finance Corporation (IFC) loaned $15 million to Exploraciones y Explotaciones Mineras Izabal S.A. (Exmibal) to help complete financing of its nickel mining and processing project. Banco Centroamericano de Integracion Economica (Cabei) was also to participate in support for the project; export credits of $50 million were expected to be forthcoming from the Export-Import Bank of the United States as well as from Canada and the United Kingdom.

The construction stage was estimated to require about 1,200 persons and about 700 would be needed when operations begin. The operation is located near El Estor in eastern Guatemala, and was designed to produce 12,700 tons of nickel per year in the form of 75% nickel converter matte. An 80% interest in Exmibal is held by International Nickel Co. of Canada Ltd. (INCO), and the remaining 20% is held by The Hanna Mining Co.

Mineral Fuels.—*Petroleum.*—It was reported that Shenandoah[7] Oil Corp. and Saga Petroleum A/S and Co. had each taken a 25% interest to explore and develop a 3,775-square-kilometer petroleum concession held in the Peten Basin by Recursos del Norte Ltd., a subsidiary of Basic Resources International, Ltd. Shenandoah was to be the operator. Saga Petroleum is a Norwegian consortium which participates in oil and gas exploration.

HONDURAS

In order to assure more rapid development, a National Geological Service, having both technical and executive functions, was to be organized. The Service was to survey all mines and leases to determine if the best interests of the country were being satisfied. Increased production at active properties would be encouraged and an effort would be made to increase efficiency. Inactive leases would be taken back from leaseholders who were not meeting their obligations to the State. In the long-term plan, the State would exploit mines or, at least, require a greater share of Honduran capital in mining enterprises. Because of the lack of human and financial resources, short-term action was planned for the State to increase its profits from active exploitation.

Geophysical prospecting and mapping have been conducted with the assistance of the United Nations. Studies of the mineral potential of the National Reserve area by the Honduran Direccion General de Minas et Hidrocarburos, resulted in offers for sale to interested parties, exclusive of exploration permits.

[7] Wall Street Journal. V. 181, No. 59, Mar. 27, 1973, p. 7.

Table 8.—Honduras: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1970	1972	Principal destinations, 1972
METALS			
Aluminum metal, including alloys, all forms	17	2	All to Nicaragua.
Antimony ore and concentrate	(2)	48	All to Belgium.
Cadmium ore and concentrate	205	99	United States 62; Japan 28; Belgium 8.
Copper metal, including alloys, all forms	(3)	--	
Gold metal, worked or unworked troy ounces	2,733	333	NA.
Iron and steel metal, including alloys, all forms	171	1,231	Mainly to Venezuela.
Lead ore and concentrate	r 17,816	16,852	Mainly to United States.
Silver:			
Ore and concentrate thousand troy ounces	3,648	2,997	Do.
Metal, including alloys ---do---	624	302	All to United States.
Zinc:			
Ore and concentrate	r 20,542	17,762	United States 11,426; Japan 5,247; Belgium 954.
Metal, including alloys, all forms	--	109	All to Nicaragua.
Other:			
Ash and residue containing nonferrous metals	89	264	British Honduras 180; West Germany 48; United States 15.
Metals, including alloys, all forms	r 48	--	
NONMETALS			
Cement	6,614	50,456	United States 18,267; British Honduras 11,597; Jamaica 8,266.
Clays and clay products	--	3	Mainly to Nicaragua.
Gypsum and plasters	(3)	--	
Salt	4,003	29	All to Nicaragua.
Sodium and potassium compounds, n.e.s., caustic soda	1	12	Do.
Stone, sand and gravel:			
Dimension stone	34	46	Mainly to United States.
Other	--	17,225	Mainly to Panamá.
Other nonmetals, n.e.s., building materials, n.e.s	7	34	United States 23; Panamá 11.
MINERAL FUELS AND RELATED MATERIALS			
Gas, manufactured	9	--	
Petroleum refinery products:			
Gasoline --thousand 42-gallon barrels	284	1	Mainly to Nicaragua.
Kerosine ---do---	1	--	
Distillate fuel oil ---do---	525	66	Nicaragua 41; Panamá 21; Jamaica 4.
Residual fuel oil ---do---	1,666	1,376	Mainly to Panamá.
Lubricants ---42-gallon barrels---	373	110	Nicaragua 30; Guatemala 29; British Honduras 27.
Other:			
Liquefied petroleum gas ---do---	r 1,785	18,297	Mainly to Guatemala.
Mineral jelly and wax ---do---	--	20	All to Guatemala.
Pitch, resin, petroleum asphalt, and petroleum coke ---do---	1,313	447	All to British Honduras.

r Revised. NA Not available.
[1] Data for 1971 not available for inclusion in this chapter.
[2] Quantity not available. Value of 1970 export $465,879 compared to 1972 value of $17,334.
[3] Less than ½ unit.

Table 9.—Honduras: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1970	1972	Principal sources, 1972
METALS			
Aluminum metal, including alloys, all forms	683	492	United States 125; Austria 54; Nicaragua 51.
Copper:			
Copper sulfate	118	83	Mainly from United States.
Metal, including alloys, all forms	313	45	United States 25; Canada 7; Mexico 6.
Iron and steel metal, including alloys, all forms	r 40,352	28,159	Belgium 7,373; United States 5,721; France 4,342.
Lead metal, including alloys	61	148	United States 68; Belgium 55; Mexico 20.
Nickel metal, including alloys	(2)	(2)	Mainly from United States.
Platinum-group metals ——troy ounces	3,022	1,029	All from United States.
Silver metal, including alloys, all forms do	2,636	4,180	Mainly from United States.
Tin metal, including alloys, all forms long tons	13	12	United States 8; United Kingdom 1; Guatemala 1.
Zinc metal, including alloys	46	383	Belgium 200; Japan 110; Guatemala 45.
Other:			
Ore and concentrate	(2)	(2)	Mainly from United States.
Ash and residue containing nonferrous metals	5	(2)	All from United States.
Metals, including alloys, all forms	7	49	Mainly from United States.
NONMETALS			
Abrasives, natural, n.e.s. (including industrial diamond)	24	28	United States 9; West Germany 7; Czechoslovakia 4.
Asbestos	1,832	1,804	Mainly from Canada.
Cement	1,392	3,055	Nicaragua 1,196; Japan 581; Belgium 547.
Clays and products (including all refractory brick):			
Crude, kaolin and other clays or earth	637	1,448	United States 620; Nicaragua 467; Netherlands 207.
Products including nonclay brick	1,195	1,076	United States 323; Nicaragua 254; Canada 120.
Diatomite and other infusorial earth	1,498	571	Nicaragua 441; United States 101; Mexico 27.
Fertilizer materials, crude and manufactured	r 35,756	39,399	Netherlands 10,444; Mexico 8,499; West Germany 7,498.
Graphite, natural	2	(2)	Mainly from United States.
Gypsum and plasters	31	40	Do.
Lime	737	609	Mainly from West Germany.
Pigments, mineral, natural, crude	9	8	Do.
Precious and semiprecious stones, except diamond ——troy ounces	932	161	West Germany 96; United States 64.
Salt	r 376	452	Mainly from United States.
Sodium and potassium compounds	r 785	1,122	Do.
Stone, sand and gravel:			
Dimension stone, crude, partly worked and worked	211	12	Mainly from Guatemala.
Sand (including ground quartz)	r 64	10	All from United States.
Sulfur:			
Elemental, all forms	458	109	Mainly from West Germany.
Sulfuric and sulfurous acids	496	356	United States 194; West Germany 95; Netherlands 67.
Talc and steatite	47	46	Italy 29; United Kingdom 8; United States 5.
Other nonmetals, n.e.s.:			
Crude	64	17	All from United States.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	754	214	Colombia 86; United States 28; West Germany 25.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural	--	1	All from United States.
Coal and coke, including briquets	398	140	Colombia 86; United States 28; West Germany 25.
Gas, manufactured	(2)	2	NA.
Hydrogen	3	1	Mainly from United States.

See footnotes at end of table.

Table 9.—Honduras: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1970	1972	Principal sources, 1972
MINERAL FUELS AND RELATED MATERIALS —Continued			
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	r 4,914	4,429	Mainly from Venezuela.
Refinery products:			
Gasoline ---do---	79	61	Netherlands Antilles 35; Nicaragua 16; Jamaica 7.
Kerosine and jet fuel ---do---	2	2	Mainly from Nicaragua and United States.
Distillate fuel oil ---do---	323	314	Mainly from Netherlands Antilles.
Lubricants ---do---	45	56	United States 38; Jamaica 10; Netherlands Antilles 7.
Other:			
Liquefied petroleum gas 42-gallon barrels	53	974	Mainly from Nicaragua.
Mineral jelly and wax thousand 42-gallon barrels	11	8	Mainly from United States.
Unspecified ---do---	108	78	Mainly from Netherlands Antilles.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	3,715	3,425	Mainly from United States.

r Revised. NA Not available.
[1] Data for 1971 not available for inclusion in this chapter.
[2] Less than ½ unit.

COMMODITY REVIEW

Metals.—*Gold, Silver, Lead, and Zinc.*—A preliminary feasibility study by Allianza Industrial, S.A., a wholly-owned subsidiary of NRD Mining Ltd. of Vancouver, Canada, showed that the Tatumbla gold deposit could be mined at a rate of 54,400 tons of ore per year for a period of 4 years. Negotiations for an option to lease the property were completed, subject to approval by the Honduran Government.

Private work was also done by the Honduran subsidiary of the United Siscoe Mines (of Canada), Siscon de Honduras, on the Clavo Rico gold property in the Department of Choluteca, near the town of Comayagua.

El Mochito's 25th year of operation was highlighted by improved ore grade and continued improvement in metallurgy, resulting in increased production of silver, lead, zinc, and cadmium. Higher metal prices more than offset increased costs of labor, supplies, and concentrate shipping and treatment. In 1973 the mine produced 282,753 tons of ore from an average of 34 stopes. The mill processed 282,657 tons, averaging 13.1 ounces of silver, 0.01 ounce of gold per ton, 8.42% lead, and 10.04% zinc.

Production at El Mochito for 1973 is shown in the following tabulation:

	Silver (troy ounces)	Gold (troy ounces)	Lead (metric tons)	Zinc (metric tons)
Lead concentrates	2,447,910	1,468	19,197	3,300
Zinc concentrates	688,083	720	1,583	22,198
Doré bullion	266,296	288	--	--
Total	3,402,289	2,476	20,780	25,498

Cadmium contained in concentrates amounted to 120 tons in 1973.

Assured and probable ore reserves in the main area decreased by 138,985 tons to 1,621,501 tons, grading 13.4 ounces of silver and 0.009 ounce of gold per ton; 10.48% lead and 10.94% zinc. The San Juan ore body reserves increased by 188,626 tons to 2,763,006 tons, grading 3.2 ounces of silver and 0.002 ounce of gold per ton; 2.80% lead, 7.53% zinc, and 0.37% copper.

At Shaft No. 6, a large pump station was completed on the 2,100 level to pump mine water to the 1,725 level pump station. Loading pockets below the 2,100 level and a system of ore and waste passes was completed. Preparations were completed to

sink the No. 2 shaft from the 1,725 level to the 2,225 level.

A system of crosscuts, raises, and sublevels was driven at the San Juan ore body preparatory to stoping. The first stope was scheduled for completion by mid-1974, and plans called for the production of 27,215 tons of ore from this area during 1974. This was the first stage of an expansion program designed to increase total production gradually over the next 4 years to 417,000 tons per year, at which time 136,000 tons were to be produced annually from the San Juan ore body.

Work in the Soledad Area was intensified during the year. A 124-meter adit was driven and diamond drilling was started, but only two holes were completed by yearend. The drilling program on this prospect was to continue during 1974.[8]

Cia. Minera Los Angeles, S.A., a wholly owned subsidiary of NRD Mining Ltd., reported that a geochemical soil sampling program on 28 square kilometers surrounding its existing silver-lead-zinc mining operations in Honduras was nearly completed and three areas of high lead-zinc values were identified. Trenching of soil covering bedrock at one anomaly provided a sample of gossan material taken at a depth of 8 meters in the main trench that assayed 32.8% lead and 20.5% zinc.

A potentially exploitable low-grade silver-copper-antimony occurrence at Pinolapa, in the Department of Comayagua, drilled by Minerales S.A. (Minsa) yielded encouraging values but the project was not carried any further.

NICARAGUA

The United Nations issued a statement on the earthquake that devastated the capital city of Managua on December 23, 1972. There were estimates of 10,000 deaths, the number injured totaled 20,000, and about 300,000 people were homeless. About 25% of the country's population was housed in Managua; more than 50% of its commercial services and 70% of the industrial output were centered in the city. Business activities generated about 40% of the gross national product. About 740,000 square meters of commercial buildings, warehouses, and public and private offices were destroyed; these accounted for 60% of the commercial capacity of Managua, equivalent to 29% of that of the entire country. No losses were reported at mining properties. By yearend, costs for building a middle class house (exclusive of the cost of the building lot) had risen 35.8%, and labor costs increased about 40%. Price rises for steel and plywood were mainly responsible for the rise in building costs. The rent control law was extended for 1 year and certain constitutional guarantees were suspended in the national interest.

The International Bank for Reconstruction and Development (IBRD) approved a loan of $11 million to finance foreign exchange requirements for expansion and modernization of the Pacific coast port at Corinto; total cost of the project, to be completed in 1976, was expected to be $14.6 million. The Corinto Port Authority (CPA) was to be the borrower responsible for the project and the Republic of Nicaragua was to guarantee the loan. The port of Corinto is the only Nicaraguan port with deepwater berthing facilities and naturally protected anchorage. The main work was construction of a new wharf of 240 meters to replace an obsolete timber-deck pier; other work included channel dredging and navigational aids, service and administration buildings, and other normal port infrastructure. Traffic at the port was expected to increase from the 1972 level of 660,000 tons to about 1 million tons in 1976.

A radar survey was made of the entire country with good results. Imagery obtained allowed preparation of maps showing geology, geomorphology, surface drainage, generalized land utilization, and vegetation.

[8] Rosario Resources Corporation. 1973 Annual Report, pp. 3-4.

Table 10.—Nicaragua: Exports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1972	Principal destinations, 1972
METALS		
Aluminum metal, including alloys, all forms	65	Honduras 45; El Salvador 9; Costa Rica 8.
Copper:		
Ore and concentrate	5,371	All to West Germany.
Metal, including alloys, all forms	2	All to United States.
Iron and steel metal:		
Scrap	2	All to Honduras.
Semimanufactures	6,724	Honduras 3,224; Costa Rica 2,287; Guatemala 935.
Lead ore and concentrate	4,502	United States 3,259; West Germany 1,243.
Silver metal, worked and partly worked, troy ounces	154,741	Canada 145,611; United States 9,130.
Zinc ore and concentrate	26,587	All to United States.
Other, scrap and waste of nonferrous metals	4,150	West Germany 2,137; Netherlands 1,469; Mexico 367.
NONMETALS		
Abrasives, natural	16	All to Costa Rica.
Cement	1,084	All to Honduras.
Clay products:		
Refractory (including nonclay bricks)	5	All to Costa Rica.
Nonrefractory	2,389	Costa Rica 1,609; El Salvador 399; Honduras 244.
Diatomite	1,334	All to Honduras.
Feldspar and related materials	58	All to Costa Rica.
Fertilizer materials, manufactured, nitrogenous	22	El Salvador 16; Guatemala 6.
Gypsum and plasters	11,585	All to Costa Rica.
Lime	445	Do.
Salt	9,144	Mainly to Costa Rica.
Sodium and potassium compounds, caustic soda	12,667	El Salvador 6,818; Costa Rica 3,521; Guatemala 2,321.
Stone, sand and gravel:		
Dimension stone, crude and partly worked	49	Mainly to Costa Rica.
Sand, including ground quartz	14	All to Costa Rica.
MINERAL FUELS AND RELATED MATERIALS		
Petroleum:		
Crude and partly refined, 42-gallon barrels	97	Do.
Refinery products:		
Gasoline, do.	120	Do.
Kerosine, do.	18,892	Costa Rica 14,244; El Salvador 2,631; Honduras 1,051.
Lubricants, do.	2	All to Costa Rica.
Other:		
Liquefied petroleum gas, do.	48,427	Costa Rica 41,188; El Salvador 5,066; Honduras 1,652.
Unspecified, do.	259,296	Costa Rica 240,166; El Salvador 13,366; Honduras 5,346.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	924	El Salvador 759; Guatemala 137; Costa Rica 20.

[1] Excluding oxides and hydroxides of metals, which within the source are inseparable from salts and other compounds of metals.

Table 11.—Nicaragua: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1972	Principal sources, 1972
METALS		
Aluminum metal, including alloys, all forms	900	United Kingdom 298; El Salvador 179; Austria 136.
Copper:		
Ore and concentrate	82	All from United States.
Copper sulfate	148	United States 144; Netherlands 4.
Metal, including alloys, all forms	87	Canada 24; United States 16; West Germany 14.
Iron and steel metal:		
Scrap	1	All from Costa Rica.
Primary forms	4,733	Brazil 4,699; Spain 19; United States 10.
Semimanufactures	35,529	Japan 12,710; Costa Rica 6,323; France 6,304.
Lead metal, including alloys, all forms	159	Mexico 135; United States 12.
Nickel metal, including alloys, all forms	(2)	Mainly from West Germany.
Silver metal, worked and partly worked, troy ounces	8,134	United States 8,070; United Kingdom 64.
Tin metal, including alloys, all forms, long tons	18	United Kingdom 10; West Germany 3; United States 2.
Zinc metal, including alloys, all forms	682	Japan 301; Mexico 260; Honduras 92.
Other:		
Ore and concentrate of base metals, n.e.s	(2)	All from United Kingdom.
Scrap of nonferrous metals	28	Honduras 25; Costa Rica 3.
Base metals, including alloys, all forms, n.e.s	11	Mainly from Brazil.
NONMETALS		
Abrasives, natural	125	Costa Rica 61; United States 15; Spain 15.
Asbestos	488	Canada 476; United States 12.
Boric acid	21	United States 17; West Germany 3; Netherlands 1.
Cement	859	Japan 471; Denmark 383; United States 5.
Clays and clay products:		
Crude clays, n.e.s	3,105	United States 2,142; United Kingdom 811.
Products:		
Refractory	641	United States 584; Costa Rica 25.
Nonrefractory	232	Spain 78; Japan 61; Italy 35.
Diatomite	285	Mexico 242; United States 43.
Feldspar and related materials	646	Guatemala 339; United States 306.
Fertilizer materials:		
Crude	1	Mainly from United Kingdom.
Manufactured:		
Nitrogenous	56,178	Japan 16,771; Mexico 15,038; Netherlands 10,197.
Phosphatic	24,190	Costa Rica 13,133; United States 10,998.
Potassic	7,554	United States 4,078; West Germany 3,197.
Other	10,114	Canada 6,524; Costa Rica 2,225; Netherlands 904.
Graphite, natural	5	Mexico 3; United States 2.
Gypsum and plasters	217	United Kingdom 156; West Germany 32; United States 28.
Lime	1,424	West Germany 830; United Kingdom 318; United States 275.
Mica, worked, including splittings and waste	1	Mainly from United States and West Germany.
Pigments, mineral, natural	(2)	All from United Kingdom.
Precious and semiprecious stones, including diamond, kilograms	15	El Salvador 5; Brazil 4; West Germany 2.
Salt	11,879	Mexico 11,715.
Sodium and potassium compounds, n.e.s	528	United States 354; West Germany 142.
Stone, sand and gravel	164	Guatemala 106; United States 26; Italy 23.
Sulfur:		
Elemental	152	West Germany 84; United States 68.
Sulfuric acid	541	El Salvador 509; Netherlands 18; United States 8.
Talc	233	United States 135; Italy 51; West Germany 35.

See footnotes at end of table.

Table 11.—Nicaragua: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1972	Principal sources, 1972
NONMETALS—Continued		
Other:		
Crude nonmetallic minerals, n.e.s	197	United States 107; Mexico 53; Guatemala 37.
Meerschaum, amber, jet ----------kilograms--	11	All from United States.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s ----	174	Colombia 77; Guatemala 53; United States 32.
MINERAL FUELS AND RELATED MATERIALS		
Carbon black	3	Mainly from West Germany.
Coal, coke and peat	118	West Germany 86; Colombia 28; United States 2.
Petroleum:		
Crude and partly refined thousand 42-gallon barrels--	3,706	All from Venezuela.
Refinery products:		
Gasoline ----------do----	85	Netherlands Antilles 80; Trinidad and Tobago 2.
Kerosine ----------do----	19	Netherlands Antilles 15; United States 2.
Distillate fuel oil ----------do----	222	Netherlands Antilles 122; Panamá 54; Trinidad and Tobago 15.
Lubricants ----------do----	45	United States 30; Netherlands Antilles 8; Jamaica 6.
Other:		
Liquefied petroleum gas ----------do----	(2)	Mainly from Belgium.
Mineral jelly and wax ----------do----	9	United States 4; Colombia 3; Japan 1.
Unspecified ----------do----	1	Mainly from United States.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	6,027	United States 4,018; Netherlands Antilles 967; Trinidad and Tobago 634.

[1] Excluding oxides and hydroxides of metals, which within the source are inseparable from salts and other compounds of metals.
[2] Less than ½ unit.

COMMODITY REVIEW

Metals.—*Copper.*—The Nicaraguan assets of La Luz Mines Ltd. were acquired for 50,000 shares of Rosario Resources Corp. stock. The La Luz properties will become part of Rosario Mining of Nicaragua Inc., a wholly-owned subsidiary of Rosario Resources Corp. The principal assets acquired were the Rosita 50,000-ton-per-month mill and low-grade open pit copper mine, and the Siuna mine, a former 2,000-ton-per-day gold mine operation.[9]

In a companion move to the acquisition of the La Luz facilities, Rosario acquired from local interests, exploration and exploitation concessions covering more than 4,000 square kilometers of land surrounding the Rosita and Siuna mining concessions. The area was considered to be highly mineralized and offered promising exploration targets for Rosario's geological staff. Extensive exploration in the Rosita concession was being conducted to extend the life and profitability of the mine. Exploration work also was to be conducted in the separately acquired adjacent concessions.[10]

Gold.—Empresa Minera de el Setentrion,[11] in which Noranda Mines Ltd. had a 60.5% interest, mined and treated 113,126 tons of ore that averaged 0.63 ounce of gold per ton. The grade of ore mined was below that of 1972 because lower marginal grades were utilized due to the higher price of gold. Work continued on ventilation and hot-water pumping facilities so that deeper mining could be carried out in the Panteon vein. At yearend ore reserves were estimated at 285,763 tons averaging 0.71 ounce of gold.

Lead and Zinc.—About $3 million was invested by Neptune Mining Co. in the development of a lead-zinc operation at Vesubio, where ore reserves were originally estimated at 1.2 million tons. Mine output ranged up to 500 tons per day from deposits that averaged 12.5% zinc, 2.16% lead, 0.28% copper, 0.09 ounce gold, and 0.48 ounce of silver per ton. Reports of

[9] Page 10 of work cited in footnote 8.
[10] Skillings' Mining Review. Rosario Completes Acquisition of La Luz Mines Ltd. V. 63, No. 2, Jan. 12, 1974, p. 43.
[11] Noranda Mines Ltd. Annual Report, 1973, p. 12.

operations indicated that the mine was producing approximately 2,800 tons of zinc concentrate and 500 tons of lead concentrate per month. Neptune Mining was 51.8% owned by American Smelting and Refining Company and 36% by Rosario Resources Corp. Neptune Mining also operated a recovery plant at Bonanza.[12] Production by Neptune Mining in 1973 was 18,688 tons of zinc, 2,722 tons of lead, and 59,000 troy ounces of silver.[13]

Mineral Fuels.—Nicaragua has only one oil refinery, which is owned and operated by Esso Standard Oil, S.A., Ltd. The installed refining capacity was 21,000 barrels per day and all crude oil was imported from Venezuela.

Texasgulf, Inc., of the United States was to begin oil exploration on the Pacific Continental Shelf.

PANAMA

A new petroleum and mineral resources code was being drafted to replace the 1963 code but by yearend it had not been released.

Continuation of the Pan-American Highway through Darien Province was expected to benefit the mineral industry. New access roads were likely to increase prospecting. Copper mine exploration in Panamá has been west of the Canal Zone and, hence, outside of the area traversed by the proposed highway. Gold has been produced from the Espiritu Santo mine near Cana, about 48 kilometers south of the village of Yaviza on the proposed highway. The intrusive or eruptive character of the rocks in the San Blas Mountains, bordering the highway route on the north, and the known occurrences of gold and nonferrous minerals in the Pirre Mountain area south of the route are factors suggesting that new mineral deposits may be discovered as a result of completing this link in the highway system.

[12] Mining Journal. Nicaragua. Annual Review. June 1974, p. 333.
[13] American Smelting and Refining Company. 1973 Annual Report, p. 20.

Table 12.—Panamá: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity		1971	1972
METALS			
Aluminum metal, including alloys:			
Unwrought		148	173
Semimanufactures		279	266
Iron and steel metal, including alloys, all forms		342	123
NONMETALS			
Abrasives, natural, n.e.s	kilograms	105	143
Clays and clay products:			
Crude clays, n.e.s		13	18
Products		56	78
Stone, sand and gravel, quartz and quartzite		--	21
MINERAL FUELS AND RELATED MATERIALS			
Petroleum:			
Refinery products, not specified	thousand 42-gallon barrels	r 6,635	5,311
Liquefied petroleum gas	do	5	6
Other [1]	do	271	43

r Revised.
[1] Includes pitch, resin, petroleum coke, asphalt, and various oils.

Table 13.—Panamá: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Bauxite and concentrate, gross weight	320	172
Metal, including alloys, all forms	r 2,161	2,350
Copper metal, including alloys, all forms	r 270	348
Gold metal, unworked or partly worked ---troy ounces--	NA	868
Iron and steel:		
Scrap (including iron and steel filings)	1,216	1,711
Pig iron, ferroalloys, and similar materials (includes iron and steel powders)	201	183
Iron and steel, primary forms	r 26,135	18,637
Semimanufactures	r 31,286	37,645
Lead:		
Ore and concentrate, gross weight	10	10
Metal, including alloys, all forms	305	331
Nickel metal, including alloys, all forms	(2)	1
Platinum-group metals and silver:		
Ore and concentrate ---kilograms--	--	1
Metals, including alloys, all forms:		
Platinum group ---troy ounces--	3,279	96
Silver ---do----	12,378	16,172
Tin:		
Ore and concentrate, gross weight ---long tons--	1	(2)
Metal, including alloys, all forms ---do----	17	57
Zinc:		
Ore and concentrate, gross weight	1	1
Oxide	31	26
Metal, including alloys, all forms	311	389
Other metals, including alloys, all forms	704	676
NONMETALS		
Abrasives, natural, n.e.s., except diamond	13	15
Asbestos	165	165
Cement	r 51,126	68,980
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	616	740
Products:		
Refractory (including nonclay bricks)	1,266	1,393
Nonrefractory	364	426
Diamond, industrial ---carats--	535,000	15,000
Diatomite and other infusorial earth	413	227
Feldspar and fluorspar	27	36
Fertilizer materials, manufactured:		
Nitrogenous	r 21,452	24,476
Phosphatic	1,619	135
Potassic	360	7
Other, including mixed	r 28,324	32,866
Graphite, natural	12	13
Gypsum and plasters:		
Gypsum	16,265	16,978
Plasters	176	257
Mica, all forms	(2)	7
Precious and semiprecious stones, except diamond ---kilograms--	NA	24
Salt (excluding brine)	r 8,522	1,806
Sodium and potassium compounds, n.e.s	238	259
Stone, sand and gravel	2,328	313
Sulfur, elemental, all forms	7	21
Talc, steatite, soapstone, and pyrophyllite	360	292
MINERAL FUELS AND RELATED MATERIALS		
Coal, all grades, including briquets	1,000	8,161
Coke and semicoke	531	630
Petroleum:		
Crude and partly refined ---thousand 42-gallon barrels--	r 28,051	28,369
Refinery products:		
Gasoline ---do----	5	5
Kerosine ---do----	5	2
Distillate fuel oil ---do----	133	183
Residual fuel oil ---do----	84	62
Lubricants ---do----	r 56	61
Other ---do----	r 9	10
Total ---do----	292	323
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	3,027	265

r Revised. NA Not available.

[1] Excludes metallic oxides and hydroxides (except zinc oxide) which are reported inseparably from metallic salts.

[2] Less than ½ unit.

COMMODITY REVIEW

Metals.—*Copper.*—Canadian Javelin Ltd. (CJL) continued its appraisal of the Cerro Colorado copper prospect in Panamá. Estimates of ore totaled 2.2 billion tons averaging 0.518% copper. Some core holes showed copper content of up to 5.5%. Hole 106 was drilled to a vertical depth of 1,341 meters and was reported as still in good copper mineralization. The deposit was open to extension in three directions and at depth.

Initial plans called for mining and milling 176,000 tons of ore per day to produce 300,000 tons per year of copper when the property is fully developed. One-half would be shipped as copper concentrate, 25% as blister copper, and the remainder as electrolytic cathode or wire bar. Cost of the project was estimated at $560 million.

British Kynoch Metals, Ltd., was reported to have executed a letter of intent to buy the initial production of blister copper; purchases could be extended as the project developed. Kynoch would also help to obtain financing.

Anglo American Corp. of South Africa announced that it had purchased about 220,000 shares of CJL, and Noranda Mines Ltd. said it had acquired about 236,000 shares.

Panamá was in the process of developing a new mining law and it is possible that no actual mining will be done until it is enacted. At yearend, CJL and the Government were working toward an agreement that would allow operations to commence before final approval of the law.

Cobre Panamá, S.A. (Cobre), a consortium composed of Mitsui Mining & Smelting Co. Ltd., Dowa Mining Co. Ltd., Mitsubishi Metal Corporation, and Nittetsu Mining Co. Ltd., signed a 4-year contract with the Panamá Government to cover exploration work in the Donoso District of Colon Province. Work was to center on Botija, Petaquilla, and Rio del Medio prospects, which were discovered by a joint United Nations-Panamá Government team in 1968. The U.S. Agency for International Development provided assistance in the form of cash for laboratories and equipment and some technical help.

Cobre was granted exclusive prospecting rights for copper, molybdenum, tin, lead, and zinc; Panamá reserved the right to explore for and extract other natural resources from the same area, including minerals not named in the contract. The exploration area contains about 400 square kilometers and Cobre planned to spend about $1.5 million during the first 2-year period.

Under the agreement Cobre must comply with the current mining laws and any modifications that are not in opposition to those established in the contract. If a new mining law is adopted while Cobre is carrying out its exploration program, the company must either abide by the new law or give up its exploration contract within 90 days after any new code is adopted.

The exploration contract did not automatically grant mining rights. After the 4-year period of exploration is completed and it has been demonstrated that commercial mining is possible, Cobre has a 90-day option on the property, and within that time must come to an agreement with the Government on a mining contract. If no agreement is reached, the Government will reimburse Cobre for the expenses incurred in exploration and the concession will presumably revert to the Government.

The Government called for applications for exploration and exploitation concessions over 370 square kilometers in the eastern part of the country near the Colombian border. Copper and gold mineralization was found in the area during a mineral survey jointly conducted by the Panamá Government and the United Nations Special Fund. Applications were received beginning on July 13, 1973.

Bison Petroleum and Minerals was granted a major mineral concession on 800 square kilometers in Veragjas Province, which is known to contain gold, silver, and other metals. In the El Remance Area, gold reserves were estimated at 115,000 tons, averaging about 0.29 ounce per ton. At Hatillos, silver and base metal occurrences are also know.

Mineral Fuels.—*Petroleum.*—An exploratory well was scheduled by Plaris, S.A., a subsidiary of Santa Fe International Corp., at a site about 160 kilometers southwest of Panamá City, in the Gulf of Panamá. Water depth at the site is about 76 meters, and the test well was planned to reach a depth of nearly 4,300 meters. Drilling was to be done by Global Marine Co. under the

supervision of El Paso Panamá Co., a subsidiary of El Paso Natural Gas Co.

A test well was also projected by Corvus, S.A., a subsidiary of Oceanic Exploration Co. The test was to be sited in the Gulf of Panamá about 113 miles south of Panamá City.

An agreement was executed between the Government of Panamá and Panamá Exploration Inc., a Texaco, Inc., affiliate, for offshore exploration of a 4,978 square kilometer block on the Caribbean coast extending from Colon to Bocas del Toro Province.

The retail price for petroleum products in Panamá was raised in June and again at the end of October. The increase in October over the June price was, in percent: 12.9, 9.2, 1.6, and 8.7 for premium gasoline, regular gasoline, light diesel oil, and liquid petroleum gas in 100-pound cylinders, respectively. The price of kerosine remained at the equivalent of 21 cents per gallon because of its general use by the lower income segment of the population.

The Mineral Industry of Other South American Areas

By Staff, Bureau of Mines

CONTENTS

ECUADOR [1]

In 1973, Ecuador continued its rapid progress toward becoming a significant producer of crude petroleum, although production and reserves each amounted to less than 1% of the world totals. The petroleum boom had only a small direct effect on employment, but because of the revenues it generated, it quickly came to dominate the entire Ecuadorean economy in 1973. The value of petroleum exports in 1971 was only $2.0 million; in 1972 it was $61.0 million; and in 1973 it rose abruptly to $239.5 million, comprised about 10% of the nation's gross domestic product (GDP), and funded a large share of the year's governmental budget. Thus, in 1973 petroleum became Ecuador's principal export, and it was expected that in 1974, petroleum export revenues would exceed $600 million, twice the sum of the value of all other exports. The ambitious 5-year plan for national economic development, announced late in 1972, was predicated on the continuance of petroleum revenues of this magnitude. Ecuador became an associate member of the Organization of Petroleum Exporting Countries (OPEC) in August, and a full member in November.

A new mining development law, drafted in 1973 and promulgated in January 1974, stated that all mines and mining and quarrying activities are the property of the Ecuadorean Government and subject to its control. The mining industry was considered a public utility and provisions were included for establishment of rights-of-way and for expropriations of land, buildings, installations, and other property. Hydrocarbons were exempted from this new law, since they were covered under the Hydrocarbons Law of September 1971.[2]

Production of mineral commodities in 1973 is shown in table 1. Production of crude petroleum and natural gas each increased about 2½ times, petroleum output reaching 76 million barrels and natural gas 12.4 billion cubic feet. Proven reserves of petroleum were 5.7 billion barrels and total resources estimated at 114 billion barrels. Output of gold remained about the same as in 1972 but output of silver increased 10%. Changes in production of the several other commodities were mixed.

By yearend, most of the petroleum concession areas in eastern Ecuador had reverted to the State, either in compliance with the Hydrocarbons Law of 1971, or voluntarily after unsuccessful exploration. Exploration had slowed greatly, but five foreign-owned groups remained in the Oriente Region. The state-owned petroleum corporation, Corporación Estatal Petrólera Ecuatoriana (CEPE), planned to retain some of the more promising areas

[1] Prepared by W. C. Butterman, physical scientist, Division of Nonferrous Metals—Mineral Supply.

[2] Mineral Trade Notes. V. 1, No. 4, April 1974, pp. 7-26.

for itself. Aside from that oil found by the Texaco-Gulf consortium, (Cià. Texaco de Petróleos del Ecuador, S.A., and Gulf Ecuatoriana de Petróleos, S.A.) little petroleum of commercial quantity or grade had been found in the eastern region in 7 years of drilling, although a group headed by the U.S.-owned Cayman Corp. was expected to begin exporting oil on a modest scale in 1975. Cayman had brought into production five of seven wells drilled, and after signing a new 22-year contract with the Ecuadorean Government, made plans to drill 90 development wells and was negotiating with the Government on the construction of a pipeline. In 1973, the Shenandoah Oil Corp.-Reading & Bates venture and the O.K.C. Group each drilled one dry hole; Sun Oil Co. drilled four holes, of which one was a producer.

Of the river basins in eastern Ecuador which were of interest to the petroleum industry, development had proceeded furthest in the upper Amazon Basin. Fifteen fields had been identified, and of 132 wells drilled by the Texaco-Gulf Consortium, 107 were producers, capable, on the average, of more than 2,500 barrels per day per well. A new 20-year contract between Ecuador and Texaco-Gulf, signed in August, was considered by the Ecuadorean Government as a model for future petroleum contracts. Among other terms highly favorable to the Nation, Ecuador took an option to buy a 25% interest in the venture, and early in 1974 called for negotiations on the purchase. It was explained that the option would be exercised earlier than planned because membership in OPEC obliged the Government to participate actively in its petroleum properties.

The capacity of Ecuadorean refineries was reported to be about 36,000 barrels per day. A contract was awarded early in 1974 by CEPE to a Japanese firm for construction of a 55,000-barrel-per-day refinery on the coast at Esmeraldas, scheduled to come onstream late in 1976.

At yearend, the Natural Resources Ministry invited tenders for development of the Chaucha copper-molybdenum deposit and the La Platta copper-zinc-lead-silver deposit, and early in 1974 announced that five companies were qualified bidders, including the Cayman Corp. The Chaucha deposit, which is in southern Ecuador, about 20 miles inland, had been drilled earlier by the Japanese Overseas Mineral Resources Development Co. Ltd.; 55 million tons of ore grading less than 0.5% copper was outlined and then the project was dropped as uneconomical.

Table 1.—Other South American Areas: Production of mineral commodities

Area, commodity, and unit of measure	1971	1972	1973 p
ECUADOR [1]			
Cadmium, mine output, metal content ——kilograms	941	NA	NA
Cement, hydraulic ——thousand metric tons	462	482	e 435
Clays, kaolin ——do	554	e 550	e 550
Copper, mine output, metal content ——metric tons	564	438	e 481
Gas, natural:			
Gross production ——million cubic feet	9,620	5,328	e 12,400
Marketable production e ——do	500	500	5,500
Gold, mine output, metal content ——troy ounces	11,028	12,623	e 12,660
Natural gas liquids:			
Natural gasoline ——thousand 42-gallon barrels	NA	119	117
Liquefied petroleum gases ——do	52	50	50
Total ——do	NA	169	167
Petroleum:			
Crude oil ——do	1,354	28,579	76,220
Refinery products:			
Gasoline ——do	3,501	3,572	4,065
Jet fuel ——do	153	--	911
Kerosine ——do	373	400	400
Distillate fuel oil ——do	2,009	2,235	2,606
Residual fuel oil ——do	3,021	2,878	3,013
Lubricants ——do	2	1	--
Other:			
Liquefied petroleum gas ——do	17	10	25
Unspecified ——do	--	414	186
Refinery fuel and losses ——do	609	607	2 7
Total ——do	9,685	10,117	11,213
Silver, mine output, metal content ——troy ounces	72,158	69,465	e 76,411
Sulfur, elemental, from ores e ——metric tons	6,000	6,000	6,000
Zinc, mine output, metal content ——do	126	49	e 54
FRENCH GUIANA			
Columbite-tantalite ——kilograms	NA	1,145	NA
Gold, mine output, metal content ——troy ounces	2,315	997	e 1,000
GUYANA [1]			
Aluminum:			
Bauxite, dry equivalent, gross weight --thousand metric tons	3,920	3,344	3,276
Alumina ——do	310	260	e 272
Diamond:			
Gem ——thousand carats	e 19	e 20	31
Industrial ——do	e 29	e 29	21
Total ——do	e 48	e 49	52
Gold, mine output, metal content ——troy ounces	1,409	4,026	7,551
PARAGUAY			
Cement, hydraulic ——thousand metric tons	81	75	74
Clays:			
Kaolin e ——metric tons	1,200	4,000	8,000
Other e ——thousand metric tons	470	510	600
Gypsum e ——metric tons	12,000	11,000	10,500
Lime ——do	23,556	24,263	25,476
Petroleum refinery products:			
Gasoline ——thousand 42-gallon barrels	450	527	569
Jet fuel ——do	48	49	64
Kerosine ——do	121	140	134
Distillate fuel oil ——do	467	476	655
Residual fuel oil ——do	263	253	437
Other, liquefied petroleum gas ——do	2	34	89
Refinery fuel and losses ——do	117	84	104
Total ——do	1,468	1,563	2,052
Pigments, natural mineral, ocher e ——metric tons	45	60	90
Sand, including glass sand e ——thousand metric tons	431	451	541
Stone:			
Dimension e ——do	67	72	87
Crushed and broken:			
Limestone (for cement and lime) e ——do	156	146	143
Other e ——do	1,520	1,320	1,400
Talc, soapstone, and pyrophyllite e ——metric tons	160	220	250
SURINAM			
Aluminum:			
Bauxite, gross weight ——thousand metric tons	6,718	7,777	6,686
Alumina ——do	r 1,277	1,378	e 1,400
Metal, primary ——do	54	50	54
Cement ——do	49	e 50	NA
Clays, common e ——metric tons	3,200	3,300	NA
Gold, mine output, metal content ——troy ounces	643	e 600	NA

See footnotes at end of table.

Table 1.—Other South American Areas: Production of mineral commodities—Continued

Area, commodity, and unit of measure	1971	1972	1973 p
SURINAM—Continued			
Sand and gravel:			
Sand:			
Common e thousand metric tons	120	130	NA
Stone sand do	13	e 13	NA
Gravel do	e 10	210	NA
Stone, crushed and broken do	e 140	e 150	NA
URUGUAY			
Abrasives, natural corundum metric tons	--	--	304
Aluminum, secondary do	e 400	40	35
Cement, hydraulic thousand metric tons	388	465	563
Clays, type unspecified metric tons	300,166	321,656	284,822
Coke, gashouse do	15,122	13,565	13,236
Feldspar do	1,208	971	205
Fluorspar do	--	47	96
Gas, manufactured million cubic feet	933	923	906
Gem stones, semiprecious:			
Agate metric tons	[3] 1	55	209
Amethyst do	--	--	44
Gypsum do	--	47	--
Iron and steel:			
Iron ore (for cement production) do	3,300	1,210	3,990
Steel, crude do	e 16,000	--	350
Steel, semimanufactures do	46,500	45,550	49,762
Lime thousand metric tons	48	e 50	48
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	2,156	2,132	1,931
Jet fuel do	184	170	135
Kerosine do	1,306	1,382	1,453
Distillate fuel oil do	2,681	2,470	2,869
Residual fuel oil do	5,205	5,133	5,113
Lubricants do	3	2	1
Other:			
Liquefied petroleum gas do	261	295	291
Unspecified do	246	178	134
Refinery fuel and losses do	556	181	201
Total do	12,598	11,943	12,128
Sand and gravel:			
Sand:			
Common thousand metric tons	1,355	1,965	1,338
Glass do	128	124	--
Gravel do	e 220	--	NA
Stone:			
Dimension [4] do	23	32	[5] 17
Crushed and broken:			
Alum schist metric tons	317	310	--
Dolomite thousand metric tons	18	19	24
Limestone do	883	e 880	900
Marble do	--	--	4
Quartz metric tons	786	810	1,551
Other (including ballast) thousand metric tons	1,171	1,279	1,807
Sulfur, elemental, byproduct e [6] metric tons	117	114	116
Talc, soapstone, and pyrophyllite (ground) do	852	1,323	1,997

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] Apparently the majority of refinery fuel and losses is included in the totals for the individual refinery products.

[3] Exports.

[4] Consists partly of exports.

[5] In addition to this total, the Central Bank of Uruguay reports 10,780 cubic meters of curbstone and 63,161 cubic meters of granite as exports.

[6] Recovered from refinery gases.

FRENCH GUIANA [3]

The Nation's minerals industry made only a small contribution to the world mineral supply. Minor quantities of clay, gold, sand and gravel, and crushed stone were produced. Increasing world prices for precious metals may cause renewed interest in gold operations and stimulate explora-

[3] Prepared by Benjamin Petkof, physical scientist, Division of Nonferrous Metals—Mineral Supply.

tion for and development of new gold deposits.

The Aluminum Co. of America announced in its 1973 annual company report that its options on bauxite reserves in French Guiana were allowed to lapse.

GUYANA [4]

The production of bauxite represented the major segment of the Nation's mineral industry. A significant portion of the bauxite output was processed into alumina and calcined bauxite. The government-owned Guyana Bauxite Co. (Guybau) provided almost 74% of the Nation's output of processed and unprocessed material. Guyana did not consume its own output but exported it to other consuming nations primarily for processing into aluminum metal. Guyana accounted for almost 5% of world bauxite production, and 1% of world alumina production.

The remainder of the country's mineral output consisted of small quantities of gem and industrial diamond and gold.

Significant reserves of unexploited minerals such as kaolin and kyanite are available in the country. Kaolin deposits are thought to exist throughout the bauxite belt and extend from Linden, through Kwakwani on the Berbice River, and to Orealla on the Demerara River. Reserves of almost 7 million tons of clay have been delineated at Ituni and Linden. Some of the reserves near Ituni were classified as Georgia-grade kaolin. Reserves of 2.2 million tons kyanite were also known. Some interest has been indicated by Guybau in processing the kyanite into synthetic mullite for use in the manufacture of refractories.

[4] Prepared by Benjamin Petkof, physical scientist, Division of Nonferrous Metals—Mineral Supply.

Table 2.—Guyana: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
Aluminum:			
Bauxite:			
Dried refractory	(1)	27,555	West Germany 17,138; Denmark 5,295; United States 4,468.
Calcined	699,693	661,589	United States 230,799; United Kingdom 107,341; Japan 59,634.
Other ----thousand tons--	2,086	1,637	Canada 884; Virgin Islands 510; United States 236.
Oxide (alumina)	306,775	261,478	U.S.S.R. 169,329; People's Republic of China 32,987; United States 21,915.
Copper, scrap	--	3,774	United Kingdom 2,602; West Germany 785; Japan 280.
Mineral fuels and related materials ----value--	$38,549	$13,124	NA.
Precious and semiprecious stones, uncut and cut, not set ----do----	r $1,237,207	$993,935	Belgium $370,179; United Kingdom $284,178; Netherlands $165,831.

r Revised. NA Not available.
1 Revised to none.

Table 3.—Guyana: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity		1971	1972
METALS			
Aluminum, including alloys, all forms		103	68
Iron and steel, semimanufactures		72,241	40,621
NONMETALS			
Cement		94,915	70,774
Clays and clay products (including all refractory brick)		--	3,046
Fertilizer materials, manufactured:			
Nitrogenous		29,218	29,144
Phosphatic		--	8,469
Potassic		3,251	--
Lime	value	r $219,788	$296,795
Pigments, mineral, including processed iron oxides		497	429
Salt		3,427	3,236
Sodium and potassium compounds, n.e.s., caustic soda		34,796	21,136
Sulfur, sulfuric acid		1,005	--
Other, building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s		1,289	--
MINERAL FUELS AND RELATED MATERIALS			
Gas, hydrocarbon, manufactured	value	$972,662	$1,375,907
Petroleum refinery products:			
Gasoline	thousand 42-gallon barrels	r 311	325
Kerosine	do	265	247
Distillate fuel oil	do	r 589	517
Residual fuel oil	do	r 2,227	2,459
Lubricants	do	r 53	30
Other, petroleum asphalt	do	37	94

r Revised.

PARAGUAY [5]

Mineral production in Paraguay was at record levels in 1973. The volume of nonmetals production expanded 11%, to 2,889,000 tons. The total value of mineral output expanded 27%, to $30,730,000. The value of nonmetals increased 10%, to $9,775,000, and the value of petroleum refinery products increased 37%, to $20,950,000. New annual records were established for the output of most minerals.

There were few mineral exports. Leading mineral imports were crude oil, iron and steel, asphalt, and salt.

A treaty was signed between Brazil and Paraguay covering the design and construction of the Itaipu dam and hydroelectric project on the Paraná River 16 kilometers upstream from the point where Argentina, Brazil, and Paraguay meet. The $3 billion, 10-million-kilowatt project will be the world's largest.

A treaty was signed between Argentina and Paraguay covering the Yacyreta—Apipe dam on the Paraná River. Cost is estimated at $2 billion and power output will be 4 million kilowatt hours.

COMMODITY REVIEW

Nonmetals.—*Cement.*—Cement shipments decreased 2%, to 73,980 tons and were 9% below the 1971 record. Plans were made to double the size of the cement plant at Puerto Vallemi from 110,000 to 220,000 tons. New proposed dams will require large quantities of cement. Paraguay's share of the cement for the Itaipu dam will be 1,850,000 tons.

Clays.—Output of common clay was a record 600,000 tons, an increase of 18% over that of 1972. The clay was used for cement and heavy clay products. Kaolin output was a record 8,000 tons.

Gypsum.—Gypsum production decreased 5%, to 10,500 tons and was 12% below the 1971 record. The gypsum was used in cement.

Lime.—Output of lime was a record 25,480 tons, an increase of 5% above that of 1972.

Sand.—Output of common sand increased 20% to a record 541,000 tons. Paraguay will furnish more than 5 million tons of sand for the Itaipu dam.

Stone.—Production of crushed stone increased 5% to 1,543,000 tons but was 8% below the 1971 record. Most of the stone was used for cement. Proposed new dams will require large quantities of crushed stone.

[5] Prepared by Avery H. Reed, supervisory physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

Table 4.—Paraguay: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, all forms	190	55
Copper metal, all forms	219	630
Iron and steel, all forms	16,920	17,934
Lead metal, all forms	81	16
Tin metal, all forms ---long tons--	4	5
NONMETALS		
Cement, hydraulic	1,226	881
Salt	23,166	28,085
Crude minerals and manufactures, not further described	5,636	4,462
MINERAL FUELS AND RELATED MATERIALS		
Asphalt, natural	5,026	741
Coal, lignite, briquets and other solid fuels	84	46
Petroleum:		
Crude oil ---thousand 42-gallon barrels--	1,305	1,118
Refinery products:		
Gasoline ---do---	r 77	102
Kerosine ---do---	r 37	9
Distillate fuel oil ---do---	r 38	29
Residual fuel oil ---do---	25	--
Lubricants ---do---	33	30
Total ---do---	r 210	170

r Revised.

[1] In addition to the commodities listed, individually, Paraguay reports the importation of "precious stones and metals" totaling 52.6 metric tons in 1971 and .2 metric ton in 1972.

Mineral Fuels.—*Petroleum.*—Paraguay produces no crude petroleum. Exploration has been resumed after previous failures. An agreement was signed which grants to Texaco the right to explore an area of 3,100,000 hectares in the northernmost section of the country, along the border with Bolivia.

Paraguay operates one refinery at Asunción. Imports of crude oil from Algeria were 152,900 tons, compared with 145,000 tons in 1972. Plans were made to start importing crude oil from Bolivia by barge down the Paraguay River.

Refinery Products.—Output of refinery products was a record 2,052,000 barrels, an increase of 19%. Production of distillate increased 38%; gasoline, 8%; and jet fuel, 31%. The output of kerosine decreased 4%.

SURINAM [6]

Bauxite and products made from bauxite continued to be the principal export of Surinam and a major source of its foreign exchange. Surinam was the third largest bauxite-producing country in the world. An alumina plant located at Paranam was believed to be the second largest in the world.

A strike involving customs workers closed the port of Paramaribo during part of the first quarter of 1973, but shipments of bauxite, alumina, and aluminum were reportedly unaffected by the strike. Exports of bauxite during the year increased 5%, to 3,666,000 tons, of which 3 million tons was shipped to the United States. Alumina exports declined 5%, to 1,209,000 tons, while shipments of aluminum showed a slight increase.

Bauxite was mined by Suriname Aluminum Co. (Suralco), a subsidiary of Aluminum Co. of America, and Billiton Maatschappij Suriname N.V. Suralco also produced alumina and aluminum and converted bauxite to alumina for Billiton. Reynolds Metals Co., under a 1971 joint agreement with the Government, continued bauxite exploration activities in the Bakhuys Mountains in western Surinam.

An agreement was signed in August under which Billiton is to bring its assets into the formation of a new corporation, Billiton Suriname, N.V., in which the Government will participate up to 25%. Billiton also is to take up to 25% of the capital

[6] Prepared by Horace F. Kurtz, industry economist, Division of Nonferrous Metals—Mineral Supply.

of the Government company N.V. Grasshopper Aluminum Co. (Grassalco). The new Billiton company and Grassalco will form a joint venture to develop bauxite and other mineral deposits.

Alcan Aluminum Ltd. and Billiton International Metals B.V. began a feasibility study for a joint project to produce refractory-grade calcined bauxite, based on Billiton's reserves. Depending on the outcome of the study, possible annual production was foreseen at 150,000 tons, beginning in 1976.

Import data for 1972 and 1973 were not available at the time that this chapter was written. The latest trade statistics available are those for 1971, and are contained in the 1972 Minerals Yearbook chapter.

Table 5.—Surinam: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972 [1]
METALS			
Aluminum:			
Bauxite	3,596,769	[2] 3,026,025	United States 2,610,000; Canada 307,254; France 29,018; West Germany 27,095; Austria 22,398; Iceland 11,701; Italy 6,532, United Kingdom 6,144; Japan 5,883.
Oxide (alumina) and hydroxide	1,166,718	[2] 1,078,169	United States 517,881; Netherlands 189,220; West Germany 184,027; Norway 103,286; Switzerland 68,089; Italy 15,666.
Metal, including alloys, all forms	47,673	[3] 52,600	West Germany 12,322; Italy 10,938; Japan 4,079.
Copper metal, including alloys, unwrought	5,175	NA	
Iron and steel, primary forms and semimanufactures	3,232	NA	
Lead metal, including alloys, all forms	3,048	NA	
Mercury, 76-pound flasks	3	NA	
Other: Ore, slag and ashes, n.e.s	7,040	NA	
NONMETALS			
Sand, clays, earth	3,050	NA	
MINERAL FUELS AND RELATED MATERIALS			
Petroleum refinery products, lubricants 42-gallon barrels	424	NA	

NA Not available.
[1] Compiled from import statistics of trading partner countries.
[2] Sum of detail reported by listed trading partner countries.
[3] Reported as "production for export" in World Bureau of Metal Statistics. World Metal Statistics, February 1975, p. 12.

URUGUAY [7]

Mineral output in 1973 decreased 6%. Total value of production was reported to be $26.4 million, excluding fuels. Output of petroleum refinery products increased 2%, to 12.1 million barrels, but was 4% below that of 1971.

Plans were made to develop the hydroelectric potential of Uruguay. Two large products were considered: The Salto Grande dam on the Uruguay River, a joint $500 million project with Argentina, and the Palmar dam on the Negro River, a $150 million, 400,000-kilowatt project.

Two long bridges were under construction across the Uruguay River. They will unite the Argentine and Uruguayan road systems and provide Argentina with a road connection through Uruguay to Brazil.

Uruguay has little foreign trade in minerals. Crude oil is imported and refined for domestic use. There are only a few known mineral resources in the country.

COMMODITY REVIEW

Cement output expanded 21%, to 563,000 tons, 9% above the 1968 record; clay production decreased 11%, to 284,800 tons; output of sand declined 36%, to 1,338,000 tons; and production of crushed stone ex-

[7] Prepared by Avery H. Reed, supervisory physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

panded 18% to a record 2,780,000 tons.

Output of petroleum refinery products such as residual fuel oil, distillate, gasoline, and kerosine was 4% above that of 1972 and 2% above that of 1971.

Plans were made to construct a $25 million project which would include a petroleum buoy, a tank farm, and a pipeline. In 1973 Uruguay imported 1,963,000 cubic meters of crude petroleum; 46% from Kuwait, 40% from Nigeria, and 14% from Iraq.

The Mineral Industry of Albania, Denmark (Including Greenland), Iceland, and Switzerland

By Joseph B. Huvos,[1] F. L. Klinger,[2] David G. Willard,[3] and Richard F. Stevens, Jr.[2]

CONTENTS

ALBANIA [4]

In 1973, Albania was the world's third largest producer of chromite ore, accounting for 9.5% of world output. Other commodities produced that ranked lower in importance by world standards were nickeliferous iron ore, crude oil, petroleum products, copper ore, blister copper, copper wire, lignite, cement, natural asphalt, and natural gas.

Information on the performance of the mineral industry was scarce. For the current year, official Albanian sources indicated only plan fulfillment and relative growth rates in some areas of the mineral industry.

In 1973, major developments in Albania's mineral industries were continuation of plant construction performed largely with aid from the People's Republic of China (PRC). Major construction projects included the Mao Tse-tung hydroelectric station, and the steelworks and petroleum refineries at Elbasan. Other plant development projects included copper ore, chromium ore, nickeliferous iron ore, and coal (lignite) mines and preparation plants.

PRODUCTION

In 1973 production figures for Albania's mineral commodities were not available. Estimates used in this chapter are based on published growth rate data for mineral commodities and production goals set for the current 5-year plan period. In 1973, estimated production of metals and fossil fuels increased, fertilizer production was unchanged; and work continued on the construction of new fertilizer capacity.

TRADE

In 1973, minerals and related mineral products accounted for approximately three-quarters of Albania's exports. Of Albania's mineral exports, only chromite was of importance by world trade standards. Crude oil, bituminous flux, natural bitumen, nickeliferous iron ore, blister copper,

[1] Foreign mineral specialist, Division of Fossil Fuels—Mineral Supply.
[2] Physical scientist, Division of Ferrous Metals—Mineral Supply.
[3] Economist, Division of Nonmetallic Minerals—Mineral Supply.
[4] Prepared by Joseph B. Huvos.

Table 1.—Other European Countries: Production of mineral commodities

Area,[1] commodity, and unit of measure	1971	1972	1973 [p]
ALBANIA [3]			
Cement, hydraulic ---- thousand metric tons	393	r e 525	e 645
Chromium, chromite, gross weight ---- do	502	r e 580	e 670
Coal, lignite ---- do	675	r e 765	e 864
Copper:			
Mine output, metal output [3] ---- metric tons	5,900	6,320	6,980
Smelter output (blister) ---- do	5,900	e 6,320	e 6,980
Fertilizer materials, manufactured:			
Nitrogenous ---- thousand metric tons	90	e 90	e 90
Phosphatic ---- do	111	e 110	e 110
Gas, natural, gross production ---- million cubic feet	4,453	5,066	e 6,132
Iron and steel:			
Iron ore, nickelferrous, gross weight ---- thousand metric tons	400	r e 450	e 510
Semimanufactures (rolled angles, shapes, sections) ---- metric tons	34,000	e 34,000	e 34,000
Petroleum: [4]			
Crude oil:			
As reported ---- thousand metric tons	1,657	1,844	e 2,100
Converted ---- thousand 42-gallon barrels	11,057	12,306	e 14,011
Refinery products:			
Gasoline ---- do	746	e 835	e 940
Kerosine and jet fuel ---- do	155	e 175	e 197
Distillate fuel oil ---- do	1,082	e 1,210	e 1,362
Residual fuel oil ---- do	1,933	e 2,165	e 2,438
Lubricants ---- do	43	e 50	e 56
Other:			
Petroleum wax and jelly ---- do	118	e 130	e 146
Asphalt and bitumen ---- do	4,364	e 4,890	e 5,504
Petroleum coke ---- do	33	e 35	e 39
Unspecified ---- do	307	e 345	e 388
Total ---- do	8,781	e 9,835	e 11,070
DENMARK [2]			
Cement, hydraulic ---- thousand metric tons	2,733	2,873	2,888
Clays, kaolin, crude and washed [e] ---- metric tons	18,000	18,000	18,000
Coke, gashouse ---- thousand metric tons	135	150	83
Diatomaceous materials:			
Diatomite [e] ---- do	r 20	r 20	20
Moler [e] ---- do	r 218	r 218	218
Fertilizer materials, manufactured: [5]			
Nitrogenous, gross weight ---- do	88	95	79
Phosphatic, gross weight ---- do	r 565	612	642
Mixed and unspecified, gross weight ---- do	229	242	297
Iron and steel:			
Iron ore (less than 42% iron), gross weight ---- do	r 17	15	6
Pig iron and blast furnace ferroalloys ---- do	228	203	e 150
Crude steel [6] ---- do	471	498	453
Steel semimanufactures ---- do	434	423	401
Lead metal, secondary (including alloys) [5] ---- do	10,022	9,362	9,202
Lime (quicklime and agricultural) [5] ---- do	179	199	217
Peat fuel [e] ---- do	5	5	5
Petroleum:			
Crude ---- thousand 42-gallon barrels	--	622	1,460
Refinery products:			
Gasoline ---- do	12,342	12,087	14,800
Jet fuel ---- do	536	488	107
Kerosine ---- do	884	868	994
Distillate fuel oil ---- do	24,640	25,237	28,519
Residual fuel oil ---- do	31,322	27,772	24,179
Other ---- do	4,876	4,749	4,899
Refinery fuel and losses ---- do	3,150	3,609	3,738
Total ---- do	77,750	74,810	77,236
Salt [5] ---- thousand metric tons	133	306	368
ICELAND			
Aluminum smelter production, primary ---- metric tons	41,000	45,560	72,000
Cement, hydraulic ---- do	100,000	130,000	133,900
Diatomite ---- do	19,400	22,000	22,300
Fertilizer materials, manufactured, nitrogenous:			
Gross weight ---- do	24,230	r 27,500	r 30,000
Nitrogen content [5] ---- do	2,835	3,218	3,510
Pumice ---- do	24,000	r 17,217	19,000
Sand and gravel:			
Calcareous ---- thousand cubic meters	120	127	119
Other ---- thousand metric tons	4,715	5,300	5,800
Stone:			
Dimension ---- do	52	82	86
Crushed and broken ---- do	223	400	432
Scoria ---- do	--	10	10

See footnotes at end of table.

Table 1.—Other European Countries: Production of mineral commodities—Continued

Area,[1] commodity, and unit of measure	1971	1972	1973 [p]
MALTA			
Lime ---- thousand metric tons	[e] 55	59	[e] 60
Limestone ---- thousand cubic meters	NA	237	NA
Salt ---- metric tons	3,000	3,000	[e] 3,000
SWITZERLAND			
Aluminum smelter production, primary ---- metric tons	94,000	83,638	85,368
Cement, hydraulic ---- thousand metric tons	5,220	5,713	5,756
Coke, gashouse ---- do	104	91	100
Gas, manufactured ---- million cubic feet	[r] 13,626	14,060	14,853
Gypsum [e] ---- thousand metric tons	100	100	100
Iron and steel:			
Electric furnace ferroalloys ---- do	32	28	26
Pig iron and blast furnace ferroalloys ---- do	23	[e] 21	[e] 21
Crude steel ---- do	532	543	584
Steel, semimanufactures ---- do	[r] 635	646	686
Lime ---- do	142	150	138
Petroleum refinery products:			
Gasoline ---- thousand 42-gallon barrels	7,183	6,282	7,854
Jet fuel ---- do	984	920	992
Kerosine ---- do	39	23	31
Distillate fuel oil ---- do	15,860	16,792	17,725
Residual fuel oil ---- do	10,976	10,803	13,646
Other ---- do	2,430	2,735	3,158
Refinery fuel and losses ---- do	2,828	3,000	1,587
Total ---- do	40,300	40,555	44,993
Salt ---- thousand metric tons	291	256	289

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

[1] In addition to the areas listed, Greenland (a Territory of Denmark), covered textually in this chapter, presumably has continued to produce small quantities of crude construction materials and may have produced other minerals, but output is unreported.

[2] 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.

[3] Smelter output used as an estimate of mine output inasmuch as there is no evidence of ore and/or concentrate exports.

[4] Petroleum data converted to barrels from metric tons using the following factors: Crude petroleum—6.672; gasoline—8.50; kerosine and jet fuel—7.75; distillate fuel oil—7.46; residual fuel oil—6.66; lubricants—7.00; petroleum wax and jelly—7.87; asphalt and bitumen—6.06; petroleum coke—5.50; other—7.00. The tonnage figures for "other" were derived by subtracting the tonnages for individual products reported from a reported total refinery product figure, which may have excluded refinery fuel.

[5] Sales.

[6] Excludes shipyards' production of steel castings.

[7] May include small amounts of other fertilizers.

[8] Calculated on the basis of 11.7% contained nitrogen in total quantity fertilizer reported on preceding line.

[9] Exports.

electrolytic copper, and copper wire constituted the bulk of the remaining mineral exports. Other commodities also exported in 1973 were diesel oil, kerosine, sulfur, and electric power.

The main mineral and related products imported in 1973 were coke, iron and steel semimanufacturers and products, phosphate rock, and potash.

In 1973, Albania's principal trade partners were the PRC, estimated to account for the largest share, followed by Yugoslavia, Italy, Poland, Romania, West Germany, and Austria.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Chromite	[2] 484,000	172,566	Yugoslavia 54,318; Italy 53,943; Poland 35,305; Romania 29,000.
Copper metal:			
Blister and refined, unwrought	[2] 2,809	750	Italy 620; West Germany 130.
Semimanufactures	[2] 2,460	328	Yugoslavia 228; Romania 100.
Iron and steel:			
Ore, nickeliferous, gross weight	[2] 370,000	NA	
Scrap	1,286	2,504	Yugoslavia 1,300; Italy 1,204.
Silver, waste and sweepings value, thousands	NA	$120	All to Italy.
Other:			
Metalliferous ores, concentrates, scrap, n.e.s do	$10	$20	All to Yugoslavia.
Nonferrous metals, n.e.s do	NA	$87	West Germany $49; Italy $38.
NONMETALS			
Asphalt and bitumen, natural	1,716	2,683	All to Yugoslavia.
Clays and clay products, nonrefractory	5,190	23,163	Do.
Fertilizer, manufactured, nitrogenous	NA	3,166	Italy 1,966; France 1,200.
Stone, dimension, calcareous	1,577	NA	
Other, building materials of asphalt, and fiber cement, and unfired nonmetals, n.e.s	743	NA	
MINERAL FUELS AND RELATED MATERIALS			
Coal, excluding briquets	20,568	NA	
Petroleum:			
Crude:			
As reported	[2] 143,000	([3])	NA.
Converted thousand 42-gallon barrels	[2] 954	([3])	NA.
Refinery products:			
Lubricants do	10	NA	
Shale oil waste do	707	1,051	Italy 604; Yugoslavia 235; Greece 212.
Bituminous mixtures do	[2] 4,236	407	All to Romania.
Unspecified do	4	5	Italy 4; Poland 1.

NA Not available.

[1] Compiled from trade returns of trading partner countries, as reported in The Statistical Office of the United Nations. Supplement to the World Trade Annual, 1971 ed., Walker and Company, New York, 1974, and from vs. 1, 2, and 3 of the World Trade Annual, 1972 ed., Walker and Company, New York, 1974, unless otherwise specified.

[2] Compiled from official Albania trade returns.

[3] Italy reports receipt of crude oil in the amount of $33,000.

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

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum metal, including alloys, all forms	627	573	Yugoslavia 410; West Germany 163.
Iron and steel:			
Pig iron, including cast iron and ferroalloys	2,998	4,041	All from Poland.
Semimanufactures:			
Bars, rods, angles, shapes, sections	8,895	5,749	Poland 5,019; Italy 455; Yugoslavia 275.
Universals, plates, sheets	19,362	32,536	Poland 15,675; Italy 7,579; France 3,300; Yugoslavia 3,066.
Wire (excluding wire rod)	567	18	All from Sweden.
Tubes, pipes, fittings	3,542	5,858	Italy 2,228; West Germany 1,070; Poland 968; Romania 900.
Unspecified value, thousands	$577	$38	West Germany $21; Italy $11; Yugoslavia $3.
Other:			
Metallic oxides, not further identified do	$25	NA	
Nonferrous metals, n.e.s do	$102	$34	Yugoslavia $29; West Germany $5.
NONMETALS			
Asbestos, crude, simply worked	214	726	Yugoslavia $400; Italy 326.
Barite and witherite	1,987	NA	

See footnotes at end of table.

Table 3.—Albania: Apparent imports of selected mineral commodities [1]—Continued
(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Clays and clay products:			
Refractory	988	1,918	All from Yugoslavia.
Other	16	58	Do.
Other, crude nonmetals, n.e.s value, thuosands	$19	$1,982	Yugoslavia $1,911; Italy $71.
MINERAL FUELS AND RELATED MATERIALS			
Coke thousand tons	16	20	All from Poland.
Petroleum refinery products:			
Gasoline [2] thousand 42-gallon barrels	170	NA	
Distillate and residual fuel oils [e 2] do	141	141	NA.
Lubricants do	3	4	All from Italy.
Other, unspecified do	179	15	Mainly from Poland.

NA Not available.
[1] Compiled from trade returns of trading partner countries, as reported in The Statistical Office of the United Nations. Supplement to the World Trade Annual, 1971 ed., Walker and Company, New York, 1974, and from vs. 1, 2, and 3 of the World Trade Annual, 1972 ed., Walker and Company, New York, 1974, unless otherwise specified.
[2] Data from United Nations, World Energy Supplies, Series J. Nos. 16 and 17, 1968–71 and 1969-72, New York, 1973 and 1974.

COMMODITY REVIEW

Metals.—*Aluminum.*—Albania has no bauxite production, but during 1973 bauxite deposits in the Albanian Alps and in the Krujë Area were explored. The deposits in the Albanian Alps are near Valbona, and are of red color with about 60% Al_2O_3, gray with about 50% Al_2O_3 and multicolored with 56% Al_2O_3. In the Krujë Area, red bauxite lenticles a few meters thick are found.[5]

Chromium Ore.—In 1973, Albania's estimated chromium ore production increased 15.5% over that of 1972 and reached 670,000 tons. Among world producers, Albania ranked third, with chromium ore production amounting to 9.5% of the world total.

As officially reported, Albania's chromite ore production is slated to reach 900,000 tons by the end of the current 5-year plan in 1975.[6] Albania's chromite mines are found in three main areas: (1) in the Bulqiza Area, northeast of Tirana with the deposits of Batra and Thekna nearby; (2) in the north of the country in the area of Tropoja (Kam, Ragam), Kukës (Kalimash); and (3) in the south in the Shebenik-Pogradeci Area.[7]

Chromite ore is one of Albania's leading export products. Most of the chromite produced is exported. Since 1972, some chromite has been exported as concentrate.

Copper.—In 1973 Albania's estimated blister copper production increased by 10.4% over that of 1972, reaching 6,980 tons. Albania's copper deposits are located in the Mirdita Area (Giegjan, Spaç, Kurbnesh, etc.) in the north of the country.

Reserves are estimated at 50 million tons of low grade ore. However, presently mined ore averages 3% copper. The country's smelters are located at Rubik, Kukës, and Giegjan. Albanian blister contains typically 99.5% copper, 108 grams-per-ton silver, and 2 grams-per-ton gold.

At present, over 75% of the copper mined in Albania is refined at Rubik. Most of the copper produced is exported, about half of it as refined copper, the rest in the form of copper wire.

Iron Ore, Nickeliferous.—In 1973, Albania's estimated nickeliferous iron ore production increased 13.3% over that of 1972. Albania's nickeliferous iron ore deposits are found in three areas: In the northeast of Albania near Kukës; in the central area of Albania near Pogradec, and in the south near Korça. Albania's nickeliferous iron ores can be divided into in place types (Xhumaga, Liqeni, Kuq) and sedimentary types (Debrova, etc.). Nickel content of these ores is 1.0% to 1.6%. At present the nickeliferous iron ores mined

[5] Pumo, F. Données générales sur les gites minéraux de l'Albanie et caractères particuliers de ses importants gisements de nickel lateritique (Comprehensive study of Albania's mineral deposits, with emphasis on its lateritic nickel deposits). Bull. Bur. Rech. Geol. Min. (Paris), v. 41, No. 6 1973, pp. 450–465.
[6] Zeri i Popullit (Tirana). Nov. 5, 1971, p. 2.
[7] Work cited in footnote No. 6.

are exported, but by 1975 the Elbasan siderurgical combine is due to go onstream and will require the whole domestic production.

Nonmetals.—*Asbestos.*—New asbestos deposits have been discovered in Albania east of Shkodër. The two main deposits found have a mineral content ranging from 1.5% to 20%.

Cement.—In 1973, Albania's estimated cement production increased by 22.9%. The expansion of the Fush-Kruje cement plant, started during 1972, was reported to have tripled the plant's capacity. Albania has another cement plant in operation at Vlora.

Fertilizer Materials.—In 1973, Albania's estimated nitrogenous fertilizer production was unchanged. It was reported that a natural gas based urea plant was commissioned in 1973 at Fier. This complements existing ammonia and ammonium nitrate plants at the same location.

Estimates of Albania's phosphatic fertilizer production were also unchanged. Albania imports all its phosphatic raw materials, most of it from Morocco (90,000 tons in 1973). Recently several sedimentary phosphate rock deposits have been found. The deposits contain 7% to 18% phosphorous pentoxide and are found in the upper middle part of Cretaceous formations (Fushbadha, Nivica, etc.). There are plans to erect a processing plant at the Laç fertilizer plant for processing phosphate ore from these deposits.

In 1973, Albania imported all her potassic fertilizer materials amounting to 2,000 tons of potassium oxide.

Gypsum.—In 1973 a large deposit of gypsum was exploited at Kavaja southwest of Tirana. Other gypsum and anhydrite deposits of good quality are known in the zone of Korab (Peshkopi). Several other smaller deposits are at present exploited in the Ionian Zone.

Pyrite.—Some pyrite deposits have been identified in Albania's volcanic sedimentary areas near the known copper deposits. Mining of pyrite deposits started in the Spaç Area, but no production figures have been released.

Salt.—Albania has large reserves of rock salt north of Berat in the Dumre dome. Exploration of the deposits is continuing at present, and mining of the rock salt is scheduled to begin in 1975 at Delvina, located south of the Ionian Zone.

Mineral Fuels.—In Albania, estimated production of primary energy from fossil fuels and hydroelectric sources rose from 3.11 million tons of standard fuel equivalent in 1972 to 3.57 million tons in 1973. The estimated output of crude oil increased from 1.8 million to 2.1 million tons and that of natural gas from 143.5 to 173.7 million cubic meters. The share of these two fuels in Albania's primary energy supply increased correspondingly from 72.8% to about 73.5% during the 1972–73 period. In 1973, Albania produced an estimated 864,000 tons of coal (lignite). The share of coal (lignite) in the primary energy supply decreased from 22.3% in 1972 to 21.9% in 1973. The share of hydroelectric power decreased from 4.9% to 4.6% during the same period. The trend is toward increasing production of crude oil, natural gas, hydroelectric power and coal.

In 1973, Albania produced 1.765 billion kilowatt-hours of electricity, 41.2% more than that in 1971. Thermal powerplants generated 550 million kilowatt-hours of electricity (31.2%) and hydroelectric powerplants about 1.215 billion kilowatt-hours (68.8%). Installed capacity of electric powerplants at yearend totaled about 200,000 kilowatts. In 1972 Albanian industry consumed about 73% of the fuel extracted in the nation and 8.5% of the electric energy produced.

Total primary energy balances of Albania for 1972 and 1973 are shown in table 4.

Table 4.—Albania: Total primary energy balance for 1972 and 1973
(Million tons of standard fuel equivalent)

Year	Total primary energy	Coal lignite	Crude oil and petroleum products	Natural and associated gas	Hydro-electric
1972:[1]					
Production	3.105	0.420	2.397	0.191	0.097
Imports	.020	.020	--	--	--
Exports	1.150	--	1.150	--	--
Apparent consumption	1.975	.440	1.247	.191	.097
1973:[1]					
Production	3.573	.475	2.730	.231	.137
Imports	.020	.020	--	--	--
Exports	1.333	--	1.300	--	.033
Apparent consumption	2.260	.495	1.430	.231	.104

[1] Production data for 1972 and 1973 were estimated on the basis of 1971 data in the Official Statistical Yearbook of Albania, and from other sources in the Albanian daily press.

Asphalt and Bitumen (Natural).—Asphalt is mined near Vlora in the area of Albania's oilfields. In 1973, no production figures were available.

Coal.—In 1973, Albania's small lignite mines produced an estimated 864,000 tons of lignite, an increase of 12.9% over that of 1972. By 1975, production plans call for an annual production exceeding 1.25 million tons.

Albania's lignite deposits are of good quality, are black in color, and have a calorific value that often exceeds 4,900 kilocalories per kilogram. The deposits are at Memaliaj, Krraba, Mushqeta, Mëzez and Manëz in the Tirana synclinical and near Pogradec at Alarupi. At Mborje-Drenova near Korçë, two layers of 2 meters thickness are mined.

Natural Gas.—In 1973, Albania's estimated natural and associated gas production was 173.7 million cubic meters, an increase of 21.0% over that of 1972. By the end of the current 5-year plan in 1975, production is slated to reach 255 million cubic meters per year. Much of the natural gas is used as a feedstock for ammonia at the Laç nitrogenous fertilizer plant.

Petroleum.—In 1973 Albania's estimated total crude oil production was 2.1 million tons, an increase of 13.9% over that of 1972.

Albania's petroleum reserves, estimated at 16 million tons are concentrated mainly in the areas west of Stalin. The first deposits discovered were those at Patos and Stalin, both of Pliocene age. The oil is in small lenticle shaped deposits or sometimes narrow layers in a tectonically faulted area. Recent extended geological surveys resulted in the discovery of the Marinka deposits, located southeast of the Fier gasfields. The crude oil was found in the calcareous strata of Mesozoic age. As a result of the discovery, production plans for crude oil have been raised and are slated to reach 2.7 million tons per year by 1975.[8]

Albania's petroleum refining plants are located at Stalin, Cerrik, and Patos, and a new refinery is under construction at Fier. The refinery will have a cracking plant, making Albania independent of petroleum product imports in the future.

DENMARK (INCLUDING GREENLAND)[9]

Despite inflationary trends in the Danish economy in 1973 (wholesale prices up 15%, industrial wages up 19%, and the cost of imported raw materials up 30%, compared with those of 1972), substantial investments in the mineral industry appeared to continue. Det Danske Staalvalsevaerk A/S (DDS) concluded most contracts for the construction of an electric steelworks by 1976. New plants were completed in the fertilizer industry, and expansions of two petroleum refineries were underway. Offshore, production capacity for crude oil from the Dan Field will be increased by 3 new production platforms and 18 development wells by 1976. A relatively high level of activity was apparently maintained in building construction during 1973. With rising oil prices, which were expected to increase Denmark's trade deficit in mineral commodities in 1974, there

[8] Work cited in footnote No. 6.
[9] Prepared by F. L. Klinger.

was a noticeable increase in consumption of coal in 1973.

In Greenland, production of lead-zinc ore began at Marmorilik, and the first shipment of concentrates was made in October. An exploration license for diamond was issued. No further developments were reported concerning iron deposits at Isua, uranium at Kvanefjeld, or molybdenum in the northeast. The Government was not expected to grant licenses for offshore exploration for oil and gas before 1975.

PRODUCTION

Volume indices of production for the various branches of the Danish mineral industry were not available. Volume indices of sales (in kroner) for the first three quarters of 1973 indicated gains of about 10% in all branches except primary metals, but because of rising prices for most commodities, these indices were poor measures of physical output. Production of steel was less than that in 1972. Output of petroleum products also appeared to be less, although there was a modest gain in output of crude oil from the Danish sector of the North Sea. Output of cement and other construction materials may have increased slightly with the possible exception of moler and other diatomaceous earth. The quantity of moler products sold in 1973 was nearly twice that of 1972. Sales of manufactured fertilizers increased by 15% to more than 900,000 tons in 1973.

In Greenland, production of lead and zinc ore was begun in late summer. Shipments of cryolite from stockpiles at Ivigtut were continued, but there was no further production.

Production of mineral commodities is detailed in table 1.

TRADE

Exports of mineral commodities[10] in 1973 were valued at approximately $460 million,[11] 40% more than those in 1972. In terms of value, petroleum products and nonmetallic mineral manufactures continued to be the leading export items. Imports of mineral commodities in 1973 were valued at $1.88 billion, up 49% compared with those of 1972. Petroleum fuels and semimanufactures of iron and steel were the principal items.

The net deficit in mineral commodity trade rose to approximately $1.4 billion in 1973, an increase of about 50% compared with that of the previous year. Higher prices were mainly responsible, although imports of major commodities such as steel and coal were substantially greater than those in 1972. With rapidly rising prices for crude oil and petroleum products, the trade deficit in mineral commodities was expected to increase in 1974.

With Denmark's accession to membership in the European Communities (EC) on January 1, 1973, the aggregate volume of trade with EC countries was considerably increased in 1973 compared with that of the previous year. Trade in mineral commodities with the EC in 1973 comprised 29% of the value of exports (21% in 1972) and 50% of the value of imports (34% in 1972). These changes were mainly due to the simultaneous accession to the EC of the United Kingdom, Denmark's major trading partner.

The surcharge on Danish imports, which was imposed in 1972, was terminated in March 1973.

Danish trade statistics for 1971 and 1972 are shown in table 5 and 6.

[10] Including the following numerical divisions of the Standard International Trade Classification (S.I.T.C.): 27, 28, 32, 33, 34, 51, 56, 66, 67, and 68.

[11] Conversions from Danish kroner (DKr) to U.S. dollars were made at the following rates: for 1972 DKr 6.974=US$1.00; for 1973, DKr 6.046=US$1.00. Source: International Monetary Fund. International Financial Statistics. V. 27, No. 9, September 1974, pp. 112–113.

Table 5.—Denmark: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Bauxite and concentrate	4,212	17,350	Sweden 5,726; France 5,401; West Germany 2,585.
Oxide and hydroxide[1]	37	61	West Germany 18; United Kingdom 17; United States 13.
Metal, including alloys:			
Unwrought, including scrap	3,664	6,993	Sweden 2,270; Belgium-Luxembourg 1,349; West Germany 1,222.
Semimanufactures	6,666	7,324	Sweden 3,692; West Germany 992; United Kingdom 672.
Antimony, metal including alloys, all forms	21	29	Venezuela 11; Trinidad and Tobago 11; Peru 5.
Chromium, chromite	15	--	
Cobalt metal, including alloys, all forms	4	(2)	NA.
Copper metal, including alloys:			
Scrap	5,744	2,133	Belgium-Luxembourg 1,096; West Germany 442; Netherlands 153.
Unwrought	2,738	3,329	West Germany 2,200; Sweden 919.
Semimanufactures	2,714	3,306	United Kingdom 1,613; Sweden 1,096; Norway 135.
Iron and steel:			
Ore and concentrate	9,716	8,402	West Germany 6,053; Netherlands 1,550.
Roasted pyrite	98,780	95,527	West Germany 55,368; Netherlands 40,159.
Metal:			
Scrap	34,540	88,853	Sweden 37,283; West Germany 27,140; Norway 19,219.
Pig iron, including cast iron	635	22	Sweden 16; West Germany 4.
Sponge iron, powder, shot	98	295	West Germany 294.
Ferroalloys	r 23	2	NA.
Steel, primary forms	2,717	1,671	Norway 1,012; Sweden 475.
Semimanufactures:			
Bars, rods, angles, shapes, sections	r 124,893	91,195	West Germany 34,862; Sweden 21,892; United Kingdom 19,602.
Universals, plates, sheets	113,974	126,934	Sweden 60,112; West Germany 30,008; Norway 25,052.
Hoop and strip	1,553	4,977	Sweden 4,923.
Rails and accessories	4,655	12,294	People's Republic of China 6,372; West Germany 2,528; Italy 2,195.
Wire	r 4,485	4,178	Sweden 3,177; Finland 446.
Tubes, pipes, fittings	13,959	19,707	Sweden 13,249; United Kingdom 1,588; Poland 591.
Castings and forgings, rough	r 9,564	7,655	Sweden 5,145; West Germany 799; Norway 620.
Total semimanufactures	r 273,083	266,940	
Lead:			
Ore and concentrate	230	900	All to West Germany.
Oxides	29	13	Sweden 5; Malta 5.
Metal, including alloys:			
Scrap	153	650	Sweden 488; West Germany 162.
Unwrought	3,868	3,790	Norway 1,266; United States 894; Sweden 526.
Semimanufactures	177	204	Finland 123; Iceland 48; Sweden 31.
Magnesium metal, including alloys, all forms	96	128	United States 89; West Germany 26; Belgium-Luxembourg 6.
Manganese oxides	1	2	NA.
Mercury 76-pound flasks	5	14	Finland 11.
Molybdenum metal, including alloys, all forms	4	2	All to West Germany.
Nickel metal, including alloys, all forms	174	228	West Germany 112; Sweden 72.
Platinum-group metals and silver:			
Waste and sweepings thousand troy-ounces	1,289	1,125	United Kingdom 434; West Germany 312; Sweden 141.
Metals, including alloys:			
Platinum group do	(2)	(2)	Mainly to Norway.
Silver do	498	145	Finland 100; Norway 29.
Tin metal, including alloys:			
Unwrought long tons	1,597	1,019	Netherlands 163; Hungary 160; Norway 103; Venezuela 88.

See footnotes at end of table.

Table 5.—Denmark: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Tin metal, including alloys—Continued			
Semimanufactures ___ long tons __	79	73	Sweden 41; Syria 8; West Germany 6.
Titanium dioxide	111	50	Jordan 15; Kuwait 15; Sweden 14.
Zinc:			
Oxide	28	51	Kuwait 15; Japan 12; Iceland 7; Malta 7.
Metal, including alloys:			
Scrap, including blue powder (dust)	2,839	2,371	West Germany 1,140; Norway 491; United Kingdom 257.
Unwrought and semimanufactures	462	309	Greenland 75; West Germany 35; Iceland 34.
Other:			
Ash and residue containing nonferrous metals	5,732	6,222	West Germany 1,743; Belgium-Luxembourg 1,677; Netherlands 1,370.
Oxides, hydroxides, peroxides of metals, n.e.s	14	11	Indonesia 4; Kenya 4; Sweden 2.
Base metals, including alloys, all forms, n.e.s	r 8	5	West Germany 3; Sweden 1.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	3	10	United States 4; Kenya 3.
Grinding and polishing wheels and stones	1,233	1,049	Iran 281; Ethiopia 212; Pakistan 132.
Asbestos	54	109	Norway 42; Sweden 38; Yugoslavia 11.
Barite and witherite	23	10	All to Iceland.
Boron materials:			
Crude natural borates	1	--	
Oxide and acid	1	2	Mainly to Mexico.
Cement	227,561	256,417	Dominican Republic 72,190; Poland 21,155; Israel 21,131; Bahamas 21,047.
Chalk	19,145	16,510	Sweden 7,637; Norway 4,458; Finland 1,876.
Clays and clay products (including all refractory brick:			
Crude clays, n.e.s	4,514	3,753	Sweden 1,243; Finland 1,038; West Germany 196.
Products:			
Refractory [3]	r 51,798	46,064	United Kingdom 15,180; West Germany 7,352; Sweden 2,540.
Nonrefractory	96,089	93,869	West Germany 69,896; Norway 14,434; Sweden 6,121.
Cryolite and chiolite	27,936	17,870	NA.
Diamond:			
Gem, not set or strung value, thousands	r $27	$26	Belgium-Luxembourg $20; Finland $5.
Industrial ___ do	(2)	(2)	All to West Germany.
Diatomite and other infusorial earth	65,048	56,420	West Germany 35,774; United Kingdom 7,689; Netherlands 3,877.
Feldspar and fluorspar	404	528	Poland 520.
Fertilizer materials:			
Crude:			
Phosphatic	(2)	--	
Other	353	250	Sweden 175; Hungary 55; Italy 20.
Manufactured:			
Nitrogenous	37	49	Iceland 39; West Germany 6.
Phosphatic	277	49,570	East Germany 29,371; U.S.S.R. 20,100.
Potassic	9	22	All to West Germany.
Other, including mixed	550	449	Sweden 241; Italy 105; Netherlands 69.
Ammonia	r 901	15,958	Norway 9,427; Sweden 6,319.
Graphite, natural	7	4	NA.
Gypsum and plasters	31	38	Sweden 30.
Lime	21,517	15,591	Norway 12,464; Sweden 2,631.
Magnesite	10	2	NA.
Mica, all forms	11	46	Sweden 27; Finland 8; Switzerland 5.
Pigments, mineral, including processed			

See footnotes at end of table.

Table 5.—Denmark: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
iron oxide	151	288	Finland 144; West Germany 97; Yugoslavia 18.
Precious and semiprecious stones, except diamond kilograms	299	211	Norway 130; Botswana 20; France 15; United States 14.
Salt	8,532	123,742	Sweden 67,793; Norway 52,725; Finland 2,882.
Sodium and potassium compounds, n.e.s	2,431	959	Sudan 489; Brazil 232; Indonesia 100.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	83,339	72,147	West Germany 71,999.
Worked	914	1,470	West Germany 810; Sweden 427; Netherlands 175.
Dolomite, chiefly refractory grade	29	46	Yugoslavia 24; Finland 10.
Gravel and crushed rock thousand tons	3,518	3,524	West Germany 3,500.
Limestone (except dimension)	113,516	103,547	Sweden 53,869; West Germany 34,907.
Quartz and quartzite	80	35	Sweden 9.
Sand, excluding metal bearing	139,581	140,570	Sweden 101,930; West Germany 20,028; Norway 11,500.
Sulfuric acid	28	45	Sweden 27; Iceland 17.
Talc, steatite, soapstone, pyrophyllite	78	66	Iceland 16; Kuwait 15; Sweden 11.
Other nonmetals, n.e.s.:			
Crude	859	1,218	West Germany 595; Sweden 337; Finland 269.
Slag, dross, and similar waste, not metal bearing	37,753	30,556	West Germany 20,986; Norway 6,570; United Kingdom 3,000.
Oxides and hydroxides of magnesium, strontium, barium	2	1	Mainly to Iceland.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	119	48	Norway 17; Sweden 8; Finland 7.
Carbon black and gas carbon	444	253	Sweden 152; Iceland 27; Finland 30.
Coal and coke including briquets	56,245	62,009	Sweden 36,171; Norway 13,952; West Germany 5,117.
Gas, hydrocarbon, liquefied	3,020	4,527	Sweden 1,567; Norway 1,362; United Kingdom 1,311.
Peat, including peat briquets and litter	3,638	1,912	West Germany 1,392; Japan 314; Norway 98.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	r 5,051	5,096	Sweden 3,793.
Kerosine and jet fuel do	339	378	Sweden 241; Norway 80.
Distillate fuel oil do	3,911	4,896	Sweden 4,414; Norway 469.
Residual fuel oil do	5,532	6,284	Sweden 3,354; Norway 814; Netherlands 546.
Lubricants do	145	145	Norway 104; Sweden 22.
Other do	431	639	Norway 466; Finland 155.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	7,454	7,827	Sweden 6,969.

r Revised. NA Not available.
[1] Not including synthetic corundum.
[2] Less than ½ unit.
[3] Including those of magnesite, diatomite, and other refractory materials.

Table 6.—Denmark: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite and concentrate	27,359	35,708	Guyana 34,633.
Oxide and hydroxide[1]	555	456	United States 200; West Germany 97; France 87.
Metal, including alloys:			
Scrap	842	904	East Germany 466; Sweden 303; Norway 66.
Unwrought	9,428	3,594	Norway 1,287; United Kingdom 1,171; Sweden 640.
Semimanufactures	28,580	42,728	Sweden 7,526; Norway 6,613; West Germany 6,556.
Antimony metal, including alloys, all forms	88	83	People's Republic of China 55; United Kingdom 21.

See footnotes at end of table.

Table 6.—Denmark: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Cadmium metal, including alloys, all forms	r 17	8	Norway 5; West Germany 2.
Chromium:			
Chromite	1,859	1,203	Republic of South Africa 1,183.
Oxide and hydroxide	324	210	West Germany 129; United Kingdom 28.
Cobalt:			
Oxide and hydroxide	5	4	Belgium-Luxembourg 2.
Metal, including alloys, all forms	21	12	Belgium-Luxembourg 8.
Copper:			
Ore and concentrate	27	--	
Metal, including alloys:			
Scrap	515	237	Iceland 81; Sweden 74; United Kingdom 32.
Unwrought	3,856	6,066	Belgium-Luxembourg 5,541; Sweden 266; West Germany 209.
Semimanufactures	26,062	30,006	Sweden 10,948; United Kingdom 7,686; Belgium-Luxembourg 2,966.
Iron and steel:			
Ore and concentrate	557	84	All from Sweden.
Roasted pyrite	r 6,701	15,505	Norway 12,697; West Germany 2,808.
Metal:			
Scrap	2,698	3,382	West Germany 1,711; Sweden 1,052, United Kingdom 569.
Pig iron, including cast iron [2]	18,057	50,002	East Germany 25,836; U.S.S.R. 11,394; West Germany 5,274.
Ferroalloys	17,731	16,438	Norway 12,695; U.S.S.R. 1,982.
Steel, primary forms	139,150	128,938	Norway 54,603; West Germany 31,421; Sweden 29,347.
Semimanufactures:			
Bars, rods, angles, shapes, sections [3]	r 416,145	447,229	West Germany 121,939; Sweden 75,771; Belgium-Luxembourg 67,211.
Universals, plates, sheets	r 582,834	723,472	West Germany 217,513; Sweden 138,036; France 86,094.
Hoop and strip	r 70,035	75,513	West Germany 31,138; Belgium-Luxembourg 16,152; Sweden 9,948.
Rails and accessories	r 18,692	16,018	France 8,731; West Germany 4,199; Belgium-Luxembourg 1,714.
Wire	r 17,162	21,585	West Germany 9,548; Belgium-Luxembourg 5,571; Sweden 3,490.
Tubes, pipes, fittings	r 142,245	162,814	West Germany 42,772; United Kingdom 30,084; Austria 11,909.
Castings and forgings, rough	r 491	510	Sweden 203; Norway 172.
Total semimanufactures	r 1,247,604	1,447,141	
Lead:			
Oxides	1,102	910	Mexico 302; Sweden 187; West Germany 146.
Metal, including alloys:			
Scrap	4,360	6,401	Norway 2,886; Hungary 1,323; Kenya 623.
Unwrought	13,831	10,327	United Kingdom 3,515; Sweden 3,260; Peru 1,017.
Semimanufactures	r 938	1,220	West Germany 936; United Kingdom 122.
Magnesium metal, including alloys, all forms	136	134	Norway 106; Sweden 20.
Manganese:			
Ore and concentrate	5,763	4,810	People's Republic of China 2,000; Netherlands 1,545; West Germany 1,140.
Oxides	2,552	2,091	Japan 1,401; Netherlands 493; Belgium-Luxembourg 80.
Mercury ---76-pound flasks	325	368	Sweden 116; Spain 81; Mexico 35.
Molybdenum metal, including alloys, all forms	7	3	West Germany 1.
Nickel:			
Matte	4	64	United Kingdom 63.
Metal, including alloys:			
Unwrought, including scrap	99	38	United Kingdom 25; Canada 7.
Semimanufactures	r 393	607	West Germany 222; United Kingdom 221; Sweden 65.

See footnotes at end of table.

Table 6.—Denmark: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Platinum-group metals and silver, including alloys, all forms:			
Platinum group thousand troy ounces	15	17	West Germany 5; Switzerland 5; Netherlands 3.
Silver do	2,945	3,646	West Germany 1,257; United Kingdom 1,247; Switzerland 514.
Tin:			
Oxide long tons	4	9	United Kingdom 4; France 2; West Germany 2.
Metal, including alloys:			
Scrap do	313	236	Switzerland 61; Austria 37; United States 29.
Unwrought do	1,019	826	Netherlands 295; People's Republic of China 262; West Germany 115.
Semimanufactures do	88	98	United Kingdom 58; West Germany 31.
Titanium oxides	6,227	7,251	Norway 1,946; Netherlands 1,563; West Germany 984.
Tungsten metal, including alloys, all forms	19	15	Sweden 9; West Germany 5.
Zinc:			
Oxide	2,029	1,964	West Germany 845; Netherlands 341; East Germany 340.
Metal, including alloys:			
Blue powder including scrap	734	1,095	United Kingdom 549; Norway 267; Belgium-Luxembourg 262.
Unwrought	11,006	14,914	Norway 4,300; Netherlands 3,866; United Kingdom 2,372.
Semimanufactures	r 6,891	6,962	Poland 3,233; France 2,124; Yugoslavia 1,075.
Other:			
Ore and concentrate of base metals, n.e.s.	1,002	173	United Kingdom 103; Republic of South Africa 41.
Ash and residue containing nonferrous metals	1,798	1,366	Sweden 661; West Germany 460; Switzerland 94.
Metals including alloys, all forms:			
Metalloids	2,115	2,877	West Germany 1,156; United States 544; Sweden 446.
Alkali, alkaline earth, rare-earth metals	239	180	West Germany 136; France 40.
Pyrophoric alloys	5	6	United Kingdom 4.
Base metals, including alloys, all forms, n.e.s.	r 78	11	West Germany 3; Sweden 3; United Kingdom 2.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	5,799	9,627	Iceland 5,636; West Germany 3,272.
Dust and powder of precious and semiprecious stones kilograms	6	7	United States 3; Switzerland 3.
Grinding and polishing wheels and stones	1,161	1,085	Sweden 354; West Germany 246; Austria 212.
Asbestos	26,798	26,213	Canada 10,897; Cyprus 6,997; Republic of South Africa 5,125.
Barite and witherite	1,371	754	West Germany 549; People's Republic of China 205.
Boron materials:			
Crude natural borates	2,073	2,088	United States 1,575; Turkey 495.
Oxide and acid	174	178	Turkey 80; France 59; United States 24.
Cement	6,505	24,250	Sweden 20,445; United Kingdom 1,927; Finland 992.
Chalk	2,828	2,209	Sweden 1,760; France 270; United Kingdom 79.
Clays and clay products (including all refractory brick):			
Crude clays, kaolin, other clays	71,796	62,268	United Kingdom 40,440; Czechoslovakia 9,216; West Germany 6,169.
Products:			
Refractory (including nonclay bricks)	34,637	33,570	West Germany 11,342; Sweden 8,034; Austria 7,278.
Nonrefractory	r 57,508	80,573	West Germany 40,751; Japan 12,775; Sweden 10,717.

See footnotes at end of table.

Table 6.—Denmark: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Diamond:			
Gem, not set or strung thousand carats	4	4	Belgium-Luxembourg 1.
Industrial do	140	68	West Germany 67.
Diatomite and other infusorial earth	3,306	2,950	United States 1,537; Iceland 582; France 367.
Feldspar, leucite, nepheline syenite	9,363	9,527	Norway 8,888; Sweden 542.
Fertilizer materials:			
Crude:			
Nitrogenous	12,031	9,100	All from Chile.
Phosphatic	313,027	324,355	Morocco 208,069; Tunisia 28,760.
Potassic	735	1,545	All from West Germany.
Manufactured:			
Nitrogenous	142,753	118,670	Norway 96,489; West Germany 14,009; Netherlands 2,714.
Phosphatic:			
Thomas (basic) slag	532	460	All from West Germany.
Other	21,771	15,138	Netherlands 10,987; Belgium-Luxembourg 1,930; West Germany 1,252.
Potassic	256,112	225,929	West Germany 156,771; East Germany 46,619; U.S.S.R. 11,967.
Other, including mixed	387,639	406,486	Norway 330,613; West Germany 60,604.
Ammonia	213,736	225,003	Trinidad and Tobago 73,239; Norway 6,796; United States 50,390.
Fluorspar	2,487	2,792	France 1,873; Republic of South Africa 450; United Kingdom 319.
Graphite, natural	212	174	West Germany 80; United Kingdom 46; Norway 45.
Gypsum and plasters	239,751	227,154	Poland 137,610; France 73,135.
Lime	3,923	2,724	West Germany 1,720; Poland 920.
Magnesite	7,468	6,388	Austria 3,856; Czechoslovakia 1,060; Poland 440.
Mica:			
Crude, including splittings and waste	381	282	Norway 128; United Kingdom 88; Republic of South Africa 56.
Worked, including agglomerated splittings	58	72	West Germany 30; Belgium-Luxembourg 21; United States 7.
Pigments, mineral:			
Natural, crude	466	442	West Germany 122; Cyprus 113; Sweden 99.
Iron oxides, processed	3,913	4,998	West Germany 4,218; Spain 512; United Kingdom 141.
Precious and semiprecious stones, except diamond kilograms	10,581	4,343	West Germany 2,295; Brazil 1,727.
Pyrite	144,530	153,538	Spain 119,288; Portugal 32,800; Belgium-Luxembourg 1,364.
Salt	133,853	231,257	West Germany 80,990; U.S.S.R. 50,626; East Germany 31,078.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous (including marble)	8,818	11,076	Norway 5,407; Sweden 3,395; Italy 2,052.
Slate	13,358	13,725	Norway 6,651; Switzerland 2,896; West Germany 1,400.
Other (granite, gneiss, etc.)	182,087	79,284	Switzerland 74,638; Norway 2,803.
Worked, all types	50,291	45,302	Portugal 23,333; West Germany 8,869; Sweden 8,307.
Dolomite, chiefly refractory grade	29,898	34,832	Norway 29,094; West Germany 3,928; Sweden 1,160.
Gravel and crushed rock	r 551,750	594,022	Sweden 555,723; Norway 30,277.
Limestone (except dimension)	71,187	104,204	Sweden 97,034; Poland 4,237.
Quartz and quartzite	6,631	4,634	Sweden 2,064; Norway 1,961; West Germany 257.
Sand, excluding metal bearing	122,717	118,725	Belgium-Luxembourg 96,793; West Germany 10,698; Sweden 7,378.
Sulfur:			
Elemental, all forms	15,308	12,702	West Germany 5,830; France 3,065; Finland 2,550.
Sulfur dioxide and sulfuric acid	4,195	15,462	Norway 9,754; Sweden 3,320; West Germany 2,046.
Talc, steatite, soapstone, pyrophyllite	13,659	11,550	Norway 7,646; West Germany 2,319; Austria 654.

See footnotes at end of table.

Table 6.—Denmark: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Other nonmetals, n.e.s.:			
Crude	41,855	36,903	West Germany 22,922; East Germany 6,000; Sweden 5,786.
Slag, dross, and similar waste, not metal bearing	8,012	3,734	United Kingdom 2,248; Norway 835; West Germany 550.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,601	439	United States 290; West Germany 101; Trinidad and Tobago 35.
Carbon black	3,648	3,575	United Kingdom 1,453; West Germany 741; Sweden 570.
Coal and coke including briquets thousand tons	2,448	2,343	Poland 1,676; U.S.S.R. 455.
Gas, hydrocarbon, liquefied do	106	117	West Germany 35; Sweden 26; United Kingdom 22.
Peat, including peat briquets and litter	15,057	14,492	Sweden 12,815; Finland 985.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	78,212	72,638	Saudi Arabia 21,690; Oman 13,287; Iran 12,574.
Refinery products:			
Gasoline do	7,913	9,285	Netherlands 2,925; United Kingdom 2,799; Belgium-Luxembourg 1,495.
Kerosine and jet fuel do	4,776	5,361	Netherlands 2,051; United Kingdom 1,728; Norway 507.
Distillate fuel oil do	24,944	30,380	United Kingdom 12,251; Netherlands 3,754; U.S.S.R. 3,352.
Residual fuel oil do	30,602	38,124	United Kingdom 9,746; Netherlands 4,797; Italy 4,015.
Lubricants do	691	709	United Kingdom 361; Netherlands 158; Sweden 93.
Mineral jelly and wax do	133	141	West Germany 104; Indonesia 7.
Other do	1,957	1,558	West Germany 464; Netherlands Antilles 453; Netherlands 396.
Total do	71,016	85,558	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	47,632	23,833	Sweden 6,931; West Germany 6,850; Netherlands 5,195.

r Revised.
1 Not including synthetic corundum.
2 Including spiegeleisen, grit, sponge, and powder of iron and steel.
3 Including wire rod.

COMMODITY REVIEW

Metals.—*Iron and Steel.*—DDS reported production of 415,000 tons of raw steel in 1973,[12] about 12% less than that in 1972. The company's production of finished steel was 388,000 tons, including 204,000 tons of plates and 184,000 tons of sections. The reduced output was primarily due to a 3-week strike by production workers in 1973. DDS was the only major producer, accounting for about 98% of total Danish output.

Danish production of steel continued to be based almost entirely on domestic scrap. Consumption of scrap was reported at 487,000 tons in 1972; no data were available for 1973. The country's steelmaking facilities in 1973 consisted of six open-hearth furnaces and one electric furnace. Effective production capacity in 1973 was estimated by the Organization for Economic Cooperation and Development (OECD)[13] at 510,000 tons per year.

Exports of iron and steel in 1973 totaled 385,000 tons including 112,000 tons of scrap. The total was about 10% more than that in 1972. Imports of iron and steel totaled about 1,772,000 tons (including only 4,000 tons of scrap) in 1973, about 8% more than that in 1972. Apparent consumption was about 1.8 million tons, compared with nearly 2 million tons in 1972. Steel prices increased consider-

[12] Det Danske Staalvalsevaerk A/S. Arsberetning (Annual Report) for 1973.
[13] Organization for Economic Cooperation and Development. The Iron and Steel Industry in 1972 and Trends in 1973. Paris, 1974, 99 pp.

ably during the year; the wholesale price index for iron and steel semimanufactures in November 1973 was 35% higher than 1 year earlier. Iron and steel stocks in Denmark on December 31, 1973, included 50,000 tons of pig iron and ferroalloys, 414,000 tons of scrap, and approximately 500,000 tons of semimanufactures.

DDS went ahead with its project to establish a new electric steelworks. The new works will have a production capacity of 500,000 tons of raw steel per year by 1976. A second phase of construction was expected to double this capacity, at which time the company's open-hearth furnaces will be retired from service. Principal contractors for the project included Demag AG; Brown, Boveri & Cie.; and a consortium of Danish companies headed by Højgard & Schultz A/S and Kampmann, Kierulff & Saxild A/S.

Lead, Zinc, and Other Nonferrous Metals.—Production of lead-zinc-silver ore from the Black Angel mine at Marmorilik, Greenland, was begun in August 1973 by Greenex A/S. The ore was transported to the concentrator by a mile-long aerial tramway across Marmorilik fiord. The concentrator was designed to treat 1,650 tons of ore per day and to produce 135,000 tons of zinc concentrate and 35,000 tons of silver-bearing lead concentrate per year. One shipment of 20,000 tons of concentrates was made in 1973 before the fiord was closed by ice, and further shipments were not expected to be possible before May 1974. The concentrates will be shipped to smelters in Europe.

Under the concession granted by the Danish Government, Greenex will be exempt from Danish income taxes but will pay the Government an annual royalty of 45% of the profit from the Black Angel operation (after all capital expenditures up to the start of production have been recovered). Greenex is owned by Vestgron Mines Ltd., which in turn is owned 62% by Cominco Ltd. Other companies owning portions of Vestgron included Westfield Minerals Ltd. (about 15%) and Northgate Exploration Ltd. (5%).

Danish consumption of nonferrous metals in 1970–72 was reported by OCED[14] as follows:

	1970	1971	1972
Aluminum, primary thousand metric tons	9.2	9.1	0.7
Copper, refined do	3.1	4.7	4.1
Lead, refined do	27.0	22.2	20.4
Zinc metal do	12.4	9.1	12.8
Tin, refined tons	747.0	950.0	504.0
Nickel, refined tons	76.0	108.0	76.0

Although published statistics[15] showed a sharp drop in consumption of primary aluminum in 1972 and 1973 compared with that in 1970 and 1971, net imports of unwrought aluminum and semimanufactures (including alloys and scrap) by Denmark totaled about 33,000 tons in 1972 and 43,200 tons in 1973. Net imports of copper on the same basis were 27,500 tons in 1972 and 26,000 tons in 1973. Danish stocks of unwrought metal, semimanufactures, and scrap on December 31, 1973, included 12,100 tons of aluminum, 17,600 tons of copper, 7,000 tons of lead, and 3,900 tons of zinc.

Increases in domestic wholesale price indices for nonferrous metals (apparently including manufactures) from November 1972 to November 1973 were as follows: Aluminum, 9%; copper, 62%; lead, 41%; zinc, 161%; and tin, 35%.[16]

Nonmetals.—*Cement and Other Construction Materials.*—The volume of building construction continued to increase in 1973. Compared with that in 1972, the total area of buildings completed was up 12% and the area of those under construction at yearend was up 7.5%, although the area of new buildings started was about 3% less. Most of the gains were registered in commercial and industrial construction; in residential construction, the number of new starts was down 21%, and the total area was 15% less than that during the previous year. The net effect, however, appeared to be a substantial increase in consumption of construction materials in 1973.

Sales of cement totaled 2,888,000 tons, about the same as that in 1972; exports, however, dropped 45% to 141,000 tons and imports (242,000 tons) increased ten-

[14] Organization for Economic Cooperation and Development. The Non-Ferrous Metals Industry 1972. Paris, 1973, pp. 36–37.
[15] World Metal Statistics (London). May 1974, p. 9.
[16] Statistiske Efterretninger. V. 66, No. 5, Jan. 22, 1974, pp. 110–112.

fold compared with those of the previous year. Denmark's production capacity for cement was estimated at 3.2 million tons per year in 1973 and was expected to increase by about 6% during 1974.[17]

Exports of stone, sand and gravel were about 900,000 tons less than those in 1972. Imports of gypsum rose 35% to 300,000 tons, but imports of kaolin and other clays were essentially unchanged. Sales of crude moler and other diatomaceous materials increased; sales of refractory products made from these materials were estimated at more than 250,000 tons, but exports declined. There was a strong increase in imports of concrete and asbestos-cement products and sheet glass in 1973.

Cryolite.—Exports of cryolite rose to 31,160 tons in 1973, 75% more than that in 1972. The exports were valued at DKr 59.6 million, about 50% more than that of the previous year.

Diamond.—The occurrence of microscopic diamond in some kimberlite dikes in west Greenland reportedly led Charter Consolidated Ltd. to apply for and receive a prospecting license in 1973.[18]

Fertilizer Materials.—Imports of most fertilizer materials increased in 1973. The largest gains were registered in unspecified manufactured materials (600,000 tons) and ammonium and calcium-ammonium nitrates (200,000 tons). Imports of potassium chloride and crude phosphate totaled 246,000 tons and 345,000 tons, respectively.

The major Danish manufacturer of fertilizer, Superfos A/S, produced 836,000 tons in 1973. Phosphorus (P) and phosphorus-potassium (PK) fertilizers accounted for 70% of the total output; the remainder consisted of compound nitrogenous (NPK) fertilizer. The company completed a drying and granulating plant and a "double contact" sulfuric acid plant at Fredericia in late 1973. The new acid plant will replace four older plants.

Consumption of fertilizer plant nutrients in Denmark continued to increase. Consumption during the agricultural year 1972–73 included approximately 323,000 tons of nitrogen, 162,000 tons of potassium, and 61,000 tons of phosphorus.[19]

Mineral Fuels.—*Coal and Coke.*—Consumption of coal and coke increased in 1973. Imports of coal totaled 3.02 million tons, 38% more than that in 1972, and imports of coke increased about 10% to 134,000 tons. Approximately 86% of the coal came from Poland, and 13%, from the U.S.S.R. Most of the coke was imported from West Germany and France. Despite increased imports of coal, domestic stocks at yearend (1.65 million tons)[20] were about 500,000 tons less than 1 year earlier. Consumption of coal in thermal powerplants during the year ended October 31, 1973, appeared to be running about 40% more than that in 1972. During the same period, the domestic wholesale price index for coal increased about 10% and that for coke increased by 7%.

In terms of standard coal equivalent, consumption of coal in 1972 (1.84 million tons) was distributed as follows: Thermal powerplants, 84%; gasworks, 6%; industrial use, 5%; and domestic heating, 5%.[21]

Electric Power.—More than 99% of the electricity produced in Denmark was generated by thermal powerplants burning imported fuels. Fuel consumed in powerplants during the 12 months ending October 31, 1973, included about 2.3 million tons of coal and 3.2 million tons of petroleum products.[22] Due to the increased use of coal in 1973, consumption of petroleum products in this sector was probably about 20% less than that in 1972.

Two powerplants, each of 275-megawatt generating capacity, were scheduled to begin service in 1973 at Aalborg and Kyndby. A similar plant was scheduled to begin service at Odense in 1974. All three plants were designed to burn fuel oil.[23] Maximum generating capacity of Danish powerplants as of December 31, 1973, was estimated at 5,400 megawatts.[24]

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[17] Organization of Economic Cooperation and Development. The Cement Industry Statistics 1972, Trend 1973. Paris, September 1973, p. 39.

[18] Mining Journal (London). Mining Annual Review, 1974, p. 467.

[19] Superfos A/S (Vedback). Annual Report and Accounts, 1973. Graph on p. 6.

[20] Statistiske Efterretninger. V. 66, No. 27, May 9, 1974, p. 566.

[21] Statistical Office of the European Communities (Eurostat) (Luxembourg). Energy Statistics. No. 4, 1973, p. 25. "Standard coal equivalent" in this publication is based on a calorific value of 7,000 kilocalories per kilogram.

[22] Page 109 of work cited in footnote 21.

[23] Organization of Economic Cooperation and Development. 25th Survey of Electric Power Equipment; Situation and Prospects as of 1 January 1972. Paris, 1973, p. 36.

[24] ———. The Electricity Supply Industry, 22d Enquiry. Paris, 1972, p. 47.

Net production of electricity in 1973 was estimated at 18.5 billion kilowatt-hours, compared with 19.4 billion kilowatt-hours in 1972. Gross inland consumption in 1972 was 18.3 billion kilowatt-hours, of which 60% was consumed by households, 22% by industry, and 7% by the energy sector (power stations, refineries, etc.).[25]

Petroleum.—Dansk Undergrunds Consortium (DUC) drilled four exploration wells in the Danish sector of the North Sea during 1973. In one well a thin, high-pressure oil zone was encountered at a depth of 13,450 feet,[26] but the other wells were dry. Onshore, drilling of one exploration well was scheduled for 1974, east of Voldum on the Jutland peninsula.[27]

About 15 companies were reportedly interested in offshore exploration in the vicinity of the Faeroe Islands, but no concessions were reported during 1973. No further licenses were granted for exploration off Greenland and no drilling was expected in 1974. The Danish Government has not yet decided on the terms under which Greenland concessions will be granted. Particular attention was being given to environmental considerations.

In the Dan oilfield of the Danish offshore area, DUC drilled a sixth development well from its production platform in 1973. The production wells have been drilled to a depth of about 2,000 meters below the surface. Crude oil production from the field in 1973 reportedly averaged about 4,000 barrels per day;[28] this was about 40% of the volume anticipated when the field was brought into production in mid-1972. All oil produced was being refined in Denmark. DUC planned to drill 18 more development wells from 3 additional platforms by the end of 1975. After the new facilities have been installed, annual production of crude oil may increase to about 1.25 million tons per year.[29] The low rates of oil production were also said to indicate low production potential for natural gas in the area.[30] Crude oil reserves in the Dan Field were estimated at 90 million barrels.[31] Ultimately recoverable reserves of oil and natural gas liquids in the Continental Shelf area of the Danish sector of the North Sea were estimated at 385 million barrels.[32]

Crude Oil Imports and Refining.—Imports of crude oil by Denmark in 1973 totaled 9.72 million tons, slightly less than that in 1972 although the total value was up about 10% to DKr 1.65 billion. The principal supplying countries were Saudi Arabia (37%), Iran (29%), Kuwait (11%), Nigeria (10%), and Oman (7%).

Total refining capacity of Denmark's three refineries in 1973 was about 226,000 barrels per day. Total capacity was expected to increase by about 20% by 1976. Gulf Oil Refining A/S will increase the capacity of its plant at Stigsnaes (Skelskør) by about 45%, to 140,000 barrels per day, and A/S Dansk Shell will increase the capacity of its Fredericia refinery by 10% to 65,000 barrels per day by 1975. Refining capacity of Dansk Esso A/S at Kalundborg was 73,000 barrels per day.[33]

Imports of petroleum products in 1973 totaled 11.6 million tons. The principal supplying countries were the United Kingdom and the Netherlands. About 80% of imports consisted of fuel oils. Exports of petroleum products totaled 2.88 million tons, of which 67% consisted of fuel oils and 25% consisted of gasoline. Domestic stocks on December 31, 1973, included 3.5 million tons of petroleum products and 556,000 tons of crude oil.

From November 1972 to November 1973, the domestic wholesale price index for crude oil increased by 72%. Most of the increase occurred between October and November 1973. Increases in indices for major petroleum products during the same 12-month period amounted to 40% for gasoline, 68% for gas oil, and 21% for fuel oil.[34]

Gross consumption of all petroleum products in Denmark in 1973 was estimated at 18.0 million tons, compared with 18.2 million tons in 1971 and 19.1 million tons in 1972.[35] Inland consumption ac-

[25] Pages 95 and 98 of work cited in footnote 21.
[26] World Oil. V. 179, No. 3, Aug. 15, 1974, p. 92.
[27] Mona Palmer Publishing Co., Inc.; World Petroleum Report '74. V. 20, 1974, p. 20.
[28] Work cited in footnote 27.
[29] Mining Journal (London). Mining Annual Review, 1974, p. 467.
[30] "North Sea's Latest Estimates"; Petroleum Press Service. V. 40, No. 6, June 1973, p. 205.
[31] Petroleum Publishing Co. International Petroleum Encyclopedia—1974. Tulsa, Okla., 1974, p. 268.
[32] "How Much Oil Under the Sea?" Petroleum Press Service. V. 40, No. 9, September 1973, p. 330.
[33] Work cited in footnote 27.
[34] Statistiske Efterretninger. V. 66, No. 5, Jan. 22, 1974, p. 110.
[35] Eurostat (Luxembourg). Energy Statistics. No. 4, 1973, p. 61.

cording to the same source in 1971 and 1972 is shown by the accompanying tabulation:

Consuming sector	Thousand metric tons	
	1971	1972
Energy:		
Electric powerplants	3,531	4,137
Gasworks	164	178
Total energy	3,695	4,315
Industry:		
Chemical	283	289
Iron and steel	92	176
Petrochemical	86	90
Other	3,148	3,152
Total industry	3,609	3,707
Transportation:		
Highway	1,980	2,023
Aircraft	632	712
Railways	94	107
Coastal and inland shipping	214	216
Total transportation	2,920	3,058
Domestic:		
Household, etc	6,266	6,208
Agriculture	800	846
Fishing	169	192
Total domestic	7,235	7,246
Grand total [1]	17,459	18,326

[1] Total shown is slightly less than total shown by source publication.

Source: Statistical Office of the European Communities (Eurostat) (Luxembourg). Energy Statistics. No. 4, 1973, p. 61.

ICELAND [36]

Every sector of Iceland's economy enjoyed a boom year in 1973, and the mineral industry was no exception. The opening of new potlines at the Straumsvik aluminum smelter brought about a near doubling of aluminum output and an increase of more than 50% in the total value of mineral production. Mineral exports had previously tripled in value in 1972, owing to the resumption of aluminum shipments following the 1971 market slump, and may have increased slightly further in 1973. Only a small growth would be needed to shift the country's balance of mineral trade into the black. Future prospects improved with the signing of agreements for the construction of a ferrosilicon plant and an exchange of information between Iceland and the United States on the utilization of geothermal power.

The price of this booming year was a rampaging inflation, which shot the cost of living up by nearly 30% and threatened to topple the Government. As a result of the political crisis, decisions on questions such as the proposed sea chemicals complex and ratification of the ferrosilicon smelter agreement had to be postponed. An additional consequence was the rise in construction activity to a level out of proportion to the country's needs as Icelanders sought shelter for their savings in real property, auguring a future downturn in the demand for building materials.

On a more positive note, the much-publicized volcanic eruption on the island of Heimay caused less disruption of the economy than had been feared, and reconstruction of the town and harbor com-

[36] Prepared by David G. Willard.

menced in midyear, as soon as the eruption ceased.

Government Policies and Programs.—Membership for Iceland in the EC was still being delayed by the dispute with West Germany and the United Kingdom over Iceland's unilateral extension of its fishing jurisdiction to 50 miles offshore. Although the risk of armed conflict over the issue died down, negotiations failed to produce the agreement that was being demanded by the EC as a condition of membership.[37]

Although the Government remained interested in attracting foreign investment, it became increasingly likely that domestic majority ownership would be required. The Government itself would be the most probable partner.[38] Contracts were being let for the Sigalda hydroelectric project, which will add 150 megawatts of the inexpensive power that is the country's main attraction to investors. Completion of the project was being set for late 1975 or early 1976.[39]

PRODUCTION

Additional capacity came onstream at the Icelandic Aluminum Co. smelter late in 1972 and boosted the country's aluminum production by over 50% in 1973. Output totaled 72,000 tons compared with 45,560 tons in 1972. Recovery of the European aluminum market from the 1971 slump allowed the company to utilize its entire added capacity.

Production levels for other mineral commodities changed relatively little from the previous year; however, the total values of some products showed extreme gains because of the country's rampant inflation. Cement output increased 3%, but 1973 sales amounted to $6.0 million, 54% above the $3.9 million total for 1972. The earnings of nitrogenous fertilizer producers nearly tripled, from $2.4 million in 1972 to $7.0 million in 1973, while output remained almost stable. Total value of recorded mineral production (excluding clay products) was up 56% at $61.9 million compared with the 1972 level of $39.8 million; the bulk of the increase resulted from the increased physical output of aluminum.

Mineral production in 1974 should be at about the same level as that in 1973. No plans have been announced for a further increase in aluminum smelting capacity, although production was at full capacity in 1973. Potential new mineral developments such as the ferrosilicon plant and the sea chemicals complex still appear to be some years in the future. A decrease in the production of building materials is even possible since the current construction boom has been fueled largely by inflation.

Mineral production statistics for Iceland are included in table 1.

TRADE

Iceland's mineral trade picture brightened considerably in 1972 as aluminum shipments resumed and exports of diatomite doubled. Aluminum exports had been curtailed in 1971 because of market weakness, and more than half of the smelter's output had been stockpiled. Industrial recovery in 1972 permitted an increase in exports to 3½ times the depressed 1971 level, and their value rose by over 300% from $10.1 million in 1971 to $31.1 million in 1972.

Diatomite sales also jumped sharply in 1972 and exceeded production by a considerable margin, implying a drawdown of stocks. General economic recovery in Europe apparently accounted for the improvement since the product is used for brewery filters and other purposes in several European countries.

The gains in these two commodities, which account for practically all of the country's mineral exports, resulted in a near tripling of mineral export value to $33.6 million in 1972 from $12.1 million in 1971. In combination with almost no change in the value of mineral imports, the result was a vast improvement in the balance of mineral trade that, while still negative, was more nearly even than in any previous year. The following tabulation shows balances of mineral trade and

[37] U.S. Embassy, Reykjavik, Iceland. State Department Airgram A–87, Oct. 24, 1972, p. 4.
[38] U.S. Embassy, Reykjavik, Iceland. State Department Airgram A–28, Mar. 27, 1973, enclosure 1, p. 1.
[39] U.S. Embassy, Reykjavik, Iceland. State Department Airgram A–87, Oct. 3, 1973, p. 7.

total trade for the years 1970 through 1972, in million dollars:

	1970	1971	1972
Total commodity trade:			
Exports	146.4	150.1	191.4
Imports	157.1	220.7	233.4
Balance	-10.7	-70.6	-42.0
Mineral commodity trade:			
Exports	21.4	12.1	33.6
Imports	31.3	r 39.6	39.8
Balance	-9.9	r -27.5	-6.2

r Revised.

Iceland might achieve a positive mineral trade balance in 1973 as a result of the expansion of the aluminum smelter, although inflation in the prices of imports, especially of petroleum products, will be an offsetting factor.

Mineral commodity trade statistics for Iceland are given in table 7.

Table 7.—Iceland: Mineral commodity trade

(Metric tons unless otherwise specified)

Commodity	1971	1972
EXPORTS		
METALS		
Aluminum metal, including alloys, unwrought	16,718	59,237
Ores and scrap, not further identified value	$39,000	$52,000
Nonferrous metal scrap and metal-bearing residues	466	634
NONMETALS		
Abrasives, natural, not further identified	5,342	36,907
Diatomite	17,079	
IMPORTS		
METALS		
Aluminum:		
Bauxite	93,185	63,900
Metal, including alloys, all forms	998	747
Copper metal, including alloys, worked	193	153
Iron and steel metal:		
Ingots	1,428	NA
Semimanufactures	29,180	31,988
Unspecified value, thousands	$162	$121
Lead metal, including alloys, all forms	224	NA
Platinum-group metals and silver, all forms value	r $95,000	$140,000
Zinc metal, including alloys, all forms	102	173
Other:		
Nonferrous base metal ore and concentrate, not further identified	4	NA
Nonferrous metals, not further identified, n.e.s value	$57,000	$193,000
Metalliferous ores and scrap, not further identified do	$3,000	$41,000
NONMETALS		
Abrasives, natural, n.e.s do	$7,000	NA
Caustic soda	371	NA
Cement, hydraulic	3,012	12,443
Clay products:		
Refractory	1,808	1,505
Nonrefractory	1,309	1,034
Cryolite and chiolite	250	NA
Diatomaceous earth	1,021	NA
Fertilizer materials:		
Manufactured:		
Nitrogenous	3,449	3,321
Phosphatic	10,061	9,944
Potassic	4,806	8,678
Other, including mixed	23,090	30,588
Ammonia	2,107	NA
Gypsum and plasters	6,041	NA
Lime	1,162	NA
Pigments, titanium oxides	658	NA
Salt	52,017	48,098
Stone, sand and gravel, n.e.s	399	NA
Sulfuric acid	674	NA
Other:		
Minerals, crude, n.e.s	617	NA
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	586	616

See footnotes at end of table.

Table 7.—Iceland: Mineral commodity trade—Continued
(Metric tons unless otherwise specified)

Commodity		1971	1972
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural		5,420	NA
Coal, coke briquets		1,487	NA
Petroleum refinery products:			
Gasoline, motor	thousand 42-gallon barrels	550	539
Kerosine and white spirit	do	387	572
Distillate fuel oil	do	2,239	2,070
Residual fuel oil	do	651	657
Lubricants	do	43	45
Mineral jelly and wax	do	2	NA
Other:			
Liquefied petroleum gas	do	6	7
Nonlubricating oils, n.e.s	do	7	NA
Pitch coke	do	7	NA
Bituminous mixtures	do	5	NA
Total	do	r 3,897	NA

r Revised. NA Not available.

COMMODITY REVIEW

Petroleum.—Iceland came to the attention of world petroleum interests for the first time when an international geophysical research team discovered unexpectedly thick sedimentary layers beneath the ocean floor northeast of the island. The team estimated that sedimentary formations as much as 3 kilometers thick lie under water between Iceland and Jan Mayen island and reported the presence of butane gas in some samples taken from the ocean bottom. Several oil companies immediately requested information on the findings. Prospects for petroleum production are not very promising, however, because the water depth in the area averages about 2,500 to 3,000 feet.[40]

Sea Chemicals.—No report was published during the year on the proposed complex at Reykjanes that would use seawater and geothermal steam and brines to produce sodium chloride, potassium chloride, magnesium, and several other chemicals. It is probable that the economic and political crisis diverted the Government's attention from the project.

Other Minerals.—Agreement on the construction of a ferrosilicon smelter was reached between the Government and Union Carbide Corp. in July. However, legislative ratification of the agreement had not been obtained by yearend. The smelter, which would be located near Akranes on the west coast, is estimated to cost $28 million and will produce about 50,000 tons per year of 75% ferrosilicon. Ownership will be divided, with the Government holding 65% and Union Carbide holding 35%. Electric power will come from the Sigalda project, construction of which began during the year.[41]

Another power-intensive industry continuing under study during the year was the proposal for an electro-metallurgical smelter to process imported ilmenite into titanium-dioxide-rich slag and pig iron. Feasibility studies were being conducted by the United Nations Industrial Development Organization (UNIDO), with final decisions to be made in 1 or 2 years. Under the present plan, black sand deposits in Gambia, estimated to total 5 million tons, plus additional deposits in Senegal would provide the raw material source.[42]

In addition to its hydroelectric potential, Iceland contains a large resource of geothermal power, only a small part of which has been developed. In November, an agreement was signed between Iceland and the U.S. Atomic Energy Commission for exchange of information on the utilization of geothermal energy, a source of power that has become of increasing interest worldwide as problems have emerged in the supply of fossil fuels.[43]

[40] U.S. Embassy, Reykjavik, Iceland. State Department Airgram A–100, Dec. 7, 1973, 1 p. and enclosure.

[41] Mining Journal. Mining Week. V. 281, No. 7198, Aug. 3, 1973, p. 87.

[42] Mining Journal. Industry in Action. V. 282, No. 7222, Jan. 18, 1974, p. 38.
U.S. Embassy, Vienna, Austria. State Department Telegram 1357, Feb. 15, 1974, 1 p.

[43] U.S. Embassy, Reykjavik, Iceland. State Department Airgram A–98, Nov. 6, 1973, 1 p. and enclosure.

SWITZERLAND [44]

Because of the country's lack of significant mineral resources and its landlocked location, the major mineral industry of Switzerland in 1973 was represented primarily by processing facilities that import raw materials and export finished mineral products.

Modest domestic production of several nonmetallic mineral commodities continued during the year: Limestone (lime) production fell 8%, while domestic cement and salt increased 1% and 13%, respectively. Production of gypsum remained unchanged from that reported in 1972. Production of refined aluminum, all based upon imported raw materials, increased 2% during 1973. This material continued to supply the country's needs. In addition, a small excess was exported in the form of aluminum ingots and semifabricated products. Domestic petroleum refining and steel industries, also based on imported raw materials, largely met requirements for these processed mineral commodities. Production of rolled sheet steel and steel ingots increased 5% and 9%, respectively, during 1973. The imported crude oil used as petroleum refinery feedstock increased 22%, while the two major Swiss petroleum refinery outputs, distillate fuel oil and residual fuel oil, rose 6% and 26%, respectively. Imported natural gas increased 45% during the year and totaled 15,701 million cubic feet.

The estimated Swiss gross national product (GNP) increased to a new record high of 131.1 billion Swiss francs (SwF), about $44.9 billion, representing an apparent growth rate of 12.9%. The country's rate of inflation accounted for about 8.6% of the apparent growth rate and was one of the highest rates of inflation in the industrialized European countries.

The main restraint to expanded output and productivity during 1973 was the continued extreme labor shortage. This was reflected by data on the total Swiss labor force that indicated that there was an average of only 81 persons unemployed compared with 3,804 unfilled positions during the year. Industrial production increased 5.4% and prices, as measured by the Consumer Price Index, rose 11.9% in 1973.

The growth in the real Swiss GNP, measured in terms of 1973 prices, decreased to 4.3% from a revised real GNP growth of 5.8% in 1972.[45] Thus, inflation decreased slightly and accounted for about two-thirds of the total record high growth during the year. The Swiss Government's anti-inflation program, which was beginning to show results in mid-1973, was dealt by a blow by the rapid rise in the cost of imported petroleum and other raw materials in the latter part of the year. Higher import costs, higher demand for Swiss exports, and a continued chronic labor shortage were expected to result in a 10% to 12% increase in prices during 1974. Continued government efforts to reduce domestic demand should slow the 1974 GNP growth to about 2%. High inflation, tight credit, labor shortages, and the highly revaluated Swiss franc are causing many Swiss businesses to investigate possibilities for direct investment in the United States. These factors also make U.S. exports potentially more competitive in the Swiss market.

Petroleum, the country's main energy source, provided about 81% of the total energy consumed in Switzerland during 1973. Consumption of petroleum products increased 7% and totaled 111 million barrels during the year. Preliminary data indicated that imports of crude oil increased about 13.6% to 45.9 million barrels in 1973. Libya continued to be the major source and supplied about 35% of the total crude oil imports. Other significant sources of 1973 Swiss crude oil imports were, the United Arab Emirates (26%), Algeria (14%), Kuwait (10%), and Saudi Arabia (6%). Imports of refinery products during the year decreased 12% and totaled 56.1 million barrels, most of which were obtained from sources in the EC, mainly from West Germany, Italy, France, and the Netherlands. The major exports of refined petroleum products were reported to be about 1.5 million barrels of fuel oil shipped to Austria (94%) and West Germany (6%).

Hydroelectric and nuclear power accounted for about 16% of the total 1973 Swiss energy, coal provided about 2%, and imported natural gas supplied the remainder.

[44] Prepared by Richard F. Stevens, Jr.

[45] U.S. Embassy, Bern, Switzerland. Economic Trends Report-Switzerland. State Department Airgram A-152, May 17, 1974, 9 pp.

Since Switzerland has no facilities for mining, reprocessing, or fabricating nuclear materials, all the fuel for the country's nuclear reactors was imported. The problem of radioactive waste management in Switzerland was relatively simple since the fuel elements were fabricated outside of the country and, after use, were exported for reprocessing. Operational wastes such as water, sludge, and contaminated clothing were mixed with concrete and poured into stainless steel containers at each nuclear plant site pending the development of permanent underground storage facilities.

The relationship between Swiss mineral commodity trade and total commodity trade is indicated in the following tabulation, which also shows the disparity in the balance of trade:

	Value (million dollars)		Mineral commodities share of total trade (percent)
	Mineral commodity trade	Total commodity trade	
Exports:			
1970	275	5,120	5.4
1971	274	5,768	4.8
1972	391	6,877	5.7
Imports:			
1970	1,258	6,471	19.4
1971	1,267	7,154	17.7
1972	1,426	8,471	16.8
Trade balance:			
1970	-983	-1,351	XX
1971	-993	-1,386	XX
1972	-1,035	-1,594	XX

XX Not applicable.

During 1972, nonferrous metal exports (excluding ores, concentrate, and scrap), primarily wrought aluminum products, represented about 44% of the total Swiss mineral exports by value or over $173 million. Precious and semiprecious stones, including industrial diamond, accounted for 25% or $98 million of the total mineral exports. Iron and steel valued at $50 million accounted for 13% of the Swiss mineral exports in 1972. The Western European countries of the EC and the European Free Trade Association (EFTA) continued to be the major recipients of Swiss mineral exports.

Mineral fuels, the largest major group of mineral commodity imports in 1972, primarily as crude petroleum, contributed 32% valued at $462 million to total Swiss mineral imports. Iron and steel imports, valued at $426 million contributed 30%, and nonferrous imports valued at $249 million represented 17% of the total. Imports of gems and semiprecious stones were valued at $113 million in 1972, or almost 8% of the total reported mineral imports. EC countries continued to be the major sources of most of the 1972 Swiss mineral imports (excluding mineral fuels).

Data on Swiss petroleum and petroleum products were converted from metric tons to U.S. barrels of 42 gallons by using the conversion factors given in the report International Petroleum Annual, 1972.[46] The apparent consumption of refined petroleum products in Switzerland, approximately 41% of which was domestically refined from imported crude oils and the remainder of which was imported as refined products, is estimated in the following tabulation, in millions of barrels:

Product	1972	1973	Change (percent)
Distillate fuel oil	51.7	58.2	+12.6
Motor and aviation gasoline	22.8	23.1	+ 1.3
Residual fuel oil	16.4	17.1	+ 4.3
Kerosine and jet fuel	6.0	5.4	-10.0
Refinery fuel and loss	3.0	1.6	-46.7
Lubricants (including greases)	.6	.7	+16.7
Other refined products	4.0	4.5	+12.5
Total[1]	105.1	110.5	+ 5.1

[1] Data may not add to totals shown because of independent rounding.

[46] U.S. Bureau of Mines. International Petroleum Annual, 1972. March 1974, 30 pp.

Table 8.—Switzerland: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Bauxite and concentrate	38	1	All to France.
Oxide and hydroxide	142	153	United States 26; Finland 23; West Germany 18.
Metal, including alloys:			
Unwrought	16,975	21,242	West Germany 12,120; Italy 4,202; Austria 1,347.
Semimanufactures	33,270	39,836	Austria 4,993; United Kingdom 4,896; Denmark 4,011.
Antimony metal, including alloys, unwrought kilograms	1,538	67	NA.
Arsenic trioxide, pentoxide and acids do	48	20	NA.
Beryllium metal, including alloys, all forms do	15	117	Italy 105; France 5; West Germany 4.
Chromium oxide and hydroxide do	46,124	1,496	West Germany 493; United Kingdom 115; Italy 20.
Copper:			
Matte	3	196	Netherlands 175; West Germany 20.
Copper sulfate	470	98	Austria 64; West Germany 15; France 9.
Metal, including alloys:			
Scrap	8,029	10,878	West Germany 6,771; Italy 1,976; Austria 878.
Unwrought	2,958	4,195	West Germany 2,411; Italy 1,705.
Semimanufactures	7,570	9,718	United States 2,835; Israel 1,368; Italy 958.
Gold metal, unworked or partly worked thousand troy ounces	r 630	962	West Germany 462; Belgium-Luxembourg 283; Denmark 49.
Iron and steel:			
Ore and concentrate, including roasted pyrite	5,506	8,318	West Germany 8,309.
Metal:			
Scrap	30,016	92,342	Italy 76,730; West Germany 9,022; France 3,156.
Pig iron, ferroalloys, similar materials	6,771	9,419	West Germany 3,404; Italy 1,855; Netherlands 1,743.
Steel, primary forms	r 2,453	783	Italy 764.
Semimanufactures	r 104,283	133,746	West Germany 38,813; Austria 26,187; Italy 13,134.
Lead:			
Ore and concentrate kilograms	--	500	NA.
Oxides	r 2	2	Mainly to United Kingdom.
Metal, including alloys:			
Scrap	6,089	7,169	Italy 5,241; France 762; West Germany 332.
Unwrought	529	1,020	Italy 693; France 166; Austria 154.
Semimanufactures	221	105	Belgium-Luxembourg 40; Austria 31; France 15.
Magnesium metal, including alloys, all forms	r 148	213	West Germany 103; Italy 39; Austria 19.
Manganese oxides	10	38	West Germany 31; France 6.
Mercury 76-pound flasks	r 98	119	West Germany 46; France 28; Austria 20.
Molybdenum metal, including alloys, all forms	1	2	Mainly to West Germany.
Nickel:			
Matte, speiss, similar materials	1	107	West Germany 79; Italy 25.
Metal, including alloys:			
Scrap	643	600	West Germany 429; Italy 82; Netherlands 42.
Unwrought and semimanufactures	844	845	France 187; West Germany 149; Italy 105.
Platinum group metals and silver, including alloys:			
Platinum group thousand troy ounces	128	252	France 44; Italy 39; West Germany 26.
Silver do	22,000	43,106	West Germany 16,250; Italy 14,768; France 6,630.

See footnotes at end of table.

Table 8.—Switzerland: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Tin metal, including alloys:			
Scrap ____ long tons __	r 143	146	West Germany 76; France 70.
Unwrought ____ do ____	41	53	Italy 20; France 20; West Germany 8.
Semimanufactures ____ do ____	82	81	West Germany 43; Austria 18; United Kingdom 8.
Titanium oxides ____	27	162	France 104; West Germany 30; Austria 16.
Tungsten metal, including alloys, all forms ____	41	31	West Germany 28; Portugal 2.
Uranium and thorium oxides, including rare-earth oxides ____ kilograms __	1,522	3,087	United States 2,114; Czechoslovakia 158; Netherlands 121.
Zinc:			
Oxide ____	14	1	Mainly to West Germany.
Metal, including alloys:			
Scrap ____	1,496	1,314	Italy 938; France 258; Belgium-Luxembourg 84.
Unwrought ____	154	63	Italy 48.
Semimanufactures ____	42	67	West Germany 29; Austria 22; France 8.
Other:			
Ore and concentrate ____	808	230	Italy 194; West Germany 13; Sweden 11.
Ash and residue containing nonferrous metals ____	20,665	20,812	Italy 7,670; West Germany 6,533; Belgium-Luxembourg 2,436.
Waste and sweepings of precious metals ____	155	163	West Germany 93; France 63; United Kingdom 6.
Oxides, hydroxides, peroxides of metals, ne.s ____	46	1,943	West Germany 1,902.
Metals, including alloys, all forms:			
Metalloids ____	4,532	4,661	West Germany 4,075; Spain 475; United Kingdom 36.
Alkali, alkaline earth, rare-earth metals ____ kilograms __	748	1,002	West Germany 32; United States 8.
Pyrophoric alloys ____ do ____	348	1,958	West Germany 136.
Base metals, including alloys, all forms, n.e.s ____	r 43	87	West Germany 63; France 8.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc ____	17	19	West Germany 3; Italy 3.
Dust and powder of precious and semiprecious stones ____ kilograms __	2,047	1,548	Netherlands 874; Italy 207; France 150.
Grinding and polishing wheels and stones ____	838	939	United Kingdom 241; West Germany 238; Algeria 72.
Asbestos ____	94	46	West Germany 19; Belgium-Luxembourg 9; Austria 7.
Barite and witherite ____	13	29	West Germany 26; France 2.
Boron materials:			
Crude natural borates ____	--	1	NA.
Oxide and acid ____	3	4	Hungary 2.
Cement ____	84,092	24,785	West Germany 21,393; France 1,071; Italy 1,032.
Chalk ____	101	40	France 25; West Germany 7.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s ____	9,833	9,488	West Germany 9,027; Austria 346; Denmark 57.
Products:			
Refractory (including nonclay bricks) ____	1,134	1,541	Austria 684; West Germany 523; France 128.
Nonrefractory ____	56,296	47,401	West Germany 20,933; Austria 12,376; France 11,472.
Cryolite and chiolite ____ kilograms __	301	10,800	Italy 10,000.
Diamond:			
Gem, not set or strung value, thousands __	$25,652	$35,163	France $8,824; West Germany $7,776; Italy $2,855.
Industrial ____ do ____	$1,145	$2,214	West Germany $584; Belgium-Luxembourg $551; United Kingdom $469.

See footnotes at end of table.

Table 8.—Switzerland: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Diatomite and other infusorial earth	125	92	Austria 48; Italy 33; West Germany 9.
Feldspar and fluorspar	321	275	West Germany 147; Sweden 55; Peru 30.
Fertilizer materials:			
Manufactured:			
Nitrogenous	54	90	West Germany 23; Belgium-Luxembourg 20; Angola 20.
Phosphatic	9	10	NA.
Potassic	12	1	Mainly to West Germany.
Other, including mixed	432	583	France 158; West Germany 125; Italy 124.
Ammonia	42	54	France 7.
Graphite, natural	4	37	West Germany 20; France 14.
Gypsum and plasters	4,059	5,594	Austria 5,441; France 106; West Germany 23.
Lime	3,272	4,697	France 2,737; West Germany 1,943.
Magnesite	29	32	West Germany 16.
Mica:			
Crude, including splittings and waste	82	63	Sweden 13; Austria 12; Ireland 12.
Worked	r 321	327	Sweden 52; United Kingdom 31; Netherlands 26.
Pigments, mineral:			
Natural, crude	39	32	Italy 9; Austria 5; West Germany 2.
Iron oxides, processed	15	59	France 48; West Germany 5.
Precious and semiprecious stones, except diamond:			
Natural, crude thousand carats	23,380	22,345	India 4,675; Italy 4,135; United Kingdom 1,815.
Manufactured do	310,360	330,070	West Germany 70,195; France 49,175; Austria 40,800.
Pyrite (gross weight) kilograms	--	490	NA.
Salt and brine	7	55	Malaysia 2.
Sodium and potassium compounds, n.e.s	11,369	20,714	Hungary 11,492; Austria 5,319; West Germany 3,311.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	39,529	43,303	West Germany 29,142; Italy 7,462; France 2,469.
Worked	10,360	11,156	West Germany 10,109; Austria 577; France 173.
Dolomite, chiefly refractory grade	51	57	West Germany 5; Italy 1.
Gravel and crushed rock	r 22,134	34,973	West Germany 28,820; France 3,993; Italy 877.
Limestone (except dimension)	17	10	West Germany 5.
Quartz and quartzite	29,529	35,458	Italy 28,406; West Germany 5,234; Netherlands 720.
Sand, excluding metal bearing	14,050	10,201	West Germany 5,274; France 2,805; Austria 1,059.
Sulfur:			
Elemental, all forms	235	153	West Germany 151.
Sulfur dioxide	129	73	Mainly to Austria.
Sulfuric acid, oleum	15,035	47,621	France 31,908; West Germany 13,058; Italy 2,310.
Talc, steatite, soapstone, pyrophyllite	1,633	1,266	Italy 1,183; Austria 44; France 15.
Other nonmetals, n.e.s.:			
Crude	363	297	West Germany 122; Italy 58; France 28.
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture	3,539	4,499	West Germany 4,138; France 350.
Slag and ash, n.e.s	234	122	West Germany 27.
Oxides and hydroxides of magnesium, strontium, barium	12	11	West Germany 1; U.S.S.R. 1; Italy 1.
Bromine, iodine, fluorine	3	4	France 2.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	r 146	471	France 393; West Germany 28; Austria 16.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	8	1,007	United Kingdom 1,000.
Carbon black and gas carbon:			
Carbon black	96	79	France 43; Italy 7; U.S.S.R. 7.
Gas carbon kilograms	1	9	NA.

See footnotes at end of table.

Table 8.—Switzerland: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Coal, all grades, including briquets	4,924	1,921	Mainly to West Germany.
Coke and semicoke	13,055	28,057	Austria 20,574; Italy 5,883; West Germany 1,530.
Gas, hydrocarbon, manufactured	90	102	Mainly to France.
Hydrogen, helium, and rare gases	70	67	Austria 61; West Germany 1.
Peat, including peat briquets and litter	273	501	Austria 391; West Germany 56.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	97	2	Mainly to Austria.
Distillate fuel oil do	30	22	Do.
Residual fuel oil do	739	751	Austria 746.
Lubricants do	r 64	95	Italy 53; Austria 18; France 13.
Other:			
Liquefied petroleum gas do	82	58	Italy 56.
Unspecified do	3	5	West Germany 1; Austria 1.
Total do	r 1,015	933	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	1,491	1,163	Italy 522; France 213; West Germany 209.

r Revised. NA Not available.

Table 9.—Switzerland: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite and concentrate	3,405	11,046	France 7,613; Italy 3,258.
Oxide and hydroxide	181,148	162,347	Surinam 68,089; Guinea 53,689; Australia 22,207.
Metal, including alloys:			
Unwrought	6,181	24,891	Iceland 9,525; Norway 7,647; Czechoslovakia 2,108.
Semimanufactures	11,152	12,942	West Germany 3,513; Norway 2,370; Sweden 1,738.
Antimony metal, including alloys, unwrought	159	212	People's Republic of China 179; Netherlands 19.
Arsenic trioxide, pentoxide and acids	113	24	France 23.
Beryllium metal, including alloys, all forms kilograms	138	405	United States 231; United Kingdom 167.
Chromium:			
Chromite	5,016	3,867	Republic of South Africa 3,467.
Oxide and hydroxide	497	544	West Germany 341; Italy 91; United Kingdom 67.
Cobalt oxide and hydroxide	5	5	Belgium-Luxembourg 4.
Columbium and tantalum metal, including alloys, all forms, tantalum	4	2	Mainly from United States.
Copper:			
Matte	40,454	30,289	Belgium-Luxembourg 8,405; West Germany 8,283; Zambia 5,366.
Copper sulfate	868	609	U.S.S.R. 317; Hungary 199; France 80.
Metal, including alloys:			
Scrap	432	397	Israel 265; France 71; Chile 37.
Unwrought	r 2,121	3,366	West Germany 2,145; United Kingdom 519; Belgium-Luxembourg 508.
Semimanufactures	42,206	40,807	United Kingdom 19,432; West Germany 6,328; Belgium-Luxembourg 2,926.
Gold metal, unworked or partly worked thousand troy ounces	r 82	88	West Germany 46; France 24; Italy 5.
Iron and steel:			
Ore and concentrate, including roasted pyrite	49,377	28,729	Mauritania 19,891; Italy 7,295; West Germany 1,332.

See footnotes at end of table.

Table 9.—Switzerland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principle sources, 1972
METALS—Continued			
Iron and steel—Continued			
Metal:			
Scrap	27,490	78,458	West Germany 53,304; Netherlands 18,795; Austria 3,179.
Pig iron and similar materials	69,589	56,287	West Germany 36,677; France 7,787; Norway 4,151.
Ferroalloys	17,106	22,793	Bulgaria 3,705; Czechoslovakia 3,575; France 3,008.
Steel, primary forms	227,789	275,109	France 116,024; Belgium-Luxembourg 65,394; West Germany 52,014.
Semimanufactures:			
Bars, rods, angles, shapes, sections:			
Wire rod thousand tons	91	152	West Germany 72; France 55; Austria 9.
Other bars and rod do	233	233	West Germany 65; Italy 64; France 44.
Angles, shapes, sections do	234	287	West Germany 92; France 84; Belgium-Luxembourg 84.
Universals, plates, sheets do	599	674	France 195; West Germany 194; Netherlands 59.
Hoop and strip do	185	214	Belgium-Luxembourg 56; West Germany 48; Austria 35.
Rails and accessories do	59	64	Austria 34; France 13; West Germany 11.
Wire do	33	37	Austria 17; West Germany 10; United Kingdom 3.
Tubes, pipes, fittings do	158	176	West Germany 61; Italy 23; Austria 22.
Castings and forgings, rough do	3	3	West Germany 1; Belgium-Luxembourg 1; Austria 1.
Total do	1,595	1,840	
Lead:			
Ore and concentrate	5	1	NA.
Oxides	281	218	Mexico 90; United Kingdom 47; France 40.
Metal, including alloys:			
Scrap	10	10	West Germany 6; Italy 2.
Unwrought	22,794	21,830	United Kingdom 8,210; France 3,778; West Germany 2,767.
Semimanufactures	1,059	1,285	West Germany 1,092; Netherlands 67; Belgium-Luxembourg 60.
Magnesium metal, including alloys, all forms	r 1,000	1,053	United States 558; Norway 253; U.S.S.R. 205.
Manganese oxides	759	886	Japan 400; Belgium-Luxembourg 182; United States 161.
Mercury 76-pound flasks	r 912	1,567	Spain 608; West Germany 336; Yugoslavia 259.
Molybdenum metal, including alloys, all forms	r 11	11	United States 4; West Germany 3; Austria 2.
Nickel:			
Matte, speiss, and similar materials	r 146	23	NA.
Metal, including alloys:			
Scrap	2	34	West Germany 21; France 6; United Kingdom 4.
Unwrought	1,649	1,474	Norway 453; Canada 258; France 185.
Semimanufactures	2,067	1,228	West Germany 518; United Kingdom 351; France 114.
Platinum-group metals and silver, including alloys:			
Platinum group thousand troy ounces	r 82	208	U.S.S.R. 63; West Germany 48; Netherlands 36.
Silver do	r 21,103	38,377	United Kingdom 20,315; United States 9,773; Austria 2,802.
Tantalum metal, including alloys, all forms	4	2	Mainly from United States.

See footnotes at end of table.

Table 9.—Switzerland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Tin:			
Oxides ____ long tons	22	32	United Kingdom 28; West Germany 3.
Metal, including alloys:			
Scrap ____ do	16	12	West Germany 9; Sweden 3.
Unwrought ____ do	947	880	Malaysia 313; Thailand 235; United Kingdom 135.
Semimanufactures ____ do	228	217	West Germany 109; Netherlands 64; United Kingdom 18.
Titanium oxides	9,660	10,991	West Germany 3,486; United Kingdom 2,597; France 2,114.
Tungsten:			
Ore and concentrate	40	--	
Metal, including alloys, all forms	r 96	85	West Germany 80; Austria 2.
Uranium and thorium oxides, including rare-earth oxides	22	11	France 5; West Germany 2; Austria 2.
Zinc:			
Oxide	2,094	2,331	West Germany 771; France 722; Netherlands 428.
Metal, including alloys:			
Scrap	7	188	North Korea 187.
Blue powder	2,925	2,321	Belgium-Luxembourg 802; West Germany 766; United Kingdom 292.
Unwrought	25,864	32,788	West Germany 10,517; Belgium-Luxembourg 8,602; Netherlands 4,120.
Semimanufactures	2,026	1,769	West Germany 677; Belgium-Luxembourg 581; Italy 105.
Other:			
Ore and concentrate	2,242	1,822	NA.
Ash and residue containing nonferrous metals	873	759	West Germany 524; France 173; Austria 28.
Waste and sweepings of precious metals	63	24	France 10; Denmark 6; Singapore 2.
Oxides, hydroxides, peroxides of metals, n.e.s	1,494	1,097	West Germany 728; Hungary 92; France 83.
Metals, including alloys, all forms:			
Metalloids	2,330	1,983	France 869; Netherlands 771; West Germany 283.
Alkali, alkaline earth, rare-earth metals	447	525	West Germany 492; United States 32.
Pyrophoric alloys	13	17	West Germany 11; Austria 3; United Kingdom 2.
Base metals, including alloys, all forms, n.e.s	r 612	386	Japan 115; France 51; United States 48.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	1,483	1,260	West Germany 655; Italy 466; United States 111.
Dust and powder of precious and semiprecious stones ____ kilograms	776	866	Ireland 403; United States 215; United Kingdom 82.
Grinding and polishing wheels and stones	1,624	1,576	West Germany 672; United Kingdom 177; Italy 172.
Asbestos	19,898	16,764	Canada 7,461; Republic of South Africa 3,288; U.S.S.R. 3,154.
Barite and witherite	2,403	3,119	West Germany 1,695; France 1,188; Italy 235.
Boron materials:			
Crude natural borates	3,012	1,253	United States 1,128; Turkey 99.
Oxide and acid	1,171	793	France 345; Italy 312; Turkey 75.
Cement	120,931	510,430	Italy 323,572; West Germany 117,178; France 63,166.
Chalk	17,652	17,826	France 15,346; West Germany 1,546; Italy 927.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	183,079	179,954	West Germany 78,375; United Kingdom 58,897; France 26,047.

See footnotes at end of table.

Table 9.—Switzerland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Clays and clay products (including all refractory brick)—Continued			
Products:			
Refractory (including nonclay bricks)	35,851	35,088	West Germany 20,772; Austria 5,832; France 2,554.
Nonrefractory	208,737	439,567	Italy 364,867; France 33,492; West Germany 24,650.
Cryolite and chiolite	981	315	Denmark 310.
Diamond:			
Gem, not set or strung value, thousands	$37,989	$52,987	Belgium-Luxembourg $17,587; United States $7,186; Israel $6,710.
Industrial do	$1,960	$2,214	West Germany $584; Belgium-Luxembourg $551; United Kingdom $469.
Diatomite and other infusorial earth	2,778	2,432	France 630; Denmark 449; United States 369.
Feldspar and fluorspar	13,731	13,944	West Germany 6,874; Italy 3,471; France 3,354.
Fertilizer materials:			
Crude:			
Nitrogenous	426	154	West Germany 144.
Phosphatic	17,055	15,849	Morocco 10,414; United States 2,481; Belgium-Luxembourg 1,273.
Potassic	76,215	78,677	France 60,427; West Germany 9,883; East Germany 4,604.
Other	16,246	17,168	France 15,651; West Germany 1,127.
Manufactured:			
Nitrogenous	20,394	56,843	Austria 22,298; West Germany 17,858; France 6,331.
Phosphatic:			
Thomas (basic) slag	181,406	184,863	France 120,395; Belgium-Luxembourg 63,796; Italy 400.
Other	16,767	15,112	France 6,281; Belgium-Luxembourg 3,921; Netherlands 2,040.
Potassic	21,000	19,469	West Germany 12,577; France 6,092.
Other, including mixed	66,625	80,027	France 32,328; West Germany 19,718; Belgium-Luxembourg 16,272.
Ammonia	10,383	9,704	Austria 9,307; West Germany 209; France 111.
Graphite, natural	377	255	West Germany 127; Austria 68; Italy 28.
Gypsum and plasters	111,043	135,442	West Germany 71,867; Austria 29,791; France 20,540.
Lime	26,823	36,335	Italy 18,868; West Germany 16,441; Austria 895.
Magnesite	4,498	5,340	Austria 5,227; West Germany 45; Czechoslovakia 45.
Mica:			
Crude, including splittings and waste	678	747	West Germany 282; United Kingdom 220; India 146.
Worked, including agglomerated splittings	327	224	France 156; Belgium-Luxembourg 58; United Kingdom 5.
Pigments, mineral:			
Natural, crude	367	293	West Germany 125; Austria 88; France 66.
Iron oxides, processed	2,770	2,514	West Germany 2,440; United Kingdom 34; Italy 15.
Precious and semiprecious stones, except diamond:			
Natural thousand carats	294,575	296,145	Brazil 101,860; United States 78,095; West Germany 54,005.
Manufactured do	139,820	107,610	France 100,635; West Germany 4,645; Japan 715.
Pyrite (gross weight)	25,342	10,240	All from Italy.
Salt and brine	1,898	2,282	France 1,795; Netherlands 220; Belgium-Luxembourg 115.
Sodium and potassium compounds n.e.s.:			
Caustic soda	8,683	10,592	West Germany 4,194; France 3,715; Italy 1,693.
Caustic potash, sodic and potassic peroxides	3,739	4,084	Italy 1,273; France 1,127; West Germany 1,071.

See footnotes at end of table.

Table 9.—Switzerland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	41,807	36,761	Italy 22,050; France 7,110; Austria 6,042.
Slate	582	886	Italy 465; West Germany 301; Belgium-Luxembourg 38.
Other	91,123	65,655	West Germany 31,583; France 17,048; Italy 15,583.
Worked:			
Slate	1,287	1,275	Italy 1,053; France 107; West Germany 56.
Paving and flagstone	49,517	52,481	Italy 34,922; Austria 9,594; Poland 5,728.
Other	11,334	14,535	Italy 10,539; West Germany 1,222; Norway 752.
Dolomite, chiefly refractory grade	13,856	13,069	Italy 8,125; France 3,860; West Germany 641.
Gravel and crushed rock thousand tons	4,991	6,164	France 3,000; West Germany 1,707; Italy 863.
Limestone (except dimension)	53,649	61,450	France 60,136; West Germany 563; Austria 404.
Quartz and quartzite	10,010	4,354	West Germany 3,205; Belgium-Luxembourg 609; Italy 215.
Sand, excluding metal bearing thousand tons	1,217	1,573	Italy 766; France 480; West Germany 200.
Sulfur:			
Elemental:			
Other than colloidal	50,895	38,194	West Germany 15,099; France 8,183; United States 6,769.
Colloidal	287	339	West Germany 253; France 76.
Sulfur dioxide	28	28	Italy 25.
Sulfuric acid, oleum	1,555	2,548	France 1,591; West Germany 872.
Talc, steatite, soapstone, pyrophyllite	12,893	13,794	Austria 7,945; France 3,472; Italy 1,086.
Other nonmetals, n.e.s.:			
Crude:			
Pozzolan and santorin earth	4,714	5,111	France 2,612; West Germany 2,499.
Other	21,996	29,860	West Germany 18,249; France 4,842; Hungary 2,577.
Slag, dross and similar waste, not metal bearing:			
From iron and steel manufacture	55,219	87,529	France 84,182; Italy 3,261.
Slag and ash, n.e.s	16,824	14,587	West Germany 14,044; France 541.
Oxides and hydroxides of magnesium, strontium, barium	340	295	United Kingdom 76; West Germany 57; France 44.
Bromine, iodine, fluorine	r 1,868	1,823	France 769; United Kingdom 529; Israel 334.
Building materials of asphalt, asbestos, and fiber cement, unfired nonmetals, n.e.s	13,390	16,014	West Germany 8,042; Austria 6,182; United Kingdom 414.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	3,226	1,737	Trinidad and Tobago 1,539; United States 138.
Carbon black and gas carbon:			
Carbon black	9,184	8,833	France 2,865; West Germany 2,149; Italy 1,574.
Gas carbon	166	66	Mainly from West Germany.
Coal and briquets:			
Anthracite and bituminous coal thousand tons	277	147	West Germany 81; France 31; Poland 10.
Briquets of anthracite and bituminous coal do	23	19	West Germany 13; France 4.
Lignite and lignite briquets do	76	53	West Germany 51; East Germany 1.
Coke and semicoke do	190	170	West Germany 122; France 20; Italy 13.
Gas, hydrocarbon, manufactured kilograms	176	797	United States 507.
Hydrogen, helium, rare gases	r 1,584	4,358	West Germany 3,644; France 539; Italy 98.

See footnotes at end of table.

Table 9.—Switzerland: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Peat, including peat briquets and litter	47,507	51,191	West Germany 44,935; Poland 3,596; U.S.S R. 1,007.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	39,045	36,143	Libya 14,168; Bahrain 8,417; Algeria 5,927.
Refinery products:			
Gasoline do	14,200	15,616	Italy 5,573; France 5,504; West Germany 3,244.
Kerosine and white spirit do	r 697	719	Italy 383; France 159; Netherlands 79.
Distillate fuel oil do	37,203	37,151	France 14,249; Italy 7,937; West Germany 7,550.
Residual fuel oil do	5,429	5,527	France 3,153; West Germany 1,826; Netherlands 319.
Lubricants do	r 747	753	West Germany 211; Netherlands 117; Belgium-Luxembourg 93.
Other:			
Liquefied petroleum gas do	1,264	1,759	West Germany 960; Netherlands 764; France 23.
Mineral jelly and wax do	79	76	West Germany 45; East Germany 7; People's Republic of China 5.
Unspecified do	2,998	4,847	France 1,221; West Germany 655; Italy 534.
Total do	62,617	66,448	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	r 38,170	39,120	France 13,044; West Germany 7,019; Italy 4,389.

r Revised. NA Not available.

A detailed report, Environmental Protection in Switzerland, was prepared by the Swiss Federal Office for Environmental Protection and released during the year.[47] This report describes the present legal authority that the Swiss Cantonal and Federal Governments share in dealing with environmental problems. The report also provides data on current environmental programs in Switzerland. Cantons have licensing authority for environmental protection of nuclear power installations. The only specific study required in the nuclear field is on the environmental impact of cooling towers. In general, Swiss nuclear environmental and safety practices are similar to those regulations and standards developed by the U.S. Atomic Energy Commission and the International Atomic Energy Agency particularly for the transportation of radioactive fuels and wastes.

COMMODITY REVIEW [48]

Metals.—*Iron Ore.*—The principal Swiss iron ore mine is in the Herznach-Wolflinswil region northwest of Aarau where Jura-Bergwerke AG mines extensive low-grade reserves and produces semiconcentrates averaging 28% to 30% iron content. This material is consumed in nearby centers. A second major iron ore mine is located at Gonzen, near Sargans.

Nonmetals.—*Construction Minerals.*—Nonmetallic industrial minerals that were produced during the year included limestone for cement at Jura, and slate, marble, granitic building stone, and sand and gravel for civil engineering work.

Salt.—Salt from Bex and Rheinfelden was mined to meet domestic market needs.

Mineral Fuels.—*Coal.*—Mining of low-grade anthracite coals reportedly took place at Collonges, Dorénaz, Ferden, Grône, Bramois, Chandoline, and Nendax.

Oil and Gas.—The annual report of Swiss Petroleum Association (Union Pétroliere) indicated that only one oil well was drilled during the year and that less than

[47] U.S. Embassy, Bern, Switzerland. Environmental Protection in Switzerland. State Department Airgram A-481, Dec. 20, 1973. 41 pp.

[48] Mining Journal (London). Switzerland: Watch on Swiss Mining. V. 280. No. 7192, June 22, 1973. p. 514.

$0.6 million was spent on exploration activities.[49] No oil or gas had been found or produced in commercial quantities as of the end of the year.

Petroleum.—Several currently noncommercial petroleum deposits have been found in the Jura Area of Switzerland. However, the country continues to rely upon petroleum imports to supply the liquid fossil fuels required to support the country's major energy source.

[49] U.S. Embassy, Bern, Switzerland. LOS—Request for Mineral Data. State Department Telegram 4233, Oct. 12, 1973, 2 pp.

The Mineral Industry of Other African Areas

By Staff, Bureau of Mines

CONTENTS

BOTSWANA [1]

The mineral industry of Botswana made significant progress in 1973 with the start-up of copper-nickel operations by Bamangwato Concessions Ltd. (BCL) at Selebi-Pikwe, the startup of the Anglo-American Corp. colliery at Morupule, and the increased output of diamonds by De Beers Botswana Mining Co. (Pty.) Ltd. operation at Orapa. Also indicative of Botswana's progress in mining was the announcement by De Beers that it would develop a second diamond mine located about 25 miles southeast of the Orapa mine. Production of diamond from the new mine was expected to begin within 2 years.

According to the Government National Development Plan for 1973–1978, mineral production is expected to contribute $43.5 million [2] annually to the economy of Botswana. The gross domestic product (GDP) in 1973 was estimated at $75 million. An annual growth rate of 14% through 1978 has been predicted, based largely on minerals development.

An important event for the Government of Botswana was the establishment of a new Ministry of Mineral Resources and Water Affairs. The Ministry's Department of Geological Survey will compile the national inventory of mineral resources and assume an increasing role in exploration and proving of mineral resources.[3] The

[1] Prepared by Henry E. Stipp, physical scientist, Division of Ferrous Metals—Mineral Supply.

[2] Where necessary, values have been converted from South African rand (R) to U.S. dollars at the rate of R1=US$1.495.

[3] U.S. Embassy, Gaborone, Botswana. State Department Airgram A-3, Jan. 10, 1974, 17 pp.

new Department of Mines will evaluate all proposed developments and monitor the extraction and processing industries to see that development policies are implemented. Another significant event was the formulation by the Government of a mineral development policy. The purpose of this policy is to control the exploitation of Botswana's mineral resources so that they are developed in a manner consistent with the interests of the nation.

The Government was considering the possibility of producing synthetic crude oil from coal, because of the recent oil crisis. Botswana's reserves of medium-grade, noncoking bituminous coal are among the largest in the world, reportedly totaling an estimated 40 billion tons.

The United Nations Development Program (UNDP) project to study water resources of eastern Botswana, including hydrological studies of the Okavango Delta, was terminated in May 1972; however, results of the study were not available until April 1973. Early studies reportedly showed that the water resources of eastern Botswana will be fully exploited by 1988. A preliminary feasibility study of the large-scale transfer of water from the Okavango area to the eastern part of the country is currently underway.

Reportedly, Government of Botswana policy is to promote prospecting by private organizations and to encourage rapid investigation and early relinquishment of prospecting areas. The Ministry of Mineral Resources and Water Affairs will grant prospecting concessions or mining leases in proven areas, dependent upon the organization's willingness to prospect or mine in the more remote areas of the country. Although the Government will maintain a favorable environment for private investment, it intends to participate in the ownership and management of mining companies. Also it will provide university training in geology and mining engineering for qualified Botswana citizens in order to prepare them for responsible positions.

The Mines and Minerals Act of 1967 is considered to be the most important legislation in the minerals field; however, the Government was drafting a comprehensive Mines, Quarries, Works Machinery and Equipment Bill in 1973, which will regulate mainly public health and safety.

The Botswana Government and the Canadian International Development Agency (CIDA) negotiated a $1.5 million loan for the purpose of conducting regional airborne magnetic surveys. The 2-year program will consist of a traverse along a line between Lake Ngami and Sua Pan. A second survey will be conducted in a southeasterly direction from near Ghanzi to Kanye. The objectives of the surveys are to measure the thickness of the Kalahari sands above bedrock and to delineate geological structures underlying the sands. Geophysical investigations on determining the depth and structure of the Okawango Delta in the Northwest District continued in 1973. Followup studies in adjacent areas are scheduled through 1975. In addition, the Geological Survey planned to study and compile a report on the distribution of trace elements in Botswana. The investigation was scheduled for completion in 1975. The Botswana Geological Survey also will continue a systematic mapping program.

Reportedly, the Government was studying the feasibility of establishing a quasi-governmental company, to include the Botswana Development Corp., for the purpose of producing building and construction materials such as gypsum, asbestos, limestone, rock aggregate, and clay. Except for several small rock quarrying operations, Botswana is almost entirely dependent on imports of construction materials.

The 1971 census report estimated the total labor force in Botswana at 385,000 persons. About 7% of the labor force (26,950) was employed in the cash economy, 6% (23,100) was employed in the cash economy and also in subsistence farming, and 60% (231,000) was engaged in subsistence agriculture. Perhaps as many as 60,000 are employed in the Republic of South Africa, many in mining. The remaining 11% (43,950) are unemployed. Persons engaged in mining are employed in the first two groups.

Production of mineral commodities in 1973 was valued at an estimated $34.9 million, compared with $27.7 million in 1972. Increased output and prices of diamond were mainly responsible for the sharp rise in total value of mineral output. Production of coal valued at $148,277 was recorded for the first time. Statistics on

production of mineral commodities are shown in table 1.

The copper-nickel mine and smelter at Selebi-Pikwe was progressing as planned, with mining operations providing ore to the crusher in October. The ore body was reached in the open pit, and 150,000 tons of ore was exposed for mining to supply the concentrating plant and smelter, which began operating at yearend. Water from the Shashe Dam, which had a 3-year supply available, was piped to the mine and smelter. A new power station at Selebi-Pikwe began supplying power to the mine from the first 15-megawatt generator installed. At yearend the power station was completed and turned over to Botswana Power Corp. The station also will supply electricity to Shashe and Francistown. Coal from a mine near Palapye was shipped to the smelter and the thermoelectric power station at Selebi-Pikwe over a new railroad line from Serule that was completed around September. BCL, the operating company for the consortium which owns the Selebi-Pikwe development, planned to make its first shipment of copper-nickel matte to the American Metal Climax, Inc. (AMAX), nickel refinery, Braithwaite, Louisiana, at yearend.

Coal production at the Morupule colliery of Anglo-American Corp. Botswana Ltd., located 6 miles west of Palapye, began around July. Mine development cost was reported as about $4.8 million. The present underground mine will be converted to an open pit operation if a market larger than the expected 200,000 tons per year can be developed. The mine was started primarily to supply coal to the electric power station and the copper-nickel complex at Selebi-Pikwe. Reserves of coal in a 98.8-square-mile area west of the colliery were estimated at 5,000 million tons based upon measurements taken from 64 boreholes.

The De Beers Botswana Mining Co. (Pty.) Ltd. announced in November that it would develop a second diamond mine on a kimberlite deposit about 25 miles southeast of the Orapa mine. It was expected that construction of the underground mine would be completed in 18 to 24 months. The kimberlite pipe, reportedly the fifth largest in the world, has a higher ratio of gem stones to industrial diamonds than the deposit at Orapa. Costs to develop the mine to the production stage have been estimated at $20 million. Apparently the company planned to enlarge processing facilities at Orapa and move the bulk kimberlite material from the new mine to Orapa by truck or conveyor belt for separation. Reportedly De Beers has located 14 kimberlite pipes in its Orapa concession area and was prospecting over an extensive area. Field surveys and drillings were carried out in the Southern District, and other surveys were conducted in the Central and Kgalagadi Districts.

Precious stone prospecting licenses also have been granted to United States Steel Corp. for areas in west and northwest Botswana, Cyril Hurvitz Exploration Co. (Pty.) Ltd. for areas in Southern and Kgalagadi Districts, and the Phoenix Mining and Prospecting Co. (Pty.) Ltd. for upper Okavanga.

A lease for mining gypsum west of Foley was granted to Minerals Research (Pty.) Ltd. Deposits containing an estimated 3 million tons have been proved, and a mine and plant to produce 5,000 tons per year will be constructed.

A refinery for extracting salt and soda ash from the Sua Pan, about 100 miles northwest of Francistown, could be constructed within the next 5 years by Makgadikgadi Soda Ltd., a subsidiary of BCL. The Government of Botswana would be responsible for constructing the infrastructure, which would include a township for 5,000 persons. A market for the soda ash could be developed in the Republic of South Africa where consumption of 180,000 tons per year results from a wide range of manufacturing processes. The plant at Sua Pan also would produce 100,000 tons per year of salt for local consumption and export to the Republic of South Africa, Zambia, and Malawi. Potash and sodium sulfate also could be recovered from the brine if markets for these products can be developed. The total cost of the project was estimated at about $130 million.

Table 1.—Other African Areas: Production of mineral commodities

Country, commodity, and unit of measure [1]	1971	1972	1973 [p]
BOTSWANA			
Coal (not further described) ---------- metric tons	--	--	15,532
Copper matte, copper content ---------- do	--	--	e 1,400
Diamond:			
Gem ---------- carats	82,191	360,440	362,469
Industrial ---------- do	739,723	2,042,496	2,053,991
Total ---------- do	821,914	2,402,936	2,416,460
Gem stones, semiprecious, rough, not further described ---------- kilograms	104,642	100,289	72,914
Manganese ore and concentrate, gross weight metric tons	r 35,603	--	340
Nickel matte, nickel content ---------- do	--	--	e 1,300
Talc ---------- do	130	688	--
BURUNDI [2 3]			
Lime ---------- do	e 140	150	e 150
Rare-earth metals, bastnaesite concentrate, gross weight ---------- do	e 275	250	--
Tin ore and concentrate:			
Gross weight ---------- long tons	e 65	154	e 350
Tin content ---------- do	e 50	111	e 250
CAMEROON [2]			
Aluminum metal, primary ---------- metric tons	50,693	46,200	e 44,000
Cement, hydraulic ---------- do	141,000	164,461	e 170,000
Gold, mine output, metal content ------- troy ounces	96	50	e 64
Stone:			
Limestone ---------- do	71,300	29,200	e 30,000
Marble ---------- do	1,500	800	e 800
Tin ore and concentrate:			
Gross weight ---------- long tons	30	35	e 30
Tin content ---------- do	22	19	e 24
CENTRAL AFRICAN REPUBLIC [2]			
Diamond: e			
Gem ---------- carats	284,342	345,907	251,108
Industrial ---------- do	153,107	178,195	129,358
Total ---------- do	437,449	524,102	380,466
Gold ---------- troy ounces	NA	NA	e 64
CHAD [2]			
Natron: e			
Slabs ---------- metric tons	7,000	NA	NA
Broken ---------- do		NA	NA
CONGO [2]			
Copper, mine output, metal content ----------do	1,647	1,371	927
Fertilizer materials, potash, crude, K_2O equivalent do	260,854	287,306	269,199
Gas, natural:			
Gross production ---------- million cubic feet	r 535	523	551
Marketed production ---------- do	r 535	523	551
Gold, mine output, metal content ------ troy ounces	2,974	2,082	1,222
Lead, mine output, metal content ------ metric tons	29	473	1,340
Petroleum, crude -------- thousand 42-gallon barrels	r 108	2,510	15,361
Zinc, mine output, metal content ------ metric tons	633	2,153	3,495
ETHIOPIA [2 4]			
Cement, hydraulic ---------- thousand metric tons	211	188	204
Clays, kaolin ---------- metric tons	10,285	26,584	e 12,570
Copper, mine output, gross weight ---------- do	--	--	1,900
Gold, mine output, metal content ------- troy ounces	21,226	20,784	19,575
Gypsum and anhydrite, crude ---------- metric tons	3,582	4,650	e 4,500
Lime ---------- do	14,380	47,142	11,230
Limestone ---------- do	148,720	167,786	98,523
Petroleum refinery products:			
Gasoline ---------- thousand 42-gallon barrels	659	627	639
Jet fuel ---------- do	300	200	249
Kerosine ---------- do	4	--	--
Distillate fuel oil ---------- do	1,405	1,331	1,388
Residual fuel oil ---------- do	1,815	1,558	1,596
Other:			
Liquefied petroleum gas ---------- do	39	37	41
Asphalt ---------- do	126	148	132
Unspecified ---------- do	--	38	--
Refinery fuel and losses ---------- do	647	561	584
Total ---------- do	4,995	4,500	4,629

See footnotes at end of table.

Table 1.—Other African Areas: Production of mineral commodities—Continued

Country, commodity, and unit of measure [1]	1971	1972	1973 [p]
ETHIOPIA [2 4]—Continued			
Platinum, mine output, metal content, troy ounces	217	248	235
Pumice, metric tons	--	8	10
Salt:			
Rock, thousand metric tons	10	10	e 10
Marine, do	280	281	107
Total, do	290	291	117
GUINEA [2]			
Aluminum:			
Bauxite, gross weight, do	r 1,997	2,050	e 3,050
Alumina, metric tons	r 665,020	663,270	635,000
Diamond: e			
Gem, thousand carats	22	25	25
Industrial, do	52	55	55
Total e, do	74	80	80
Gold, mine output, metal content e, troy ounces	4,000	4,000	4,000
IVORY COAST [2]			
Cement, hydraulic, thousand metric tons	500	583	600
Diamond: [6]			
Gem, thousand carats	130	e 134	e 120
Industrial, do	196	e 200	e 180
Total, do	326	334	300
Petroleum refinery products:			
Gasoline, thousand 42-gallon barrels	1,292	1,505	1,750
Jet fuel, do	320	342	425
Kerosine, do	388	310	380
Distillate fuel oil, do	1,790	2,206	2,534
Residual fuel oil, do	1,898	2,121	3,067
Other, do	70	446	81
Refinery fuel and losses, do	248	621	389
Total, do	6,006	7,551	8,626
LESOTHO [2]			
Diamond:			
Gem, carats	1,010	833	1,132
Industrial, do	5,805	8,186	7,456
Total, do	6,815	9,019	8,588
MALAGASY REPUBLIC [2]			
Abrasives, natural:			
Corundum, kilograms	1,465	3,000	--
Garnet (industrial only), do	40,500	10,700	2,600
Beryllium, beryl concentrate, industrial grade, gross weight, metric tons	60	9	3
Cement, hydraulic, thousand metric tons	70	64	70
Chromium, chromite concentrate, gross weight, metric tons	150,000	111,770	157,714
Clays, kaolin, do	1,969	1,968	1,823
Feldspar, do	r 2	2	1
Gem and ornamental stones:			
Agate, kilograms	25,194	--	12,600
Amazonite, do	7,208	1,200	1,500
Amethyst:			
Gem, do	11	2	4
Geodes, do	9,100	9,900	14,900
Apatite (ornamental only), do	--	--	2,400
Aragonite, metric tons	867	1,268	219
Beryl:			
Gem, kilograms	36	2	4
In quartz, do	150	NA	--
Calcite (ornamental only), do	1,600	NA	NA
Celestine, do	12,800	37,100	63,500
Chalcedony, do	--	--	200
Cipoline marble, metric tons	1,122	521	600
Citrine, gem, kilograms	13	10	22
Diopside, gem, do	850	--	384
Garnet:			
Gem, do	40	24	62
Other ornamental, do	3,300	3,700	9,000

See footnotes at end of table.

Table 1.—Other African Areas: Production of mineral commodities—Continued

Country, commodity, and unit of measure [1]	1971	1972	1973 [p]
MALAGASY REPUBLIC [2]—Continued			
Gem and ornamental stones—Continued			
Jasper ____ kilograms	320	270	500
Labradorite ____ do	7,900	12,500	56,600
Quartz:			
Rose quartz ____ do	69,600	158,900	165,100
Geodes ____ do	1,200	NA	NA
Other ornamental ____ do	[r] 43,900	18,600	37,400
Rhodonite ____ do	56,000	31,100	33,400
Tourmaline:			
Gem ____ do	--	--	200
Other ornamental ____ do	3,400	4,700	7,500
Gold, mine output, metal content ____ troy ounces	412	190	71
Graphite, all grades ____ metric tons	20,025	18,155	13,963
Mica, phlogopite:			
Block ____ do	34	58	125
Splittings ____ do	443	341	566
Scrap ____ do	111	187	199
Total ____ do	588	586	890
Petroleum refinery products:			
Gasoline ____ thousand 42-gallon barrels	967	1,062	1,198
Jet fuel ____ do	443	490	618
Distillate fuel oil ____ do	1,078	1,195	1,365
Residual fuel oil ____ do	1,337	1,269	1,511
Other ____ do	96	92	128
Refinery fuel and losses ____ do	330	368	260
Total ____ do	4,251	4,476	5,080
Quartz, piezoelectric ____ kilograms	600	2,100	400
Rare-earth metals:			
Bastnaesite concentrate, gross weight metric tons	61	42	--
Euxenite ore, gross weight ____ kilograms	400	--	--
Salt, marine ____ metric tons	27,900	21,000	[e] 20,000
Stone:			
Calcite (industrial) ____ do	1,321	152	382
Quartz (metallurgical) ____ do	92	153	17
Zirconium concentrate, gross weight ____ kilograms	2,700	14,000	--
Other, mineralogical samples, not further described ____ metric tons	22	700	922
MALAWI [2]			
Abrasives, natural, corundum ____ do	[e] 10	NA	NA
Cement, hydraulic ____ thousand metric tons	63	74	[e] 75
Gem and ornamental stone ____ metric tons	--	--	9
Kyanite ____ do	1,400	NA	NA
Lime [e] ____ do	250	250	250
Sodalite [e] ____ do	2,400	2,400	2,400
Stone, sand and gravel:			
Limestone ____ do	[e] 100,000	114,000	141,890
Shale [e] ____ do	100,000	100,000	100,000
Other stone ____ thousand cubic meters	[e] 300	NA	NA
Sand ____ do	[e] 200	NA	NA
MALI [2]			
Gold, mine output, metal content [e] ____ troy ounces	30	30	30
Salt [e] ____ metric tons	3,000	3,000	3,000
Stone:			
Limestone ____ do	[e] 2,500	NA	NA
Marble ____ do	[e] 2,500	NA	NA
MAURITANIA [2]			
Copper, mine output, metal content ____ do	4,740	15,051	21,277
Gypsum ____ do	--	[e] 600	1,375
Iron ore and concentrate, gross weight thousand metric tons	8,457	9,298	10,480
Rare-earth metals, monazite concentrate, gross weight [e] ____ metric tons	100	100	100
Salt, marine [e] ____ do	1,000	1,000	1,000
MAURITIUS [2]			
Lime ____ do	NA	6,000	[e] 6,600
Salt, marine ____ do	5,000	5,400	[e] 6,000
NIGER [2]			
Cement, hydraulic ____ thousand metric tons	30	33	[e] 33
Gold, mine output, metal content ____ troy ounces	119	--	--
Gypsum [e] ____ metric tons	400	1,500	1,500
Salt [e] ____ do	4,000	4,000	4,000
Stone, limestone, not further described [e] ____ do	30,000	33,000	33,000

See footnotes at end of table.

Table 1.—Other African Areas: Production of mineral commodities—Continued

Country, commodity, and unit of measure [1]	1971	1972	1973 [p]
NIGER [2]—Continued			
Tin, mine output, metal content ____ long tons __	67	73	91
Uranium concentrate, gross weight ____ metric tons __	429	867	948
RWANDA [2]			
Beryllium, beryl concentrate, gross weight ____ do ____	194	103	95
Columbite-tantalite, ore and concentrate, gross weight:			
Columbite-tantalite ____ do ____	473	[e] 500	33
Columbite-tantalite-tin ____ do ____	--	--	587
Lithium minerals, amblygonite ____ do ____	--	--	23
Natural gas:			
Gross [e] ____ million cubic feet __	20	25	26
Marketed ____ do ____	[e] 20	[e] 25	26
Tin, mine output, metal content ____ long tons __	[r] 1,333	1,468	[e] 1,500
Tungsten, mine output, metal content ___ metric tons __	200	260	[e] 380
SENEGAL [2]			
Cement, hydraulic ____ thousand metric tons __	241	335	296
Clays:			
Fuller's earth (attapulgite) ____ metric tons __	2,810	3,089	(7)
Other ____ do ____	2,650	2,000	[e] 2,000
Fertilizer materials, phosphatic:			
Crude:			
Aluminum phosphate __ thousand metric tons __	147	165	219
Calcium phosphate ____ do ____	[r] 1,454	1,250	1,533
Manufactured:			
Aluminum phosphate, dehydrated ____ do ____	[r] 39	52	64
Other [8] ____ do ____	2	6	5
Petroleum refinery products:			
Gasoline ____ thousand 42-gallon barrels __	669	988	874
Jet fuel and kerosine ____ do ____	587	776	805
Distillate fuel oil ____ do ____	834	1,183	1,077
Residual fuel oil ____ do ____	1,522	1,606	1,987
Other ____ do ____	66	54	44
Refinery fuel and losses ____ do ____	242	247	292
Total ____ do ____	3,920	4,854	5,079
Salt ____ metric tons __	116,000	134,899	140,000
Stone:			
Basalt ____ cubic meters __	25,100	55,738	81,500
Marble (cipoline) ____ do ____	350	375	380
SEYCHELLES ISLANDS [2]			
Phosphate rock, including coral rock phosphate metric tons __	6,000	9,217	[e] 9,500
SOMALI REPUBLIC [2]			
Salt, marine [e] ____ do ____	2,000	2,000	2,000
SOUTHERN RHODESIA [2 9]			
Asbestos [e] ____ do ____	80,000	80,000	80,000
Beryllium, beryl concentrate, gross weight [e] ___ do ____	90	60	60
Cement, hydraulic ____ thousand metric tons __	559	626	[e] 650
Chromium, chromite, gross weight [e] ____ do ____	[r] 600	[r] 600	600
Coal, bituminous [10] ____ do ____	3,093	2,762	3,060
Coke, metallurgical [10] ____ do ____	[e] 245	297	237
Columbium–tantalum minerals, tantalite, gross weight [e] ____ metric tons __	40	40	40
Copper:			
Mine output, metal content [11] ____ do ____	29,337	38,300	41,821
Metal:			
Smelter [11] ____ do ____	27,909	41,075	[e] 42,000
Refined [11] ____ do ____	23,300	30,000	30,000
Fertilizer materials, crude phosphate rock ____ do ____	105,000	110,000	150,000
Fluorspar [e] ____ do ____	150	150	150
Gold, mine output, metal content [e] ____ troy ounces __	501,551	502,000	500,000
Iron and steel:			
Iron ore [e] ____ thousand metric tons __	500	500	500
Pig iron and ferroalloys [e] ____ do ____	[r] 280	[r] 290	290
Crude steel [e] ____ do ____	160	[r] 200	300
Lithium minerals, gross weight [e 12] ____ metric tons __	61,000	61,000	61,000
Magnesite [e] ____ do ____	20,000	20,000	20,000
Nickel:			
Mine output, metal content [e] ____ do ____	11,600	12,000	11,800
Smelter production [e 13] ____ do ____	[r] 10,000	[r] 10,000	10,000
Pyrite: [e]			
Gross weight ____ thousand metric tons __	73	73	73
Sulfur content ____ do ____	30	30	30
Silver, mine output, metal content [14] thousand troy ounces __	91	126	169

See footnotes at end of table.

Table 1.—Other African Areas: Production of mineral commodities—Continued

Country, commodity, and unit of measure [1]	1971	1972	1973 [p]
SOUTHERN RHODESIA [2 9]—Continued			
Stone, industrial limestone [e] ____ thousand metric tons __	650	700	700
Tin: [e]			
Mine output, metal content _____ long tons __	600	600	600
Smelter _____ do ____	600	600	600
Tungsten, mine output, metal content [15] __ metric tons __	[r] 186	151	154
SPANISH SAHARA [2]			
Fertilizer materials, crude phosphate rock _____ do ____	([16])	150,000	696,400
SUDAN [2]			
Cement, hydraulic _____ do ____	[r] 189,000	159,000	208,397
Chromium, chromite concentrate, gross weight __ do ____	21,100	23,083	32,050
Gypsum and anhydrite, crude [e] _____ do ____	2,000	2,000	2,000
Iron ore, gross weight (exports) _____ do ____	4,100	--	--
Magnesite, crude [e] _____ do ____	100	100	100
Mica, all grades _____ do ____	97	NA	NA
Petroleum refinery products:			
Gasoline _____ thousand 42-gallon barrels __	810	863	904
Jet fuel _____ do ____	667	642	728
Kerosine _____ do ____	133	132	144
Distillate fuel oil _____ do ____	2,036	2,431	2,576
Residual fuel oil _____ do ____	1,268	1,650	1,950
Other _____ do ____	1,822	2,042	1,787
Refinery fuel and losses _____ do ____	331	383	490
Total _____ do ____	7,067	8,143	8,579
Salt _____ do ____	57,663	60,000	75,030
SWAZILAND [2]			
Asbestos, chrysotile _____ do ____	35,484	28,683	36,900
Barite _____ do ____	7,525	150	116
Clays, kaolin _____ do ____	2,049	2,177	1,602
Coal, bituminous _____ do ____	148,347	126,035	140,386
Iron ore, direct shipping, gross weight thousand metric tons __	2,886	2,566	1,993
Stone, quarry product _____ thousand cubic meters __	25	45	46
Talc (pyrophyllite) _____ metric tons __	204	108	126
TOGO [2]			
Cement, hydraulic (ground from imported clinker) _____ do ____	49,123	116,800	113,865
Clays for brick production _____ do ____	[e] 3,000	NA	NA
Fertilizer materials, phosphate rock:			
Run-of-mine _____ thousand metric tons __	[e] 3,430	NA	NA
Beneficiated product _____ do ____	1,715	1,928	2,292
Stone, marble _____ metric tons __	[e] 3,000	NA	1,240

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

[1] In addition to the countries listed individually in this table, Dahomey, Equatorial Guinea, the French Territory of the Afars and Issas, Gambia, and Upper Volta, all covered textually in this chapter, presumably produce modest quantities of crude construction materials such as clays, stone, sand, and gravel, and may produce minor amounts of other mineral commodities (most notably gypsum, lime, and salt), but no production data are reported, and available information is inadequate to make reliable estimates of output levels.

[2] In addition to the commodities listed, modest quantities of a variety of crude construction materials presumably were produced, but no production data are reported and available information is inadequate to make reliable estimates of output levels.

[3] Limited quantities of tungsten minerals and columbite-tantalite concentrates may also be produced, but no production data are reported and available information is inadequate to make reliable estimates of output levels.

[4] Includes output of the Province of Eritrea.

[5] Excludes 1,806,652 bricks reported produced in Ethiopia proper.

[6] Erroneously reported in previous edition; data presented therein were in carats, not thousands carats as indicated.

[7] Output for 1973 reported as 3,727 cubic meters.

[8] Products marketed under the trade names "baylifos" and "phosphal."

[9] In addition to the commodities listed, graphite, natural corundum, and mica have been produced in the past and output presumably has continued, but no basis for estimation of output is available; similarly, a variety of crude construction materials presumably continued to be produced, but no basis for estimation of output is available. Through 1965 natural corundum output was at a level of several thousand tons annually, ranking it second only to the U.S.S.R. in output of this commodity.

[10] Data are sales for years ended August 31 of that stated.

[11] Data are for years ended September 30 of that stated.

[12] Figures presented are 1964 total recorded production rounded; eycryptite, lepidolite, petalite, and spodumene were all produced in 1964. No reliable basis exists for estimating either individual output levels for these minerals or total output on a year-to-year basis for 1965–73.

[13] Includes nickel content of nickel oxide and nickel fonte.

[14] Output of Inyati mine only for years ended September 30 of that stated.

[15] Data are for Beardmore mine only for years ended September 30 of that stated.

[16] Revised to none.

BURUNDI [4]

The mineral industry of Burundi continued to be of minor importance to the national economy in 1973. Mineral output was limited to small tonnages of cassiterite (a tin mineral) concentrates and lime, small quantities of placer gold, and unmeasured amounts of common construction materials such as stone, sand and gravel, and clay. The only significant new mining activity during 1973 was the continued exploration and evaluation of nickel deposits in the eastern part of the country by a mineral survey team operating under the UNDP. Interest is exploring for oil on Lake Tanganyika and the Ruzizi plain continued, but no concession areas were granted by the Government.

Although the country was rocked by tribal strife in 1972 and again in May 1973, Burundi's economy remained strong, buoyed by high world coffee prices and substantial foreign aid. The balance of payments was positive for the fifth straight year, and export earnings rose $6.6 million to a record $31.4 million.[5] Agricultural products accounted for virtually all of the export earnings; mineral products, largely tin and rare-earth concentrates, comprised about 1% of the total. Imports of mineral commodities were primarily iron and steel semimanufactures, refined petroleum products, cement, and salt.

Although statistics on 1973 mineral production are not available, the output of bastnaesite, produced at a small underground mine near Karonge by Société Minérale de Karonge (SOMIKA), reportedly ceased owing mainly to declining ore grade and higher operating costs coupled with weak world prices. In 1972, bastnaesite output was estimated to be less than 300 tons. Tin was recovered by SOMIKA from alluvial deposits near the Rwanda border. Most of the tin concentrates was shipped to Europe for processing.

A UNDP mineral survey team pinpointed several areas of significant nickel mineralization in eastern and southeastern Burundi in 1973. The nickel, which is garnierite type, occurs in residual lateritic cappings on ultrabasic rocks in the Musongati massif. Results from a few, widely spread, shallow drill holes indicated the probable existence of sizable nickeliferous ore bodies at Musongati and Nyabikere. The ore zones, grading about 2% nickel, averaged 24 meters in thickness. At year-end, the UNDP team was investigating a third promising area of nickel mineralization along a 20-kilometer strip of basic and ultrabasic rocks between the towns of Rutana and Mabanda. The UNDP mineral survey project was expected to be completed near the end of 1974, at which time a final report of the field studies would be issued. Mining companies in the United States and Europe have expressed interest in the nickel deposits. However, the Burundi Government had not agreed to any mining grants.

CAMEROON [6]

The Federal Republic of Cameroon has a small mining industry that produced a few minerals in 1973. The country produced minor quantities of gold, limestone, marble, and tin ore. Other mineral-based commodities such as primary aluminum and hydraulic cement also were produced. The aluminum was produced from alumina imported from the neighboring country of Guinea.

Cameroon exported unwrought aluminum metal and tin ore and concentrate, and imported various metals, nonmetallic minerals, and petroleum refinery products.

Studies of bauxite deposits near Minim Martap were completed by Société d'Etudes des Bauxites du Cameron (SEBACAM) and were presented to the Government. The Minim Martap deposits are thought to have 2,000 million tons of reserves containing 43% aluminum oxide. Because the deposits are located a relatively long distance from a seaport, development is not anticipated in the near future.

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[4] Prepared by James H. Jolly, physical scientist, Division of Nonferrous Metals—Mineral Supply.

[5] Where necessary, values have been converted from Burundi francs (RBF) to U.S. dollars at a rate of RBF78.35=US$1.00.

U.S. Embassy, Bujumbura, Burundi. Economic Trends Report. State Department Airgram A-33, Apr. 12, 1974, p. 3.

[6] Prepared by Benjamin Petkof, physical scientist, Division of Nonferrous Metals—Mineral Supply.

Traces of oil and natural gas have been found in the offshore areas of Cameroon, but problems relating to the geologic structure have delayed active drilling. Several companies are actively engaged in oil exploration under government licenses.

The Government announced that work was conducted in the area of Poli for uranium, at Manfe for corrundum and sapphire, at Batquri and Betare-Oya for auriferious quartz, and at Poli and Tcholliré for copper.

Table 2.—Cameroon: Foreign trade in mineral commodities
(Metric tons unless otherwise specified)

Commodity	1971	1972
EXPORTS		
METALS		
Aluminum metal, including alloys:		
Scrap	38	29,836
Unwrought	28,722	
Semimanufactures	5,751	6,721
Copper metal, including alloys:		
Scrap	266	NA
Unwrought	--	
Iron and steel metal:		
Scrap	3,091	NA
Semimanufactures	279	352
Lead:		
Ore and concentrate	22	NA
Metal, including alloys, unwrought and semimanufactures	28	
Tin ore and concentrate	31	NA
Other ore and concentrate of base metals, n.e.s	341	NA
NONMETALS		
Cement	2,461	4,778
Fertilizer materials:		
Crude, potassic	--	NA
Manufactured:		
Nitrogenous	174	
Potassic	8	NA
Other, including mixed	11	
Lime	--	NA
Salt and brine	115	NA
Talc, steatite, soapstone, pyrophyllite	10	NA
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	9	NA
Hydrogen, helium, rare gases	23	NA
Petroleum:		
Crude and partly refined ------ --- thousand 42-gallon barrels --	(1)	NA
Refinery products ---------- do ----	3	
IMPORTS		
METALS		
Aluminum:		
Oxide and hydroxide	92,011	85,075
Metal, including alloys, all forms [2]	497	433
Arsenic trioxide, pentoxide, acids	5	NA
Chromium:		
Chromite	20	NA
Oxide and hydroxide	--	
Copper metal, including alloys, all forms [2]	83	218
Iron and steel metal:		
Scrap	--	
Pig iron, ferroalloys, similar materials	110	
Steel, primary forms	73	
Semimanufactures:		
Bars, rods, angles, shapes, sections	14,829	[2] 62,432
Universals, plates, sheets	11,301	
Hoop and strip	872	
Rails and accessories	20,208	
Wire	3,548	
Tubes, pipes, fittings	4,707	
Lead:		
Oxides	49	NA
Metal, including alloys, all forms [2]	18	24
Magnesium metal, including alloys, all forms [2]	110	[3] 100
Manganese oxides	--	NA
Nickel metal, including alloys, all forms [2]	2	1
Platinum and platinum-group metals ---------- troy ounces --	--	NA

See footnotes at end of table.

Table 2.—Cameroon: Foreign trade in mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972
IMPORTS—Continued		
METALS—Continued		
Tin metal, including alloys, all forms [2] long tons	3	9
Titanium oxides	102	NA
Zinc:		
Oxide	33	NA
Metal, including alloys, all forms [2]	12	23
Other:		
Ore and concentrate of base metals, n.e.s	8	NA
Oxides, hydroxides, peroxides of metals, n.e.s	1	
Metals, including alloys, all forms:		
Alkali, alkaline earth, rare-earth metals	2	NA
Pyrophoric alloys	1	
Base metals, including alloys, all forms, n.e.s.[2]	2	1
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	26	NA
Grinding and polishing wheels and stones	25	
Asbestos	6	NA
Barite and witherite	1,791	NA
Boron materials:		
Crude natural borates	43	NA
Oxide and acid	70	
Cement	136,814	176,509
Chalk	277	NA
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	258	NA
Products:		
Refractory (including nonclay brick)	1,329	NA
Nonrefractory	1,466	
Cryolite and chiolite	--	NA
Diatomite and other infusorial earth	524	NA
Fertilizer materials:		
Crude:		
Nitrogenous	13	NA
Potassic	4,391	
Manufactured:		
Nitrogenous	54,835	28,900
Phosphatic	890	NA
Potassic	4,362	5,387
Other, including mixed	417	4,999
Ammonia	336	NA
Graphite, natural	10	NA
Gypsum and plasters	2,004	NA
Lime	1,625	NA
Magnesite	1	NA
Mica, crude, including splittings and waste	2	NA
Pigments, mineral:		
Natural, crude	67	NA
Iron oxides, processed	22	
Salt	20,982	696
Sodium and potassium compounds, n.e.s	2,814	NA
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	--	NA
Worked	1	
Dolomite, chiefly refractory grade	881	
Gravel and crushed rock	4	
Limestone (except dimension)	1,416	
Sand, excluding metal bearing	148	
Sulfur:		
Elemental, all forms	6	NA
Sulfur dioxide	--	
Sulfuric acid, oleum	106	
Talc, steatite, soapstone, pyrophyllite	228	NA
Other:		
Crude	166	38,277
Slag, dross, similar waste, not metal bearing	--	19
Oxides and hydroxides of magnesium, strontium, barium	2	NA
Bromine, iodine, fluorine	1	
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	506	
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	709	NA
Carbon black	2	NA
Coal and briquets	71	NA
Coke and semicoke	70	NA
Hydrogen, helium, rare gases	11	NA

See footnotes at end of table.

Table 2.—Cameroon: Foreign trade in mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity		1971	1972
IMPORTS—Continued			
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum refinery products:			
Gasoline	thousand 42-gallon barrels	818	766
Kerosine	do	536	499
Residual fuel oil	do	816	769
Lubricants		70	
Other:			
Liquefied petroleum gas	do	28	
Pitch	do	131	431
Bitumen and other residues and bituminous mixtures, n.e.s	do	47	
Unspecified	do	5	
Total	do	2,451	2,465
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals		116	25,525

NA Not available.
[1] Less than ½ unit.
[2] May include some quantities of more highly processed materials than usually reported in Minerals Yearbook.
[3] May include some beryllium.

Source: 1971: Eurostat, Foreign Trade Yearbook 1970–71 for Mauritania, Niger, Senegal, Togo, Chad, Cameroon, Madagascar, Zaire. Luxembourg 1973; 1972: Ministere du Plan et de la Comptabilite Nationale, Bulletin Mensuel de Statistique No. 2, February 1974.

CENTRAL AFRICAN REPUBLIC [7]

An improved year for the mining industry in 1972 was followed by a weaker performance in 1973, but prospects for the future had become a little brighter by yearend. Diamond production, which had risen 20% in 1972, fell 27% in 1973, to reach its lowest point in 11 years, and other potential mineral developments again failed to move ahead. However, a contract for petroleum exploration was signed during the year, and progress was made in negotiations on the Bakouma uranium deposit, thus providing some rays of hope for progress in the future.

Government Policies and Programs.—Authorities in the Central African Republic indicated their increasing concern about the slow rate at which domestic employees of international companies were being trained for and promoted into skilled labor and managerial positions in place of European expatriates. In a press interview, the Minister of Justice and Labor quoted statistics showing that less than 1% of the country's citizens who were employed by foreign companies held such jobs.[8]

As a part of a continuing effort to obtain foreign assistance in the country's development, the Government signed an agreement with Romania to form a joint mining company. The firm, named Scaromines, will conduct a variety of research and exploration programs concentrating on iron, copper, diamond, and hydrocarbons.[9]

PRODUCTION AND TRADE

Diamond production in the Central African Republic declined by 27% to 380,000 carats in 1973 from 524,000 carats in 1972. Total value declined at a similar rate to $10.9 million in 1973 from $15.0 million in 1972. The proportion of gem to industrial diamond was estimated to have remained the same as in the year before: 66% gems and 34% industrial stones by weight. Implied in the value figures was a slight decrease in the overall unit price, to $26.97 per carat in 1973 from $28.57 in 1972, when the relative change in the values of the African Financial Community franc (CFAF) and the U.S. dollar are taken into account.[10] Since production is not broken down between the large-scale company operations and individual native digging activity, it is not possible to determine which was responsible for the slump in ouptut.

The country's only other mineral production consisted of gold and building ma-

[7] Prepared by David G. Willard, economist, Division of Nonmetallic Minerals—Mineral Supply.
[8] Joint Publications Research Service. Government Insists on Central Africanization of Cadres. Translation on Africa. No. 350, JPRS L/4657, Aug. 30, 1973, p. 47.
[9] Joint Publications Research Service. Joint Central African-Romanian Firm. Translations on Africa No. 1422, JPRS 61049, Jan. 23, 1974, p. 5.
[10] Where necessary, values have been converted from African Financial Community francs (CFAF) to U.S. dollars at a rate of CFAF225=US$1.00 in 1972 and CFAF240=US$1.00 in 1973.

terials, but neither quantity nor value of output was reported for either commodity. A small quantity of gold is recovered as a byproduct of diamond mining operations. Building materials output includes crushed stone and sand and gravel, plus brick and ceramic tile from domestic plants.

Statistics on diamond production in the Central African Republic are included in table 1.

Exports of diamond increased in quantity in 1972 but decreased in value. Exports totaled 505,385 carats in 1972, compared with 427,254 carats in 1971, a gain of 18%; but their value declined by 6%, from $13.3 million in 1971 to $12.5 million in 1972. Variations in the proportion of gem to industrial stones, along with the country's perennial problem of smuggling, probably accounted for the difference in trends. Since diamond constitutes more than 95% of total mineral exports by value (the remainder consisting of reexported scrap metals, structural clay products, fertilizer materials, and salt), mining's contribution to the balance of trade declined accordingly. Data were not available on imports of mineral commodities; however, mineral trade in previous years had been showing a positive but decreasing balance, and this trend doubtless continued.

COMMODITY REVIEW

Diamond.—An expansion of the diamond mining operation that was formed in 1972 resulted in the establishment of a new company, Société Centrafricaine d'Exploitation Diamantifere (SCED). Ownership of SCED was divided between the Government with 20%, Diamond Distributors, Inc. (DDI), with 20%, and a new majority partner, Cominco, Ltd. with 60%. The addition of Cominco permitted an expansion of the planned investment to some $8 million which will be used for exploration and development of mines at N'Zako and Berberati, enlargement of the diamond cutting facility at Bangui, and assistance to independent native diamond producers. Construction of the new cutting factory and National Diamond Center began early in 1973. SCED's entire output will be marketed by DDI.[11]

Petroleum.—A concession was granted to the combine of Shell Oil Co. and Continental Oil Co. (CONOCO) to explore for petroleum in the northern part of the country, next to the border of Chad where the combine currently has drilling operations underway. A total of $1.75 million is expected to be spent on exploration between 1973 and 1978.[12]

Uranium.—Development of the uranium deposits at Bakouma was handed over to Swiss Aluminum Ltd. of Zurich (Alusuisse) after the U.S. company Agricola Metals Corp. was unable to locate an applicant for the concession within the 1-year period agreed upon in its 1972 contract with the Government. Agricola had, in fact, succeeded in interesting Westinghouse Electric Corp. in the deposits, but the negotiations with Alusuisse had proceeded too far by the time a Westinghouse representative arrived in the country. Alusuisse was granted the exclusive right to explore Bakouma during 1974–75 and to exploit the deposit afterward if it is determined to be commercial.

The legal situation in regard to Bakouma remained muddy since the Government had unilaterally voided its original contract with Compagnie des Mines d'Uranium de Bakouma (URBA) after URBA had failed to meet its scheduled date for opening a mine, and had not given Agricola the 2 months' notice of termination required under that contract. Difficulty in separating the uranium from its high-phosphate ore and the weak uranium market of recent years have been the main problems holding up development of the resource.[13]

Other Minerals.—Funds were included in the 1973 government budget for construction of a cement clinker grinding plant.

As part of the agreement setting up Scaromines, that company was given the right to develop the iron ore deposits of the Bogoin region. Previous studies of these deposits had regarded them as too small to be commercial.[14]

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[11] Northern Miner. Cominco to Mine Diamonds in Central African Republic. V. 59, No. 37, Nov. 29, 1973, p. 32.
U.S. Embassy, Bangui, Central African Republic. State Department Airgram A-60, July 7, 1973, pp. 4–5.

[12] U.S. Embassy, Bangui, Central African Republic. State Department Airgram A-40, May 11, 1974, p. 6.

[13] U.S. Embassy, Bangui, Central African Republic. State Department Airgram A-11, Feb. 9, 1974, 4 pp.

[14] Joint Publications Research Service. Romanian Minister's Visit. Translations on Africa No. 352, JPRS L/4659, Sept. 12, 1973, p. 8.

Romanian aid was also involved in the plans for a 15,000-ton-per-year nitrogenous fertilizer plant, for which no starting date had been announced. Cost of the plant was estimated at approximately $100,000.[15]

Mineral resource studies by the Government, the UNDP, and the Bureau de Recherches Géologiques et Miniéres (BRGM) continued during the year. These studies, involving deposits of tin in the Yalinga and N'Zako regions and evidences of mineralization in other parts of the country, were scheduled over the period 1971–75.[16]

CHAD [17]

Chad produces only natron and an unreported amount of common salt and building materials; the latter includes clay for the brickyard at N'Djamena (formerly Fort Lamy), which is mined at quarries at Mani on the right bank of the Chari River, and at Niellim on the road to Sarh (formerly Fort Archambault). Reported minerals production is given in table 1.

Reported exports of mineral products were negligible, except for refueling of international aircraft and a small tonnage of natron. Imports included small amounts of basic semifinished metal and nonmetal products, and fuels, which are all imported except for firewood. Trade in these commodities is shown in table 3.

Production of natron, the chief mineral product of Chad, has been erratic in recent years; it was discontinued temporarily in 1970 because of the large inventories on hand, which corresponded to a 3-year supply, and apparently resumed subsequently. Natron was a monopoly of National Marketing Company of Chad (SONACOT) until the shutdown, and was afterwards opened to private enterprise.

A specimen of natron was examined by the U.S. Bureau of Mines, by optical emission spectroscopy, X-ray diffraction, and chemical analysis. It was identified as the equivalent of the mineral trona produced in the United States, with the formula $NaHCO_3 \cdot Na_2CO_3 \cdot 2H_2O$. Only trace amounts of calcium and magnesium were found, and concentrations of sulfate and chloride ions were very low.

Reconnaissance surveys of gold, copper, and lead occurrences were continued during the year under the UNDP, particularly in the regions around the towns of Pala, Fianga, Léré, Tagobo, and Foulbé in Mayo Kebbi Prefecture, south of N'Djamena; and in Ouaddai Prefecture in the east. The UNDP also planned to train local prospectors and to construct a minerals laboratory.

The CONOCO, in equal partnership with Shell since 1972 was scheduled to finish in September its stepped up seismic campaigns, which had examined areas around Mondou, Doba, and Sarh; south of Bousso; and near Mao and Rig Rig, in the Kanem District northeast of Lake Chad.[18] It was planned to drill several test holes late in 1973 or early in 1974. Oil exploration, like other mineral activity, has been hampered by local unrest.

[15] Page 6 of second work cited in footnote 11.
[16] Joint Publications Research Service. New Uranium Process Studied: Diamond Production Decreases. Translation on Africa No. 1244, JPRS 57791, Dec. 18, 1972, p. 6.
[17] Prepared by William F. Keyes, physical scientist, Division of Nonmetallic Minerals—Mineral Supply.
[18] Annales de Mines (Paris). October 1973, pp. 106–107.

Table 3.—Chad: Foreign trade in mineral commodities
(Metric tons unless otherwise specified)

Commodity	1971	1972
EXPORTS		
METALS		
Iron and steel:		
Scrap	--	NA
Semimanufactures, tubes, pipes, fittings	23	
NONMETALS		
Clay products, nonrefractory building bricks	--	NA
Natron	1,079	7,000
Other nonmetallic minerals, crude, n.e.s	5	8,003

See footnote at end of table.

Table 3.—Chad: Foreign trade in mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972
EXPORTS—Continued		
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Motor ---------- 42-gallon barrels --	26	
Lubricants ---------- do ----	14	NA
Liquefied petroleum gas ---------- do ----	--	
IMPORTS		
METALS		
Aluminum metal, including alloys, all forms ----------	151	166
Copper metal, including alloys, semimanufactures ----------	5	NA
Iron and steel metal:		
Pig iron ferroalloys, similar materials ----------	4	3,793
Semimanufactures ----------	4,661	
Lead metal, including alloys, unwrought and semimanufactures ----------	2	NA
Tin metal, including alloys, semimanufactures ---------- long tons --	1	NA
Zinc metal, including alloys, semimanufactures ----------	1	NA
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc ----------	3	NA
Grinding and polishing wheels and stones ----------	11	
Cement ----------	11,427	11,496
Clay products (including all refractory brick):		
Refractory (including nonclay brick) ----------	4	NA
Nonrefractory ----------	223	
Diatomite and other infusorial earth ----------	16	NA
Fertilizer materials:		
Crude:		
Nitrogenous ----------	--	NA
Potassic ----------	4	
Manufactured:		
Nitrogenous ----------	799	
Phosphatic ----------	515	NA
Potassic ----------	140	
Other, including mixed ----------	--	
Ammonia ----------	--	NA
Lime ----------	271	NA
Mica, worked, including agglomerated splittings ----------	1	NA
Pigments, mineral, iron oxides, processed ----------	1	NA
Salt and brine ----------	5,195	4,090
Sodium and potassium compounds, n.e.s ----------	536	NA
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked ----------	--	NA
Worked ----------	2	
Gravel and crushed rock ----------	--	NA
Sulfur:		
Elemental, other than colloidal ----------	81	NA
Sulfuric acid, oleum ----------	24	
Talc, steatite, soapstone, pyrophyllite ----------	16	NA
Other, building materials of asbestos cement and fiber cement ----------	220	NA
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural ----------	21	NA
Hydrogen, helium, rare gases ----------	15	NA
Lignite and lignite briquets ----------	15	NA
Petroleum refinery products:		
Gasoline ---------- thousand 42-gallon barrels --	226	162
Kerosine ---------- do ----	150	124
Distillate fuel oil ---------- do ----	168	143
Residual fuel oil ---------- do ----	14	NA
Lubricants ---------- do ----	14	9
Other:		
Liquefied petroleum gas ---------- do ----	4	NA
Unspecified ---------- do ----	22	5
Total ---------- do ----	598	NA

NA Not available.

Source: 1971: Eurostat. Foreign Trade Yearbook 1970–71 for Mauritania, Niger, Senegal, Togo, Chad, Cameroon, Madagascar, Zaire, Luxembourg, 1973; 1972: Ministere du Plan et Des Aides Exterierues, Sous-Direction de la Statistique, Bulletin de Statistique No. 208, 1st quarter 1973.

CONGO [19]

Potash continued to be the major product of Congo's mineral industry in 1973. Copper, lead, and zinc comprised the metal production, while petroleum production assumed increasing importance.

Potash was mined from a high-grade sylvite deposit at Holle (60% K_2O) by the Compagnie des Potasses du Congo (CPC) from mines 45 kilometers from Pointe Noire. Potash production was 443,911 tons, with exports estimated at 430,000 tons per year.[20] Concentration of the raw salt was by flotation, with a total capacity of about 800,000 tons. Although potash reserves were estimated at 35 million tons of K_2O,[21] complications in the geologic structure made further exploitation difficult. The possibility of exploiting the carnallite deposits was being considered.

Mine output of metals was relatively small. Société Miniere de M'Passa evaluated its low-grade ore and determined that about 400,000 tons of copper-lead-zinc ore were available. In 1972, exploration teams with U.S.S.R. technical assistance determined that there were deposits in the Djenguilé District estimated 300,000 tons averaging 28% lead, 9% zinc, and 4% copper. Deposits in the Yanga-Koubenza area were estimated at 1.2 million tons of ore grading 12% lead, 16% zinc, and 5% copper. The Katanga copper-bearing strata was mapped as extending into the Niari Basin, and in August 1973, Essence et Lubrificiant de France (Elf), Elf-Congo signed an agreement to explore this area. In other metals, the Congolese Mining Bureau reported reserves of cassiterite at 1,400 tons, but no mention of any type of exploitation of these tin deposits was made in 1973. Late in 1973 Romanian exploration teams were reported to have been involved in exploration for iron ore deposits. These developments, together with the construction of a mill scheduled for completion in 1974 at Mfouati, provide a potential for a significant increase in metal production.

Petroleum has been a major mineral product since the small Pointe Indienne Field was discovered in 1960. By mid-1972 the field had been largely depleted with a total production of 5.4 million barrels of crude oil.[22] The Emeraude Field was discovered in 1969 and was producing by late 1971. In February 1973 the northern part of the Emeraude went into production, and 13 wells were completed with a yield for 1973 of 42,000 barrels per day.[23] Further exploration was to be conducted as Elf-Congo was granted exploration permits by the Congolese Government on a 4,550-square-kilometer offshore tract and a 1,660-square-kilometer onshore tract. The Government has 15% participation in each tract. Production for the Emeraude Field is expected to reach 22 million barrels per year in 1975. Wildcat wells drilled by Elf-Congo discovered gas in the pre-salt Chela sandstone, and Louvessi Marine discovered oil in the upper Albian sandstone.

In July 1973 the Congolese Government formed a national company called Hydro-Congo to conduct its own petroleum exploration and exploitation. The Government also was involved in building a refinery. A contract was signed with Siberta, a Belgian consortium, for refinery equipment to be prefabricated in Belgium. Completion of the refinery was scheduled for 1975.

Gas production in 1973 was 15.6 million cubic meters. Gas was put to domestic use primarily to generate electricity at the Holle steam generating station.

Further exploitation of mineral deposits has been seriously hampered by inadequate transportation facilities, but progress designed to alleviate this situation were underway in 1973. These programs include straightening and strengthening of track and roadbed and the purchase of new locomotives and cars for the Congo-Ocean Railroad. These improvements were projected to increase the line's capacity to 10 million tons per year by 1975, largely for increased ore traffic. At the port of Pointe Noire dredging was undertaken to increase the depth of the port to accommodate ore ships of 65,000 tons. A harbor for oil tankers up to 130,000 tons was scheduled to be completed by yearend.

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[19] Prepared by Ronald J. DeFilippo, physical scientist, Division of Nonferrous Metals—Mineral Supply.

[20] U.S. Department of State. Congo (Brazzaville). Bulletin 7896 (revised), June 1973, 4 pp.

[21] Mining Journal Ltd. (London). Mining Annual Review. 1974, p. 373.

[22] Converted at 7.206 barrels per ton of crude oil.

[23] American Association of Petroleum Geologists Bulletin. V. 58, No. 10, October 1974, p. 2057.

DAHOMEY [24]

The mineral industry of Dahomey was a minor factor in the economy of the country in 1973; the gross national product (GNP) was estimated at about $280 million.[25] Dahomey's main industry is agriculture; 75% of the population depends upon subsistence crops for a living. Salaried employees totaled about 38,000, of whom more than two-thirds were in public service.

Production of mineral commodities in Dahomey consisted of sand and gravel output and the manufacture of cement from imported clinker. Two companies were preparing to recover salt from sea water operations. Output was expected to begin in 1974. Deposits of marble, phosphate, and limestone have been discovered but are not quarried at present. Gold deposits have been located in northern Dahomey, but no production was reported in 1973. Traces of copper minerals have been found in the Lanta area, southwestern Dahomey. An undeveloped deposit of iron ore, estimated to contain 250 million tons (50% iron content) of reserves, has been located at Loumbo-Loumbo, northern Dahomey.[26] Exploration for crude oil in offshore waters by Union Oil Co. of California led to the discovery of a modest deposit in 1968, which was considered to be uneconomic to develop. In early 1973, Union Oil relinquished its concession area to the Government of Dahomey. Several other oil firms, including U.S. companies, were negotiating with the Government for rights to the concession at yearend. A ceramics factory located in Cotonou was expected to begin operating later this year. Capacity of the plant was reported as 630 tons of industrial ceramics, tiles, and sanitary articles.

The UNDP in association with the Government of Dahomey was studying underground water resources in northern Dahomey and working to strengthen the Government Geological and Mining Service. The underground water study consisted of using near-surface groundwater to irrigate small farms in order to increase market gardening and food crops. The program to strengthen the Geological and Mining Service consisted of training Dahomey nationals by studying mineral deposits in the north-east and central-east regions. A thorough study will be made of copper, chrome, and nickel traces found in seven areas investigated in previous years. The first phase of the program was completed in midyear. The second phase will consist of surveys of areas in the northwest, on both sides of the Atacora range, and in the south. Possible extensions into Dahomey of the Togo phosphate deposits will be investigated. The program was scheduled for a 2-year period. A reorganization of the Department of Mines also was planned.

The Government of Dahomey in its 4-year plan (1972–75) will give priority to the construction of import substitution industries such as cement, marble, and ceramic plants, and a petroleum refinery. Preliminary work will begin in 1974 on the cement plant located at Onigbolo and a petroleum refinery.

A new mining and petroleum code was passed in April. The code defines the rights of authorized firms in regards to prospecting permits and exploitation permits.

Several ministers from the Dahomey Government and a Romanian delegation conferred on the possibility of Romanian organizations exploiting Dahomey's crude oil.

In November the Council of Ministers approved a decree requiring all industrial and business organizations located in Dahomey to establish their head office and keep records in the country by January 1, 1974.

A clinker grinding plant managed by the Dahomey Cement Co. has been operating since September 1970. Although capacity of the plant is 200,000 tons per year, production was 16,350 tons in 1970 and 86,588 tons in 1971.[27]

At yearend 1973, Shell Oil Co. of Dahomey with a 4,632-square-mile onshore and offshore concession area near the border with Togo was the only active petro-

[24] Prepared by Henry E. Stripp.
[25] Where necessary, values have been converted from African Financial Community francs (CFAF) to U.S. dollars at the rate of CFAF220=US$1.00.
[26] Mining Annual Review (London). Dahomey. June 1974, p. 376.

leum firm in Dahomey. Pividoy International Corp. of Los Angeles held a petroleum concession area during 1972, but their area reverted to Dahomey in 1973. Litwin Ltd. of the United Kingdom was given a contract for the design and construction of an 18,000-barrel-per-day petroleum refinery at Cotonou.

EQUATORIAL GUINEA AND FERNANDO PO [28]

The mineral industry of Equatorial Guinea and Fernando Po contributed negligible value to the economy of the country in 1973. Production of mineral commodities probably consisted of the quarrying of stone, and sand and gravel for local use in construction. Agriculture is the dominant industry.

Generally there has been a lack of private foreign investment; however, the completion of the Port of Bata, expected by 1975, may create opportunities for private foreign investment. Potential investment in Equatorial Guinea and Fernando Po has been inhibited by the lack of an investment code and laws specifically outlining natural resource exploitation. Despite these factors exploration for crude oil in offshore waters, mainly by Spanish and United States firms, has taken place since 1968 when the country became independent from Spain. In 1973 three U.S. petroleum companies were negotiating with the Government of Equatorial Guinea for unused petroleum exploration concessions, which were held at one time by several large U.S. oil companies. Merchants Petroleum Co. acquired a 5% interest in Aracca Petroleum Corp. exploration concessions of about 18 million acres offshore West Africa, including a concession in Equatorial Guinea; both companies are U.S. firms.[29] No drilling plans were disclosed.

ETHIOPIA [30]

Ethiopia's mineral industry was a minor factor in the economy of the country. Although the total value of mineral commodities produced in Ethiopia was small, the country has the potential to greaty increase production and value of mineral products. Output of copper ore and concentrates for the first time was reported by Ethio-Nippon Mining Co. There was renewed interest in exploration for nonferrous minerals in the area around Debarwa-Adi Nefas. Exploration for crude oil and natural gas continued in the Ogaden Region, southwestern Ethiopia, with Tenneco Ethiopia, Inc., testing the commercial potential of its crude oil and natural gas deposits discovered at yearend 1972 and January 1973, respectively.

The Ethiopian Government and the UNDP signed an agreement for a project covering a period of 3 years, to strengthen the Geological Survey. UNDP's contribution to the project was valued at about $1.2 milion,[31] while Ethiopia would contribute more than $4.8 million in kind. The Ethiopian Geological Survey and UNDP carried out an investigation of the size of alluvial gold deposits in western Wallega Province. Exploration for copper and gold deposits also was continued near Katta, where several small occurrences of high-grade ore have been found. Exploration was conducted in Tigre, Eritrea, and Wallega Provinces to determine the ore grade and size of the many mineral deposits indicated by iron ore gossans, geochemical anomalies, and copper occurrences.

A general investigation of the gold potential of Ethiopia was also undertaken by the Geological Survey. Results of the Survey's reconnaissance studies reportedly will be available in mid-1974. Detailed investigations of gold deposits in the Government mining area near Sidamo were carried out, as well as studies of the grade and size of diatomite deposits in the Provinces of Shewa, Ansi, and Harar. Limestone reserves and grade were inventoried for the cement factory at Diredawa, and

[27] Bulletin de l'Afrique Noire. Industry Electric Power, Highway Infrastructure Surveyed. Mar. 14, 1973, pp. 14249–14257.
[28] Prepared by Henry E. Stipp.
[29] World Petroleum Report. Equatorial Guinea. V. 20, 1974, p. 56.
[30] Prepared by Henry E. Stipp.
[31] Where necessary, values have been converted from Ethiopian dollars (Eth$) to U.S. dollars at the rate of Eth$2.05 = US$1.00.

silica sand deposits were investigated for the local manufacture of glass.

The Government of Ethiopia reportedly welcomes the participation of U.S. companies in developing the country's natural resources. Very favorable mining legislation was passed 5 years ago, and prospects are now thought to be good for locating deposits of copper, platinum, and lead. In early 1973, total U.S. investment in Ethiopia was estimated at $23.7 million, mainly in the petroleum and manufacturing sectors of the economy.

Production of mineral commodities in 1973 increased sharply in value, owing largely to higher prices for petroleum products, cement, salt, and gold as shown in table 1. Foreign trade in mineral commodities consisted mainly of exports of petroleum products to the French Territory of the Afars and Issas and imports of semimanufactured iron and steel products and crude oil and refined products, as shown in tables 4 and 5.

The Ethio-Nippon copper mine at Debarwa was expected to furnish about 160,000 tons of concentrate valued at about $50 million over an 8-year period.[32] Reportedly the grade of ore, 7.8%, was among the highest in the world. The company also planned to recover about 10,000 tons of zinc concentrate. When fully operational, the Debarwa mine will employ 300 persons including Ethiopian mining technicians. At yearend Ethio-Nippon shipped 1,900 tons of copper concentrate, valued at about $341,000, to the port of Massawa for export to Japan. Annual output of concentrates was expected to reach 40,000 tons per year in about 2 years. The company planned to begin mining operations at its Adi Nefas deposit, about 6 miles east of Asmara, in 1977.

An exploration license for copper and several other metals was granted to Tenneco Ethiopia, in an area west of Ethio-Nippon's concession area at Debarwa.

Artena Corp. was studying lateritic nickel deposits in Sidamo Province. Reportedly an exploration license for gold and base metals was granted to a Canadian firm for a small concession area in Wallega Province.[33]

Tenneco Ethiopia continued drilling operations in its 50-million-acre concession area in the Ogaden Desert near Godi. Tenneco, which holds a 50% interest in the concession, was operator for the group, which includes Chevron Ethiopia Inc. and Texaco Ethiopia Inc., each with a 25% interest. In early 1973, Tenneco discovered a high-volume natural gas deposit with its Calub No. 1 well, located about 400 miles southeast of Addis Ababa.

Whitestone International-Louisiana Land and Exploration Co., which obtained a petroleum concession in Harar Province north of Tenneco's area, began seismic studies.

The Ethiopian Oil Corp. (EOC) contracted for additional geophysical work in its Red Sea concession area. One or two exploratory holes were to be drilled offshore in the EOC concession. In October, drilling on two holes located at 16°50'N, 39°10'E and at 16°39'N, 39°10'E was completed with negative results for General American Oil Co. Despite the adverse results, prospects were described as favorable that future drillings would locate crude oil.

The oil refinery of Ethiopian Petroleum Share Co. at Assab has an operating capacity of about 625,000 tons. It operates about 335 days per year on three shifts and is closed down for 1 month for repairs and maintenance. It is supplied with Saudi crude oil about every 10 days. Crude storage capacity is about 40,000 tons. Refinery products are regular and premium gasoline, diesel fuel, jet fuel, fuel oil (including bunkering oil), cooking gas, and two types of asphalt.

A feasibility study has been completed on a pipeline for refined products from the refinery to Addis Ababa paralleling the new Mille-Awash Station road. Approximately 76% of the refinery output is shipped to Addis Ababa. The study indicated that a pipeline would be more profitable than the tanker trucks that haul petroleum products to the capital. Plans have been made to expand the refinery capacity to 1 million tons by 1977.

[32] U.S. Embassy, Addis Ababa, Ethiopia. State Department Airgram A-37, Feb. 27, 1974, p. 1.
[33] Mining Annual Review (London). Ethiopia. 1974, p. 362.

Table 4.—Ethiopia: Exports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, unwrought and semimanufactures	--	11
Iron and steel metal:		
Scrap	--	260
Semimanufactures	1	7
Tin, including alloys, all forms long tons	--	(2)
Zinc, including alloys, all forms	1	167
Other, ash and residue containing nonferrous metals	235	2
NONMETALS		
Cement	29,781	22,548
Clays and clay products (including all refractory brick)	513	576
Salt and brine	--	82,495
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	17	689
Worked	--	(2)
Sand, excluding metal bearing	--	2
Other nonmetals, n.e.s.:		
Crude	148,512	--
Slag, dross, similar waste, not metal bearing	--	151
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	--	164
MINERAL FUELS AND RELATED MATERIALS		
Carbon black and gas carbon	--	27
Coal	10	--
Gas, hydrocarbon, manufactured	--	21,169
Petroleum refinery products:		
Distillate fuel oil thousand 42-gallon barrels	(3)	508
Lubricants do		(2)
Mineral jelly and wax do		(2)

[1] Data for 1971 are compiled for Ethiopian monthly trade returns which are not sufficiently detailed to provide complete reporting of mineral commodities; data for 1972 are compiled from the more detailed annual trade returns of the nation.

[2] Less than ½ unit.

[3] Source publication does not separate individual petroleum commodities; total tonnage exported in 1971 was 113,264 tons compared with 68,091 tons in 1972.

Table 5.—Ethiopia: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum, including alloys, all forms	372	523
Arsenic trioxide, pentoxide, acids	--	21
Copper:		
Copper sulfate	--	983
Metal, including alloys, unwrought and semimanufactures	125	48
Iron and steel:		
Ore and concentrate	20	--
Metal:		
Scrap	2,763	--
Pig iron, including cast iron	1	20
Sponge iron, powder, shot	--	4
Steel, primary forms	9,508	619
Semimanufactures:		
Bars, rods, angles, shapes, sections	7,506	6,069
Universals, plates, sheets	27,311	21,323
Hoop and strip	47	528
Rails and accessories	697	503
Wire	1,843	1,012
Tubes, pipes, fittings	5,672	3,151
Castings and forgings, rough	1	32
Lead, including alloys, all forms	108	56
Manganese oxides	--	10
Mercury 76-pound flasks	--	(2)
Nickel, including alloys, all forms	1	1
Silver:		
Ore and concentrate troy ounces	3,279	--
Metal, including alloys do	--	772
Tin, including alloys, all forms long tons	234	(2)
Titanium oxides	--	19

See footnotes at end of table.

Table 5.—Ethiopia: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS—Continued		
Zinc:		
Oxide	--	15
Metal, including alloys, all forms	1,316	579
Other:		
Ash and residue containing nonferrous metals	11	3
Oxides, hydroxides peroxides of metals, n.e.s	--	108
Metals, including alloys, all forms	--	13
NONMETALS		
Abrasives, natural, n.e.s	(2)	137
Barite and witherite	--	10
Cement	610	503
Chalk	--	6
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	--	10
Products	977	1,635
Fertilizer materials:		
Crude:		
Nitrogenous	--	1
Phosphatic	--	100
Potassic	--	25
Other	--	394
Manufactured:		
Nitrogenous	22,628	3,141
Phosphatic		391
Potassic		100
Other		13,737
Ammonia	--	31
Graphite, natural	--	2
Gypsum and plasters	--	(2)
Pigments, mineral:		
Natural, crude	--	125
Iron oxides, processed	--	19
Salt and brine	--	141
Sodium and potassium compounds, n.e.s.:		
Caustic soda	--	3,180
Caustic potash, sodic and potassic peroxides	--	34
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	16	53
Worked	--	34
Sand, excluding metal bearing	--	1
Sulfur:		
Elemental, all forms	1	899
Sulfuric acid	--	280
Other nonmetals, n.e.s.:		
Crude	1,305	--
Slag, dross, similar waste, not metal bearing	--	1,050
Oxides and hydroxides of magnesium, strontium, barium	--	11
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	--	291
MINERAL FUELS AND RELATED MATERIALS		
Asphalt and bitumen, natural	--	7
Carbon black	--	75
Coal and coke, including briquets	10,072	14
Gas, hydrocarbon, manufactured	--	13
Petroleum:		
Crude ---- value, thousands	$8,695	$7,175
Refinery products:		
Gasoline ---- thousand 42-gallon barrels	(3)	95
Kerosine ---- do		56
Jet fuel ---- do		159
Distillate fuel oil ---- do		155
Residual fuel oil ---- do		(2)
Lubricants ---- do		33
Other:		
Liquefied petroleum gas ---- do		(2)
Mineral jelly and wax ---- do		34
Nonlubricating oils, n.e.s ---- do		5
Bituminous mixtures, n.e.s ---- do		4
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	4	66

[1] Data for 1971 are compiled from Ethiopian monthly trade returns which are not sufficiently detailed to provide complete reporting of mineral commodities; data for 1972 are compiled from the more detailed annual trade returns of the nation.

[2] Less than ½ unit.

[3] Source publication does not separate individual petroleum commodities; total tonnage imported in 1971 was 63,593 tons compared with 68,883 tons in 1972.

THE FRENCH TERRITORY OF THE AFARS AND ISSAS [34]

The mineral industry of the French Territory of the Afars and Issas was a negligible factor in the economy. Gross territorial product in 1970 (latest year available) amounted to the equivalent of $67.64 million, of which about 75% represented services and trade. Activity in the mineral industry sector consisted mainly of foreign trade. Imports of mineral commodities were mainly metals and semimanufactured metal products, petroleum products, and cement and building materials.

Recent discovery of geothermal resources in the Territory has provided a sector of the mineral industry where future development could occur. A French university team was studying the deposits at midyear.

GAMBIA [35]

The mineral industry of Gambia was not a significant factor in the economy of the West African country, which had a GNP estimated at about $60 million. Agriculture was the dominant industry.

Activity in the mineral industry in 1973 consisted mainly of investigation and exploration for mineral deposits and foreign trade in mineral commodities. Unrecorded quantities of stone and sand and gravel probably were produced for local consumption. The United Nations Industrial Development Organization (UNIDO) conducted feasibility studies of ilmenite deposits near the coast in the Western Division. Reportedly the studies have outlined deposits of about 5 million tons of black sands in Gambia and additional reserves in Senegal.[36] The Governments of Gambia and Iceland signed a letter of intent to establish an ilmenite processing plant in Gambia and an electrosmelting plant for ilmenite in Iceland.[37]

The planned development of ilmenite processing plants was dependent upon the results of the UNIDO studies. The UNDP was conducting studies on the exploitation of kaolin deposits in the Upper River Area. The studies were scheduled for completion at yearend.

Shell Oil Corp. was granted a petroleum exploration concession onshore and in Gambian territorial waters. Merchants Petroleum Co. of the United States acquired a 5% interest in Aracca Petroleum Corp. exploration rights in Gambia. Aracca's offshore petroleum exploration license was renewed by the Government. Terra Resources of the United States and five independent petroleum firms reportedly had an option on 1.6 million acres offshore Gambia.[38]

The Government of Gambia was negotiating with several Middle Eastern petroleum producing countries for help in financing and supplying crude oil for a petroleum refinery to be constructed in Gambia. Estimated cost of the refinery was about $48 million.

GUINEA [39]

Bauxite and alumina were the principal mineral products of Guinea, and exports of these commodities continued to be a major and growing source of foreign exchange.

The first shipload of high-grade bauxite from the large Boké project left the new port at Kamsar in early August. Production was scheduled at 4 million to 5 million tons in 1974 and 9 million tons by 1979. The bauxite was mined at Sangaredi and shipped about 80 miles by rail to Kamsar where it was crushed and dried before exportation. Boké is operated by Guinea Bauxite Co. (CBG), which is owned by the Government of Guinea (49%) and Halco Mining, Inc. (51%). Halco is a consortium consisting of Aluminum Co. of America, 27%; Alcan Aluminium Ltd., 27%; Martin Marietta Alum-

[34] Prepared by Henry E. Stipp.
[35] Prepared by Henry E. Stipp.
[36] Mining Annual Review (London). The Gambia. June 1974. p. 375.
[37] Mining Journal (London). Gambia/Iceland Ilmenite Venture? V. 282. No. 7222. Jan. 18, 1974. p. 38.
[38] World Petroleum Report. Gambia. V. 20, 1974. p. 57.
[39] Prepared by Horace F. Kurtz, industry economist, Division of Nonferrous Metals—Mineral Supply.

inum, Inc., 20%; Péchiney Ugine Kuhlmann (PUK), 10%; Vereinigte Aluminium-Werke, A.G. (VAW), 10%; and Montecatini-Edison S.p.A., 6%. The Government receives 65% of the profits of CBG.

Compagnie International pour la Production de l'Alumine (FRIA) was the only other producer of bauxite in Guinea in 1973 and the only producer of alumina in Africa. The name of the company was changed to Friguia during the year when the Government acquired a 49% ownership of the enterprise. The remaining 51% was owned by the FRIA consortium, consisting of Olin Corp. (38.5%), PUK (36.5%), British Aluminum Co., Ltd. (10%), Swiss Aluminium Ltd., (10%), and VAW (5%).

Bauxite deposits at Debele in the Kindia region were being developed by the Government with assistance from the U.S.S.R. Ore was to be shipped about 70 miles by rail to Conakry for export to the U.S.S.R. Production was expected to be 2.5 million to 3.0 million tons per year; however, initial shipments were delayed until 1974.

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). The Nimba deposits have been reported at 400 million to 600 million tons of low-sulfur, low-phosphorus ore grading over 60% iron. A multinational company, Mifergui-Nimba, was formed in 1973 to develop the Nimba deposits. The Government of Guinea was reported to own 50% of the company, and other African countries and European and Japanese companies were to share the remainder. The exact composition of the group was apparently open to change at yearend. A similar company was expected to be formed to develop the Simandou deposits. Plans for the Nimba project called for an eventual production rate of 15 million tons per year. Initially, ore is to be shipped over the rail system used by LAMCO and exported from Buchanan, Liberia. Further plans include extension of the Conakry-Kankan railroad so that ore can be shipped from Nimba and Simandou through Guinea to Conakry.

In nonmetallic minerals, the Government and the Belgian firm Basse Sambre were reportedly establishing a company to prospect and mine diamonds and other precious minerals in Guinea. A new brickworks capable of using 12,000 cubic meters of clay annually began production at Kankan in February.

The Government granted offshore oil exploration rights to Buttes Gas and Oil Co. Shell Oil Co., the last company to hold a concession in this area, surrended its rights in 1970 and 1971. The Governments of Guinea and Algeria reportedly reached an accord for eventual construction of a refinery in Guinea capable of processing 1.5 million tons of crude oil annually.

IVORY COAST [40]

The Ivory Coast again showed progress in mineral production for 1973. Cement and refined petroleum products were produced at near capacity, showing increases in both tonnage and value. Diamonds decreased in the number of carats produced, but the value increased significantly. The country's most important potential mineral development, the Mt. Klahoyo iron ore project, is becoming increasingly attractive. An international syndicate has been formed to examine the economic feasibility of the project. The method of transporting the ore to a pelletizing plant at San Pedro is yet to be determined. Construction of a railroad from San Pedro to Man opening up the entire western area of the country is favored by the Government. Offshore petroleum exploration ceased with the drilling of three dry holes.

Government Policies and Programs.—Société pour le Dévelopment Minièr de la Côte d'Ivoire (SODEMI) continued its countrywide exploration program. The effort is concentrated on a 44,600-square-kilometer area in the Tienko, Odienne, Touba, Tingrela, Boundiali, and North Suéguéla regions. SODEMI, complying with the 1971–75 mineral exploration program, published its activities report for 1972. Discoveries of zinc, copper, nickel, chromium, bismuth, and mercury values as well as diamond were reported. Chrome,

[40] Prepared by W. Timothy Adams, physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

nickel, molybdenum, and zinc were reported in the Tingrela-Boundial-Sueguela triangle near Odienne. Lateritic nickel deposits of the greatest interest are located at Syala and Mount Konsan. The exploitability of the discoveries is being investigated. Molybdenum-copper anomolies at Mameli, Béoumi, Tibeita, and Gueyebli and a columbite-tantalite deposit at Issia, reported in the 1972 Yearbook, are being investigated.[41]

SODEMI continued its investigation of gravel, clays, shell marl, ornamental stone, and other nonmetallic mineral deposits in various sections of the country. Ivory Coast Glassware Co. (SOC IVER) is building a 10,000-ton-per-year glass container plant to exploit a glass sand deposit near Port Bouet.[42]

The aerogeophysical survey and prospecting operation reported in the 1972 Yearbook continued to be carried out by Kenting Earth Sciences Limited (Canada) under the supervision of SODEMI. Financing is by the Canadian Government.

Kaiser Engineers signed a contract for engineering and construction management services on the Taabo hydroelectric power project. This project is located on the Bandama River below the recently dedicated Kossou Dam. The dam will have a generating capacity of 210 megawatts and is scheduled for completion in 1979 at a cost of $103 million. The Ivory Coast's long-term response to increased petroleum costs is the Taabo project and additional projected hydroelectric plants on the Sassandra, Cavally, and Cumoe Rivers. Discussions continued with Ghana to obtain electric power from the Nation's Akossomba Dam.[43]

Custom fees, port costs, and land transportation costs increased a minimum of 20%. Imported consumer commodity costs rose 25% to 80%. Rates for electric power increased slightly. However, power rates are expected to increase in several small steps to minimize impact on the consumer. Prospects for continued economic development are somewhat uncertain because of the worldwide scarcity of investment capital and materials.[44]

PRODUCTION

Output of the country's mines, mills, and quarries increased significantly in 1973. Production of cement and refined petroleum products recorded sizable gains. Diamond production was down in carats produced but showed an increase in dollar value. Value of recorded mineral production rose 51% to $54.9 million in 1973 from $36.4 million in 1972. Production figures for sand, gravel, and stone used as building material were not reported and are not included in the totals.

Diamond production decreased 10% from 333,500 carats in 1972 to 299,916 carats in 1973. Société Anonyme de Recherches et d'Exploitation Minières en Côte d'Ivoire (SAREMCI) accounted for 75% of the total output, and Société West African Selection Trust and Harry Winston, Inc. (WASTON) accounted for the remainder.

Output of cement rose 13% to 600,000 tons in 1973 from 583,000 in 1972. A slightly lower level is expected in 1974. However, implementation of new construction programs in the near future will increase demand sharply.

Petroleum refinery output increased as a preflash unit and a hydroskimming unit came onstream in 1973. Expansion of installed refinery capacity to approximately 32,000 barrels per day should meet the refined products requirements of the country and increase the amount available for export.

The increase in cement production and refined petroleum products is responsible for most of the increase in value of mineral production. However, the changing value of the dollar versus the Central African franc provides an overly optimistic picture. The true rate of increase is probably 4% to 5%.

TRADE

Overall trade statistics show a favorable balance of $117.3 million for 1972 with timber, coffee, and cocoa the mainstays of the economy. Mineral trade represents a relatively small portion of the total. Mineral imports in 1972 rose 34% over those of 1971, while mineral exports rose 109% over those of 1971.

Increases in exports of cement and refined petroleum products were mainly responsible for the increased value. Although

[41] Industries et Travaux Outremer (France). p. 16. "Saremel Delays."
[42] Work cited in footnote 41.
[43] U.S. Embassy, Abidjan, Ivory Coast. Telegram ABIDJA 01697, Mar. 6, 1974.
[44] U.S. Embassy, Abidjan, Ivory Coast. State Department Telegram, ABIDJ 01616, Mar. 4, 1974.

more crude oil was imported, its value was more than offset by increased value of refined products obtained from the expansion of the refinery. Diamond exports were down from 1971, but the value increased by 30%. Imports of clinker for cement increased in both tonnage and value.

A wide variety of minerals and related products was imported. Purchases of primary and semimanufactured metals and crude petroleum were responsible for 69% of the value of mineral imports. Imports of manufactured fertilizers increased in value; however, the tonnage was approximately the same.

Tables 6 and 7 contain detailed statistics on exports and imports of minerals and related commodities.

Total commodity trade and mineral commodity trade balances are given below in million dollars:

	1970	1971	1972
Total commodity trade:			
Exports	473.4	504.2	649.0
Imports	391.6	441.6	531.7
Balance	81.8	62.6	117.3
Mineral commodity trade:			
Exports	11.2	11.4	23.8
Imports	55.9	59.3	79.8
Balance	−44.7	−47.9	−56.0

Source: Ivory Coast, Statistiques du Commerce Exterieur de la Côte d'Ivoire. U.S. Bureau of Mines.

Table 6.—Ivory Coast: Exports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal and alloys, all forms	628	924
Arsenic sulfides, natural	45	--
Copper:		
Scrap	1,150	1,067
Metal and alloys, unwrought and semimanufactures	3	2
Iron and steel:		
Scrap	4,352	11,858
Pig iron, ferroalloys, similar materials	3	2
Primary forms	(1)	1
Semimanufactures	r 1,925	3,092
Lead:		
Ore and concentrate	(1)	--
Metal and alloys, all forms	194	354
Nickel metal and alloys, all forms	3	7
Tin metal and alloys, all forms long tons	14	24
Zinc metal and alloys, all forms	12	363
Other:		
Metal-bearing sands	(1)	1
Ores and concentrates of nonferrous metals, n.e.s	--	(1)
Metalloids, n.e.s	14	3
NONMETALS		
Abrasives, natural, crude, n.e.s kilograms	60	125
Boron minerals, crude natural	(1)	(1)
Cement, hydraulic	26,871	30,518
Chalk	2	--
Clays and clay products (including all refractory brick):		
Crude, all types	(1)	1
Products:		
Refractory (including nonclay brick)	2	--
Nonrefractory	49	172
Diamond:		
Gem, not set or strung carats	1,175	160
Industrial do	274,825	537,405
Diatomite	(1)	3
Fertilizer materials:		
Manufactured:		
Nitrogenous	105	4,904
Phosphatic	2,277	473
Potassic	1,205	154
Other, including mixed	586	(1)
Ammonia	4	151
Gypsum and plasters	28	39
Lime	87	89
Pigments, mineral, natural, crude	37	1
Precious and semiprecious stones, except diamond kilograms	350	1,280
Salt	755	971
Sodium and potassium compounds, n.e.s	214	141
Stone, sand and gravel, dimension stone, crude and partly worked	3	11

See footnotes at end of table.

Table 6.—Ivory Coast: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972
NONMETALS—Continued		
Sulfur:		
Elemental, all forms	1	(1)
Sulfuric acid	42	17
Talc and steatite	1	5
Other crude nonmetals, n.e.s	5	1
MINERAL FUELS AND RELATED MATERIALS		
Carbon black ---- kilograms	1	4,035
Petroleum refinery products:		
Gasoline ---- thousand 42-gallon barrels	r 184	276
Kerosine ---- do	r 72	125
Distillate fuel oil ---- do	r 115	226
Residual fuel oil ---- do	146	644
Other:		
Liquefied petroleum gas ---- do	6	9
Bitumen and bituminous mixtures, n.e.s ---- do	r 2	9
Unspecified ---- do	r 22	30
Total ---- do	r 547	1,319

r Revised.
1 Less than ½ unit.

Table 7.—Ivory Coast: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Oxide and hydroxide	(1)	(1)
Metal and alloys, all forms	5,927	3,983
Antimony metal and alloys, all forms	23	--
Chromium oxide and hydroxide	4	2
Cobalt metal and alloys, all forms	--	5
Copper metal and alloys, all forms	321	274
Gold metal, unworked or partly worked ---- thousand troy ounces	21,895	15,946
Iron and steel:		
Roasted pyrite	(1)	--
Scrap	195	219
Pig iron, ferroalloys, similar materials	26	27
Steel, primary forms	8,397	14,070
Semimanufactures	r 59,891	56,682
Lead:		
Oxides	106	98
Metal and alloys, all forms	132	98
Nickel metal and alloys, all forms	1	9
Platinum metal and alloys, all forms ---- troy ounces	32	354
Silver metal and alloys, all forms ---- do	16,333	4,604
Thorium and uranium salts ---- kilograms	358	276
Tin metal and alloys, all forms ---- long tons	9	16
Titanium:		
Ore and concentrate	2	--
Oxides	260	248
Zinc:		
Oxides	84	101
Metal and alloys, all forms	2,615	1,160
Other:		
Ores and concentrates of base metals, n.e.s	53	6
Ash and residue containing nonferrous metals	56	7
Oxides, hydroxides, peroxides of metals, n.e.s	80	76
Waste and sweepings of precious metals	(1)	--
Sand, metal bearing	141	142
Metalloids, n.e.s	5	5
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	25	19
Grinding and polishing wheels and stones	100	77
Asbestos	3	3
Barite and witherite	1,168	170
Boron:		
Crude natural borates	110	105
Oxide and acid ---- kilograms	732	302
Cement, hydraulic	395,828	508,208
Chalk	1,170	142

See footnotes at end of table.

Table 7.—Ivory Coast: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1971	1972
NONMETALS—Continued			
Clays and clay products (including all refractory brick):			
Crude, n.e.s.:			
Bentonite		39	83
Kaolin		54	75
Refractory		5	47
Other		r 268	34
Products:			
Refractory (including nonclay brick)		386	924
Nonrefractory		r 4,555	5,624
Diamond, all grades	carats	55,000	--
Diatomite		77	106
Feldspar, fluorspar, nepheline syenite		5	6
Fertilizer materials:			
Crude, phosphatic		150	4
Manufactured:			
Nitrogenous		7,017	5,248
Phosphatic		3,618	6,075
Potassic		28,549	24,469
Other, including mixed		r 9,656	9,362
Ammonia		4,553	6,516
Graphite	kilograms	261	1,394
Gypsum and plasters		28,188	25,358
Lime		4,215	4,249
Magnesite		1	2
Mica, all forms		2	1
Pigments, mineral:			
Natural, crude		145	91
Iron oxides, processed		54	49
Precious and semiprecious stones, except diamond	kilograms	18	7
Salt		24,264	28,706
Sodium and potassium compounds, n.e.s		4,602	5,010
Stone, sand and gravel:			
Dimension stone:			
Crude		186	647
Worked		944	1,041
Dolomite, chiefly refractory grade		5,084	7,943
Gravel and crushed rock		1,631	2,774
Quartz		3	11
Sulfur:			
Elemental		2,517	2,609
Sulfur dioxide		(1)	--
Sulfuric acid		93	12
Talc and related materials		650	657
Other nonmetals, n.e.s.:			
Crude		510	2,742
Fluorine, chlorine, iodine		43	52
Metalloids, n.e.s		5	5
MINERAL FUELS AND RELATED MATERIALS			
Carbon black		105	151
Coal and briquets		25	21
Coke and semicoke		282	310
Peat and peat briquets		53	24
Petroleum:			
Crude	thousand 42-gallon barrels	4,763	8,271
Refinery products:			
Gasoline	do	r 208	57
Kerosine	do	r 137	68
Distillate fuel oil	do	r 207	70
Residual fuel oil	do	46	(1)
Lubricants	do	r 90	116
Other:			
Liquefied petroleum gas	do	1	1
Bitumen and bituminous mixtures, n.e.s	do	r 12	18
Petroleum coke	do	32	35
Unspecified	do	r 11	9
Total	do	744	374
Crude chemicals from coal, oil, and gas distillation		r 1,640	980

r Revised.
1 Less than ½ unit.

COMMODITY REVIEW

Metals.—*Iron Ore.*—Interest continues in the deposits near Man. Pickands Mather's exploration permit was extended for an additional 3 years.[45] An international consortium has been formed to examine the feasibility of developing a mine with a capacity of 10 million tons per year. Construction of a pelletizing plant is included in the study. Members of the consortium are British Steel Corp., 20%; Mitsubishi Shoji Kaisha (MSK), 20%; Sumitoma Shoji Kaisha (SSK), 20%; Union Siderurgique du Nord et de L'Est de la France (Usinor), 10%; Hoogevens, 10%; Pickands Mather, 15%; and SODEMI, 5%.[46]

Transportation and marketing is being examined. Pickands Mather has proposed a slurry pipeline to move ore to a pelletizing plant located on the coast. The location for a loading wharf capable of handling a 250,000-ton ore carrier and with a depth of 75 feet has not been determined.[47]

Gold.—A deposit at Ity, 60 kilometers west of Man, is expected to be exploited in the near future. Recoverable reserves are reported as 583,000 troy ounces.

Nonmetals.—*Cement.*—Cement plants in the Abidjan area ground 660,000 tons of imported clinker in 1973. A plant is planned for the San Pedro area to serve the southwest region. It is not known whether this plant will process local materials or grind imported clinker.

Diamond.—Diamond continues to be the only exploitable mineral resource that yields substantial foreign exchange. SAREMCI began a complete modernization of its facilities, to be finished in 1974.[48]

Stone.—Société d'Exploitation du Granit Ivoirien (SEGI) constructed a crushing and sizing plant to produce railroad ballast to be used in rebuilding the Abidjan-Niger railroad. Tonnage in excess of railroad requirements will be used for road improvement. Ivory Coast Marble and Granit Company was formed in association with the Guinet group to process and shape imported marble, local granite, and marble from a new quarry being opened. Quarries in the San Pedro, Grand Bereby, and Tabou regions are expected to be competitive on the European market.[49]

Mineral Fuels.—*Petroleum.*—The Societe Ivoirienne de Raffinage (SIR) processed 1.1 million tons of crude petroleum in 1972. Expansion of the refinery through the addition of a hydroskimming unit raised installed capacity to 18 to 20 million tons, triple that of the original refinery constructed in 1965. The Ivory Coast Lubricants Manufacturing Co. planned to manufacture special lubricants. The Texaco Lubricants Co. (LUBTEX) is planning to expand its plant that presently has a 6,000-ton capacity.[50]

Exploratory seismic work has been unpromising. The Shell offshore concession has been given up since exploratory drilling in the most promising areas showed no signs of oil. Estimated total recoverable resources are considered negligible.[51]

LESOTHO[52]

Prospects for the mining industry in Lesotho brightened slightly during 1973. A worldwide rise in the price of diamond, coupled with a higher output of gem diamond, resulted in greater revenue from the country's only commercial mineral product. Plans were also announced for an expansion of the diamond cutting and polishing plant, offering the possibility of increased earnings through exports of processed instead of rough stones. Most important of all, agreement was reached with De Beers Consolidated Mines, Ltd. for exploration and, subsequently, production at Letseng-la-Terai, the leading diamond area.

Exploration programs conducted during the year by the UNDP and Westrans Petroleum, Inc., revealed several new diamond pipes and possible petroleum-bearing

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[45] U.S. Embassy, Abidjan, Ivory Coast. Airgram A–91, Aug. 3, 1974.
[46] Mining Magazine. V. 130, No. 5, May 1974, p. 375.
[47] Mining Journal. V. 281, No. 7202, Oct. 5, 1973, p. 278.
[48] Joint Publications Research Service. Translation on Africa. No. 1257, JPRS 58089, Jan. 29, 1973, p. 16, "Saremci Delays."
[49] Industries at Travaux d'Outre Mer (French). October 1973, pp. 209–213.
[50] Joint Publications Research Service. Translation on Africa. No. 1297, JPRS 58772, Apr. 17, 1973, pp. 1–8. "New Oil Refineries Stimulate Economic Growth of French-Speaking Black Africa." Paris, Europe-Outremer, French, February 1973, pp. 15–17, 19–20.
[51] U.S. Embassy, Abidjan, Ivory Coast. Telegram ABIDJ 06764, Sept. 26, 1973.
[52] Prepared by David G. Willard.

formations whose value has yet to be determined.

On the negative side, plans for a major water development project on the Malibamatso River collapsed because agreement on a price for the water could not be reached with the Republic of South Africa, the proposed major user.[53]

PRODUCTION AND TRADE

Lesotho's only recorded commercial mineral product is diamond. Output of diamond remained depressed in 1973, because the two largest producing areas, Letseng-la-Terai and Kao, continued to be closed to native diggers in order to promote their development by mining companies. Value of the output was higher than in 1972 owing to a greater proportion of gem-quality stones.

Total value was $381,000 in 1973, up 30% from the 1972 value of $293,000. Gem diamonds, valued at $242,000, comprised 64% of the total value, while industrial-grade stones accounted for the remaining $139,000. The total is still far below the $914,000 earned by diamond production in 1970, prior to the closure of Letseng-la-Terai and Kao.

Production of gem stones other than diamond, crushed stone, cement brick, and precast concrete also takes place in Lesotho, but the quantities are small and are not reported.

Diamond production figures for Lesotho are included in table 1.

Most of the country's diamond output is exported in raw form. Diamond export figures, therefore, closely approximate production totals. In addition, the Lesotho Diamond Works cuts and polishes some stones before they are exported, and rough stones are also imported by the company for processing and later reexport. However, statistics on exports of processed stones were not yet available for 1972.

Foreign trade statistics were not available for either 1972 or 1973, but little improvement was foreseen in Lesotho's highly unfavorable trade balance, at least in the former year. The low level of diamond production restricted the country's mineral exports, and exports of nonmineral commodities were adversely affected by Government-decreed minimum prices.[54] Costs of imported goods were rising, on the other hand, as the result of higher prices for petroleum products and the general inflationary trend in most world commodity prices. These trends were already apparent in the trade balances for 1970 and 1971, which are shown below in million dollars:

	1970	1971
Total commodity trade:		
Exports	5.2	2.9
Imports	32.0	37.5
Balance	−26.8	−34.6
Mineral commodity trade:		
Exports	.9	.3
Imports	2.5	3.1
Balance	−1.6	−2.8

Source: U.S. Embassy, Maseru, Lesotho. State Department, Airgram A–75, Apr. 4, 1973, pp. 17–18.

COMMODITY REVIEW

Diamond.—Attempts to attract the interest of mining companies in the Letseng-la-Terai diamond-producing area resulted in a 6-month exploration concession, which was granted to De Beers Consolidated Mines in July 1973. Rio Tinto Zinc had previously conducted a 3-year exploration program in the area, but had decided against opening a mine and had relinquished its concession in June 1972. During the intervening year, no other mining companies had been willing to take up the concession or a proposed larger one which included the nearby diamond-producing areas of Kao and Liqhobong. Activity was at a standstill, for the area remained closed to individual native diggers. Recent reports indicate that De Beers has decided to open a mine and that production is to begin in 1976.[55]

Newmont Mining Corp. and United States Steel Corp. terminated their combined exploration program at the Kao diamond-producing area in 1973, with a decision not to mine. The area also remained closed to native diggers while the Government attempted to interest other companies in taking over the concession. Discussions were held with Nord Resources Corp. and Anglo-American Corp. during the year, but at last report neither com-

[53] Standard Bank Review. Lesotho. December 1973, p. 26.

[54] U.S. Embassy, Maseru, Lesotho. State Department Airgram A–25, Apr. 4, 1973, p. 19.

[55] Mining Journal. De Beers Plans Diamond Mine. V. 282, No. 7729, Mar. 8, 1974, p. 171. U.S. Embassy, Maseru, Lesotho. State Department Telegram 776, July 18, 1973, 1 p.

pany had applied for an exploration permit.[56]

Diamond digging by individual natives continued at Liqhobong and Limpane, two areas which have been set aside for that activity, and constituted the only diamond production during the year. Exploration activity at the country's other diamond pipes had been terminated previously and was not renewed during the year. The Diamond Exploration Project, a survey of Lesotho's diamond resources by the UNDP, has located many new diamondiferous areas, but activity has not progressed far enough to determine their production potential.[57]

Lesotho Diamond Works, the country's diamond cutting and polishing plant, was purchased by Broadacres Investments, Ltd. Plans called for the formation of a new company, and a site in Maseru was being sought for a larger plant.[58]

Petroleum.—Westrans Petroleum, Inc., reported that aerial photographic surveys of its concession area in southern and western Lesotho had revealed several promising surface geologic features. Gravity and magnetic studies of these formations were to be conducted early in 1974, after which drilling would begin at the most favorable sites. Westrans holds a petroleum exploration concession covering 4.2 million acres, under which it is obligated to drill one hole per year from 1974 through 1982.[59]

MALAGASY REPUBLIC [60]

The economy of the Malagasy Republic is basically agricultural with 40% of the 7.5-million population engaged in subsistence agriculture. Attempts to improve this sector of the economy through the formation of agricultural cooperatives have generally failed. A small industrial sector dominated by petroleum refining, food processing, cotton textiles, and cement has grown steadily. However, there are fewer than 300,000 wage earners in the country. Mining activity was increasing but accounted for only approximately 4% of total 1973 exports. Marketing of Malagasian products continued to be difficult because of lengthy shipping time and the reluctance of ships to make port calls. The economic situation remained relatively stagnant following the change in government in May 1972, and an element of uncertainty continued to exist as the new government developed and initiated its policies and programs.

Increased prices for graphite and chromite in 1973 will probably be offset by decreased shipments. Increased production of petroleum refinery products and decreased imports of consumer goods should maintain the export-to-import ratio. Technical and economic evaluation of the Manantenina bauxite deposits was completed. Prospects for exploitation were considerably improved. A loan agreement for the construction of the Namorona River hydroelectric project was signed with Japan. Deposits of iron and lateritic nickel were being evaluated. Ilmenite and zircon sands along the east coast showed promise of economic development. Oil prospecting, both onshore and offshore, was continuing, but remained unsuccessful through 1973. Coal deposits in the south were being reexamined for possible exploitation.

New and reoriented governmental programs and policies were outlined in 1973, reflecting the increased nationalistic feeling. Regulations and laws favored increased local participation in industry, local processing of resources to increase value of exports, and continued economic development through attraction of local and foreign investment capital. Price rises in crude oil intensified official interest in exploration. Increased and more efficient exploitation of known coal resources as replacement for and processing into liquid petroleum products was being considered. The Government was proceeding slowly to establish what it considered the legitimate economic prerogative of the Malagasy Republic.

Government Policies and Programs.—The hiatus in economic activity continued as new programs and policies were announced. The immediate effect of the change in government was a drop in trade

[56] U.S. Embassy, Maseru, Lesotho. State Department Airgram A-44, June 13, 1973, 2 pp.
[57] Lesotho Department of Mines and Geology. Annual Report, 1971, pp. 10–12.
[58] Mining Journal. Boost for Lesotho Diamond Industry. V. 280, No. 7193, June 29, 1973, p. 539.
[59] Mining Annual Review. Lesotho. July 20, 1973, p. 347.
U.S. Embassy, Maseru, Lesotho. State Department Airgram A-73, Nov. 14, 1973, 1 p.
[60] Prepared by W. Timothy Adams.

and a flight of capital. Reform of the tax system was announced pending the completion of a study. Immediate changes were increases in personal exemptions, from $375 to $416; reduction of the import tax on food, drugs, and raw materials; and increases in tariffs protecting local manufacturers and on imported consumer goods.[61] Monetary reserves as of May 1973 totaled $62.5 million. With establishment of Malagasy monetary independence and withdrawal of guarantees of backing by the French treasury, restriction of imports and reorientation of financial policy received priority.[62]

The Central Bank of Malagasy Republic (BCRM) was established July 2, 1973, as a financially autonomous agency. Its function is execution of money, credit, and exchange policies, insuring foreign and domestic Malagasy currency stability, and coordination of productive resource activity with development plans. The general legal framework was defined: however, working provisions were not stated.[63]

Future intentions of the Government were generally stated to be the Malagasization of the economy. Overall direction of this policy was outlined as strengthening the role of the State in key sectors of the economy, expansion of overall Malagasy investment participation, and increasing the number of Malagasy nationals employed in all areas and levels of business and economic activity. There was no change in corporate taxes, and the rate remained at 31% on profits and 15% on dividends.[64]

Subsequent statements on economic policy reflected the desire to increase local participation in overall economic activity. The Government apparently intends to cooperate with private enterprise. However, companies dealing solely in Malagasy commodities were requested to transfer company headquarters to Malagasy or face a financial penalty. Companies operating in Malagasy were expected to place Malagasys in administrative posts within a specified time period and to allow the investment of Malagasy capital.[65]

A new Investment Code, Ordinance Number 73–507, was announced September 19, 1973, and published in the Official Journal of the Republic of Malagasy. In the development of natural resources, there was a clear intent to add value to the product by local processing or conversion. Local needs were to be satisfied by local manufacture. Regulations in the Code favored local small, medium, and handicraft enterprises, which were to receive technical and financial assistance from the Government.[66]

Mining enterprises in particular were requested to retain an increased percentage of profits to assist in the economic development process. They were also requested to establish processing facilities to increase the value of minerals produced.[67]

A National Investment Commission was established. Objectives were to recommend measures for assisting in the attainment of national goals and to promote investments aiding national development.[68]

Stated goals of industrial policy were, satisfaction of indigenous needs for consumer and capital goods by local manufacturers, addition of maximum value to locally produced materials, and expansion of export capabilities. Although the mining industry produces approximately 4% of total exports, it has the potential for meeting the stated objectives in a relatively short time.[69]

Sea law has been clarified with establishment of the territorial limits at 50 nautical miles. The Continental Shelf has been fixed at 100 nautical miles beyond the territorial limit, or a total of 150 nautical miles from shore. The Continental Shelf is fixed at the median line relative to the Continental Shelf area of other nations.[70]

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[61] Joint Publications Research Service. Dakar, Le Moniteur African, French, Feb. 22, 1973. Translation on Africa. No. 1282, JPRS 58513, Mar. 19, 1973, pp. 14–16.

[62] Joint Publications Research Service. Translation on Africa. No. 1327, JPRS 59352, June 25, 1973, pp. 34–35. Political Climate, Withdrawal from Franc Zone Interpreted.

[63] Joint Publications Research Service. Tananarive, Madagascar-Martin, French, July 19, 1973, Translation on Africa. No. 1341, JPRS 59601, July 24, 1973, pp. 1–2.

[64] U.S. Embassy, Tananarive, Malagasy Republic. State Department Airgram A–036, Mar. 30, 1973.

[65] Joint Publications Research Service. Translation on Africa. No. 1346, JPRS 60180, Oct. 20, 1973, pp. 19–21. General Ramanantsoa's Speech on Economic Policy, Aug. 31, 1973.

[66] Joint Publications Research Service. Translation on Africa. No. 1387, JPRS 60370, Oct. 25, 1973, pp. 18–19. Decree Establishes National Investment Council.

[67] Work cited in footnote 66.

[68] Official Journal of the Republic of Malagasy, (French). Sept. 21, 1973, pp. 3029–3031.

[69] Joint Publications Research Service. Translation on Africa. No. 1381, JPRS 60278, Oct. 15, 1973, pp. 22–23. Finance Minister Explains Economic Policy.

[70] U.S. Embassy, Tananarive, Malagasy Republic. State Department Airgram A–149, Oct. 26, 1973.

A Japanese survey team completed its investigation of the southern region. Priority proposals for development were construction of a road network and improvement of water supplies.[71]

The Malagasy study on the proposed Rogez hydroelectric project on the Vohitra River was completed and submitted to the World Bank for approval.[72]

A project proposed to the International Bank for Reconstruction and Development (IBRD) was for possible railroad modernization and reorganization. A transportation coordination study was done concurrently to determine the feasibility of building a rail line between Ansirabe and Fianarantsoa. A caveat for IBRD approval of the project would be the establishment of an autonomous railway authority.[73]

PRODUCTION

Mineral production in the Malagasy Republic was erratic in 1973. Performance reflected continued marketing difficulties and uncertainty over new governmental economic policies and programs.

Value of mineral production increased about 59% to an estimated $16.7 million in 1973, from a revised estimate to $10.5 million in 1972. Petroleum refinery production accounted for most of the increase, rising from 4.5 million barrels in 1972 to an estimated 5 million barrels in 1973.

Chromite production increased to 158,000 tons and production of cement increased to approximately installed capacity. Production of mica increased 51% to about 900 tons.

Production of graphite decreased 23% to approximately 14,000 tons. Even though higher prices were in effect, the graphite value decreased 20%. Production of gem, semiprecious and ornamental stones, abrasives, and feldspar decreased sharply. Statistics are unavailable on the production of building material—stone, sand, and gravel—for domestic consumption.

TRADE

Mineral exports increased slightly over 1971. The value of mineral commodity exports paralleled worldwide price increases. Shipments of chromite concentrate were 117,900 tons valued at $3.4 million, up from 105,300 tons and $3.1 million in 1971. Other minerals showing significantly higher exports were graphite, up 3% in quantity and 21% in value; mica, up 21% in quantity and 47% in value; and gem, semiprecious, and ornamental stones which increased 45% in value.

Crude petroleum imports increased 18% to 4.858 million barrels and 27% in value. The value of refinery products increased 14% to $5.881 million. Value of the total commodity trade and mineral commodity trade 1970–72 was as follows in million dollars:

	1970	1971	1972
Total commodity trade:			
Exports	117.0	147.0	167.0
Imports	171.0	214.0	207.0
Balance	−55.0	−67.0	−40.0
Mineral commodity trade:			
Exports	13.3	12.0	14.8
Imports	29.7	30.4	32.9
Balance	−16.4	−18.4	−18.1

Source: Malagasy Republic Statistiques du Commerce Exterieur de Madagascar. V. 2, issues for 1970, 1971, and 1972.

A continuing decline in the balance of mineral trade was expected in 1973. Uncertainly over the Government's role in proposed policies and programs, and marketing and transportation difficulties were the chief contributors to the trend. Increased value of chromite and graphite shipments probably were offset by lower tonnages shipped, while increased petroleum refinery capacity came close to meeting local demand. The decrease in imports of refined petroleum products in conjunction with imposition of import controls on consumer goods was expected to maintain the ratio of exports to imports.

Detailed statistics on mineral commodity trade are given in tables 8 and 9.

[71] Joint Publications Research Service. Tananarive, Madagascar-Martin, French, Dec. 2, 1972, Translation on Africa JPRS 57981, Jan. 15, 1973, pp. 1, 4.

[72] U.S. Embassy, Tananarive, Malagasy Republic. State Department Telegram, Tanna 01621, Nov. 26, 1973.

[73] U.S. Embassy, Tananarive, Malagasy Republic. State Department Airgram A-030, Mar. 13, 1973.

Table 8.—Malagasy Republic: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, including alloys, all forms	2	(1)
Beryl ore and concentrate	14	48
Chromite	r 105,269	117,885
Copper metal and alloys:		
Unwrought and scrap	212	230
Semimanufactures	(1)	(1)
Iron and steel:		
Scrap	--	3,761
Semimanufactures	497	271
Lead:		
Oxide	72	46
Metal, including alloys, all forms	5	6
Manganese ore and concentrate	14	--
Silver metal, including alloys, all forms troy ounces	32	8,038
Tin metal, including alloys, all forms long tons	(1)	--
Thorium ore and concentrate	13	35
Zinc metal and alloys, all forms	3	(1)
Other:		
Ore and concentrate	55	54
Metalloids, n.e.s	4	2
Metals, including alloys, all forms	--	(1)
NONMETALS		
Abrasives, natural	7	4
Cement, hydraulic	116	133
Chalk	(1)	--
Clays and clay products	r 12	12
Feldspar, leucite, nepheline	(1)	1
Fertilizer, natural and manufactured	1	64
Graphite, natural	17,777	18,334
Gypsum and plasters	--	(1)
Lime	13	1
Mica, all forms	r 946	1,149
Pigments, mineral, natural	(1)	(1)
Precious and semiprecious stones including quartz crystal and synthetic stones, except diamond kilograms	r 139,048	185,159
Salt and brine	2,168	2,295
Stone, sand and gravel	r 89	177
Talc, steatite, soapstone, pyrophyllite	--	(1)
Other, building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	1	6
MINERAL FUELS AND RELATED MATERIALS		
Petroleum:		
Crude and partly refined thousand 42-gallon barrels	(1)	(1)
Refinery products:		
Gasoline do	r 314	286
Kerosine do	r 142	110
Distillate fuel oil do	r 271	330
Residual fuel oil do	r 1,149	1,187
Lubricants do	(1)	(1)
Other:		
Liquefied petroleum gas do	(1)	80
Bitumen and bituminous mixtures do	(1)	(1)
Miscellaneous do	166	146
Total do	2,042	2,139
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	(1)	--

r Revised.
1 Less than ½ unit.

Table 9.—Malagasy Republic: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Oxides and hydroxides	341	161
Metal, including alloys, all forms	r 1,414	984
Arsenic oxide and acid	2	5
Chromium oxide and hydroxide	1	1
Cobalt oxide and hydroxide kilograms	5	30
Copper:		
Ore and concentrate	(1)	--
Metal, including alloys, all forms	r 141	69
Gold metal, unworked and partly worked troy ounces	9,099	23,181
Iron and steel:		
Ore and concentrate	5	--
Scrap	90	293
Pig iron, ferroalloys, similar materials	52	6
Steel, primary forms	(1)	3
Semimanufactures	r 45,781	40,250
Lead:		
Oxides	14	12
Metal, including alloys, all forms	408	384
Magnesium metal, including alloys, all forms	(1)	(1)
Manganese oxides	5	(1)
Mercury 76-pound flasks	6	2
Nickel metal, including alloys, all forms	(1)	(1)
Platinum-group metals, including alloys, all forms troy ounces	64	96
Rare-earth metals, including alloys, all forms	3	6
Silver metal, including alloys, all forms troy ounces	4,662	7,395
Tin:		
Oxide long tons	--	(1)
Metal, including alloys, all forms do	13	18
Titanium oxides	20	15
Zinc:		
Oxide and hydroxide	29	41
Metal, including alloys, all forms	96	96
Zirconium ore and concentrate kilograms	--	180
Other:		
Oxides and hydroxides	4	4
Metalloids, n.e.s	9	5
Metals, including alloys, all forms	12	8
Pyrophoric alloys	4	4
NONMETALS		
Abrasives:		
Crude, natural	r 26	10
Dust and powder of precious and semiprecious stones kilograms	13	85
Grinding and polishing wheels and stones	52	49
Asbestos	5	20
Barite	12	2
Boron materials:		
Crude natural borates	15	41
Oxide and acid	11	7
Cement, hydraulic	93,206	61,632
Chalk	615	492
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	684	46
Products	r 1,612	1,386
Cryolite and chiolite, natural	--	8
Diamond, all grades thousand carats	30	35
Diatomaceous earth	103	40
Feldspar, leucite, nepheline	10	--
Fertilizer materials:		
Crude and manufactured:		
Nitrogenous	6,502	516
Phosphatic	r 3,027	2,223
Potassic	3,798	3,931
Other, including mixed	10,963	2,887
Ammonia	68	39
Graphite, natural	(1)	1
Gypsum and plasters	4,569	4,174
Lime	1,128	1,601
Magnesite	37	25
Mica, crude and worked	15	(1)
Pigments, mineral, including iron oxide	182	91
Precious and semiprecious stones, including synthetic, except diamond kilograms	r 112	2,195
Quartz, crystal	27	167
Salt and brine	r 654	863

See footnotes at end of table.

Table 9.—Malagasy Republic: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity		1971	1972
NONMETALS—Continued			
Sodium and potassium compounds		2,299	1,979
Stone, sand and gravel:			
Dimension stone		20	2
Gravel and crushed rock, n.e.s		39	4
Limestone		(1)	--
Quartz and quartzite		18	20
Sand, excluding metal bearing		55	19
Sulfur:			
Elemental, all forms		30	5
Sulfur dioxide		2	3
Sulfuric acid		134	113
Talc, steatite, soapstone, pyrophyllite		94	54
Other:			
Crude nonmetals, n.e.s		6,716	8,961
Oxides and hydroxides of magnesium, strontium, barium		r 1	(1)
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural		(1)	(1)
Carbon black		6	3
Coal, including briquets, all grades		23,060	21,418
Coke and semicoke		105	64
Petroleum:			
Crude and partly refined	thousand 42-gallon barrels	3,958	4,858
Refinery products:			
Gasoline	do	112	62
Kerosine and jet fuel	do	11	7
Distillate fuel oil	do	177	113
Residual fuel oil	do	1	1
Lubricants	do	r 49	49
Other:			
Liquefied petroleum gas	do	1	(1)
Mineral jelly and wax	do	r 28	37
Petroleum coke	do	14	3
Bitumen, bituminous mixtures, other residues	do	r 76	86
Miscellaneous	do	(1)	(1)
Total	do	r 469	358
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals		181	152

r Revised.
1 Less than ½ unit.
2 Partial figure.

COMMODITY REVIEW

Metals.—*Bauxite.*—Compagnie de Produits Chimiques et Péchiney concluded its investigation of deposits near Manantenina. Reserves were estimated at 150 million tons of 45% alumina. A technical study has shown that exploitation is feasible. Péchiney is searching for associates to aid in the development of the project.[74] A loan agreement for $20 million has been signed with Japan, $9.3 million of which will provide assistance to construct the hydroelectric complex on the Namorona River. This project would supply power for the establishment of aluminum smelters.[75]

Chromite.—Production of chromite increased 41% to approximately 158,000 short tons in 1973. The Lake Alaotra deposit has a prominent position in government plans for increasing the value of resources. To this end a government survey on the Rogez hydroelectric project (Vohitra River) was completed and forwarded for World Bank approval. Power from the proposed facility would be used to produce ferrochrome.[76] The production rate for chromite is approximately 12,000 tons per month of dry concentrate averaging 50% to 52% chromium. Reserves are estimated at 5.5 million tons of ore.[77]

Iron.—Exploration activity has located ore deposits in addition to the Ambonimahavony deposit reported in the 1971 Minerals Yearbook. Reserves at this deposit have been revised to an estimated 30 million tons with 30% to 50% iron. Madagascar Service Géologiques (MSG) discovered a deposit grading 45% iron at Ambatovy near Moramanga. The Bureau de Re-

[74] Mining Annual Review. July 20, 1973, p. 359.
[75] U.S. Embassy, Tananarive, Malagasy Republic. State Department Airgram A-061, May 18, 1973.
[76] U.S. Embassy, Tananarive, Malagasy Republic. State Department Telegram Tanana 01621, Nov. 26, 1973.
[77] Work cited in footnote 76.

cherches Géologiques et Minières (BRGM) found a deposit at Bekiskopa and at Fasentsara where reserves are estimated at 100 million tons grading 30% to 35% iron.[78] Drilling operations of Société Alu-Suisse in the Ambohipaky coastal region discovered a deposit containing an estimated 240 million tons averaging 35% iron.[79]

Nickel.—Exploration and evaluation continued on the Ambatovy nickel deposit. This deposit is estimated to contain 120 million tons of lateritic ore containing 1% to 2% nickel. The deposit would be exploited with power from the proposed Rogez hydroelectric project.

Nonmetals.—*Cement.*—The Amoania cement plant recovered from the strike in 1972 and produced at installed capacity. The construction of a second cement plant to satisfy local needs was under consideration.

Graphite.—Extensive reserves of high-quality graphite are known. Capacity was estimated at 35,000 tons per year; however, exports were limited by market conditions and transportation. Production in 1973 was 13,963 tons.

Mica.—Production increased 52% to 890 tons in 1973. However, strong competition from synthetic products continued to make mica production erratic.

Mineral Fuels.—*Coal.*—Utah Development Co. applied for a coal prospecting permit in Tulear region, southern Madagascar.[80]

Petroleum.—Drilling continued to be unsuccessful. The Continental Oil Co. (CONOCO) closed down its field activities but continued financial activities through its associated exploration companies, Madagascar Oil Co. and Chevron Oil Co. Tenneco, Inc.'s (TENNECO) offshore well in the Bay of Antongil on the east coast was dry.[81] Other offshore operations were scheduled by Ocean Exploration Co. (U.S.) south of Ft. Dauphin, and by Azienda Generale Italiana Petroli S.p.A. (AGIP) (Italy), northwest of Majunga. Sabah Marine Areas Co. (Japan) expressed interest in exploration. Some reshuffling of combines occurred. Hispanica de Petroleos, S.A. (Hispanoil) (Spain), associated with Compagnie Français de Pétrol and Texas Gulf International. Mitsubishi Petroleum Development Corp. acquired 50% of CONOCO's joint exploration venture with Société de Petroles de Madagascar (SPM). PETROBRÁS (Brazil) acquired 50% of Chevron's Tulear concession. Seismic survey data were said to be promising in the Tulear concession.

The petroleum refinery at Tamatave recovered from the 1972 yearend strike and was operating at close to installed capacity of 31,500 barrels per day. However, it was believed that the newly installed capacity had not kept pace with the estimated increase in consumption.

Other Minerals.—The entire east coast of Madagascar is covered by exploration permits for ilmenite and zircon sand. Operators include Bethlehem Steel, United States Steel, Montecatini-Edison S.p.A. (Montedison), and MSG. Montedison has discovered commercially exploitable deposits.[82]

MALAWI[83]

The mineral industry of Malawi was not a significant factor in the economy of the country, which had a gross domestic product (GDP) of $515 million[84] (current prices) in 1973. Agriculture was the main sector of the economy, contributing about 46% of the GDP.

The Geological Survey of Malawi was compiling a geological atlas of the country. Ten maps at a scale of 1:250,000 and a description of the geology and economic minerals of Malawi were featured. The geochemical mineral exploration program, started in 1963, was continued. So far anomalies of nickel, tin, uranium, columbium, and arsenic have been outlined by analysis of rock samples. The Malawi Geological Survey planned to start a comprehensive investigation for industrial min-

[78] Work cited in footnote 76.
[79] World Mining. V. 26, No. 7, June 25, 1973, p. 148.
[80] U.S. Embassy, Tananarive, Malagasy Republic. State Department Airgram Tanana 01276, Sept. 12, 1973.
[81] Joint Publications Research Service. Translation on Africa. No. 1408, JPRS 60794, Dec. 17, 1973. TENNECO and CONOCO Operations Suspended.
[82] Work cited in footnote 81.
[83] Prepared by Henry E. Stipp.
[84] Where necessary, values have been converted from Malawi kwacha (MK) to U.S. dollars at the rate of MK1=US$1.20.

erals and a detailed assessment of groundwater resources.

Production of mineral commodities was not significant, consisting of 141,890 tons of limestone for cement manufacture at the Changalumi plant of Portland Cement Co. (Malawi) Ltd. The Malawi Development Corp. negotiated a $5.25 million loan with the Bank of America to purchase equity in the Portland Cement Co. (Malawi) Ltd. and to expand the firm's production capacity.[85] There has been strong demand for cement in Malawi and for export to neighboring countries.

Foreign trade in mineral commodities consisted mainly of imports of iron and steel semimanufactures, fertilizer materials, and petroleum products. Exports of mineral commodities were confined mainly to iron and steel products, as shown in table 10.

Although the output of mineral commodities was small, a number of mineral occurrences have been investigated and described by the Malawi Geological Survey. The most important of these are cerium-rich monazite in carbonatite located near Kangankunde Hill (15°08'S, 34°53'E); bauxite located on Mulanje Mountain (15°58'S, 35°38'E); sulfide deposits near Malingunde (14°10'S, 33°38'E); apatite near Chingale and Tundulu (12°22'S, 34°04'E and 12°57'S, 33°23'E); coal near Livingstonia and Chiromo (10°36'S, 34°07'E and 16°33'S, 35°08'E); and pyrochlore near Tundulu (12°57'S, 33°23'E).

Lonrho (Malawi) Ltd. started a program to evaluate the monazite-strontianite deposits at Kangankunde Hill; reportedly this could be the first mine in Malawi to produce for export. The bauxite deposits on Mulanje Mountain have been evaluated recently by Lonrho, which found that they could not be exploited commercially at present. Reportedly, the apatite deposits were to be developed in the near future. A small gem-cutting industry has been established in Malawi, based mainly on the cutting of pink and blue corundum from Chimwadzulu Hill.[86]

Nine tons of red agates were mined in Chikwawa District, and an investigation was started at a sunstone deposit.[87]

The transit of mineral commodities from Zambia through Malawi and Mozambique to ports on the Indian Ocean increased in 1973.

[85] Standard Bank Review (London). Malawi. September 1973, p. 16.
[86] Cannon, R. T. Geological Survey of Malawi. Overseas Geology and Mineral Resources (London). No. 41, 1973, pp. 10–15.
[87] Mining Annual Review (London). Malawi. June 1974, p. 364.

Table 10.—Malawi: Foreign trade in mineral commodities
(Metric tons unless otherwise specified)

Commodity	1971	1972
EXPORTS		
METALS		
Aluminum metal and alloys, all forms	1	--
Copper metal and alloys, all forms	102	85
Iron and steel: Pig iron, ferroalloys, crude steel, semimanufactures	1,098	890
Lead metal and alloys, all forms	44	85
NONMETALS		
Cement, hydraulic	25	29
Other nonmetals, n.e.s	--	203
IMPORTS		
METALS		
Aluminum metal and alloys, all forms	434	370
Copper metal and alloys, all forms	28	57
Iron and steel:		
Scrap	50	
Pig iron, ferroalloys, crude steel semimanufactures	21,844	23,352
Lead metal and alloys, all forms	27	26
Nickel metal and alloys, all forms	--	(1)
Tin metal and alloys, all forms long tons	4	19
Zinc metal and alloys, all forms	1	44
Other: Precious metals, not further specified troy ounces	10,894	1,346

See footnotes at end of table.

Table 10.—Malawi: Foreign trade in mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity		1971	1972
IMPORTS—Continued			
NONMETALS			
Abrasives, natural, n.e.s		7	12
Cement, hydraulic		4,763	3,035
Clays and clay products:			
Nonrefractory		1,019	838
Refractory		149	636
Fertilizer materials:			
Crude, natural phosphatic		--	11
Manufactured:			
Nitrogenous		84,637	52,592
Phosphatic		944	118
Potassic		442	182
Other, including mixed		5,313	4,140
Lime		1,803	2,865
Mica		12	--
Salt and brine		12,519	13,819
Sodium and potassium compounds, n.e.s		1,807	1,305
Stone, sand and gravel:			
Dimension stone		25	10
Other		r 718	625
Sulfur:			
Elemental		9	136
Sulfuric acid		41	18
MINERAL FUELS AND RELATED MATERIALS			
Carbon black		17	35
Coal, coke, peat		49,320	54,235
Petroleum:			
Crude and partly refined	thousand 42-gallon barrels	(1)	--
Refinery products:			
Gasoline	do	293	327
Jet fuel	do	57	68
Kerosine	do	r 1	1
Distillate fuel oil	do	105	408
Residual fuel oil	do	34	39
Lubricants	do	25	22
Other:			
Paraffin	do	104	116
Unspecified	do	36	31

r Revised.
1 Less than ½ unit.

MALI [88]

The Republic of Mali's mineral industry contributed minor value to the economy which was represented by the gross national product estimated at $330 million [89] (current prices) in 1973.

Mali was confronted by problems resulting from the extensive drought that has plagued many countries in the sahel region of Africa. Apparently these problems took priority over other functions such as development programs. Reportedly Société Nationale de Recherches et d'Exploitation des Resources Minières (SONAREM) did not carry out any new exploration or development projects in 1973. SONAREM evaluated gold occurrences in the Kalana area, aided by U.S.S.R. technicians, and iron ore deposits with reserves of about 500 million tons of hematite and goethite in the Kayes-Koulikoro area of the Senegal River Basin.[90]

The UNDP continued its search for ground water resources. In 1973 $192,000 was to be spent on the project, which has been active for 4 years. A research project involving the Earth Resources Technology Satellite (ERTS) was conducted by agencies of the United States and Mali Governments. Using images recorded by remote sensing and transmission equipment, technicians were evolving new methods of finding water resources, mineral deposits, and for agricultural developments.

Mineral commodities produced in 1973 consisted mainly of gold, limestone, salt, and unrecorded quantities of crude construction materials. Cement was manufactured at a plant located near Diamou. Brick and ceramic articles were produced in plants located near Magnanbougan and

[88] Prepared by Henry E. Stipp.
[89] Where necessary, values have been converted from Malian francs (MF) to U.S. dollars at the rate of MF460=US$1.00.
[90] Mining Annual Review (London.) Mali. June 1974, p. 376.

Djikoroni, respectively. Data on minerals production are shown in table 1.

Foreign trade in mineral commodities in 1972 consisted mainly of imports of petroleum products and iron and steel semimanufactures. There was no export of mineral commodities from Mali.

Exploration for crude oil continued with Texaco Mali Incorporated conducting geophysical studies north of Timbuktu. The company has been awarded a petroleum concession area of 300,000 square miles in northwestern Mali. Texaco planned to begin drilling operations near yearend 1974 or early 1975.

In late 1973, Murphy Eastern Oil Co. of the United Kingdom and Comoro Exploration Limited was awarded a 6.3-million-acre petroleum exploration and exploitation concession area in eastern Mali, between Gao and Ansonga. Sunningdale Oils Limited of Canada also is a member of the consortium with Murphy and Comoro.

MAURITANIA [91]

The mineral industry of the Islamic Republic of Mauritania contributed significantly to the economy of the country in 1973, with an output value estimated at more than $121.4 million,[92] compared with $89.7 million (revised) in 1972. Minerals output value in 1973 accounted for about 69% of the GNP, estimated at $176 million.

Activity in the mineral industry consisted of exploration for mineral deposits, crude oil, and natural gas. The French BRGM conducted an exploration project for copper and chromite near Selibaby, south-central Mauritania. Exploration was carried out by BRGM for the Société Nationale Industrielle et Minière (SNIM). The UNDP completed mineral exploration studies in Reguibat Orientale and Reguibat Dorsale and reportedly found indications of manganese mineralization. UNDP planned to search for underground water aquifers and signed an accord to provide $1.5 million to conduct this program after June 1974.

The Government of Mauritania will provide matching funds of $848,000.[93] Compagnie Français des Pétroles conducted an exploration program for uranium in the Reguibat Dorsale and Tasiast areas of west-central Mauritania. Exploration for copper and nickel deposits in the Atar area reportedly was initiated. Société des Mines de Fer de Mauritanie (MIFERMA) was continuing its studies on the guelb deposits, especially the El Rhein guelb of central Mauritania. MIFERMA planned to complete its investigation of the economic feasibility of producing 3.5 million tons per year of high-grade iron ore from the guelb deposits in 1973.

In September the Government granted a uranium and rare-earth exploration and mining permit for 24,700 square miles to Total, a French mining and nuclear firm. The permit is valid for 2 years.

The Governments of Mauritania and France planned to conduct joint research studies including photogeologic and topographic mapping and mineralogical studies of the Zemour region for lead, copper, and nickel, the Ain Ben Tili area for sulfur, and the borders of the Taoudeni Basin for lead and zinc.[94] The BRGM planned to conduct prospecting studies for phosphate rock in the Senegal River region.

Production of mineral commodities in 1973 consisted of 60% copper concentrates valued at $32.4 million, iron ore valued at $88.9 million, and gypsum valued at $22,888. Unrecorded quantities of salt, stone, clay, and sand and gravel were produced for local consumption. Quantity figures on the production of mineral commodities in Mauritania are shown in table 1.

Foreign trade in mineral commodities consisted mainly of exports of iron ore, copper concentrate, and gypsum. Exports of iron ore in 1973 totaled 10.331 million tons, going chiefly to the United Kingdom—2.302 million tons, France—1.896 million tons, Japan—1.581 million tons, Belgium—1.277 million tons, Italy—1.253 million tons, and West Germany—1.029 million tons. Exports of copper concentrate

[91] Prepared by Henry E. Stipp.

[92] Where necessary, values have been converted from Mauritanian ouguiya (UM) to U.S. dollars at the rate of UM45 = US$1.00.

[93] Industries et Travaux d'Outremer. Mauritania. No. 238. September 1973. p. 810.

[94] Industries et Travaux d'Outremer. Mauritania. No. 242. February 1974. p. 155.

(60% copper content) in 1973 totaled 18,892 tons. Shipments of copper concentrate went mainly to France and Spain. Exports of gypsum in 1973 totaled 1,955 tons, all to Senegal.

The Rouessa plant of MIFERMA began producing iron ore in 1973. When at full capacity an additional production of 3 million tons of 55% iron ore from low-grade deposits will enable MIFERMA to export up to 11.4 million tons of 55% to 63% iron ore in 1974. The plant required an investment of $55.6 million and when operating at full capacity will permit MIFERMA to increase employment by 3% to 4,518 persons. The Kedia d'Idjil iron ore deposits containing ore with an average iron content of 63% can be mined over a longer period by supplementing them with lower grade ore.

A steel plant estimated to cost about $18.2 million was planned for construction at Nouadhibou. Reportedly the plant will consist of electric furnaces consuming iron and steel scrap and a rolling mill with a capacity of 10,000 tons of steel products per year. The plant would be designed for eventual expansion to 17,000 tons per year of iron and steel products.

The Société Minière de Mauritania (SOMIMA) copper mine and plant operations near Akjoujt improved with output of 34,814 tons of copper concentrate, almost reaching plant capacity, during the last 2 months of 1973.[95] SOMIMA uses the Torco process in producing concentrate from copper oxide ore. The firm has experienced problems mainly in processing the ore to concentrate form. Production of copper concentrate was expected to reach 30,000 tons per year (60% copper content) by 1975.

At yearend SNIM began production of gypsum at N'Drahamcha Sebkha about 35 miles north of Nouakchott. Production reached 1,375 tons in 1973 and was expected to increase to 15,000 tons in 1974. Output was shipped mainly to the Société Ouest Africaine des Ciments plant in Senegal. Gypsum reserves in the N'Drahamcha deposit were estimated at 4 billion tons. Investment in plant and equipment reportedly was $266,000.

Exploitation of salt from N'Drahamcha Sebkha at 20,000 to 30,000 tons per year reportedly was planned for August 1974. The salt would be consumed by SOMIMA for use in producing copper concentrate by the Torco process and for salting fish.

Texaco Mauritania Inc. began drilling its first wildcat well about 100 miles north of Tichit, in the Taouedini Basin, at yearend. The well, which was the first drilled on land in Mauritania, was planned to reach a depth of 11,000 feet. Lack of water sources and transportation problems delayed drilling for a month.

VOEST Alpine Montan AG, an Austrian state-owned firm, and the Mauritanian Government signed a contract for construction of a $65 million petroleum refinery at Nouadhibou. Reportedly the U.S. firm M. W. Kellogg will participate as an engineering subcontractor, and Planet Oil and Mineral Co. of the United States will manage refinery operations. The refinery, which will have a 1-million-ton-per-year crude oil capacity, was scheduled to start operating in 1976. Supply of crude oil will come from Algeria. About one-third of production will be used by Mauritania, and about two-thirds will be exported to Europe, mainly West Germany.

[95] Mining Annual Review (London). Mauritania. June 1974, p. 372.

Table 11.—Mauritania: Exports of mineral commodities [1]
(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Copper ore and concentrate, gross weight	5,340	16,198	Spain 8,574; France 4,336; Belgium-Luxembourg 2,671; West Germany 617.
Iron and steel:			
Ore and concentrate, except roasted pyrite ---------- thousand tons --	8,601	8,837	France 2,364; United Kingdom 1,720; Belgium-Luxembourg 1,211; Italy 1,182; Japan 1,088; West Germany 725; Spain 507; United States 40.
Metal, scrap ----------	2,372	NA	
NONMETALS			
Clay products, nonrefractory ----------	17	NA	
Salt ----------	2,165	NA	

NA Not available.
[1] Source: 1971—Official Mauritanian export returns; 1972—Import statistics of trading partner countries listed under "Principal destinations, 1972."

MAURITIUS [96]

The mineral industry of Mauritius contributed about 0.2% to the 1973 GNP, but was thought to show about a 15% increase over the 1972 mineral production value, estimated at $600,000.[97] Over 90% of Mauritius exports, valued at approximately $131 million in 1973,[98] continued to be sugar and sugar products. The world energy crisis spurred hopes that current oil exploration efforts might make Mauritius an oil-producing country.

Texaco completed seismic studies with the sounding ship *Western Endeavour* in the St. Branden and Nazareth Banks areas in the Indian Ocean, north of Mauritius. On the basis of seismic explorations, Texaco was preparing to start its first test drilling. Two drilling sites were proposed.

An oil refinery was planned for Mauritius.[99] Compagnie Mauricienne des Huiles de Petrole Ltd. was promoter for the project. The bulk of Mauritian petroleum supplies came from Iran and Bahrain. The company hoped to put lubricants, automobile oil, and industrial oil on the local market by the end of 1973.

On Rodrigues, a small island east of Mauritius, expansion of Port Mathurin was being planned by the firm Sir Alexander Gibb and Partners to permit easier unloading of petroleum products. The port improvement was being financed by the British Government ($7 million) and involves a pier designed for unloading petroleum products, enlargement of the approach channel, and filling of an area alongside the interior port where gasoline storage tanks were to be constructed. Petroleum products from the largest single product imported into Rodrigues. Shell and British Petroleum companies were reportedly interested in the project.[1]

A Mauritian-Indian financed cement plant was reportedly planned for Fort William in 1972,[2] but no information was available on its status in 1973. The raw materials were to be obtained from mostly local sources, with only 4% to be imported.

Lime production was valued at $287,293 and was approximately 6,000 tons in 1972. Salt production, by sea water evaporation, was 5,400 tons valued at $287,293 in 1972. In 1973 both commodities were expected to show a 10% increase in quantity; lime was expected to go up about 30% in price in 1974.[3] Unrecorded quantities of stone, sand, and gravel were produced for road and building construction.

A new iron and steel manufacturing company, Shipbreaking and Steel Rolling Industries, started operations with 80% local ownership and 20% Hong Kong interests. The company acquired a 6,135-ton cargo ship, *MV Filippos,* and was converting its

[96] Prepared by Janice L. W. Jolly, physical scientist, Division of Ferrous Metals—Mineral Supply.
[97] Where necessary, values have been converted from the Mauritius rupee (Mau Rs) to U.S. dollars at the rate of Mau Rs5.43=US$1.00.
[98] International Financial Statistics (Washington, D.C.). Mauritius. V. 27, No. 7, July 1974, p. 250.
[99] Le Mauricien (Port Louis). Plans for Building Oil Refinery Announced. June 9, 1973, p. 1.
[1] L'Express (Rodrigues). Development of Port Mathurin Planned. Dec. 2, 1973. p. 1.
[2] L'Express (Port Louis). Cement Plant. Feb. 24, 1972, p. 1.
[3] U.S. Embassy, Port Louis, Mauritius. Department of State Telegram, May 7, 1974. Accurate figures for 1973 production were not available.

metal to steel bars. An order for 70 tons of steel bars was reportedly received from Reunion. A new steel fabrication industry firm was planned by three Mauritius partners (75%) and an Indian company (25%). The Building and Engineering Co., Ltd., Ireland/Blyth Ltd., and A.R. Mohamed Ltd. of Mauritius were reported as formulating plans to begin construction of the plant at the beginning of 1974. About $1.1 million has been invested in the enterprise.

Construction of the Mauritius Chemicals and Fertilizers Industry Ltd. fertilizer plant in Fort George was in its final phase, and the plant was expected to be operational by April 1974. It was expected to provide all of the fertilizer needs for Mauritius. About 60,000 tons were expected to be sold on the local market.[4] Micro Jewels, Ltd., was reportedly planning possible synthetic diamond manufacture, using the General Electric process. The firm was expected to be situated in Port Louis.

NIGER [5]

The mineral industry of Niger continued to be a small but important sector of the national economy in 1973. The industry was the main employer of industrial labor, and uranium became the most valuable export commodity. Increased uranium sales significantly reduced the balance of trade deficit by offsetting, to a great extent, losses in export income normally received for agricultural products, output of which continued to decline owing to 6 years of drought.

The value of mineral production, for which statistics are not available, probably increased due to higher world prices for tin and increased uranium output. Uranium production, valued at an estimated $12.3 million, accounted for most of Niger's mineral production value in 1973. Other mineral commodities produced were cement, limestone, clay, gypsum, tin, salt, minor quantities of gold, and various amounts of crude construction materials (stone, sand and gravel, and clay) for local consumption. The only mineral exports were uranium and tin concentrates. Exports of uranium oxide (U_3O_8), which were 994 tons in 1973 compared with only 353 tons in 1972, accounted for about 44% of total export sales. Principal mineral imports were iron and steel semimanufactures and refined petroleum products.

Mineral exploration activities increased in intensity in 1973 and included searches for uranium, base metals, and petroleum. Joint ventures involving the Government and foreign companies were formed to explore and develop uranium deposits south of the Arlit uranium mine and near Djado in northeastern Niger. Large sections of the country, under lease to U.S. petroleum companies, were being investigated, largely by seismic methods, to locate favorable drilling sites. Three companies planned to drill for petroleum in 1974. The Ministry of Mines and Geology and a UNDP mineral survey team continued to evaluate mineral occurrences in various parts of the country. Exploratory drilling for base metal deposits was carried out by the Government at Donkolo in the Tillabery District, but the results were incomplete.

Société des Mines de L'Air (SOMAIR), operator of the country's only uranium mine (at Arlit in northwest Niger), produced 948 tons of U_3O_8 in concentrate from 1,049,960 tons of ore milled in 1973. This was an increase of 81 tons U_3O_8 over the 1972 output. The company planned to increase the annual capacity of the Arlit mill to 1,500 tons U_3O_8 by 1975 and eventually to 1,800 tons U_3O_8 by 1977. The feasibility of leaching uranium from dump material was also being investigated as a means of further increasing production.

The Government of Niger, the French Commissariat à l'Énergie Atomique (CEA), and the Overseas Uranium Resources Development Co. of Japan planned to develop the Akouta uranium deposit, which lies about 10 kilometers south of the Arlit mine.[6] The venture, which will cost about $70 million,[7] would begin production in 1979 at a rate of 600,000 tons of ore per year, producing about 2,000 tons of U_3O_8 concentrate. The concentrate was to

[4] L'Express (Port Louis). Interview With Antoine Harel, Board Chairman of Mauritius Chemicals and Fertilizers Industry, Ltd. Oct. 7, 1973, pp. 1, 8.

[5] Prepared by James H. Jolly.

[6] Mining Journal. Akouta Startup Soon. V. 281, No. 2706, Sept. 28, 1973, p. 260.

[7] Where necessary, values have been converted from Communauté Financiere Africaine francs (CFAF) to U.S. dollars at a rate of CFAF250=US$1.00.

be sold equally to Japan and France. The uranium reserves, estimated at about 30,000 tons U_3O_8, would be sufficient for a 15-year operation.

The Government, CEA, and Urangesellschaft A.G., a West Germany company, signed an agreement in December to establish a company to explore for and exploit uranium deposits in the Djado region in northeastern Niger. A Japanese firm also expressed interest in participating in the project. The first phase of the project, an exploration program covering a 40,000-square-mile area, was expected to cost about $13.3 million.[8]

Another company, involving Continental Overseas Oil Co., a subsidiary of CONOCO, CEA, and the Government, was being formed to develop the uranium deposits near Imouraren, which lies about 50 kilometers south of Arlit.

The Government planned to develop a coal deposit, discovered near Agadez in 1964, to fuel a thermal power electricity station at the Akouta uranium mining operation. Agadez coal reserves were estimated at about 4.5 million tons. The proposed power station was to be of sufficient size to eventually supply electrical power to both the Arlit and Imouraren mining operations.

Société Minière du Niger produced 136 tons of tin concentrate, the same as in 1972, at the Taroudji and El Meki mines in the southern Air Mountains. During 1973, 140 tons of tin concentrate, valued at about $415,000, was exported to Nigeria and Belgium for processing.

The small gold production resulted from artisanal panning of alluvial deposits in the Sirba River region. The Geological Service Department of Niger continued to investigate gold occurrences in the Maradi region, but no significant deposits were reported. Niger's one cement plant, at Malbaza, operated at about 75% of capacity during 1973, producing about 33,000 tons of cement. Traditional production of salt by solar evaporation was sufficient for domestic needs.

In oil exploration, Texaco Niger, Inc., Niger Sun Oil Co., and CONOCO scheduled test drilling in 1974.[9] Texaco planned to drill at a site 75 miles southwest of Bilma in the Agaden concession, if the GON would build a suitable airstrip at Fachi to accommodate aircraft which would bring in the drilling rig and supplies. CONOCO, which held a concession in eastern Niger with Shell Oil Co., planned to bring in a drilling rig from Chad to sink a well near N'Guigmi in the Lake Chad region late in 1974. Sun Oil was expected to start drilling north of Ouallam, in southwestern Niger, before the end of 1974. Other U.S. petroleum companies continued aeromagnetic and geophysical exploration programs in their respective concession areas.

Pritchard-Rhodes Ltd. (PRL), a subsidiary of International Systems and Controls Corp., submitted a proposal to the Government for the construction of a small oil refinery at Gaya to serve markets in Niger and Upper Volta, if a feasibility study indicated a viable project. PRL envisioned a refinery capable of processing about 5,600 barrels of imported Nigerian crude oil per day. Cost of the proposed project was estimated at about $14.5 million.

RWANDA [10]

Cassiterite, the chief mineral produced and exported in Rwanda, showed a production decrease of 11%, and tungsten mine production was up 46% compared with that of 1972. Exports of cassiterite accounted for 16% of the total value of exports, compared with 27% in 1972. The total value of mineral exports fell from about $6.9 million in 1972 to about $6.3 million in 1973.

The new Rwandan Government that came to power on July 5 publicly stated that it favored foreign private investment. The Government preferred joint ventures which involve its substantial participation. A revision of the existing investment code was underway.

Société Minière du Rwanda (SOMIRWA) was established by combining the major private mining companies with the Government holding a 49% interest. The

[8] U.S. Embassy, Niamey, Niger. State Department Airgram A-85, Dec. 28, 1973, p. 1.
[9] U.S. Embassy, Nianey, Niger. State Department Airgram A-07, Feb. 1, 1974, p. 1.
[10] Prepared by V. Anthony Cammarota, Jr., physical scientist, Division of Nonferrous Metals—Mineral Supply.

primary aim of the new company was to discourage cassiterite smuggling.

The People's Republic of China reportedly sent a team of technicians to Rwanda to study the possible construction of a 50,000-ton-per-year cement plant.

Table 12.—Rwanda: Exports of selected mineral commodities
(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
Beryllium, beryl concentrates	r 174	100	Kenya 60;[1] Tanzania 40.[1]
Columbium and tantalum, columbite-tantalite concentrates	30	38	Kenya 28;[1] Tanzania 10.[1]
Tin ore and concentrate, long tons	2,118	2,285	Belgium-Luxembourg 2,024; Kenya 99;[1] Tanzania 92;[1] United Kingdom 55; Uganda 15.
Tungsten ore and concentrate	773	638	Tanzania 369;[1] Kenya 252.[1]

r Revised.
[1] Initial shipment destination; ultimate destination unkown.

Table 13.—Rwanda: Imports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal and alloys, all forms[1]	160	148
Copper metal and alloys, all forms[1]	7	3
Iron and steel, pig iron, ferroalloys, crude steel, iron and steel semimanufactures[1]	8,766	6,639
Lead metal and alloys, all forms[1]	1	6
Nickel metal and alloys, all forms[1]	(2)	(2)
Tin metal and alloys, all forms[1] long tons	(2)	(2)
Zinc metal and alloys, all forms[1]	3	4
Other:		
Ores, concentrates, cinders, waste and scrap of all metals	(2)	NA
Metals and alloys, all forms[1]	(2)	(2)
NONMETALS		
Cement, hydraulic	11,715	13,863
Fertilizer materials	NA	3,304
Salt	10,195	10,249
Other crude nonmetals	166	106
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Gasoline:		
Aviation thousand 42-gallon barrels	2	2
Other do	72	76
Kerosine do	27	36
Distillate fuel oil do	52	58
Other	10	20

NA Not available.
[1] May include some quantities of more highly processed materials than usually reported in Minerals Yearbook.
[2] Less than ½ unit.

SENEGAL [11]

The principal mineral produced in the Republic of Senegal was phosphate rock. Much lesser quantities of attapulgite (fuller's earth), cement raw materials, salt, and building stone were produced.

Two companies mine phosphate rock in Senegal. Compagnie Sénégalaise des Phosphates de Taiba mines calcium phosphates and the Société Sénégalaise des Phosphates de Thiès produces a natural aluminum phosphate. International Minerals and Chemicals Corp., a U.S. corporation, has a 12.5% interest in Phosphates de Taiba. Phosphates de Thiès is a subsidiary company of the Péchiney-St. Gobain group in France.

The Taiba company deposits are located about 70 miles from Dakar near Tivaouiane. From an initial production level of 400,000 tons in 1961, over 1.5 million tons was produced in 1973. The phos-

[11] Prepared by William F. Stowasser, physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

phate-bearing ore seam is about 21 feet thick under overburden that ranges from 50 to 80 feet thick. All of the calcium phosphate was exported to 14 countries with about 34% going to France, 17% to the United Kingdom, 16% to the Netherlands, and 10% to Greece. Production from the Taiba mine increased from 1,250,000 tons in 1972 to 1,537,109 tons in 1973. The value of exports, 1,446,339 tons in 1972 and 1,537,109 tons in 1973, was $2,653,405 in 1972 and $1,310,276 in 1973. The reduction in value was principally due to a change in the exchange rate, from 227 to 243 CFA francs to the US$1.00.

The Société Sénégalaise des Phosphates de Thiès operates the Pallo mine north of Thiès. The mineral is a calcium aluminum phosphate that is broken by blasting after a thin overburden is stripped by bulldozing. The ore is crushed and screened into 4 by 10 millimeter–, 10 by 40 millimeter–, and 40 by 70 millimeter–fractions. Most of the ore is calcined to increase the P_2O_5 content to 34%. This product, if sold for fertilizer purposes, is called Phospal. The ore is calcined at either Lam-Lam near Pallo or at Nante, France. Some of the calcined ore is used to prepare an animal feed supplement called Polyfos. Production from the Pallo mine increased from 224,454 tons in 1972 to 288,739 tons in 1973. A comparison between 1972 and 1973 production for each product from Pallo is shown in the following tabulation:

	1972	1973	Change (percent)
Natural aluminum phosphate rock	165,646	218,895	+32
Dried phosphate rock	52,338	63,816	+22
Phospal and polyfos	6,238	5,407	−13
Baylifos	232	78	−66
Crushed aluminum phosphate	--	543	--
Total	224,454	288,739	+29

Most of the aluminum phosphate rock, 134,272 tons, was exported to France as was 66,130 tons of dried phosphate rock. Phospal and Polyfos were exported to the Ivory Coast, Malagasy Republic, and Spain. The value of exports from the Pallo mine was about $2.5 million.

The reserves in the Pallo mine area have been estimated to exceed 50 million tons, adequate to maintain projected production for 20 years. The mineralized beds are 55 to 60 feet thick, covered by about 10 feet of overburden.

The total production of phosphate rock in 1973 was 1,821,739 tons, an increase of 23.5% over production in 1972.

Senegal announced that phosphate rock prices would be tripled following similar price increases by Morocco and Tunisia that would become effective in 1974. The Government intends to expand production from the Taiba mine to 1.8 million tons by 1977. A new deposit, contiguous to the Taiba, with reserves estimated to be about 90 million tons was recently mapped. The investment required for the mine infrastructure was estimated to be $100 million. The Pallo mine will be expanded to increase its capacity to 600,000 tons per year as soon as possible at a cost of $4 million. Other phosphate deposits that have not been evaluated are located in northern Senegal in the area of Lake Guiers.

The Senegalese system of export taxes include fiscal, research, conditioning, fiduciary, and statistical. These total 2.5% of the value of phosphate exports up to 500,000 tons, and 5.5% over 500,000 tons.

The three-kiln cement plant at Rufisque, operated and owned by Société Ouest-Africaine des Ciments (SOCOCIM), decreased production from 335,692 tons in 1972 to 295,834 tons in 1973. The plant's capacity was to be increased to 400,000 tons per year during 1973. Most of the production was consumed domestically with 21% exported to neighboring countries.

The Société Prochimat produced 3,727 tons of attapulgite, an increase of 21% over production in 1972. Most of this production is used for drilling mud in offshore exploration.

Salt production from the Sine-Saloum Saltflats was 140,000 tons, an increase of 12% over that of 1972.

Senegal operates a petroleum refinery at M'Bao near Dakar to supply domestic consumption. All crude petroleum is imported. Petroleum prospecting is being conducted on five concessions. Copetao (a subsidiary of the French Petroleum Co.) and Casamance Petroleum Co. (a subsidiary of Texasgulf, Inc.) have 13,700 square kilometers on the western Casamance concession. Senegalese Shell Prospecting and Exploitation (Shell Senrex) has a total of 20,000 square kilometers in the three sectors of northern Senegal, Casamance, and an area off Dakar. Interest has in-

creased in a large viscous petroleum deposit off Casamance that was discovered in 1966 by Copetao. The estimated reserves are 100 million tons. If the recovery costs can be justified, production could exceed 1.8 million tons per year.

West Germany's Deminex obtained a 30% interest in Shell's exploration permits. When Shell's three areas onshore and offshore were granted in 1971, Shell's permits covered 94,000 square kilometers. Esso suspended oil exploration by Esso Exploration after discouraging results were obtained off Senegal, Gabon, and the Ivory Coast.

A technical and economic study is being conducted by the Senegalese Geological and Mining Exploration Bureau and the Krupp, Fried. Krupp Hüttenwerke AG of an iron ore deposit with reserves of 1.25 billion tons grading at least 60% Fe. The deposit is 700 kilometers from the coast and must be beneficiated to acceptable phosphorus levels before it could be exploited and marketed. If these problems can be resolved, a 10-million-ton-per-year production will be planned.

Table 14.—Senegal: Exports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, including alloys, all forms	7	15
Copper metal, including alloys, all forms	585	657
Iron and steel:		
Scrap	9,067	9,192
Semimanufactures	1,044	1,109
Gold, troy ounces	482	--
Lead metal, including alloys, all forms	r 140	211
Nickel metal, including alloys	3	156
Silver metal, including alloys, all forms, troy ounces	--	35
Tin ore and concentrates, long tons	156	--
Zinc metal and alloys, all forms	23	1
NONMETALS		
Cement, hydraulic	59,379	98,937
Clays, crude	2,497	2,890
Diatomite and other infusorial earth	--	1
Fertilizer materials:		
Crude, thousand tons	1,207	1,426
Manufactured:		
Nitrogenous	1,524	240
Phosphatic	88,577	67,195
Mixed	93,933	6,194
Ammonia	3	2
Gypsum	6	1
Salt	75,926	129,469
Sand and gravel	13	334
Sodium and potassium compounds, n.e.s	135	16
Sulfuric acid, including oleum	5	22
Stone, dimension, worked	1	2
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Gasoline, thousand 42-gallon barrels	155	148
Kerosine, do	621	355
Distillate fuel oil, do	375	685
Residual fuel oil, do	327	384
Lubricants, do	r 25	37
Other:		
Liquefied petroleum gas, do	33	17
Unspecified, do	(1)	3
Total, do	1,536	1,629

r Revised.
1 Less than ½ unit.

Table 15.—Senegal: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Oxide and hydroxide	(1)	1
Metal and alloys, all forms	364	545
Antimony metal and alloys, all forms	2	2
Copper:		
Ore and concentrate	(1)	--
Metal and alloys, all forms	85	64
Gold metal, unwrought and semimanufactures, troy ounces	3,755	1,546
Iron and steel:		
Ore and concentrate	(1)	(1)
Scrap	475	40
Pig iron, ferroalloys, primary steel forms	29	32
Semimanufactures	32,097	43,243
Lead:		
Oxide	33	52
Metal and alloys, all forms	29	29
Magnesium metal and alloys, all forms	(1)	--
Manganese ore and concentrate	1	--
Nickel metal and alloys, all forms	3	1
Platinum-group metals and alloys, unwrought and semimanufactures, troy ounces	22	32
Silver metal and alloys, unwrought and semimanufactures, thousand troy ounces	112	350
Tin metal and alloys, all forms, long tons	8	12
Titanium oxide	104	137
Tungsten metal and alloys, all forms	(1)	NA
Zinc:		
Oxide	33	58
Metal and alloys, all forms	37	7
Other:		
Metalloids, n.e.s	3	4
Nonferrous metals and alloys, all forms	(1)	NA
NONMETALS		
Abrasives, crude and natural, except diamond	4	5
Asbestos	1,016	960
Barite and witherite	516	351
Borates, crude, natural	(1)	180
Cement, hydraulic	3,083	39,506
Chalk	1,919	2,199
Clays and clay products:		
Clays, crude, including kyanite and related materials	3,374	3,744
Products:		
Nonrefractory	2,326	1,998
Refractory	643	617
Diatomite and other infusorial earth	33	94
Fertilizer materials:		
Manufactured:		
Nitrogenous	1,519	3,581
Phosphatic	77	125
Potassic	4,440	10,667
Mixed	6,090	(1)
Ammonia	6,770	11,807
Graphite	2	8
Gypsum and plasters	9,208	11,331
Lime	1,855	2,105
Magnesite, crude	60	40
Mica, crude and worked	(1)	(1)
Pigments, mineral:		
Natural	144	62
Iron oxide, manufactured	79	102
Salt	86	103
Sodium and potassium hydroxide compounds	4,331	4,131
Stone, sand and gravel:		
Dimension stone, crude and worked	182	349
Quartz and quartzite	40	50
Crushed stone and gravel, n.e.s	88	64
Sand, not metal bearing	45	49
Sulfur:		
Elemental	24,252	16,342
Sulfuric acid and sulfur dioxide	51	58
Talc and related materials	216	228
Other:		
Crude ores and concentrates	13	13
Oxides and hydroxides of barium, magnesium, strontium	13	915

See footnotes at end of table.

Table 15.—Senegal: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity		1971	1972
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural		9	17
Carbon black		3	36
Coal and coal briquets		210	75
Coke		234	129
Peat		3	5
Petroleum:			
Crude	thousand 42-gallon barrels	4,141	4,294
Refinery products:			
Gasoline	do	23	50
Kerosine	do	(1)	2
Distillate fuel oil	do	3	27
Residual fuel oil	do	(1)	(1)
Lubricants	do	36	28
Other:			
Liquefied petroleum gas	do	(1)	6
Unspecified	do	6	68
Total	do	68	181
Crude chemicals from coal, oil, and gas distillation		512	674

NA Not available.
[1] Less than ½ unit.

SOMALI REPUBLIC [12]

The mineral industry of Somalia continued to be dominated in 1973 by exploration for minerals, largely carried out by foreign technical assistance and funds. The GNP was estimated at $231 million [13] with agriculture and services contributing 90% and industry 9.3%. The 1974–78 5-year development plan was announced by the Government. A budget of $35.1 million was planned, and it was intended to boost industry's contribution to the GNP by 50% or more. Major importance was attached by the Somalian Government to the search for minerals and hydrocarbons. Somalia continued to receive substantial amounts of foreign aid, and while there was a significant ($8.4 million) ordinary budget surplus in 1973, there was also a trade balance deficit of $15.7 million. During 1973, internal sources provided $11.7 million, and foreign finance provided $33.8 million for the Development Program.[14] In April 1973, the Foreign Trade Ministry was reorganized into two ministries, Foreign and Domestic. The Domestic Ministry includes the agency for petroleum affairs.

The Somali Republic was listed by the United Nations as one of the world's 25 least developed nations, and foreign investment possibilities were poor. Markets were small, labor was largely unskilled, and the natural resources so far discovered were just beginning to be exploited. A policy of nationalization of principal industrial and commercial enterprises, as well as tight controls on remaining private firms, including restrictions on repatriation of profits and capital and on foreign worker employment, also discouraged outside investment. A notable exception was the arrangements made for oil exploration, which was openly encouraged by the Government.

There was a continuing and growing interest in the search for oil by several groups, but so far there were no reported discoveries. Four international groups were searching for oil, both onshore and offshore. CONOCO of the United States and three other groups represented by French, German, and British operating companies were conducting exploration programs. Hammar Petroleum Co. of Fort Worth, Tex., and its subsidiary, Burmah Oil, started its first well in the Upper Djouba Valley on August 30, 1973, about 25 miles outside Bula Hawa. A geological survey had been made previously of the area. Elf Somalia (an affiliate of Enterprise de Recherches et d'Activites Petrolieres (ERAP)

[12] Prepared by Janice L. W. Jolly.
[13] Where necessary, values have been converted from Somalian shillings (Ss) to U.S. dollars at the rate of Ss6.925=US$1.00.
[14] U.S. Embassy, Mogadiscio, Somali Republic. Department of State Airgram, A-89, Dec. 12, 1973.

of France) with Exxon of the planned geological research in on- and offshore areas covering some 7,145 square miles. During 1973, ELF signed a second agreement with the Somali Government and was granted a concession of 3,850 square miles in deep water of the Chisimaio region. ELF started exploratory drilling offshore of Bender Beila on Somalia's north Indian Ocean coast. CONOCO has a 24,000-square-mile petroleum concession in the Mudug, Nagal, and Bosasso regions.

Although a number of important mineral deposits occur in Somalia, the lack of infrastructure and related facilities generally prohibits economic mining. Rapid construction of a road system and other facilities are therefore considered as essential by the Somalian Government for development. The Fanole Dam being constructed by joint Somali-Soviet Union efforts, the north-south road being built by the People's Republic of China (PRC), and the reopening of the salt production facility at Hafun in the northeastern Somali coast were among the important projects for 1973. The road linking Belet Huen with Bourao, a distance of 650 miles, was started in 1972 by the PRC and was expected to take 4 years to complete. The European Communities (EC) was financing a study concerning a road linking Berbera and Bourao. A deep water port was started in October 1973 at Mogadiscio with EC and International Development Association (IDA) assistance. IDA allotted $13 million for the port development. A small iron foundry was planned for Mogadisco, and a cement factory was also under discussion.

The UNDP continued its mineral exploration efforts throughout 1973 as Phase III of the mineral and groundwater survey continued throughout the country. This phase, lasting into 1974, was expected to cost $2.0 million.

Mineral deposits of copper, piezoelectric quartz, manganese, zinc, and tin have been uncovered by an excavation program in the northern region. Prospecting was underway for copper in the Seinat region and for manganese in the Kudad region. Fieldwork continued on shows of nickel, chrome, zinc, and lead. Plans were being made for detailed geological and geochemical studies in Gabileh-Hargeisa (copper), at Durdur, 80 miles north of Hargeisa (chrome and nickel), and in Borama-Hargeisa (zinc and lead). More tests were made on the manganese and lead deposits in the Bosaso-Laskhoreh areas. Kyanite and gold occurrences were also observed by field teams in the northern Somalia area.

A search for minerals with piezoelectric properties was being carried out in the pegmatite terrain of Abde-Kadir, Borama, Burmado, Darburb, Lafarug, and Mandera areas of the northwest. An agreement was signed with the Soviet Union for specialists to begin prospecting and exploiting piezoelectric minerals in these areas. Bulgaria had begun work on prospecting and small-scale experimental production from the tin mines of the Majayahan-Dalan region.

Titanium reserves of about 10 million tons were reported by the Government Survey in the black sand area along the Indian Ocean, northeast of the Djouba River. Somala Nuclear Corp., a subsidiary of the Italian Ente Nazionale Idrocarburi (ENI) group, was continuing onsite studies of radioactivity in the underground rocks in the Bur region. Work was underway by the UNDP on some radioactive ores in sedimentary deposits at Mudug in central Somalia. Uranium reserves were estimated at 10,000 tons in this area, and further prospecting and exploitation were contemplated. The Wabo carnotite deposit was estimated to contain as least 5,000 tons of uranium oxide at an average grade of 0.07% U_3O_8.

Exploration by a geochemical team for gold in the Merca red dunes, and for light metals in the Dinsor-Bur areas was in preliminary stages.

The recovery of salt by solar evaporation methods and quarrying of meerschaum, stone, and sand and gravel for local consumption were the principal commodities produced in 1973. Somalia's few exports were primarily unprocessed agricultural commodities. Small quantities of metal scrap were exported. Import statistics are shown in table 16.

Table 16.—Somali Republic: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum, semimanufactures	--	(1)	All to People's Democratic Republic of Yemen.
Iron and steel:			
Ore and concentrate	10	--	
Scrap	3,041	(1)	Do.
Pig iron and ferroalloys	43	4	All to Ethiopia.
Semimanufactures	r 7	39	Ethiopia 36; Kenya 3.
Platinum-group metals and silver troy ounces	3,633	12,571	Kenya 9,292; Italy 1,929; People's Democratic Republic of Yemen 1,350.
Other, nonferrous metals, not further described:			
Ores and concentrates	260	--	
Unwrought, semimanufactures, scrap	2	--	
NONMETALS			
Cement, hydraulic	262	--	
Clays and clay products (including all refractory brick):			
Crude clays	--	1	All to Italy.
Products, refractory	--	(1)	All to West Germany.
Fertilizer materials, crude, not further described	10	--	
Salt	16	22	Ethiopia 17; Kenya 4.
Stone, sand and gravel	1	(1)	Mainly to Australia and Italy.
Sulfur, including unroasted pyrite	--	10	All to People's Democratic Republic of Yemen.
Other:			
Crude nonmetals, n.e.s	120	(1)	Do.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	--	150	All to Saudi Arabia.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural	4	(1)	All to Italy.
Petroleum refinery products:			
Gasoline 42-gallon barrels	r 1	14	All to ship stores.
Kerosine and jet fuel do	r (1)	20	People's Democratic Republic of Yemen 19; ship stores 1.
Distillate fuel oil do	--	503	Ship stores 468; People's Democratic Republic of Yemen 35.
Lubricants do	--	22	Mainly to ship stores.

r Revised.
1 Less than ½ unit.

Table 17.—Somali Republic: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum and alloys, unwrought and semimanufactures	32	81	People's Republic of China 54; Kenya 12; India 8; Hong Kong 5.
Copper and alloys, unwrought and semimanufactures	45	10	Italy 7; Kenya 2; French Somaliland 1.
Iron and steel:			
Ore and concentrate	(1)	--	
Scrap	(1)	--	
Pig iron and ferroalloys	(1)	24	Mainly to U.S.S.R.
Steel, primary forms	r 1,534	1,225	U.S.S.R. 981; Italy 188; Japan 46.
Semimanufactures	r 6,453	8,336	Italy 4,001; Japan 2,217; People's Republic of China 679; United Kingdom 377; Kenya 363.
Lead and alloys, unwrought and semimanufactures	64	16	Mainly from Italy.
Nickel and alloys, unwrought and semimanufactures	(1)	5	Do.
Silver and platinum group:			
Ore and concentrate	1	--	
Metal troy ounces	r 11,446	43,500	People's Democratic Republic of Yemen 28,968; Japan 7,137; United Kingdom 3,440.

See footnotes at end of table.

Table 17.—Somali Republic: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Tin and alloys, unwrought and semimanufactures ____ long tons	7	4	Italy 2; People's Democratic Republic of Yemen 1.
Zinc and alloys, unwrought and semimanufactures	815	11	Mainly from Italy.
Other:			
Nonferrous base metal ores, not further described	(1)	--	
Nonferrous metal scrap, not further described	(1)	41	All from Italy.
Nonferrous base metals, unwrought and semimanufactures	6	9	U.S.S.R. 5; Kenya 3.
NONMETALS			
Abrasives, natural, including industrial diamond ____ kilograms	250	568	Italy 505; U.S.S.R. 63.
Cement, hydraulic	68,682	54,883	Pakistan 30,077; U.S.S.R. 17,385; People's Republic of China 1,760; Kenya 1,669.
Clays and clay products (including all refractory brick):			
Crude clays	115	208	Mainly from Italy.
Products:			
Refractory	50	890	People's Republic of China 658; Italy 227; United Kingdom 3.
Nonrefractory	208	707	Italy 551; People's Republic of China 108; Czechoslovakia 22.
Fertilizer materials:			
Crude	1,117	234	Kenya 213; Ethiopia 12.
Manufactured	6,205	5,819	Italy 3,948; Kuwait 1,308; Japan 503.
Lime	428	200	All from Italy.
Salt	55	9	Italy 4; People's Republic of China 3; United Kingdom 2.
Stone, sand and gravel	r 6,057	41	Italy 32; Kenya 4; United Kingdom 3.
Other:			
Crude nonmetals, n.e.s	172	15	People's Republic of China 5; Italy 3; West Germany 2; People's Democratic Republic of Yeman 2.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	684	1,670	People's Republic of China 635; Belgium 370; Singapore 256; Yugoslavia 148.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt, natural	20	2,315	French Somaliland 1,553; Saudi Arabia 690; Italy 72.
Petroleum:			
Crude and partly refined 42-gallon barrels	1	1	All from Kenya.
Refinery products:			
Gasoline ____ do ____	127,389	116,468	U.S.S.R. 104,724; Saudi Arabia 8,065; Kenya 2,035.
Kerosine and jet fuel ____ do ____	49,674	43,022	U.S.S.R. 39,028; Iran 2,290; Saudi Arabia 1,391.
Distillate fuel oil ____ do ____	294,072	358,358	U.S.S.R. 295,900; Saudi Arabia 41,099; Iran 18,962.
Residual fuel oil ____ do ____	130	173	Saudi Arabia 160; Italy 13.
Lubricants ____ do ____	12,880	15,756	U.S.S.R. 12,784; Kenya 1,337; Saudi Arabia 507; Italy 441.
Other:			
Liquefied petroleum gas ____ do ____	1,605	1,887	Kenya 1,615; Hong Kong 82; People's Democratic Republic of Yemen 80.
Unspecified ____ do ____	1,816	55,957	Iran 54,199; Kenya 1,167.
Total ____ do ____	r 487,566	591,621	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	39	5	French Somaliland 3; Italy 1; People's Democratic Republic of Yemen 1.

r Revised.
1 Less than ½ unit.

SOUTHERN RHODESIA [15]

Rhodesia's growth as a viable mineral producer continued in 1973 despite economic sanctions against the country. The value of mineral output, which has more than doubled since sanctions were imposed in 1965, increased 27% to R$135.9 million.[16]

The current year's volume-value ratio reversed that of 1972 when volume was up 10% and value up only 6%. In 1973, value increased 27% and volume increased only 13%. Higher gold and copper prices helped bring about the reversal.

Registration of new mining and quarrying companies in 1973 was at an alltime high of 50, with nominal capital of $3,010,700. Five mining concerns increased their registered capital by $7,616,000. The contribution of mining and quarrying industries represented 6.4% of the GDP of $2,411,450,000, an increase of 12% over that of 1972.

The Rhodesian Government loaned R$296,368 to miners during the fiscal year. This was R$237,679 more than in 1972. The loans were for development work, establishment of water supplies, purchase of plants and machinery, and assistance in marketing minerals.

Approximately 58,000 persons were directly employed in the mining industry in 1973, with Africans representing 94% of this figure.

Exploration for minerals, particularly gold, was at a feverish pitch most of the year as firms and individual prospectors seized the opportunity to cash in on greatly increased prices. At yearend 45 exclusive prospecting orders were in effect.

The sharp increase in gold and copper prices, improvements in the nickel price, and greater chromite production more than negated the adverse effects of the U.S. dollar devaluation.

The 1972 U.S. exemption of chromite and other strategic minerals from sanctions by the Byrd amendment remained in effect through 1973.

Rhodesia supplied 6,993 million kilowatt-hours of electrical energy to the Central African Power Corp. (CAPCO) grid and withdrew 4,889 million kilowatt-hours. These represented increases of 22% and 21%, respectively. Energy from CAPCO together with 356 million kilowatt-hours from other sources brought total electrical energy consumed in Rhodesia to 5,245 million kilowatt-hours, an increase of 17% over last year. The mining and quarrying industries consumed 19% of the total in 1973, the same as in 1972.

COMMODITY REVIEW

Metals.—*Chromium.*—Exports of chromite and ferrochromium to the United States were as follows:

	Tons, gross weight	Value
Chromite	39,163	$1,483,000
High-carbon ferrochromium	41,806	7,904,000
Low-carbon ferrochromium	4,235	1,871,000
Ferrochromium-silicon	8,091	2,161,000

Operations at the Rio Tinto (Rhodesia) Ltd. Feoch chromite mine ceased because of the poor prices for eluvial chromite. The two other chromite mines of the group were not affected. The mine's plant, about 60 miles northeast of Salisbury, is on a care and maintenance basis and could become operational again if the market improves.

The Anglo American Corp., Rhodesia Ltd. acquired the chromium interests of Foote Mineral Co. in Rhodesia, which include the Vanad, Sutton, and Caesar mines in Mtoroshanga, Banket, and Umvukwes, respectively (all in the Salisbury area). Anglo American had been operating the Rhodesian Alloys ferrochrome plant at Gwelo and consuming ore from these mines. Present management was to be retained. Foote Mineral had a gross realization of about $2.5 million on the disposal of its interests in Rhodesia, and has no further holdings there.

The world's second largest reserve of chromite is in Rhodesia, totaling about 560 million tons or about one-third of the total world reserves.

Copper.—Copper output at the Coronation Syndicate Ltd. Inyati and Muriel mines increased 22%, totaling 7,384 tons in 1973; however, output decreased each quarter during the year. The Inyati mine

[15] Prepared by Larry J. Alverson, industry economist, Division of Ferrous Metals—Mineral Supply.

[16] Where applicable, values have been converted from Southern Rhodesian dollars (R$) to U.S. dollars at a rate of R$1=US$1.70.

accounted for most of the production. Primary development work advanced 562 meters at Muriel and 1,265 meters at Inyati.

Rhodesia's largest copper producer, Messina (Transvaal) Development Co. Ltd., (Messina) produced an estimated 34,000 tons of refined copper during its fiscal year ending September 30. This represents an increase of about 10% over that of 1972.

Messina's Mangula mine output totaled 1,335,000 tons of ore, an increase of 3.2% over 1972, and assayed 1.17% copper. Concentrate produced contained 14,455 tons of copper, an increase of 5% from that of 1972. Proved minable reserves increased by 1.3 million tons to 15 million tons; the grade dropped, however, from 1.30% to 1.27% copper. An additional 440,000 tons of oxide ore averaging 0.77% copper was treated at the leach plant, from which 2,728 tons of copper in cement copper was recovered, a decrease of 24% from that of 1972.

M.T.D. (Mangula) Ltd. planned to develop the Hans and Angwa copper ore bodies near the Alaska smelter at Sinoia. The ore reserves are reportedly 1 million and 3 million tons, respectively, and development costs should be modest. At yearend work was well advanced on the erection of the headframe, hoist, compressor house, and casting of the shaft collar. Shaft sinking of 300 meters and development work of 750 meters were planned for 1974.

The Silverside mine of M.T.D. Mangula produced 204,000 tons of ore averaging 1.44% copper. Concentrate produced contained 2,023 tons of copper in the first full year of operation. Sulfide ore reserves remained unchange at 400,000 tons grading 1.77% copper. Oxide ore reserves were depleted from 454,000 tons to 284,000 tons grading 2.05% copper.

Ore production at the Norah mine totaled 235,000 tons, averaging 1.11% copper, 93% from stopes and the rest from development work. Concentrate produced contained 2,399 tons of copper. Development advanced 3,736 meters, only slightly less than in 1972. Ore reserves were depleted to 1,732,000 tons at 1.35% copper.

The Gwai River mine produced 169,000 tons of ore grading 1.11% copper from stopes and 0.71% copper from development work, a 13% decrease from the 1972 tonnage. Recoverable copper produced was 1,581 tons, down 34% from 1972. Ore reserves were estimated at 236,000 tons containing 1.12% copper. Development advanced 1,928 meters to 4,268 meters, of which 2,179 meters (51%) was done on stope development.

The tonnage of ore produced at the Shackleton mine increased 12% to 541,000 tons of ore, grading 1.75% copper from stopes and 1.41% copper from development work. An additional 12,000 tons was drawn from surface stockpiles and bins. All ore treated in the concentrator produced 8,769 tons of copper in concentrate, down 4% from 1972. Proven ore reserves were 235,000 tons at 1.94% copper, and probable reserves were 2,644,000 tons at 1.99% copper. Total development advanced 9,867 meters.

Messina's Alaska mine produced 271,000 tons of ore grading 1.14% copper. Production from open pit workings declined 42% to 120,000 tons at 1.01% copper, while underground production from stopes and development work increased 57% to 151,000 tons at 1.24% copper. Concentrator recovery improved slightly to 77.8%, producing 2,483 tons of copper in concentrate. The disappointing performance of the Alaska smelter in the first half of the financial year necessitated an early shutdown in March. After restartup, a significant improvement in output was made. A third converter was added in August, boosting the installed capacity to meet the group's foreseeable requirements. Proven reserves decreased to 374,000 tons at 1.72% copper; development advanced 4,445 meters.

Gold.—Rising gold prices renewed interest in reopening old gold mines, some dormant for over 40 years, reworking old dumps, and prospecting new claims. Large mines that reopened include Shamva (Lonrho), Rezende, and Gaika. Medium-size mines being developed include the How (Lonrho) near Bulawayo, Roma, Ndarama, and Grande Parade. Anglo American Corp. was dewatering the Champion mine near Umtali and may reopen it, depending on results of an underground sampling program. The South African General Mining and Finance Co. was developing the Bar 20 gold mine at Gwanda. The Venice mine (Falcon Mines Ltd.) began production in June following

the successful test milling of ore at the parent mine, Dalny.

Fifty-five gold mines were brought into operation in 1973, many of them taking advantage of Government assistance in the way of loans, plant hire, and expertise. Gold claims registered during 1973 increased to 538 from 395 in 1972.

The four mines of Coronation Syndicate Ltd. (Arcturus, Inyati, Mazoe, and Muriel) produced 89,670 troy ounces of gold during the year, an increase of 4% over that of 1972. Profit for the group rose from R$2,399,000 in 1972 to R$6,020,000, due mainly to increases in the price of gold.

Nickel.—Johannesburg Consolidated Investment Co. Ltd. (JCI) decided to proceed with the development of the Shangani nickel mine in Matabeleland. Production will begin in 1975 with a milling rate of 75,000 tons per month. Mining production will start from an open pit, to be followed several years later with a deep shaft and underground operations. A nickel-copper concentrate will be produced at Shangani and treated under contract at Bindura by Bindura Smelting and Refining Co., Ltd. Reserves are estimated at 16 million tons at an average grade of 0.9% nickel, with copper and platinum-group metals as byproducts. Costs included $30 million to open the mine, $3.4 for exploration and structural development, $2.2 million for the barrage (to be constructed by the Government), and $12 million for expansion of the refinery at Bindura.

Metal production of Rhodesian Nickel Corp. Ltd. (Rhonickel) increased during the year, primarily because of a higher milling rate at the Trojan nickel mine, which averaged nearly 80,000 tons per month. Diamond drilling indicated a further 5 million tons at an average grade of 0.7% nickel, making ore reserves of 12 million tons grading 0.75% nickel available at yearend.

Rhonickel's Madziwa mine had production slightly higher than that in 1972. The mine was still experiencing difficulties with low-grade ore at both the Amm and the Sulphide Hill mines. The subvertical shaft being sunk at Sulphide Hill reached a depth of 1,500 feet, with another year of work left before completion. The company will be able to mine reserves between 800 and 2,000 feet below surface when completed. A reassessment of reserves indicated a total of 6,740,000 tons grading 0.94% nickel and 0.31% copper.

Rhonickel's wholly-owned subsidiary, Trojan Nickel acquired the Epoch property in the Filabusi District. Extensive drilling reportedly indicated a potential 2,500,000 tons of ore grading 0.75% nickel. The company planned to establish a concentrator at Epoch which will supply additional material to the Bindura refinery, bringing output close to the refinery capacity of 16.5 million pounds per year of nickel cathode.

Exports of nickel to the United States in 1973 were 3,569 tons valued at $10,977,000.

Tungsten.—The Beardmore mine of Messina produced a total of 36,000 tons of ore grading 0.67% tungsten trioxide (WO_3). From this, 33,000 tons containing 0.72% WO_3 was milled. Also 13,000 tons of slimes containing 0.61% WO_3 was treated in the slime plant. The gravity concentration plant recovered 312 tons of scheelite concentrate containing 194 tons of WO_3.

Ore reserves at yearend were calculated at 6,000 tons containing 0.66% WO_3. This tonnage plus ore mined from nonreserve sources should be sufficient to the end of December 1973, when underground production is expected to cease. At that time the plant will retreat selected portions of slime and sand dumps, thus producing about 100 tons of WO_3.

A company was reportedly being formed to establish and operate a $425,000 refinery to recover tungsten from scheelite. It is being developed in close association with the Tribal Trust Land Development Corp. (Tilcor), because much of the scheelite will come from tribal areas. The reserves of scheelite are ample, but low prices have heretofor caused a number of mines to cease production. The ability of Rhodesia to produce a refined product from scheelite could determine whether or not the industry is economically viable.

Nonmetals.—*Asbestos.*—Exports of crude asbestos (chrysotile) to the United States totaled 767 tons valued at $423,478. There were 12 operating mines in 1973 which produced about 80,000 tons of asbestos, but most of the production came from the Gaths and Shabanie mines of the Rhodesian and General Asbestos Corp. (Pvt.) Ltd. and the Pangani and Van-

guard mines of Pangani Asbestos Mines (Pvt.) Ltd.

Mineral Fuels.—*Coal.*—Wankie Colliery Co. Ltd., Rhodesia's only coal producer, has four opencast and two underground mines. Production from the newly reopened No. 1 colliery was 281,960 tons for the operating year ending August 31. Reserves are approximately 6 million tons. The No. 3 colliery produced 897,983 tons, 38% more than in 1972. The No. 4 colliery, which went into production on August 8, 1973, produced 9,195 tons; planned capacity is 1,400,000 tons per year. Reserves were estimated at 37 million tons. Production from opencast operations was 1,875,651 tons, up 92% from that of 1972. Wankie's total coal production for the year was 3,064,789 tons, up 11% from that of 1972.

Coke production, affected by the loss of northern markets, totaled 282,037 tons, a decrease of 7% from that of 1972, while coke sales totaled 237,000 tons, down 20% from those of 1972. Extensions of the coke plant were underway to be completed by yearend.

The new thermal power station to be built at Wankie will be supplied with a high ash coal from Wankie's opencast mine by agreement with the Electricity Supply Commission. The first 120 megawatts of power of a planned 1,280 megawatts was expected to be commissioned in 1977.

Primary exploration by Rio Tinto (Rhodesia) Ltd. led to the discovery of good-quality coal in the Sengwa area, and a major portion of the company's exploration is being devoted to the project.

SPANISH SAHARA [17]

The principal mineral production in the Spanish Sahara was phosphate rock. Production in 1973 was 696,400 tons. Although this was an appreciable increase over the 159,000 tons produced in 1972, it did not approach the projected 2 million tons. In 1972, only 73,000 tons was exported; this increased significantly in 1973 to 654,900 tons. Shipments were made to France, 28,300 tons; West Germany, 34,500 tons; Spain, 358,200 tons; the United States, 27,800 tons; Brazil, 42,000 tons; Japan, 120,800 tons; and Lebanon, 43,200 tons.

Fosfatos de Bu-Craa (Fosbucraa) is a wholly-owned subsidiary of the Spanish Government's Instituto Nacional de Industria. Fosbucraa started mining in 1971, and full production of 3 million tons was scheduled for 1973. The mine is in the northern part of the country, 107 kilometers southeast of El Aaiun and 100 kilometers from the Atlantic coast. A drilling program with holes on 1-kilometer centers confirmed reserves of 1.7 billion tons of phosphate rock.

Overburden is stripped with 60-cubic-yard bucket draglines, and the ore is dug with bucket-wheel excavators or with power shovels. Bottom-dump 100-ton-capacity haulage trucks deliver the ore to the mine primary crushing plant. Crushed but unbeneficiated ore is conveyed 98.6 kilometers to the beneficiation plant at El Aaiun. Oversize 10-millimeter rock from the primary crushing plant is not conveyed to the plant at El Aaiun. The ore is crushed and washed in sea water to permit wet separation of sands and slimes from phosphate-bearing nodules. The circuit uses screens, cyclones, and finally centrifuges to wash the ore with fresh water prior to drying in fluid-bed dryers. The product will grade between 34% and 37% P_2O_5 and does not contain any appreciable quantity of organic matter. One of the problems that has held back production has been the operation of the water desalinization plant. Without an assured supply of fresh water to wash the chlorides from the rock, the rock is unduly corrosive in wet phosphoric acid digestion and filtration circuits.

The production from the mine was projected to increase to 2.2 million tons in 1974, to 4.1 million in 1975, and to 5 to 6 million tons in 1976. The decision to expand production to 10 million tons per year will probably not be made until 1975.

Three Spanish companies have asked the Government for permission to construct phosphoric acid plants in the Canary Islands. Unión Explosivos Rio Tinto (UERT) proposed a 100,000-ton-per-year P_2O_5 plant. Fuinsa proposed a 75,000-ton-per-year P_2O_5 plant, and Cia.

[17] Prepared by William F. Stowasser.

Insular de Canarias proposed to double the size of its existing 40,000-ton-per-year phosphoric acid plant. The plants would consume Fosbucraa rock. Rio Tinto was expanding its 300,000-ton-per-year plant at Huelva, Spain, to 400,000 tons per year and will expand to 500,000 tons per year in 1975 in anticipation of rock shipments from Fosbucraa.

The Spanish Government has granted CONOCO and its partners a 3-year extension of petroleum search rights on three offshore blocks on condition that at least one well is drilled during the extension period.

A well was drilled by Empresa Nacional de Petróleos de Aragon (ENPASA), a Spanish company. Although the well was completed in December 1973, no data have been released. ENPASA, after relinquishing five offshore licenses during 1972, retained only a northern block of 13,630 square kilometers. Surface activity was limited to seismic investigations covering 309 kilometers of line on land and 1,114 kilometers offshore.

SUDAN [18]

The mineral industry of Sudan experienced no great breakthrough in production during 1973, and the main emphasis was on exploration with foreign technical assistance and the assessment of Sudan's mineral potential, which is known to be promising. Agricultural products form the major exports. The total value of mineral exports for the first 6 months of 1973 was estimated at $2.6 million.

Mineral exploration was being undertaken by both foreign and local mining and oil companies. Mineral prospecting licenses covered almost the entire northeastern third of Sudan. The UNDP Special Fund project included mineral exploration in three areas covering about 76,383 square miles. The Sudanese Geological Survey proposed mineral exploration for the Red Sea Hills area and in the southern part of Equatoria and Bahr El Ghazal Provinces. United States, Canadian, and Australian companies were reportedly involved in mineral exploration. Sudanese and Romanian officials signed a trade agreement for 1974. Romania will help improve the river system in Sudan and will undertake joint projects, including exploitation of mineral wealth. The People's Republic of China's 90 specialists were to begin prospecting in late 1973 for chrome in the vicinity of northern Ingessana Hills, bringing the total number of Chinese working on the project to 100. Very little prospecting was being done in the southern provinces owing to the security situation.

Adobe Corp. (U.S.) and American Pacific International (U.S.) were granted offshore oil exploration licenses. Ball and Collins (Oil and Gas) Ltd. of the United Kingdom was granted 17 exploration licenses (3.3 million acres) along the Red Sea. About 80% of the territory is offshore. The first well must be started by September 1975. Sudanese Resources Development Corp., a subsidiary of Oceanic Exploration Co. (U.S.), was awarded 18 oil and gas exploration licenses by Sudan. Each license can have a maximum of 49.68 square miles,[19] allowing a total of about 894 square miles (or 3.5 million acres). The tracts are located offshore in the Red Sea, starting near the Egyptian border and extending southward to Ras Abu Shagara. A reconnaissance program was expected to begin in 1974.

In the first 6 months of 1973, exports of iron scrap and of copper, lead, zinc, and other nonferrous scrap metal were valued at $472,414.[20] Most of the metal scrap was shipped to the Arab Republic of Egypt, Ethiopia, the Netherlands, Italy, Spain, the United Kingdom, and Yugoslavia. In the first 6 months of 1973, salt exported to Chad, Central African Republic, and Ethiopia was valued at $25,112. Cement, valued at $2,574, was exported to Chad in the first half of 1973. Natural sodium carbonate, valued at $1,622, was shipped to Saudi Arabia and Syria in the first half of 1973.[21] In 1973, 32,050 tons of chromite was produced and exported to Europe and the United States.

Petroleum refinery products are prominent in the mineral production listed in table 1, and were valued at $31.4 million

[18] Prepared by Janice L. W. Jolly.
[19] Sudan Ministry of Industry and Mining. Guide to Oil Exploration in Sudan. Geol. Survey Dept. Bull. 20, April 1972, 19 pp.
[20] Where necessary, values have been converted from Sudanese pounds (LS) to U.S. dollars at the rate of LS=US$2.87.
[21] Democratic Republic of Sudan. Foreign Trade Statistics, Exports. June 1973, 247 pp.

in 1973.[22] Imports of crude oil in 1973 were valued at $23.9 million. This is compared with a value for crude oil imports of $18.9 million and a refinery production valued at $23.9 million in 1972. During the first 6 months of 1973, refined petroleum products worth $2.1 million were shipped to Ethiopia, Saudi Arabia, Oman, Japan, Somalia, France, Yemen, and Singapore. Other mineral imports are shown in table 18.

Lenticular deposits of chromite in serpentine occur in the Ingessana Hills in the southeast Blue Nile Province. About 1 million tons of chromite was estimated to occur there. From 30,000 to 40,000 tons per year of 56% Cr_2O_3 was mined. Plans were being made for expansion of mine output. The chromite was exported mainly to Europe and the United States.

The UNDP mineral survey project was examining the copper deposit at Hofrat En Nahas in southwestern Darfur Province. About 10 million tons of 2.7% copper occurs in shear zones in Precambrian metasedimentary rock and associated igneous rocks. Other copper occurrences reported in the Red Sea Hills area were yet to be investigated and evaluated.

Gold-bearing ore was reportedly analyzed from the Debeb area with positive results. Several gold mines in the north and northwest of Sudan have been reopened. Examples are the Doweishat mine south of old Wadi Halfa, Bir Kateib, and Gabeit in the Red Sea Hills.

Investigation into the iron ore deposits of Sudan continued to be of interest. Recent studies[23] were published on the iron ore deposits of Kordofan.

Galena and quartz veins occur in the gneisses and graphitic schists at Kutum in Darfar Province. A lead-zinc vein deposit, locally mined but closed since 1917, occurs to the northeast of Kutum. The deposit contains 17% to 66% lead and up to 20% zinc in the Precambrian metasedimentary and associated igneous rocks.

Manganese deposits occur in the Red Sea Hills and coastal areas, in the Central Sudan, and in the Northern Province. Both epigenetic (in veins and stockworks) and syngenetic (in Plio-Pleistocene sedimentary rock) deposits occur in Sudan. Some small-scale mining is being done in the Red Sea area.

A private company was investigating the tungsten-tin deposit at Sabaloka, immediately west of the Nile River and 55 miles north of Khartoum.

UNDP projects were concentrated on the asbestos deposits at Quala El Nahal in Kassala Province and in the Ingessana Hills. The mineral is chrysotile at both deposits and is somewhat silicified in some places at Quala El Nahal.

Reserves estimated at 30 million tons of high-quality gypsum occur in the marine sedimentary series in the Red Sea coastal area at Khor Eit, 42 miles north of Port Sudan. It was being mined for local use in cement manufacture and other construction purposes.

Residual kaolin occurs near Derudeb in Kassala Province. One deposit is estimated to have reserves of 1.8 million tons of 25% Al_2O_3. Further investigation was planned for other kaolin deposits known to occur in northern Kordofan Province.

The UNDP mineral survey was investigating kyanite occurrences in the Northern Province. Reserves of 300,000 tons of 70% wollastonite were reported in a skarn area covering 11.2 square miles located in the northeastern Red Sea Hills. A preliminary investigation proved 160,000 tons of 35% magnesium oxide in serpentine rocks located north of the Red Sea Hills. Deposits containing 78% to 97% magnesium carbonate occur in the Ingessana Hills in southern Blue Nile Province, as lenses or stockwork veins in serpentine.

Pegmatite bodies containing mica, quartz, feldspar, and some tourmaline, garnet, beryl, and apatite are found in the Pubatab area of Northern Province. The mica was described as ruby mica of grades 3, 4, 5, and 6. The deposits were under investigation by a UNDP project and were previously mined on a small scale.

A number of thermal springs and sulfur deposits occur related to the Jebel Marra complex. Salt has apparently long been collected by the local people from the larger Deriba Lake. Talc occurs in the Red Sea Hills and other areas.

A joint Romanian-Sudanese exploration effort found gas on Dardara Island. A 22,000-barrel-per-day refinery at Port Su-

[22] U.S. Embassy, Khartoum, Sudan. Department of State Telegram Khartoum 968, May 10, 1974.
[23] United Nations Development Programme. Country and Intercountry Programming Sudan. DP/GC/SUD/R. 1, Mar. 30, 1973, p. 47.

dan is owned and operated by Shell Oil Co. and British Petroleum (BP) Sudan Ltd. Plans were being made for a new 200,000-barrel-per-day refinery at Port Sudan. An investment of $250 to $300 million was visualized by the joint Government-Triad Naft venture. A 400-mile pipeline was planned from Port Sudan to Khartoum with a capacity of 12,000 barrels. BP, Shell, and Kuwait Metal Pipeline Co. will supply financing and plan to finish by June 1976.

Table 18.—Sudan: Exports and reexports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Copper metal, including alloys, scrap	181	60
Iron and steel:		
Ore and concentrate	4,100	--
Metal:		
Scrap	2,000	6,484
Semimanufactures value	--	$5,213
Lead metal, including alloys, scrap	1,140	150
Manganese ore and concentrate	--	1,370
Zinc metal, including alloys, scrap	35	26
Other:		
Ore and concentrate of base metals, n.e.s	13,800	19,250
Nonferrous metal scrap, n.e.s	7,542	94
NONMETALS		
Cement	--	25
Gypsum and plasters value	(1)	--
Mica, crude, including splittings and waste	70	--
Salt	619	1,259
Sodium carbonate, natural	145,582	46,894
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Gasoline thousand 42-gallon barrels	6	131
Kerosine value	$1,557	$1,048
Jet fuel thousand 42-gallon barrels	193	209
Distillate fuel oil do	--	(2)
Residual fuel oil do	133	(2)
Lubricants do	r 1,211	1,178

r Revised.
1 Less than $1,000.
2 Less than ½ unit.

Table 19.—Sudan: Imports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum:		
Oxide and hydroxide	(1)	1
Metal, including alloys, unwrought and semimanufactures	1,401	522
Copper metal, including alloys, unwrought and semimanufactures	382	845
Iron and steel metal:		
Scrap	242	2
Pig iron, ferroalloys, similar materials	44	57
Steel, primary forms	4	85
Semimanufactures:		
Bars, rods, angles, shapes, sections	23,808	20,720
Universals, plates, sheets	22,110	19,314
Hoop and strip	3,022	2,581
Rails and accessories	214	711
Wire	1,243	675
Tubes, pipes, fittings	12,890	8,333
Castings and forgings, rough	393	675
Lead metal, including alloys, unwrought and semimanufactures	611	371
Nickel metal, including alloys, unwrought and semimanufactures	(1)	1
Platinum-group metals, including alloys, all forms troy ounces	161	643
Tin metal, including alloys, unwrought and semimanufactures long tons	r 239	121
Zinc metal, including alloys, unwrought and semimanufactures	r 308	623

See footnotes at end of table.

Table 19.—Sudan: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1971	1972
METALS—Continued			
Other:			
Oxides, hydroxides, peroxides of metals, n.e.s		14	35
Base metals, including alloys, all forms, n.e.s		8	--
Oxides of zinc and lead, not separated		300	635
Oxides of manganese, iron, cobalt, titanium, not separated		180	224
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc		118	90
Dust and powder of precious and semiprecious stones		68	6
Grinding and polishing wheels and stones		37	23
Cement		3,872	518
Chalk		411	1,015
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s		1,517	396
Products:			
Refractory (including nonclay brick)		874	667
Nonrefractory		1,948	779
Fertilizer materials:			
Manufactured:			
Nitrogenous		85,554	193,589
Phosphatic		350	300
Potassic		3	8
Other, including mixed		99	--
Ammonia		101	49
Graphite, natural		116	8
Gypsum and plasters		303	--
Iodine		14	11
Lime		645	882
Mica, crude, including splittings and waste		5	5
Pigments, mineral, natural, crude		266,164	184,578
Precious and semiprecious stones, except diamond	carats	--	515,000
Salt		50	63
Sodium carbonate, natural		232,033	359,309
Sodium and potassium compounds, n.e.s.:			
Caustic soda		7,661	3,752
Caustic potash, sodic, potassic peroxides		1,205	2
Stone, sand and gravel:			
Dimension stone	value	$7,861	$5,603
Sand, excluding metal bearing		216	--
Sulfur:			
Elemental, all forms		27	(1)
Sulfuric acid		453	372
Other nonmetals, n.e.s.:			
Crude		1,372	317
Slag, dross, similar waste, not metal bearing		2	--
Bromine, chlorine, fluorine		(1)	34
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s		1,944	3,123
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural		94	3
Carbon black		1	5
Coke and semicoke		600	--
Oxygen, nitrogen, hydrogen, rare gases		3	(1)
Petroleum:			
Crude and partly refined	thousand 42-gallon barrels	--	3
Refinery products:			
Gasoline:			
Motor	do	728	862
Aviation	do	202	147
Kerosine	do	695	697
Jet fuel	do	14	--
Distillate fuel oil	do	2,403	2,358
Residual fuel oil	do	1,411	1,309
Lubricants	do	253	237
Other:			
Liquefied petroleum gas	do	23	33
Mineral jelly and wax	do	2	2
Bituminous mixtures, n.e.s	do	10	5
Unspecified	do	(1)	(1)
Total	do	5,741	5,650
Mineral tar and other coal-, petroleum-, or gas derived crude chemicals		475	153

r Revised.
1 Less than ½ unit.

SWAZILAND [24]

Swaziland mineral industry sales have fluctuated widely since 1971, caused by changes in iron ore and asbestos production. During 1972, minerals sales value dropped by approximately 22% compared with 1971, caused principally by a decrease in iron ore sales to Japan and a change to production of lower grade asbestos. In 1973, however, there was only a 1% drop from the 1972 values. This resulted partly from continued loss of iron ore sales to Japan because of transportation difficulties, but at the same time, sales of asbestos rose by 50% to exceed iron ore for the first time since 1965.[25] In the near future, the output of iron ore and asbestos is not likely to change, but a large expansion of the coal industry is expected. As a result of the world oil crisis, experts have turned their sights towards coal as an energy source. An attempt was being made to locally convert from oil to coal-fired furnaces wherever practical.

A Mineral Rights Nondevelopment tax was announced in 1973 by the Minister for Finance. The tax was introduced in order to give an incentive to develop concessions presently being held for mining, or alternatively, to provide an incentive to surrender them for more productive use. A tax of $14.90 [26] per 2.47 acres was levied, against which any development expenses can be applied. A Mineral Rights Transfer tax and a Mineral Rights Capital Gains tax were also introduced. The Mineral Rights Capital Gains tax was 37½% and the transfer tax was 27½% on the first $29,850 and 37½% on the remainder. All of these measures for the mining sector became effective on Aug. 1, 1973.[27]

Financing was being sought by the Government for a thermal electric powerplant. The powerplant would use coal from deposits at Mpaka and would cost about $238.8 million to develop. It was hoped that construction could begin in 1976 with power being produced by 1980. About 1,500 to 2,000 megawatts' capacity was planned. The major part of the electric power output was expected to be exported. The Government was also considering an oil-from-coal plant.

Total mineral production in 1973 was valued at $15.7 million; the major minerals produced were iron ore ($5.7 million), asbestos ($9.3 million), semianthracite ($460,317), and quarry stone ($248,989). Kaolin ($24,431), barite ($7,738), and phyrophyllite ($886.54) were also produced. Tin was formerly mined in Swaziland, but in recent years, including 1973, there was no production.

Swaziland imports refined oil products only; no crude oil is imported. All of Swaziland's refined products come through Mozambique, even though 90% of it originates at the Republic of South Africa refineries and is shipped by sea to Lourenço Marques for transshipment by rail to Swaziland. The remaining 10% is directly from the Lourenço Marques refinery. As a result of the oil crisis, the Swazi's were reportedly attempting an arrangement for Arab and Nigerian oil to be refined at Mombasa and Madagascar before shipment via Lourenço Marques.

Eland Exploration Co., a subsidiary of Cominco Ltd. started prospecting for base metals in the Forbes Reef and Mhlambanyati areas. Nickel, copper, and gold were particularly being sought.

The high-grade iron ore presently mined at Ngwenya is expected to be exhausted between 1978 and 1980 at current rates of extraction. In spite of a cutback in production, the Swaziland Iron Ore Development Co. continued to be a major contributor to the mining economy. Prospecting for low-grade ore and research into feasibility of beneficiation and pelletizing were intensified during the year. A final assessment of this project was expected during 1973.

During 1973, ownership of the Havelock asbestos mine was transferred from New Amianthus Mines (Pty) Ltd., a Turner and Newall subsidiary incorporated in the Republic of South Africa, to Havelock Asbestos Mines (Swaziland) Ltd., incorporated in Swaziland. Forty percent of the shares are held by the Swaziland nation in partnership with Turner and Newall Ltd. through its subsidiary. The new company has a capital of $11.9 million.

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[24] Prepared by Janice L. W. Jolly.
[25] World Mining. Swaziland. V. 27 No. 7, June 25, 1974, pp. 141–143.
[26] Where necessary, values have been converted from South African rand (R) to U.S. dollars, at the rate of R1 = US$1.4925.
[27] Standard Bank Review (London). Swaziland, Budget. July 1973, pp. 28–29.

The Havelock mine, located at Bulembu, improved production and grade of fiber during 1973, and the price per ton rose to $260.40. Sixty-seven percent of the asbestos production went to the United Kingdom, and other major sales went to the Republic of South Africa, Zambia, Denmark, and Nigeria. This mine is expected to produce for at least 9 more years. The present production is approximately 35,000 tons of fiber per year. Production was being maintained at 3,000 tons per month. Despite difficulties in deep-shaft mining, the Havelock mine continues to be profitable.

Underground development proceeded at Swaziland Barytes Co., and a beneficiation plant was being installed. Increased production of barite was forecast for 1974.

The exploitation of Swaziland's coal deposits has been the subject of active investigation since 1970. The services of U.S. consultants were recently utilized. Representatives of Anglo American Corp. and a Japanese firm were considering exploitation of Swaziland's coal. Discussions on the coal mine started in February and an estimated $29.8 million investment was expected. This does not include coal on the Swazi nation land, which will be exploited when and if the thermal power station becomes operative. Plans were made to open the southern section of the Mpaka Collieries. The coal could be upgraded for a prospective Japanese market.

Exploration and drilling on the Swaziland Collieries concession area at Mpaka have proved 164 million tons of reserves, 16% of which is high-grade coal in one area. Seventy million tons have also been proved at Mtendekwa. The deposits at Mtendekwa are so deep that only 10 million tons can be economically mined by open-pit methods. Reserves for a further 180 million tons are reported in the southeastern part of the country, but feasibility studies are yet to be made on these deposits. The possible combined production capacity for both export and use in power generation is estimated at 5 million tons per year.

A DeBeers prospecting team has reportedly found "microscopic" diamonds and strong mineral indications of kimberlites in eastern Swaziland. The DeBeers team arrived in May 1973 to begin diamond prospecting.

The granite quarried at Van de Meer's quarry is used for roadmaking and concrete. Since the quarry was opened in 1972, approximately 35 cubic meters of stone have been mined each day.

TOGO [28]

The mineral industry of Togo continued to expand in 1973. Production of phosphate rock increased over that of 1972. The expansion of transportation facilities for exploiting a second phosphate mine was completed in late 1973. Plans were made for the construction of a phosphate fertilizer manufacturing complex that would supply domestic demand and provide a sizable surplus for export. The cement grinding plant produced at virtual capacity in 1973, and a proposal was made to double its output. The only domestic ceramic plant ran at capacity, producing ceramic tile and brick. Plans have been made to expand production facilities for the manufacture of brick.

Mineral exploration continued to be carried on in various parts of the country. The discovery of a deposit of high-purity limestone was announced. This deposit will be used as the source of raw material for a proposed cement plant.

On the less favorable side, financing is still being sought for the integrated cement plant, and construction of the oil refinery is proceeding slowly. In addition, offshore petroleum exploration has slowed for the time being.

Government Policies and Programs.—Togo signed economic agreements with Ghana and Nigeria in 1972. Togolese and Nigerian delegations continued to meet for the purpose of laying the foundations of the new Nigeria-Togo economic subgroup. A West German-Togolese agreement was signed, and a credit of $13 million was granted for the improvement of Lomé's port facilities. Construction was started on the second mole and the supporting technical facilities. Completion scheduled for 1975 will bring the capacity of the commercial port to 750,000 tons.[29] The European Development Fund granted $5.2

[28] Prepared by W. Timothy Adams.

[29] Joint Publications Research Service. Paris, Afrique Industry Infrastructures, French, 15 February 1973. Translation on Africa No. 1294, JPRS 58706, Apr. 10, 1973, pp. 28–31.

million in nonreimbursable aid to finance the improvement of the Lama-Kara-Kande road as part of the continued modernization of the Lomé-Ouagadougou international highway.[30]

Togo maintained a balanced budget for the 7th consecutive year. The new budget was expected to be larger, albeit balanced, in anticipation of increased revenue provided by growing profits from phosphate rock sales.

PRODUCTION

Mineral production in Togo increased in 1973 as the result of greater phosphate and cement output. Output of brick and ceramic tile also had a positive influence.

Compagnie Togolaise des Mines du Bénin (CTMB) mined a record 2,270,000 tons of phosphate rock in 1973, an 18% increase over the 1,927,000 tons mined in 1972. The increase reflects the expansion project started in 1970 and completed in August 1973. Production in 1974 is expected to near the installed capacity of 2.39 million tons. Expanding demand for fertilizer continues to provide a market.

Production of marble dropped approximately 20% to about 1,000 tons as construction activity decreased in Togo. At present the domestic market is the only outlet for the stone. Société Togolaise de Marbrerie et de Matériaux (SOTOMA), operator of the quarries, has diversified into brickmaking and ceramic tile. It is believed that these plants produced at near capacity in 1973. The Société des Climents de l'Afrique de l'Ouest (CIAMO) cement clinker grinding plant processed approximately 106,140 tons in 1973.

The value of Togo's recorded mineral production rose 42% to $29.0 million in 1973 from $20.4 million in 1972. However, the figures are not complete since the values of brick, kaolin, salt, sand and gravel, and stone are not available. The lessened construction activity in the area decreased slightly the growth in total mineral production.

TRADE

Exports of mineral products rose moderately in 1972 (trade figures for 1973 are not available), with increased production and sale of phosphate rock. Phosphate exports were valued at $19.8 million in 1972, up 15% from $17.2 million in 1971. Comparable mineral exports data were not available for 1972.

The remainder of Togo's mineral exports consisted largely of diamond. However, much of the diamond is imported clandestinely from Ghana and then reexported.

Mineral imports continued upward, reflecting the needs of the country's small but growing industrial sector. Crude and semiprocessed iron and steel, cement clinker, fertilizer, and clay products were the leading imported mineral-related commodities. The value of mineral trade remains favorable owing to the exports of phosphate rock. There was further improvement in 1972, rising 104% to $20.4 million from $10.0 million in 1971. The positive mineral trade balance was in contrast to the country's deficit on total trade. The unfavorable trade balance increased sharply as world prices remained relatively low for Togo's agricultural exports and world prices for finished products and consumer goods rose. Balances for total commodity trade and mineral commodity trade in 1970–72 were as follows in million dollars:

	1970	1971	1972 p
Total commodity trade:			
Exports	54.6	56.4	50.8
Imports	64.5	70.0	86.6
Balance	−9.9	−13.6	−35.8
Mineral commodity trade:			
Exports	14.7	19.9	NA
Imports	8.6	9.9	NA
Balance	+6.1	+10.0	NA

p Preliminary. NA Not available.

Source: Statistical Office of the European Community Foreign Trade Yearbook 1970–1971 (for Associate Member Countries) Luxembourg, 1972.

Production on Togo's mineral trade are contained in table 1.

[30] Joint Publication Research Service. Lomé, Togo-Presse, French, March 13, 1973. Translation on Africa No. 1298, JPRS 58798, Apr. 19, 1973, p. 31.

Table 20.—Togo: Foreign trade in mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
EXPORTS		
METALS		
Aluminum metal, including alloys, unwrought and semimanufactures	62	NA
Copper metal, including alloys, unwrought and semimanufactures	17	NA
Iron and steel metal:		
Scrap	16	NA
Semimanufactures	4,677	
Lead metal, including alloys, unwrought	--	NA
Other metals, including alloys, metalloids, n.e.s	7	NA
NONMETALS		
Cement	41,526	NA
Clay products, nonrefractory	9	NA
Diamond, gem, not set or strung ---- value, thousands	$741	NA
Fertilizer materials:		
Crude, phosphatic ---- thousand tons	1,814	1,793
Manufactured	308	NA
Salt	1	NA
Sodium and potassium compounds, n.e.s	85	NA
Stone, sand and gravel:		
Dimension stone:		
Crude and partly worked	16	NA
Worked	1	
Gravel and crushed rock	54	NA
Sulfuric acid, oleum	6	NA
Other:		
Slag and ash, n.e.s	29	NA
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	255	NA
MINERAL FUELS AND RELATED MATERIALS		
Petroleum refinery products:		
Lubricants ---- 42-gallon barrels	119	1
Bituminous mixtures, n.e.s ---- do	--	
IMPORTS		
METALS		
Aluminum metal, including alloys, semimanufactures	66	(1)
Copper metal, including alloys, semimanufactures	20	(1)
Iron and steel metal:		
Scrap	3	
Pig iron and similar materials	6	
Semimanufactures:		
Bars, rods, angles, shapes, sections	7,193	
Universals, plates, sheets	4,081	13,663
Hoop and strip	63	
Rails and accessories	532	
Wire	189	
Tubes, pipes, fittings	2,404	
Castings and forgings, rough	283	
Lead:		
Ore and concentrate	--	NA
Oxides	--	NA
Metal, including alloys, semimanufactures	16	(1)
Tin metal, including alloys, unwrought ---- long tons	1	(1)
Other metals, including alloys, metalloids, n.e.s	11	2 401
NONMETALS		
Abrasives, natural, n.e.s., grinding and polishing wheels and stones	11	NA
Cement	92,818	6,663
Chalk	5	NA
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	--	NA
Products:		
Refractory (including nonclay brick)	85	NA
Nonrefractory	596	
Diatomite and other infusorial earth	48	NA
Fertilizer materials:		
Manufactured:		
Nitrogenous	772	
Phosphatic	711	
Potassic	14	NA
Other, including mixed	9	
Ammonia	6	
Gypsum and plasters	422	NA
Lime	618	681

See footnotes at end of table.

Table 20.—Togo: Foreign trade in mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1971	1972
IMPORTS—Continued		
NONMETALS—Continued		
Mica, crude, including splittings and waste	--	NA
Pigments, mineral, natural, crude	50	NA
Salt	8,306	6,587
Sodium and potassium compounds, n.e.s	425	NA
Stone, sand and gravel:		
Dimension stone, crude and partly worked	--]	
Gravel and crushed rock	91	NA
Sand, excluding metal bearing	27]	
Sulfur:		
Elemental, other than colloidal	26]	
Sulfur dioxide	4	NA
Sulfuric acid, oleum	21]	
Talc, steatite, soapstone, pyrophyllite	56	
Other nonmetals, n.e.s.:		
Crude	31]	
Slag and ash, n.e.s	27	NA
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	927]	
MINERAL FUELS AND RELATED MATERIALS		
Coal and coke, including briquets	30	NA
Gas carbon	2	NA
Petroleum refinery products:		
Gasoline ---- thousand 42-gallon barrels	162	179
Kerosine ---- do	97	82
Distillate fuel oil ---- do	291]	505
Residual fuel oil ---- do	185	
Lubricants ---- do	13	16
Other:		
Liquefied petroleum gas ---- do	4]	
Bitumen and other residues and bituminous mixtures, n.e.s ---- do	22	NA
Unspecified ---- do	(3)]	
Total ---- do	774	NA
Mineral tar and other coal-, petroleum-, or gas derived crude chemicals	166	NA

NA Not available.
[1] Included with other metals.
[2] Includes aluminum, copper, lead, zinc, tin, and additional unspecified minerals.
[3] Less than ½ unit.
Source 1971: European Communities, Eurostat Foreign Trade Yearbook 1973 for Mauritania, Niger, Senegal, Togo, Chad, Cameroon, Madagascar, and Zaire 1970–71. 1972: Republique Togolaise, Bulletin Mensuel de Statistique, 1974, No. 2.

COMMODITY REVIEW

Cement.—During 1972 the clinker grinding plant operated at near maximum capacity. With the construction slowdown in 1973, production decreased somewhat. Doubling the capacity of the clinker grinding plant to 240,000 tons per year for $1.3 million was proposed. CIMAO continued to seek financing for an integrated cement plant. The proposed plant would have a capacity of 1.1 million tons per year and would cost, at present, an estimated $74.5 million. Limestone processed in the plant would come from a newly discovered deposit at Sikakondji, 85 kilometers from Lomé near the Dahomey border. Reserves are estimated at 132 million tons. The limestone deposit at Aveta, with its overlying deposit of phosphate rock, would not be used as a feed material for the proposed plant. Togo was attempting to arrange financing through the World Bank.[31]

Petroleum.—Shell Togorex and Ashland Oil and Refinery Co. continued to be the only companies with exploration permits. Shell continued seismic exploration, but Ashland was apparently discouraged by the two exploratory wells drilled. Prospects for exploitable oil appeared poor. Construction began on a 20,000-barrel-per-day refinery. Completion was originally scheduled for late 1975. The refinery will have the capability for catalytic reforming, hydrosulfurization and processing liquefied petroleum gas (LPG). Approximately 20% of the output is expected to supply the domestic market, while the remainder will be available for export.[32]

[31] U.S. Embassy, Lomé, Togo. State Department Airgram A–32, May 9, 1973.
[32] World Petroleum Report. V. 19, 1973, p. 70.

Phosphate.—Although the mining company CTMB had an agreement with the Government to maintain majority ownership until 1987, the Government assumed majority ownership in February 1974. Prices were quickly brought into line with those of other phosphate producers. The new mine at Kpogame began producing in September 1973 when the bridges for a road and railroad to the site were completed.[33]

The Government formed the Togolese Company of the CTMB to manage and operate the phosphate deposits. A service contract was signed between CTMB and a service company established in Paris by French phosphate specialists. The service company agreed to make technical experts and technicians available and assumed the maintenance and purchasing functions. The service company has also agreed to provide marketing experts for the Togolese Phosphate Office, which is responsible for marketing the phosphate ore.[34]

Construction of a fertilizer plant was begun with completion scheduled for 1976 at a cost of $8.9 million. Design capacity was 300,000 tons per year. Included in the plant were a 1,100-ton-per-day sulfuric acid plant and a 400-ton-per-day phosphoric acid plant. Société Togonaise de Engrais (STEW) and Sybetra Co. (Belgium) each have a 50% interest.[35]

Salt.—Société des Salines du Togo (SALINTO) reportedly had an installed capacity of 5,000 tons per day, but no information is available as to actual production.[36]

Stone.—*Marble.*—SOTOMA has only one of three marble quarries in operation. Approximately 1,000 tons were quarried in 1973 to supply to local market. Although a generalized export market has not materialized, SOTOMA hopes to export marble to Zaire, where construction is booming. SOTOMA has diversified into the production of brick and ceramic tile.[37]

Other Minerals.—The Togolese Service des Mines, assisted by the UNDP, continued investigations of a large number of sites. No major exploitable deposits of minerals were reported.

UPPER VOLTA [38]

In 1973 the mineral industry of Upper Volta was making plans for expansion. No mineral products were exported, and very little was produced for local consumption. Agricultural products and textiles form the principal exports. The terms of trade deteriorated over the 3-year period 1970–72. The trade figures for 1972 show a deficit of $39.5 million.[39] The oil crisis further aggravated the problem resulting from the drought that struck the Sudanese-Sakelian region that included Upper Volta. Relief efforts were hindered by the rising costs of transportation. The cost of aid anticipated by the drought relief program established at Ouagadougou was about $2.6 billion. The control of water resources and the fight against desert extension were two goals around which the program was established. The increased transportation costs caused by the oil crisis were estimated at $2.5 million, or 5% of the national budget.[40]

The manganese deposits of Tambao, discovered 15 years ago, remained the mineral commodity of greatest importance in respect to possible exploitation. These deposits, as well as others in nearby areas, all depend upon financial backing for the 212-mile-long Ouagadougou-Tamboa railroad in northeastern Upper Volta. For 8 years, the Government has sought financing for building this railroad. Financing for the railroad was still under consideration by a number of international concerns, and a meeting was scheduled for January 1974 to discuss current possibilities. Banks were reported as asking for more foreign show of interest in mining.

Reported as interested in mining the manganese deposits were the Japanese Mitsui Corporation, Union Carbide Co. (U.S.), Société Minière Manganese (French), Incotra (Swiss), and the Ro-

[33] European Chemical News. V. 25, No. 620, Jan. 25, 1974, p. 10.
[34] Joint Publication Research Service. Informations d'Outremer, French, June 12, 1974. Translation on Africa No. 1494, JPRS 62533, July 22, 1974. pp. 7–8.
[35] Chemical Age International. V. 108, No. 2844/45, Jan. 18–25, 1974, p. 19.
[36] Work cited in footnote 35.
[37] Work cited in footnote 31.
[38] Prepared by Janice L. W. Jolly.
[39] Where necessary, values have been converted from African Financial Community francs (CFAF) to U.S. dollars at the rate of CFAF250=US$1.00.
[40] La Semaine (Brazzaville). Drought Still on the Limelight. Jan. 27, 1974, pp. 1, 3.

manian State Trading Company. A 10-man Japanese delegation arrived in November 1973 to examine the possibilities. Union Carbide also made a feasibility study of the project. Money needed for exploitation of the deposits was an estimated $8.6 million. A reported $40 million was needed to build the railroad. A 1975 starting date was hoped for by the Government. The Tambao manganese deposit has reserves of 13.5 million tons with possibility of a 500,000-ton-per-year production. Carbonate minerals with 33% to 49% manganese have not yet been evaluated but are reported to be at least equal to the oxides. The oxidized ores run 53.88% manganese, with a phosphorus content of 0.14%.

The entire Liptako-Gourma region is affected by the lack of transportation and communications infrastructure. The Liptako-Gourma area covers east-central Niger, western Mali, and northeastern Upper Volta. The Liptako-Gourma Authority had plans to extend the projected Tambao railway to Ansongo in Mali, with a branch to the Niger capital of Niamey. A great mineral potential, not yet exploited or fully defined, is contained in the Liptako-Gourma region. Deposits listed as of interest in the three-nation area include the manganese deposits of Tambao and of Ansongo-Ojaliken, the 56 million tons of limestone at Tin Hrassan, the phosphate deposits of Boureme in Tilemse Valley of Mali, the white bauxite of Kaya-Kaungaussi, the spodumene (lithium) in pegmatites of Danholo region north of Tera, manganese at Tera (Niger), radioactive ores in the sedimentary rocks of Adrar of the Yoras, iron and vanadium in the Ansongo region, and petroleum, gas, lignite, and bituminous rocks of the Sudanese pass.

The Oursi magnetite deposit, covering about 29 square miles, was reported as containing 0.9% to 1.0% vanadium pentoxide, 40% to 50% iron, and 8% to 14% titania. The phosphates of the Arly region at Diapaga were also of interest. Research has been done on these deposits with help from the UNDP and Canada. Mining the white bauxite deposits was planned, depending upon the results of a second research study that was to start in November 1973. The first study was apparently encouraging. Société Générale d'Exploitation et de Recherche Minière (SOGEREM) was expected to sign an agreement for additional mineral exploration on the bauxite deposits. A previous study by the French BRGM indicated deposits of 3 to 5 million tons of 80% to 85% Al_2O_3. The copper mineralization at Gaoua, although of low grade (0.8% Cu), was described as being "porphyry-copper" type,[41] occurring in stockwork veinlets and associated hydrothermal alteration and diorite. The mineralization was thought to be Precambrian in age. There were reports of copper and molybdenum near Goren, a reported 50 million tons at about 0.5% Cu at Kaya.

The Poura gold mine, which closed in 1966, was being considered for possible reopening by the new Mining and Research Development Company (SOREMI). The Government received 34% of shares in SOREMI. Studies on mine exploitation by SOREMI were to begin in November 1973.[42]

The Upper Volta Government signed agreements with Canada to begin research in 1973 on an inventory of mineral deposits in Upper Volta.

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[41] Bulletin Du Bureau De Recherches Géologiques et Minières (Paris). Informations Diverses. No. 5, 1972, p. 214.

[42] Carrefour Africain (Ouagadougou). New Minster Talks About Mining Industrial Situation. July 14 and 28, 1973, pp. 2–15.

The Mineral Industry of Other Near East Areas

By Bernadette Michalski [1]

CONTENTS

The mineral industries of Arab nations along the eastern edge of the Mediterranean Sea and along the eastern and southern edges of the Arabian Peninsula are reviewed in this chapter. For most of these nations, the petroleum industry is a vital element in the economy either through revenues obtained as a result of crude petroleum production and/or through transit fees obtained from companies operating pipelines that cross national territories en route to Mediterranean outlets. The largest producer of crude oil in the area is the United Arab Emirates (Abu Dhabi) followed by Qatar, Oman, United Arab Emirates (Dubai), Syrian Arab Republic, and Bahrain. Nations in the area receiving transit revenues are the Syrian Arab Republic, Lebanon, and Jordan. Refineries operating on domestic and/or imported crudes oils are located in each of the nations with the exception of Oman, the United Arab Emirates, and the Yeman Arab Republic.

The October outbreak of the Arab-Israeli war resulted in destruction of Syrian refining and storage facilities as well as heavy damage that caused temporary closure of port facilities at Banias and Tartous, Syria's export terminals for Iraqi and domestic crude. War risks disrupted offtake of Saudi Arabian crude at the port of Sidon, Lebanon, but offtake of Iraqi crude at the port of Tripoli, Lebanon, was little affected. While war damage and the threat of war damage affected operations on the eastern Mediterranean, the effects of the Arab-Israeli war reached down the Arabian Peninsula in the form of Arab oil production cutbacks and embargoes on shipments to the United States and the Netherlands. Abu Dhabi, Qatar, and Syria accepted the decisions of the Arab Ministers of the Organization of Arab Petroleum Exporting Countries (OAPEC) and adopted embargoes and a cutback in crude production. A reduction of 10% from the September production levels was adopted in October followed by a 25% reduction in November. A further 5% reduction was made in December. Production from Dubai was reduced by 40%, not as a voluntary measure but as a result of a shutdown caused by a well fire. Dubai did, however, adopt the embargo policy against the United States. Bahrain and Oman main-

[1] Mineral specialist, Division of Fossil Fuels—Mineral Supply.

tained production levels; however, they adopted the embargoes against the United States and the Netherlands.

Government participation in oil producing operations within their borders was realized in most countries at the start of 1973. In most cases, initial participation was 25% ownership.

In addition to participation in crude oil production, many governments are giving priorities to downstream processing of hydrocarbons. Natural gas will be utilized as feedstock in the production of liquefied natural gas (LNG), natural gas liquids (NGL), and nitrogenous fertilizers. Drydock construction projects in Bahrain and Dubai are underway. Production of aluminum from imported alumina using natural gas as fuel, is now well established on the Persian Gulf; however, direct reduction of iron ore by utilizing natural gas as well as the feasibility of constructing an integrated steel mill, are also under consideration. To further diversify the economy, many nations in the area have encouraged development of cement industries based on indigenous resources of limestone and gypsum.

Table 1 lists production of selected mineral commodities in the countries covered by this chapter.

Table 1.—Other Near East Areas: Production of mineral commodities

Area, commodity, and unit of measure	1971	1972	1973 p
BAHRAIN [1]			
Aluminum, primary smelter ---- metric tons	10,200	62,700	102,700
Gas, natural:			
Gross production ---- million cubic feet	25,364	63,419	82,855
Marketed production ---- do	17,902	r e 40,000	56,575
Petroleum:			
Crude ---- thousand 42-gallon barrels	27,346	25,508	24,948
Refinery products:			
Gasoline ---- do	8,268	7,335	8,607
Jet fuel ---- do	15,634	15,033	11,839
Kerosine ---- do	1,139	950	1,529
Distillate fuel oil ---- do	19,301	20,400	19,704
Residual fuel oil ---- do	38,739	33,453	35,872
Lubricants ---- do	1,129	--	745
Other ---- do	5,745	6,390	8,194
Refinery fuel and losses ---- do	4,134	3,678	4,263
Total ---- do	94,089	87,239	90,753
JORDAN			
Cement, hydraulic ---- thousand metric tons	419	662	617
Clays ---- do	NA	3	5
Gypsum ---- do	24	30	30
Fertilizer materials, crude phosphate rock ---- do	r 764	872	633
Lime ---- do	2	2	3
Petroleum refinery products:			
Gasoline ---- thousand 42-gallon barrels	1,226	1,006	947
Jet fuel ---- do	301	334	361
Kerosine ---- do	724	756	873
Distillate fuel oil ---- do	844	1,071	1,259
Residual fuel oil ---- do	781	1,089	1,274
Other:			
Liquefied petroleum gas ---- do	186	201	199
Asphalt ---- do	210	172	244
Unspecified ---- do	--	875	833
Refinery fuel and losses ---- do	381	440	267
Total ---- do	4,653	5,944	6,257
Salt ---- thousand metric tons	24	24	25
Stone:			
Limestone ---- do	1,865	2,500	3,000
Marble ---- thousand square meters	50	75	100
LEBANON [1]			
Cement, hydraulic ---- thousand metric tons	1,499	1,626	1,656
Gypsum ---- do	37	e 40	e 40
Lime ---- do	125	e 120	152

See foonotes at end of table.

Table 1.—Other Near East Areas: Production of mineral commodities—Continued

Area, commodity, and unit of measure	1971	1972	1973 p
LEBANON—Continued			
Petroleum refinery products:			
Gasoline ---- thousand 42-gallon barrels	3,461	3,809	4,251
Jet fuel ---- do	1,679	1,051	1,610
Kerosine ---- do	194	178	178
Distillate fuel oil ---- do	2,607	2,493	2,716
Residual fuel oil ---- do	6,292	7,215	6,367
Other ---- do	467	424	704
Refinery fuel and losses ---- do	757	687	1,416
Total ---- do	15,457	15,857	17,242
Salt e ---- thousand metric tons	38	40	40
OMAN [1]			
Gas, natural:			
Gross production e ---- million cubic feet	90,000	90,000	90,000
Marketed production e ---- do	1,500	1,500	1,500
Petroleum, crude ---- thousand 42-gallon barrels	107,430	103,131	106,926
PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN			
Petroleum refinery products:			
Gasoline ---- do	1,849	3,400	3,285
Jet fuel ---- do	4,047	3,400	2,525
Kerosine ---- do	1,217	1,050	1,106
Distillate fuel oil ---- do	4,333	3,100	3,767
Residual fuel oil ---- do	13,432	14,500	12,185
Other ---- do	1,576	160	21
Refinery fuel and losses ---- do	546	1,149	1,676
Total ---- do	27,000	26,759	24,565
Salt ---- thousand metric tons	66	e 60	e 60
QATAR [1]			
Cement, hydraulic ---- do	72	e 100	e 100
Gas, natural:			
Gross production ---- million cubic feet	159,418	180,000	246,185
Marketed production ---- do	46,480	52,000	55,828
Petroleum:			
Crude ---- thousand 42-gallon barrels	156,882	176,545	208,152
Refinery products:			
Gasoline ---- do	64	69	69
Kerosine ---- do	30	37	36
Distillate fuel oil ---- do	58	60	73
Residual fuel oil ---- do	78	72	36
Other ---- do	--	--	23
Refinery fuel and losses ---- do	17	18	19
Total ---- do	247	256	256
SYRIAN ARAB REPUBLIC [1]			
Asphalt, natural ---- thousand metric tons	e 65	NA	NA
Cement, hydraulic ---- do	909	1,004	848
Fertilizer materials, crude phosphate rock ---- do	7	112	150
Gas, natural:			
Gross production e ---- million cubic feet	36,000	40,000	37,000
Marketed production e ---- do	7,000	8,000	7,000
Gypsum e ---- thousand metric tons	15	15	15
Petroleum:			
Crude ---- thousand 42-gallon barrels	36,462	45,209	38,170
Refinery products:			
Gasoline ---- do	2,360	2,448	2,542
Kerosine ---- do	2,202	2,348	2,046
Distillate fuel oil ---- do	4,540	4,469	4,334
Residual fuel oil ---- do	4,783	4,928	4,083
Other ---- do	2,548	966	664
Refinery fuel and losses ---- do	1,090	1,061	1,094
Total ---- do	17,523	16,220	14,763
Salt ---- thousand metric tons	24	e 30	e 30
Sand, glass e ---- do	15	15	15
UNITED ARAB EMIRATES [1 2]			
Abu Dhabi:			
Gas, natural:			
Gross production ---- million cubic feet	365,543	e 412,000	e 515,000
Marketed production ---- do	39,749	e 45,000	e 55,000
Petroleum, crude ---- thousand 42-gallon barrels	341,007	384,190	479,192
Ajman: Marble ---- square meters	NA	e 13,000	NA

See foonotes at end of table.

Table 1.—Other Near East Areas: Production of mineral commodities—Continued

Area, commodity, and unit of measure	1971	1972	1973 p
UNITED ARAB EMIRATES [1 2]—Continued			
Dubai:			
Gas, natural:			
Gross production e ____ million cubic feet __	36,000	44,000	63,000
Marketed production e ____ do ____	10,000	12,000	17,000
Petroleum, crude ____ thousand 42-gallon barrels __	45,648	55,942	80,207
YEMEN ARAB REPUBLIC [1]			
Salt ____ thousand metric tons __	39	74	1

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] In addition to the emirates listed (Abu Dhabi, Ajman, and Dubai), there are four others: Fujairah, Ras al-Khaimah, Sharjah, and Umm al-Qaiwain; these record no mineral production but presumably produce small quantities of crude construction materials.

BAHRAIN

During 1973, the economy sustained a balanced budget of $82.3 million.[2] Most of the nation's revenue was obtained directly or indirectly from the petroleum and natural gas industry. Bahrain oil income was based on a 12.5% royalty and a 55% income tax levy, a fee on Saudi Arabian oil processed at Awali and revenues from Bahrain's 50% interest in the Saudi Arabian Abu Safah Field operated by Arabian American Oil Co. (Aramco).

Bahrain's crude petroleum production continued to decline with daily output averaging more than 1,500 barrels less than that of the previous year. Depleting petroleum reserves will reportedly not sustain production beyond 1990.

Crude petroleum is extracted from more than 200 wells in the Awali Field operated by the Bahrain Petroleum Co., Ltd. (Bapco), which is held in partnership by Texaco, Inc., and Standard Oil Co. of California. Bapco operated a 250,000-barrel-per-day-capacity refinery at Awali. Throughput in 1973 was 90 million barrels, about 70% of which was Saudi Arabian crude delivered via the Dharan pipeline. During the year, Bapco commissioned a $60 million low-sulfur fuel oil unit at Awali. The unit's capacity is 50,000 barrels per day of 1% sulfur fuel oil or a lesser volume with a sulfur content of 0.5%. The facility includes a 52,000-barrel-per-day vacuum distillation unit, a 50,000-barrel-per-day vacuum gas oil hydrodesulfurizer, a 27-million-standard-cubic-foot-per-day-capacity hydrogen and and a 150-ton-per-day sulfur recovery plant. Construction was completed on two 625,000-barrel storage tanks at the Bapco Sitra terminal. A $2.3 million project was launched for the construction of storage and shipping facilities for naphtha, jet fuels, and kerosine products.

Production of nonassociated natural gas averages more than 200 million cubic feet per day. The third and fourth wells drilled in the Khuff Zone went into production in January and in June, respectively. About half of the production was utilized to supply power to the Aluminium Bahrain, Ltd. (Alba) aluminum smelter. The remainder was used at the Bapco refinery, the Government's 95-megawatt power station, and in field injection.

The OAPEC drydock project gathered momentum with the participation treaty ratified by six of the eight OAPEC members. Ratification by Abu Dhabi, Bahrain, Iraq, Libya, Kuwait, and Saudi Arabia had been effected, and ratification by the Arab Republic of Egypt and by Qatar is anticipated in late 1974. The project is to be equally funded with each participant giving $3.57 million for a total of $30 million toward the company's $100 million capitalization. The remaining funds being advanced on a low-interest basis. The project calls for construction of a drydock on Muharraq Island capable of servicing vessels up to 375,000 deadweight tons in its initial stage and eventually servicing tankers of 500,000 deadweight tons and

[2] Where necessary, values have been converted from Bahraini Dinars (BD) to U.S. dollars at the rate of 1BD=US$2.53.

possibly tankers of 1 million deadweight tons. Earlier proposals for the OAPEC drydock company included equity participation by Kawasaki Heavy Industries, Ltd. (Japan) and Lisnave (Portugal); however, this proposal was abandoned and the aforementioned companies will operate on a fee-based joint management contract. Engineering contracts will be tendered by late 1974, and actual construction should begin by early 1975 with the initial stage completed by 1977. Ships calling at OAPEC ports will avail themselves of the Muharraq drydock facility. In addition, the Arab Maritime Transport Co., OAPEC's own tanker fleet, will be operating 60 vessels by 1985, and all ships will be serviced at Muharraq.

Primary aluminum is produced at the Alba smelter near Askar on the island's east coast. The smelter processes alumina shipped from Aluminum Co. of America (Alcoa) operations at Kwinana in Western Australia. Power for the smelter is derived from gas wells in the Khuff formation, which supply 19 gas turbine generators at the 300-megawatt-capacity Alba Power Station. By yearend 1972, a fourth potline containing 114 electrolytic cells had been installed at the Alba smelter raising total capacity to 120,000 tons annually; however, shipping problems disrupted raw materials supplies during 1973, and primary aluminum production fell short of the 120,000-ton planned output.

Ingot production is absorbed by Alba participants in direct proportion to their equity holding, which is as follows in percent:

Government of Bahrain	40.4
British Metal Corp	17
Kaiser Aluminum and Chemical Corp	17
AB Electrokoppar	12
Breton Investments	5.1
Western Metal Corp	8.5

The Bahraini Government increased its equity in Alba by purchasing at $4 million the 17% equity originally held by General Cable (United States). The Government's ingot allotment is marketed by the Bahraini Department of Commerce and Industry and by Amalgamated Metal Corp., Ltd.

Several downstream operations have been inaugurated or are under consideration. These include the 3,000-ton-per-year-capacity aluminum powder plant in operation These include the 3000-ton-per-year-capacity aluminum extrusion plant, and a proposed aluminum-based marine paint plant to service the OAPEC drydock facility. Bahrain's production of mineral commodities is reported in table 1.

Table 2.—Trade of crude petroleum and petroleum refinery products
(Thousand 42-gallon barrels)

Commodity	1971	1972	1973
EXPORTS			
Petroleum refinery products:			
Gasoline	5,490	e 7,159	8,311
Naphtha	8,441		7,036
Jet fuel	15,870	e 14,900	9,962
Kerosine	1,079	e 920	2,107
Distillate fuel oil	21,697	e 20,000	19,254
Residual fuel oil	28,694	e 28,000	9,666
Lubricants	[1] 1,117	e 30	718
Other	165	e 6,200	4,015
Total	82,553	e 77,209	61,069
BUNKER LOADINGS			
Petroleum refinery products:			
Distillate fuel oil	727	500	636
Residual fuel oil	6,352	5,300	6,180
Total	7,079	5,800	6,816
IMPORTS			
Crude petroleum	65,989	60,309	NA
Petroleum refinery products:			
Gasoline and naphtha	1,317	e 1,500	NA
Lubricants	20	e 69	NA
Total	1,337	e 1,569	NA

e Estimate. NA Not available.
[1] May include reexports.

JORDAN

The Jordanian gross national product (GNP) was reported at $871 million[3] in 1973, a real increase of about 12% over that of the previous year. The mineral mining and processing contributions to the GNP are estimated at 10%. The nation's principal mineral industries are phosphate rock mining and beneficiating, cement manufacturing, metal manufacturing from imported crude forms, and petroleum refining based on imported crude petroleum. The construction of a fertilizer complex and the discovery of a promising copper deposit at Wadi Araba will add new dimensions to the nation's mineral industry. Production of Jordanian mineral commodities is reported in table 1.

Exports of phosphate rock, Jordan's principal mineral commodity, totaled more than 1 million tons contributing $12.7 million to Jordan's total exports valued at $44.5 million. Phosphate rock exports in 1974 are anticipated to reach a value of $60 million.

Jordanian total imports were valued at $344 million in 1973, resulting in a trade imbalance of nearly $300 million. In spite of the trade gap, Jordan enjoys a balance of payments surplus of nearly $40 million as a result of foreign grants and loans and remittances from Jordanians working abroad. Jordanian trade in mineral commodities is reported in tables 3 and 4.

The Jordanian 1973–75 development plan has allotted nearly $25 million for development of the phosphate industry. Expansion and modernization of existing operations will consume $12.7 million. Another $9.6 million is to be channeled to the construction of a phosphoric acid plant to utilize unsalable low-grade ore below 28% P_2O_5 content. The remaining $2.7 million is to be invested in exploration activities and improved beneficiation methods.

Mine production of crude phosphate rock exceeded 2 million tons. More than half of the production was derived from the El Hassa surface mine; the remaining production was derived from underground and surface operations at the Ruseifa mine. Beneficiation plants at both Ruseifa and El Hassa each have a capacity of 750,000 tons per year for producing 32% to 33% P_2O_5 content material with a moisture content below 2%. A second beneficiation plant at El Hassa has a capacity to produce 450,000 tons per year of 34% to 35% P_2O_5 content rock. At the close of the development program in 1975, mine production will exceed 3 million tons of crude phosphate rock annually. Beneficiating plants are projected to have a 2-million-ton annual production capacity for 34% to 35% P_2O_5 content material and the capacity to produce 32% to 33% P_2O_5 content material will be decreased to 1 million tons annually.

Production of rock below 28% P_2O_5 content averages one-half million tons annually with an accumulated stockpile at 6 million tons. These ores will be utilized in the production of phosphoric acid. Facilities for production of ammonium phosphates and triple superphosphates are under consideration.

Proven phosphate rock reserves in the Ruseifa and El Hassa areas are reported at nearly 300 million tons containing 28% to 36% P_2O_5. As a result of the new exploration program, proven phosphate rock reserves should be appreciably augmented.

Exploration activity has not been limited to delineating phosphate rock reserves. Discovery of commerical nonmetallic deposits near al Karak prompted formation of a joint stock company to mine gypsum, feldspar, and tripoli. The General Mining Co. with capitalization of $3 million is scheduled to commence mining operations in 1974. Proven reserves of 55 million tons of ore averaging 1.36% copper have been reported at Wadi Araba. Preliminary plans call for 30,000 tons of copper metal production by 1978. Discovery of an estimated 1.5 million tons of manganese ore in Central Jordan has been reported and is being investigated for commercial possibilities.

Although exploration for metal and nonmetallic minerals gained impetus, exploration for hydrocarbons has been temporarily suspended with the termination of the petroleum exploration concession of Desco Investments, Ltd. (Canada).

The Jordan Petroleum Refining Co. operated a 15,000-barrel-per-day-capacity re-

[3] Where necessary, values have been converted from Jordanian Dinars (JD) to U.S. dollars at the rate of JD1=US$3.18.

finery at al-Zerqa that is scheduled for expansion to a capacity of 60,000 barrels per day. The refinery throughput is supplied through a spur line of the Trans-Arabian Pipeline (TAPline), which transits Jordan for 115 miles carrying Saudi Arabian crude to the Mediterranean port of Sidon, Lebanon.

Table 3.—Jordan: Exports and reexports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum, unwrought	181	398	Syrian Arab Republic 316; Lebanon 60.
Copper matte	598	517	Japan 193; Netherlands 155; Lebanon 94.
Iron and steel:			
Metal scrap	3,725	465	Syrian Arab Republic 367; Lebanon 85.
Semimanufactures	58	297	Italy 75; Yugoslavia 72; Saudi Arabia 48.
Lead, unwrought	125	--	
NONMETALS			
Cement	90,494	298,821	Iraq 138,065; Syrian Arab Republic 98,126.
Fertilizer materials, crude, phosphatic	647,278	952,371	NA.
Stone, sand and gravel:			
Dimension stone, crude and partly worked:			
Calcareous	1,328	5,289	Syrian Arab Republic 4,486; Lebanon 506.
Granite	6,391	1,633	Syrian Arab Republic 1,398; Saudi Arabia 137.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	462	--	
Liquefied petroleum gas	1,814	--	

NA Not available.

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

Commodity	1971	1972	Principal sources, 1972 [1]
METALS			
Aluminum and alloys, semimanufactures	1,253	842	Lebanon 547; People's Republic of China 151.
Copper and alloys, all forms	182	343	India 129; West Germany 125.
Iron and steel:			
Scrap	--	804	Kuwait 619; Lebanon 66; Qatar 57.
Pig iron, ferroalloys, similar materials	--	5,000	All from Republic of South Africa.
Steel, primary forms	6,842	24,843	Republic of South Africa 17,415; U.S.S.R. 4,998; India 1,255.
Semimanufactures	17,256	51,230	Czechoslovakia 7,660; Republic of South Africa 5,887; India 5,597.
Lead:			
Oxides	460	425	United Kingdom 331; West Germany 57; France 27.
Metal, including alloys	1,360	3,030	Kuwait 1,344; Saudi Arabia 695; Zambia 450.
Titanium oxides	91	138	United Kingdom 94; West Germany 25; Belgium 10.
Other:			
Base metals, including alloys, unwrought, n.e.s	--	66	Turkey 64; France 2.
NONMETALS			
Cement	3,152	4,838	Japan 1,500; Arab Republic of Egypt 1,250; Lebanon 993.
Clays, crude	--	526	Italy 267; Kuwait 150; United Kingdom 75.
Fertilizer materials, crude or manufactured:			
Nitrogenous	3,409	3,000	Austria 930; West Germany 450; Netherlands 407.
Phosphatic	3,920	--	

See foonotes at end of table.

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

Commodity	1971	1972	Principal sources, 1972 [1]
NONMETALS—Continued			
Fertilizer materials, crude or manufactured—Continued			
Potassic	5,011	448	Netherlands 199; Austria 150; West Germany 99.
Lime	2,368	2,092	Lebanon 2,079; Kuwait 13.
Sodium and potassium compounds, caustic soda	611	311	Italy 165; Kuwait 62; Netherlands 46.
Stone, sand and gravel, dimension stone, calcareous (marble)	345	1,076	Italy 678; Saudi Arabia 261; Lebanon 77.
Sulfur	1,712	1,588	France 933; Lebanon 514; Kuwait 100.
MINERAL FUELS AND RELATED MATERIALS			
Coal and briquets, briquets of anthracite and bituminous coal	--	314	Belgium 163; West Germany 72; United States 50.
Coke and semicoke	--	471	Lebanon 324; West Germany 121; Belgium 15.
Petroleum:			
Crude thousand 42-gallon barrels	4,342	4,721	All from Saudi Arabia.
Refinery products:			
Gasoline do	--	47	Greece 38; Saudi Arabia 5.
Kerosine do	136	18	Italy 9; Netherlands 8; Greece 1.
Lubricants do	37	69	Netherlands 15; Lebanon 14; United Kingdom 12.
Other, bituminous mixtures do	--	(2)	
Total do	173	134	

[1] Jordanian imports transshipped through Lebanon are at least in part reported under the heading "Lebanon-Foreign" in official statistics without recording actual country of origin. These materials are credited to Lebanon in this table together with those materials actually from Lebanon.
[2] Less than ½ unit.

LEBANON

Domestic production of mineral commodities is limited to several nonmetallic minerals; however, imported crude petroleum and imported crude metal forms are processed at Lebanon refineries and mills and provide a significant portion of the nation's requirements for petroleum products and metal semimanufactures. Lebanon's Mediterranean ports are major petroleum export terminals for Saudi Arabian and Iraqi crudes, earning revenues estimated at well over $25 million in transit and related fees.

The pipeline of the Iraq National Oil Co. (INOC), formerly the Iraq Petroleum Co. (IPC), connecting northern Iraq petroleum fields with the Mediterranean export terminal at Tripoli, Lebanon, transported more than 170 million barrels of crude oil in 1973. Exports of crude from the Tripoli terminal totaled nearly 160 million barrels, and deliveries to the Tripoli refinery totaled more than 10 million barrels. The flow of Kirkuk crude across Lebanon was halted when Iraq nationalized IPC in June 1972. By March 5, 1973 Lebanon had claimed ownership of IPC facilities within its boundaries, and the flow of Kirkuk crude petroleum across Lebanon to the port of Tripoli was resumed on March 6 at an 11-cent-per-barrel transit fee affecting a 50% increase in net payment. Crude delivered to the Tripoli refinery was priced at $2.55 per barrel for 1973, $2.65 for 1974, and $2.75 for 1975.

The TAPline transported 151 million barrels of crude from the Persian Gulf to the port of Sidon, Lebanon. Exports totaled more than 143 million barrels, and nearly 8 million barrels of crude was delivered to the refineries en route al Zerqa, Jordan and Sidon, Lebanon. The 17,500-barrel-per-day-capacity refinery near Sidon was operated by the Mediterranean Refining Co. (Medreco) owned by Mobil Oil Co. and Caltex Petroleum Corp. Government control over exrefinery product prices continued as a source of friction with refinery operators. Increasing crude oil prices appreciably cut Medreco's profits prompting Medreco to threaten shutdown of refining operations thus cutting domestic supplies

by 40%. Negotiations between Medreco and the Government resulted in a series of temporary agreements whereby Medreco would refine all crude supplied by the Lebanese Government against a fee equivalent to 10% total processing cost. TAPline crude stored at the Zahrani tankfarm was confiscated by the Government for refining by Medreco. Negotiations then ensued between Aramco and the Government as to fixing a price for the confiscated crude. By yearend, no final settlement was reached between any of the three parties involved.

The construction of a third refinery for Lebanon continued under discussion. The project will include the participation of Saudi Arabia through the state-owned General Petroleum and Mineral Organization (Petromin). No decision as to capacity or location had been announced by yearend.

Much of the nation's requirements for rolled steel products and small-diameter pipe are supplied by the Byblos-Amdich rolling mill of Consolidated Steel Lebanon, S.A.L., the Tripoli rolling mill of the Lebanon Steel Co., S.A.L., and the two Beirut pipe mills of Société Nationalé des Tubes S.A.L. and Tubes du Levant S.A.L. Imported scrap and primary forms serve as the plants raw materials. A variety of steel semimanufactures, particularly flat products, continue to be imported.

Lebanon's commercial nonmetal mineral mining activities are focused on raw materials for the cement industry. Domestic mines and quarries supply gypsum, limestone, and clay for Lebanon's three cement plants. The largest plant is operated by the Société de Ciments Lebanoise. The plant's five rotary wet kilns bring total plant capacity to 1.1 million tons annually. Other cement manufacturing operations include a 0.5-million-ton-per-year-capacity plant operated by Cementerie National S.A.L. and a small single kiln plant operated by Société Lebanoise de Ciments Blanc.

Table 6.—Lebanon: Exports and reexports of selected mineral commodities
(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum, including alloys, all forms	6,193	8,215	Saudi Arabia 1,932; Iraq 1,755; Syrian Arab Republic 1,585.
Arsenic trioxide, pentoxide, and acids, kilograms	100	200	All to Libya.
Chromium oxide and hydroxide	--	(1)	Mainly to Iraq and Kuwait.
Copper metal, including alloys, all forms	357	349	Spain 147; West Germany 64; Saudi Arabia 42; Japan 38.
Gold metal, including alloys, unworked and partly worked, troy ounces	r 61,116	403,548	France 216;516; Switzerland 85,490; Kuwait 27,232.
Iron and steel:			
Scrap	46,205	23,885	Italy 15,981; Arab Republic of Egypt 4,589; Turkey 1,182.
Pig iron, ferroalloys, similar materials	32	71	Jordan 34; Syrian Arab Republic 25; Libya 12.
Steel, primary forms and semimanufactures	r 97,058	108,989	Arab Republic of Egypt 24,552; Algeria 21,466; Iraq 12,768.
Lead metal, including alloys, all forms	r 157	216	Saudi Arabia 110; Libya 52; Syrian Arab Republic 36.
Magnesium metal, including alloys, all forms	(1)	37	All to United States.
Manganese oxides	52	1	All to Syrian Arab Republic.
Nickel metal, including alloys, all forms	1	(1)	Mainly to Saudi Arabia.
Platinum-group metals, including alloys, all forms, troy ounces	r 525	10,068	Iraq 4,887; Saudi Arabia 3,022.
Silver, including alloys, all forms, do	168,209	112,945	All to Iran.
Tin metal, including alloys, all forms, long tons	61	1	Mainly to Libya and Saudi Arabia.
Titanium oxides	--	15	All to Kuwait.
Tungsten metal, including alloys, all forms[2], kilograms	--	12	All to Jordan.
Zinc:			
Oxide	14	26	Mainly to Syrian Arab Republic.
Metal, including alloys, all forms	3	5	Saudi Arabia 3; Qatar 1; Jordan 1.
Other:			
Ores and concentrates	(1)	--	

See foonotes at end of table.

Table 6.—Lebanon: Exports and reexports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Other—Continued			
Ash and residues containing nonferrous metals	562	502	Belgium 264; Italy 114; West Germany 46.
Precious metals, ash, sweepings and scrap ---------- kilograms	r 4,818	129	United Kingdom 91; Belgium 36.
NONMETALS			
Abrasives, natural, except diamond	136	230	Kuwait 59; Saudi Arabia 44; Qatar 35.
Asbestos	r 935	866	Saudi Arabia 690; unspecified Arab countries 176.
Cement	615,310	454,029	Libya 152,455; Syrian Arab Republic 113,877; Algeria 65,800.
Chalk	9	54	Unspecified Arab countries 39; Saudi Arabia 10; Kuwait 5.
Clays and clay products:			
Crude	70	61	Kuwait 38; Qatar 10; Saudi Arabia 5.
Products:			
Refractory	211	368	Qatar 115; Saudi Arabia 103; Kuwait 57.
Nonrefractory	r 2,059	1,754	Saudi Arabia 870; Libya 216; Kuwait 180.
Diamond:			
Crude ---------- carats	7,000	--	
Powdered ---------- do	--	2,500	All to West Germany.
Worked net set or strung - do	5,075	5,590	Belgium 2,155; United States 2,085; Australia 1,000.
Diatomite and other infusorial earth	32	92	Cyprus 73; Syrian Arab Republic 15.
Fertilizer materials:			
Crude	524	957	Libya 700; Saudi Arabia 93; Jordan 80.
Manufactured:			
Nitrogenous	15,109	68,600	Turkey 57,707; Syrian Arab Republic 10,737.
Phosphatic	70,167	105,070	Bulgaria 49,470; Iraq 17,074; United States 12,200.
Potassic	(1)	--	
Other	6,495	5	Libya 3; Kuwait 1.
Ammonia	r 138	1	Mainly to Kuwait and Qatar.
Gem stones, precious and semiprecious, except diamond - thousand carats	2,535	2,537	Brazil 800; Arab Republic of Egypt 525; Switzerland 448.
Graphite	4	6	Saudi Arabia 2; Arab Republic of Egypt 2; Libya 1.
Gypsum and anhydrite	2,635	909	Libya 710; Ghana 100; Saudi Arabia 64.
Lime	57,555	71,765	Libya 60,341; Saudi Arabia 4,901; Syrian Arab Republic 3,077.
Mica, all forms	--	(1)	Mainly to Arab Republic of Egypt and Syrian Arab Republic.
Pigments, mineral	15	134	Arab Republic of Egypt 70; Saudi Arabia 37; Kuwait 11.
Pyrite	113	--	
Salt	274	145	Kuwait 56; Saudi Arabia 47; West Germany 28.
Sodium and potassium compounds, caustic soda and caustic potash	1,251	126	Arab Republic of Egypt 100; Nigeria 22.
Stone, sand and gravel:			
Dimension stone, crude and partly worked:			
Calcareous	r 1,815	2,274	Kuwait 1.295; Saudi Arabia 767.
Other	270	229	Kuwait 154; Saudi Arabia 51; Syrian Arab Republic 24.
Dimension stone, worked	3,370	3,920	Kuwait 2,267; Saudi Arabia 1,063; Qatar 427.
Gravel and crushed rock	1,282	691	Saudi Arabia 308; Kuwait 196; Syrian Arab Republic 92.
Sand	856	504	Syrian Arab Republic 203; Saudi Arabia 175; Libya 109.
Sulfur:			
Elemental, all forms	3,946	2,223	Syrian Arab Republic 1,047; Iraq 539; Saudi Arabia 507.
Sulfuric acid	2,625	2,398	Syrian Arab Republic 1,542; Libya 729.
Talc and steatite	6	14	Libya 8; Iraq 4; Kuwait 1; Saudi Arabia 1.
Other:			
Ash and slag of nonmetals, n.e.s	109	123	Belgium 120; West Germany 3.

See footnotes at end of table.

Table 6.—Lebanon: Exports and reexports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Other—Continued			
Crude meerschaum, amber, jet ---------- kilograms --	173	250	All to unspecified Arab countries.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural -------	9	10	Mainly to Italy.
Carbon black and gas carbon --------	(1)	100	Mainly to Syrian Arab Republic.
Coal, all grades -------------------	358	318	Saudi Arabia 161; Cyprus 125.
Coke and semicoke -----------------	1,697	1,274	Iraq 582; Saudi Arabia 364; Cyprus 210.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels --	r 123	79	Bunkers 54; Syrian Arab Republic 12; Iraq 12.
Kerosine and jet fuel --- do ----	r 3,001	2,416	Mainly to bunkers.
Distillate and residual fuel oil ---------- do ----	r 2,966	3,459	Bunkers 1,120; Italy 824; United Kingdom 412.
Lubricants ---------- do ----	r 38	46	Kuwait 13; bunkers 8; Jordan 8; Syrian Arab Republic 5.
Other:			
Liquefied petroleum gas ---------- do ----	(1)	4	Mainly to Yemen Arab Republic.
Paraffin ---------- do ----	(1)	1	Mainly to Arab Republic of Egypt.
Unspecified -------- do ----	r 4	2	Mainly to Saudi Arabia.
Total ---------- do ----	r 6,132	6,007	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals ----	133	102	Bunkers 72; Iraq 30.

r Revised.
1 Less than ½ unit.
2 May include some manufactured materials, reported inseparably from unwrought and semimanufactured forms.

Table 7.—Lebanon: Imports of selected mineral commodites

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Oxide and hydroxide ----------	492	193	France 150; West Germany 40.
Metal, including alloys, all forms --	8,315	11,292	Mainly from France.
Arsenic trioxide, pentoxide, acids ----	60	12	People's Republic of China 10; France 1.
Chromium oxide and hydroxide -----	12	66	East Germany 50; West Germany 8; U.S.S.R. 6.
Cobalt oxide and hydroxide ---------- kilograms --	50	16	All from West Germany.
Copper metal, including alloys, all forms	2,872	3,940	Canada 1,760; United Kingdom 698; Belgium 398.
Gold metal, including alloys, unworked or partly worked thousand troy ounces --	2,116	1,288	Switzerland 801; France 243; United Kingdom 166.
Iron and steel:			
Scrap ----------	24,318	8,456	Iraq 2,492; United Kingdom 2,105; Liberia 902.
Pig iron and ferroalloys --------	7,071	10,777	U.S.S.R. 6,057; Hungary 4,126.
Steel:			
Common grades:			
Primary forms ----------	131,367	163,971	Bulgaria 75,807; U.S.S.R. 62,043; Yugoslavia 13,037.
Semimanufactures --------	r 138,642	184,564	Czechoslovakia 57,575; East Germany 18,161; Hungary 15,919.
Alloys and high carbon, primary forms and semimanufactures	r 1,227	1,816	Japan 505; France 377; Austria 374; East Germany 333.
Lead:			
Oxide ----------	133	134	West Germany 75; United Kingdom 31; France 28.
Metal, including alloys, all forms -	r 1,203	1,381	West Germany 344; Kuwait 329; United Kingdom 316.
Magnesium metal, including alloys, all forms ----------	1	6	Kuwait 4; France 2.
Manganese oxides ----------	1	6	Mainly from West Germany.

See footnotes at end of table.

Table 7.—Lebanon: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Molybdenum metal, including alloys, all forms ____ kilograms __	49	93	Sweden 41; United Kingdom 27; West Germany 25.
Nickel metal, including alloys, all forms	r 41	18	West Germany 10; Netherlands 4; United Kingdom 2.
Platinum-group metals, including alloys, all forms _ thousand troy ounces __	43	6	United Kingdom 4.
Silver metal, including alloys, all forms do ____	551	1,163	Switzerland 1,028; United Kingdom 83.
Tin:			
Oxides ____ long tons __	(1)	--	
Metal, including alloys, all forms ____ do ____	r 29	35	United Kingdom 26; People's Republic of China 3; Belgium 3.
Titanium oxides ____	1,319	1,520	United Kingdom 776; West Germany 600; Belgium 63.
Tungsten metal, including alloys, all forms[2] ____ kilograms __	45	84	United Kingdom 60; France 13; Netherlands 11.
Zinc:			
Oxide ____	54	91	France 39; Netherlands 28; Belgium 14.
Metal, including alloys, all forms __	r 1,006	954	Belgium 600; United Kingdom 207.
Other:			
Ores and concentrates ____	4,461	137	Australia 59; Hungary 56; Italy 10.
Ash and residue containing nonferrous base metals ____	136	282	Syrian Arab Republic 190; Iraq 54; Jordan 38.
Oxides, hydroxides, peroxides of metals, n.e.s ____	21	52	Mainly from East Germany.
Metals, including alloys, all forms:			
Metalloids ____	3	14	France 8; Netherlands 6.
Pyrophoric alloys ____	1	1	Mainly from Japan.
Unspecified ____	134	5	United Kingdom 3; People's Republic of China 1; West Germany 1.
Ash, sweepings, scraps of precious metals __ kilograms __	1,287	471	U.S.S.R. 414; Saudi Arabia 20.
NONMETALS			
Abrasives, crude, natural, n.e.s ____	r 1,140	1,023	Greece 643; Italy 240.
Asbestos ____	3,147	6,390	Cyprus 2,191; Canada 1,944; unspecified African countries 1,147.
Barite and witherite ____	6	--	
Boron:			
Crude natural borates ____	2	--	
Oxides, acids, borates ____	2,347	2,772	France 879; Switzerland 714; West Germany 375.
Cement ____	841	430	France 380; Denmark 49.
Chalk ____	1,137	963	Belgium 740; France 113; Syrian Arab Republic 60.
Clays and clay products:			
Crude ____	8,559	11,052	Turkey 7,771; United Kingdom 1,777.
Products:			
Refractory (including nonclay bricks) ____	4,375	4,356	Morocco 900; Canada 844; West Germany 830; People's Republic of China 578.
Nonrefractory ____	8,533	22,836	Italy 9,769; Spain 1,274; West Germany 1,270.
Diamond:			
Crude ____ carats __	14,985	18,080	Belgium 10,615; Zaire 3,010; U.S.S.R. 1,800.
Powdered ____ do ____	9,180	16,950	Netherlands 8,850; United Kingdom 7,100; France 1,000.
Worked, not set or strung _ do ____	33,610	48,140	Belgium 27,275; India 18,215; Zaire 1,020.
Diatomite and other infusorial earth __	96	720	Jordan 459; United States 205.
Feldspar and fluorspar ____	1,260	1,195	Italy 799; Spain 200; Austria 181.
Fertilizer materials:			
Natural:			
Phosphate rock ____	102,427	102,169	Jordan 88,371; Syrian Arab Republic 12,393; Kuwait 1,355.
Sodium nitrate ____	13,000	6,000	All from Chile.
Other ____	450	674	France 435; Austria 199; Spain 40.
Manufactured:			
Nitrogenous ____	r 41,030	112,421	Italy 36,540; West Germany 18,050; Romania 16,051.
Phosphatic ____	331	--	

See footnotes at end of table.

Table 7.—Lebanon: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Fertilizer materials—Continued			
Manufactured—Continued			
Potassic	6,473	2,696	Spain 1,080; United States 1,000; West Germany 398; U.S.S.R. 198.
Other, including mixed	7,283	18,381	Belgium 10,273; West Germany 6,386; Netherlands 1,600.
Ammonia	9,021	2,920	Portugal 1,388; Algeria 1,376.
Graphite	8	78	People's Republic of China 70; Taiwan 5.
Gypsum and anhydrite	70,199	67,497	Mainly from Syrian Arab Republic.
Lime	34	52	United Kingdom 36; Syrian Arab Republic 9; Belgium 5.
Magnesite	42	88	Netherlands 82; West Germany 5; France 1.
Mica, all forms	26	36	Norway 16; United Kingdom 12; West Germany 5.
Pigments, mineral, including processed iron oxides	215	262	West Germany 84; United Kingdom 48; Hungary 44.
Precious and semiprecious stones, except diamond:			
Natural thousand carats	12,810	21,668	India 11,949; West Germany 4,859; Brazil 1,822.
Manufactured do	10,583	12,080	France 7,726; Switzerland 2,116; Italy 1,500.
Pyrite (gross weight)	--	8	Syrian Arab Republic 7; France 1.
Salt and brine	67	218	Mainly from Jordan.
Sodium and potassium compounds, n.e.s.	3,859	3,608	Italy 2,125; France 1,064.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked:			
Calcareous	29,490	33,312	Italy 22,277; Portugal 4,737; Turkey 2,048.
Other	3,561	6,380	Syrian Arab Republic 5,937.
Worked	317	415	Syrian Arab Republic 331; Italy 37.
Dolomite	--	1	All from West Germany.
Gravel and crushed stone	8,205	8,915	Italy 6,857; Jordan 1,021; Syrian Arab Republic 437.
Limestone	7	--	
Quartz and quartzite kilograms	11,185	300	Switzerland 200; West Germany 100.
Sand, excluding metal bearing	2,655	2,555	Syrian Arab Republic 2,496.
Sulfur:			
Elemental, all forms	59,649	73,879	France 56,314; Poland 13,615.
Sulfur dioxide	11	32	All from France.
Sulfuric acid	11,683	7,088	Poland 3,998; West Germany 3,049.
Talc and related materials	r 816	957	People's Republic of China 460; Czechoslovakia 199; Norway 104.
Other nonmetals, n.e.s.:			
Ash and slag	143	200	Mainly from Iraq.
Crude meerschaum, amber, jet kilograms	145	--	
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	5	10	United States 9; West Germany 1.
Carbon black and gas carbon	109	93	United States 62; West Germany 31.
Coal, all grades	819	609	Mainly from Belgium.
Coke and semicoke	4,500	6,882	Poland 5,389; France 1,493.
Peat	155	122	U.S.S.R. 60; Romania 36; Finland 26.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	r 3,451	3,811	Iraq 2,839; Saudi Arabia 962.
Kerosine do	349	282	Iraq 212; Saudi Arabia 61.
Distillate and residual fuel oil do	5,867	6,623	Iraq 4,054; Saudi Arabia 2,568.
Lubricants do	r 153	151	Italy 69; United Kingdom 44; Romania 10.
Other:			
Liquefied petroleum gas do	850	989	Italy 537; Saudi Arabia 167; Iraq 136.
Paraffin do	6	8	U.S.S.R. 3; People's Republic of China 2; Hungary 1; Romania 1.

See footnotes at end of table.

Table 7.—Lebanon: Imports of selected mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
MINERAL FUELS AND RELATED MATERIALS—Continued			
Petroleum refinery products—Continued			
Other—Continued			
Petrolatum			
thousand 42-gallon barrels	(1)	1	Mainly from West Germany and Iraq.
Asphalt and bitumen do	162	154	Mainly from Iraq.
Unspecified do	31	30	Iraq 14; Belgium 5; United Kingdom 5; Syrian Arab Republic 4.
Total do	r 10,869	12,049	
Mineral tar and other coal-, petroleum- or gas-derived crude chemicals	r 1,090	908	Italy 464; Netherlands 292; Greece 100.

r Revised.
1 Less than ½ unit.
2 May include some manufactured materials, reported inseparably from unwrought and semimanufactured forms.

OMAN

Although current exploration results indicate a potential for a more diversified mineral economy, petroleum and natural gas remain the only minerals produced in Oman in significant quantities. In 1973, petroleum accounted for 70% of the gross national income and about 90% of government revenues. Crude petroluem production totaled an average of nearly 293,000 barrels per day from four fields operated by Petroleum Development Oman, Ltd. (PDO). Production by field is reported as follows in thousand barrels:

Field	Crude petroleum		Number of producing wells, 1973
	1972	1973	
Fahud	44,964	42,095	56
Yibal	24,680	e 31,837	59
Natih	21,800	18,646	19
Al Huwaisa	11,687	14,348	17

e Estimate.

Production from the Natih and Fahud Fields continued to decline as a result of pressure loss. Water injection secondary recovery operations were utilized at the Yibal, Fahud, and Natih Fields. Three new fields are under development in the Ghaba area of central Oman. By 1975, these fields should augment PDO's production by 60,000 to 90,000 barrels per day.

By yearend 1973, Oman's petroleum industry had been restructured. The Government of Oman had obtained a 25% participation in the PDO realigning the company ownership to 63.75% by Royal Dutch/Shell, 7.50% by Compagnie Française de Pétroles (CFP), and 3.75% by the Portuguese Participation and Exploration Corp. (Partex). In addition, the PDO had relinquished a 35,000-square-mile concession area in southern and central Oman and on the al Batinak and Dhofar coasts reducing its concession area to approximately 65,000 square miles. No activity was reported in the Wintershall Aktiengesellschaft offshore concession area near Damaniyat Island since the consortium reported a dry hole at al Batinak Marine B-1 in 1972.

New concessions awarded in 1973 included an offshore concession near R'as Musandom in the Straits of Hormuz, which was awarded to Essence et Lubrifiant de France-Entreprise de Recherches et d'Activités Petroliérés (Elf-ERAP), and an offshore concession awarded to the Sun Oil Co. in partnership with Canadian and West German firms.

Nonhydrocarbon mineral exploration was accelerated following a February agreement between the Government and the Canadian firms Marshall-Oman Exploration, Inc., and Prospection, Ltd. The agreement included a government option for 21% to 51% participation in any resulting mining operation. Drilling at Wadi Lasil revealed a pyrite-chalcopyrite zone averaging 2.25% copper at a depth of 155 feet to 265 feet and a lower average content of 1.85% when the drill hole was extended to 340 feet. The highest content of copper, 2.65%, was found between the 190-foot and 305-foot depths.

Other exploration activities indicated possible deposits of chrome ore and manganese ore in central Oman. Oman has

been totally dependent upon imports for its fast-growing cement requirements. The Government has accepted proposals by Associated Portland Cement Manufactures, Ltd. (United Kingdom), and Cementia Holding A.G. (Switzerland) for construction of a 200,000-ton-per-year-capacity cement plant near Muscat. Construction was to begin by the close of 1973. Production from this plant should satisfy domestic requirements through the decade as well as provide quantities for export.

PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN

The refining of imported crude petroleum and the production of salt were the only mineral industry activities in the People's Democratic Republic of Yemen. Refer to table 1 for production figures. Capacity at the Aden refinery is reported at 160,000 barrels per day; however, its record high throughput was 130,112 barrels per day reported in 1965. The refinery processes crude oil imported from Iran, Kuwait, the Arab Republic of Egypt, and possibly from the United Arab Emirates (Abu Dhabi). Products refined from Egyptian crude are exported back to the Arab Republic of Egypt. During 1973, an agreement was reached between Kuwait and the government activating a bunker facility formerly used by the British Navy at the Port of Aden.

Evaporated salt is produced for local consumption, and limited quantities are available for export. The Khawr Maksar evaporating ponds, the nation's only commercial salt producing area, is operated under the direction of the state-owned General Salt Organization.

No activity was reported in mineral exploration; however, the South Yemeni Algerian Petroleum Co. (SYAPCO) holds a concession agreement that includes the Hadhramaut Area. SYAPCO is owned 51% by the state petroleum agency and 49% by Société Nationale pour la Recherche, la Production, le Transport, la Transformation, et al Commercialisation des Hydrocarbures (SONATRACH).

Table 8.—People's Democratic Republic of Yemen: Exports and reexports of selected mineral commodities

Commodity		1971	1972	1973
Petroleum refinery products:				
Gasoline	thousand 42-gallon barrels	1,765	3,500	3,369
Kerosine and jet fuel	do	5,136	4,320	3,537
Distillate fuel oil	do	4,000	2,510	3,530
Residual fuel oil	do	11,010	12,636	10,090
Other, including LPG and feedstocks	do	1,792	155	42
Total	do	23,703	23,121	20,568
Salt [1]	metric tons	24,739	15,163	--

[1] Japanese imports from the People's Democratic Republic of Yemen.

QATAR

The Government's accelerated efforts to develop the nation's economy were reflected in the proposed construction of a gas-fueled integrated steel plant, and the proposed construction of a petrochemical complex. These new projects were announced in 1973 as construction activity was completed or well underway on the previous year's proposals, which included plants to manufacture fertilizers and to produce NGL utilizing associated gas, the expansion of cement manufacturing facilities, and the development of a supporting infrastructure. Qatar's production of mineral commodities is reported in table 1. Qatar's vigorous economic program is supported by revenues obtained through petroleum recovery operations. Revenues for 1973 were reported at $397 million, an increase of more than 80% over the previous year's level. Revenues for 1974 are anticipated at $1.5 billion as a result of increased royalties and taxes, the sale of government participation crude, and expanded production.

The Government of Qatar, through the

Qatar National Petroleum Co., obtained 25% interest in the operations of the nation's two producing companies, the Shell Oil Co. of Qatar (SOCQ) and the Qatar Petroleum Co., Ltd. (QPC). Government participation crude was estimated at 52 million barrels, most of which was sold back to SOCQ and QPC.

Other government measures undertaken during the year included the production cutback and embargo decrees following the October war. The first cutback representing a 10% decrease from September production levels went into effect on October 19. A total embargo on petroleum shipments to the United States was adopted on October 21, followed by the October 24 total embargo on shipments to the Netherlands, the destination for more than a third of Qatar's oil production. A 25% cutback from September production levels was in effect by November 8. Yearend cutbacks reduced Qatar's petroleum production for 1973 by about 8 million barrels.

On December 29, the Government of Qatar signed an agreement with Saudi Arabia, Kuwait, and Abu Dhabi establishing a jointly owned Gulf of Suez-Mediterranean Petroleum Pipeline Co. The pipeline terminals on the Gulf and in the Mediterranean would accommodate tankers too large to pass through the reopened Suez Canal.

During the year, negotiations were underway between the Government and two French firms, Charbonnages de France-Chimis and Gazocean, for construction of a petrochemical complex at Umm Said with product output destined for the export market.

Kobe Steel, Ltd., and Tokyo Boeki Ltd. entered into negotiations with the Qatar Government on the possible construction of an integrated steel plant fueled by natural gas. Plant capacity is proposed at 300,000 to 400,000 tons annually with product emphasis on concrete reinforcing rods. About 80% of the plant's output would be slated for the export market.

More than half of Qatar's crude oil production was produced by the SOCQ averaging more than 319,000 barrels per day of 36° API crude from 30 to 35 wells in its 3 offshore fields. Production averaged 330,000 barrels per day during the first 10 months of 1973 and was reduced to an average of 265,000 barrels per day for the remaining 2 months of the year. In spite of yearend cutbacks, overall production increased by nearly 33% over SOCQ production in the previous year. Production by field is reported as follows in thousand barrels:

Field	1972	1973
Bul Hanine	17,034	52,513
Maydan-Mahzan	55,289	50,135
Idd El Shargi	15,402	13,868

The Bul Hanine Field began production in mid-1972, at a rate of 50,000 barrels per day. In 1973 production at Bul Hanine exceeded 100,000 barrels per day and peaked at an estimated 175,000 barrels per day for a yearly average of 144,000 barrels per day.

The remainder of Qatar's crude production in 1973 was obtained from 58 wells in the Dukhan Field operated by the QPC. Daily production for 1973 averaged 251,000 barrels of 41° API crude; however, production in the first 10 months of the year averaged 261,000 barrels per day with a reduction to an average of 200,000 barrels per day in the last 2 months of the year. In spite of yearend cutbacks QPC overall production increased by nearly 4% over the previous year's level. Although the bulk of QPC's production is destined for the export market, more than 250,000 barrels of Dukhan oil was supplied via pipeline to Umm Said, where a state-owned topping plant is in operation to satisfy nearly one-fourth of local consumption requirements. Most of the nation's product requirements are satisfied by imports, chiefly from Iran. In 1975, product import requirements will be minimized as a 6,000-barrel-per-day refinery at Umm Said will be in full operation.

Construction of the QPC NGL project continued on schedule. Supplied with Dukhan Field associated gas, the plant's capacity will be 800,000 tons of NGL annually. The bulk of the plant's output will be exported to Japan. Scheduled startup date is 1975.

Natural gas is produced in association with petroleum in the Dukhan, Bul Hanine, Maydan-Mahzan, and Idd El Shargi Fields. More than three-quarters

of the 246 billion cubic feet produced in 1973 was flared. The remainder was utilized as producers fuel or transferred to the Qatar Government for use in power generation, water desalination, and chemical fertilizer feedstock.

During 1973, the Qatar Fertilizer Co. (QAFCO) operated a 900-ton-per-day-capacity urea plant. The Government holds controlling equity in QAFCO. Norsk-Hydro (Norway) acting as manager and marketer holds 20% equity and Power-Gas Corp., Ltd. (United Kingdom), holds 7% equity.

The Qatar National Cement Co. operates Qatar's sole cement manufacturing facility. The 110,000-ton-per-year capacity Umm Bab plant is being modernized and expanded under a contract to the Tarmac Construction Co. (United Kingdom). Plant capacity should be doubled by 1974 affording 150,000 tons of cement for the export market.

Table 9.—Qatar: Exports of crude petroleum and imports of petroleum refinery products
(Thousand 42-gallon barrels)

Commodity	1971	1972	1973
EXPORTS			
Crude petroleum	156,439	176,302	e 207,800
IMPORTS			
Petroleum refinery products:			
Gasoline	325	r e 340	e 340
Jet fuel and kerosine	25	r e 38	e 40
Distillate fuel oil	250	r e 283	e 290
Lubricants	10	e 25	e 25
Asphalt	38	e 30	e 30
Total	648	r e 716	e 725

e Estimate. r Revised.

SYRIAN ARAB REPUBLIC

The petroleum industry sustains the nation's economy either directly through production and processing or indirectly through fees paid for Iraqi and Saudi Arabian oil transiting Syria via pipelines linking producing fields with Mediterranean shipping terminals. In addition to petroleum and associated natural gas production, the nation also produces cement, nitrogenous fertilizers, phosphate rock, and rock salt. Refer to table 1 for production of mineral commodities. Production of mineral fertilizers was inaugurated in 1972. Current production is limited to nitrogenous fertilizers. However, a wider range of mineral fertilizers will be produced in the near future utilizing the phosphate rock now destined only for the export market.

Crude petroleum production is derived from the Karachok, Rumailan, and Sawaidiyah Fields. Production averaged nearly 105,000 barrels per day in 1973. The bulk of Syria's output is exported, and an average of 82,000 barrels per day was exported from the Tartous terminal in 1973. Syria's remaining crude production is blended with Iraqi crude and refined at the 54,000-barrel-per-day-capacity Homs refinery which satisfied most of the domestic consumption requirements until its destruction during the October war. Product imports averaged 10,000 barrels per day in 1973.

All phases of petroleum production, refining, and distribution were under the authority of the state-owned General Petroleum; however, at yearend the Syrian cabinet authorized four state-owned operations to control various phases of the industry. The Syrian Oil Co. now controls exploration and production, the Crude Oil Transport Co. controls pipeline operations, the Homs Refinery Co. controls domestic refinery operations, and the Syrian Storage Co. controls distribution. All phases of the Syrian petroleum industry are under development and expansion. Exploration activity has been accelerated to support production goals of 240,000 barrels per day by 1975. Several refinery proposals were under consideration during the year, these include construction of an 80,000-barrel-per-day refinery at Tartous, expansion of the Homs refinery to 90,000-barrel-per-day capacity, and construction of two refineries

with a total capacity of 170,000 barrels per day at Banias. Refinery feedstock will be a blend of 36° API Iraqi crude and 25° API Syrian crude. Construction plans include a network of pipelines connecting the Syrian Fields with the coastal refineries. By 1978, revenues from product exports will make a significant contribution to the national income. Revenues for 1973 were reported as follows in millions of dollars:[4]

Crude petroleum exports	$64.9
Crude petroleum sales to Homs refinery	26.5
Product exports	2.7
Product sales, domestic and imported	75.8

In addition to revenues obtained from petroleum production and processing, transit fees levied on petroleum produced in Iraq and Saudi Arabia and carried via pipeline across Syria earned an estimated $130 million during 1973 in spite of the shutdown from October 10 to November 3 of the war-damaged Banias terminal. The bulk of transit fees is earned on crude carried by pipelines of the Iraq National Oil Co. (INOC), formerly Iraq Petroleum Co. (IPC). A new transit agreement was signed between Iraq and Syria in January 1973, retroactive to June 1972 when Iraq nationalized IPC production and transportation facilities. Under the new agreement, transit fees on Iraqi crude moving across Syria to the port of Banias was settled at 41 cents per barrel, and the transit fees on Iraqi crude transiting Syria to the Lebanese port of Tripoli was placed at 30 cents per barrel. Prior transit agreements with IPC were 23 cents to Banias and 17 cents to Tripoli. The new agreement, however, transfers operating costs from Iraq to Syria. Costs are estimated at 6 cents per barrel at full capacity and 11 cents per barrel at one-half capacity.

The agreement also provides a minimum throughput guarantee of 85 million barrels per year with assured payments of up to $13 million annually if operations are discontinued by force majeure. The prices paid for Iraqi crude delivered to the Homs refinery were retroactively set to $2.45 per barrel in 1972, $2.55 per barrel for 1973, $2.65 per barrel for 1974, and $2.75 per barrel for 1975. The financial terms of the January agreement extend to December 31, 1975.

Iraq has made available a $22 million loan to raise the pumping capacity of the INOC pipeline connecting Kirkuk to Banias. The interest-free loan will be deducted from transit dues paid by Iraq. Pipeline capacity will be increased from 1.1 million barrels per day to 1.4 million barrels per day.

A second transit pipeline, the TAPline crosses southern Syria from the Jordan to the Lebanese border, a distance of less than 100 miles. During 1973, the pipeline operated at about 80% capacity with an average daily throughput of 413,700 barrels earning Syria an estimated $8.5 million in fees.

Syria continued development of the Palmyra Desert phosphate rock deposits under the General Co. of Phosphate and Mines (GECOPHAM). Production at the Khunaifis mine was inaugurated in September 1971. By 1973, total mine production was estimated at 300,000 tons (31% to 32% P_2O_5), most of which was exported to eastern Europe. Five additional mines and concentrators are to be in operation in late 1975. The al Sharqiyah A mine is anticipated to yield 600,000 tons of phosphate (30% to 31% P_2O_5) annually. The al Sharqiyah B plant will yield 600,000 tons of phosphate (29% to 30% P_2O_5) annually.

UNITED ARAB EMIRATES

The United Arab Emirates is a federation of independent sheikhdoms that includes Abu Dhabi, Ajman, Dubai, Fujairah, Sharjah, and Umm al Qaiwain. The office of president and prime minister of the federation are held by the ruler of Abu Dhabi and the Crown Prince of Dubai, respectively. Abu Dhabi and Dubai are the only oil producing members of the federation in 1973. Allocation of 25 ministerial posts are made proportionately to the size of population of each federation member. Petroleum revenues of Abu Dhabi sustain the federation budget; however, future plans include an assessment of 10% of government revenues from each federation member. During 1973, the federation estab-

[4] Where necessary, values have been converted from Syrian Pounds (LS) to U.S. dollars at the rate of 1LS=US$3.79.

lished a common currency known as a dirham valued at 0.186621 gram of gold.

Refer to table 1 for mineral production statistics on the United Arab Emirates.

Abu Dhabi.—Petroleum and natural gas are the only minerals produced in commercial quantities in Abu Dhabi. Effective January 1973, the state-owned Abu Dhabi National Oil Co. (ADNOC) obtained 25% interest in companies producing petroleum within its borders. By October, a second state-owned company was formed. The Abu Dhabi National Oil Co. for Distribution (ADNOCD) will control the importation, storage, transportation, and distribution of petroleum products. The company is owned by ADNOC at 51% equity with the remaining equity held by nationals of the United Arab Emirates.

Crude petroleum production averaged 1.3 million barrels per day representing a 25% increase over the previous year's production level, in spite of yearend production cutbacks that reduced 1973 output by an estimated 22 million barrels. More than 60% of the production was obtained from onshore operations of the Abu Dhabi Petroleum Co. (ADPC), and most of the remaining production was obtained from offshore fiields of Abu Dhabi Marine Areas, Ltd. (ADMA). Less than 1% of the total crude output was obtained from the Abu Dhabi Oil Co., Ltd. (ADOC), offshore Mubarraz Field, which came onstream in midyear. Abu Dhabi's crude output is exported, with France, Japan, and the United Kingdom, accounting for 70% of the market. During the year, 42 tankers loaded crude from the ADPC port outlet at Jebel Dhanna, and 24 tankers loaded crude from ADMA's Das terminal.

An average production of 794,000 barrels per day was reported by ADPC representing a 30% increase over the previous year's output. Production from Bu Hasa averaged 680,000 barrels per day, and Bab production averaged 110,000 barrels per day. The Asab Field came onstream in December 1973, with a reported total production of 1.5 million barrels at yearend. By 1974, the Asab Field is expected to reach production levels of 400,000 barrels per day. Near yearend, the pipeline was commissioned carrying Asab crude to Habskan, where it joined existing lines to Jebel Dhanna. At Jebel Dhanna, a fourth loading berth and additional storage tanks were completed to accommodate expanded output. The border dispute between Abu Dhabi and Saudi Arabia, which halted development of ADPC's Zarrara Field, has been resolved during 1973. The dispute erupted in 1970, when ADPC's Zarrara Field appeared to be part of the same structure as the Aramco Shuaiba Field.

Production from ADMA offshore operations averaged more than 507,000 barrels per day. Production from the Zakum Field averaged 305,000 barrels per day, of 40° API gravity, 0.9% sulfur crude, and production from the Umm Shaif Field averaged 202,000 barrels per day of 37° API 1.3% sulfur crude. By 1980, ADMA anticipates combined production from the two fields at 800,000 barrels per day as a result of a $500 million waterflood program. In 1973, ADMA transferred a 109-square-kilometer concession area to the Abu Al Bu Koosh Oil Co., operated by Compagnie Française des Pétroles (CFP), for the consortium in which it holds 51% equity; Nepco Petroleum Abu Dhabi Ltd., holds 24.5% equity, and Amerada Hess Corp. and Sunningdale Oil Co. each hold 12.25% equity. The Abu Al Bu Koosh Field, an extension of Iran's Sasson Field, is expected to come onstream in mid-1974 at an initial production rate of 30,000 barrels per day.

Construction was underway on the $300 million natural gas liquefaction plant of Abu Dhabi Gas Liquefaction Co., Ltd. (ADGLC) on Das Island. When the plant is completed in 1976, associated gas from ADMA offshore operations will be used as feedstock to produce 2.2 million tons of LNG, and 800,000 tons of liquefied petroleum gas (LPG) annually. The Tokyo Electric Power Inc. negotiated a 20-year contract for the purchase of the LNG and LPG. ADNOC participation in the project was increased from 20% to 60%. Other participants in ADGLC include British Petroleum Co., Ltd., CFP, Mitsui & Co., Ltd., and Bridgestone Liquefied Gas Co., Ltd.

The Mubarraz oilfield operated by ADOC, a Japanese consortium, including Maruzen Oil Co., Ltd., Daikyo Oil Co., Ltd., and Nippon Mining Co., Ltd., entered production in midyear. Initial flow was reported at 30,000 barrels per day of 38.5° API crude containing 0.8% sulfur. The state-owned ADNOC has negotiated a 51% share in ADOC.

Two commercial oil discoveries were reported by other Abu Dhabi concession holders during the year. Amerada Hess Corp. reported an offshore discovery 10 kilometers south of Arzana. The discovery well had a production capacity of 4,000 barrels per day of 45° API crude containing 1.0% sulfur. Amerada Hess Corp. is the operator and 31.5% owner of a consortium including Pan Ocean Oil Corp. at 31.5% ownership, Bow Valley Co., at 20% ownership, Wingate Enterprises at 12% ownership, and Houston Oil Canada, at 5% ownership. The Abu Dhabi Phillips Petroleum Co. reported a discovery 19 kilometers southwest of Jebel Dhanna. The well had an initial production of 3,400 barrels per day of 29° API crude with a sulfur content of 0.07%.

Ajman.—Marble, all of which is consumed within the Federation of the United Arab Emirates, is the only known commercially produced mineral in the 260-square-kilometer sheikhdom. Exploration for hydrocarbons has been encouraged. Offshore concessions are held by Occidental Petroleum Corp.; however, no exploration activity was reported in 1973.

Dubai.—Petroleum and associated natural gas are the only minerals produced in significant quantities. Production of crude petroleum averaged 220,000 barrels per day representing an increase of 44% over the previous year's level. Development work in both the Fateh and southwest Fateh Fields resulted in increased production levels in spite of a well fire in October, which reduced output in the last 2 months. Production for the first 10 months of the year averaged 236,000 barrels per day, with peak output averaging 292,300 barrels per day reported in the month of August. A 30,000-barrel-per-day well began burning on October 17, resulting in a field shutdown, reducing Dubai's total production to 140,000 barrels per day for November and December. Production at the Fateh Field resumed at yearend, and full recovery was anticipated by February 1974. The Fateh and Southwest Fateh Fields are operated by the Dubai Petroleum Co., a wholly-owned subsidiary of Continental Oil Co. (CONOCO), acting for a multinational group composed of Dubai Marine Areas, Ltd. (owned equally by CFP and Hispanico de Petroleos, S.A.), which holds 50% equity, Dubai Petroleum Co., which owns 30% equity, Deutsche Texaco A.G., which holds 10% equity, and Sun Oil Co. and Wintershall A.G., each holding 5% equity. By mid-December, the Dubai Petroleum Co. announced discovery of the Rashid Field 24 kilometers south of the Fateh Field. Restricted flow rates of 20 million cubic feet per day of gas and 3,346 barrels per day of 53° API condensate were registered from two zones between 2,875 meters and 2,934 meters. A combined restricted flow rate of 3,700 barrels per day of 37° and 41° API crude was recorded at depths of 3,182 meters and 3,289 meters.

At yearend, a contract was signed by the Dubai Drydock Co. with Costain Civil Engineering and Taylor Woodrow International (United Kingdom) for construction of a drydock capable of berthing simultaneously two tankers of up to 500,000 deadweight tons and a tanker of 1 million deadweight tons. Construction is scheduled for completion in 1978 at a cost of $227.5 million. The Government owns 70% of the Dubai Drydock Co., and the Galadari Brothers (Dubai) and John J. McMullen Naval Architects (New York) each own 15% of the company.

Construction of a 500,000-ton-per-year-capacity cement plant near the town of Dubai continued under consideration, but no contract was awarded by yearend.

Fujairah.—The sheikhdom of Fujairah covers an area of 1,165 square kilometers. No mineral production or mineral exploration was reported; however, the intention to open the territory for exploration has been announced, and concession awards are anticipated in 1974.

Ras al-Khaimah.—The sheikhdom of Ras al-khaimah covers an area of 1,683 square kilometers. No mineral production was reported in 1973.

A 19,000-acre offshore concession area was awarded to Vitol Exploration Co. (Netherlands) in mid-1973. The concession was relinquished by Union Oil Co. (United States) in 1972, after drilling three exploratory wells.

Sharjah.—Petroleum was discovered in October 1972 at the Mubarek A-1 well off Abu Musa Island. In 1973, a second well, A-2, was tested at a combined rate of 110,000 barrels per day. Production is anticipated by mid-1974, with initial capacity of 60,000 barrels per day of 36° API crude with a sulfur content of 0.6%. The field

was discovered and is under development by Buttes Oil and Gas Co., as operator, holding 37.5% equity. The remaining shares are held by Ashland Oil Co. and Skelly Oil Co., each holding 25% equity, and by Kerr McGee Corp., holding 12.5% equity. Near yearend, 1973, Buttes Oil and Gas Co. obtained a $30 million production loan from Cities Service Co. in exchange for 10% interest in the field. The Mubarek Field is in a 500,000-acre concession extending 12 miles out from the Abu Musa coastline, in an area claimed by Iran, Sharjah, and Umm al Quiwain. The dispute between Iran and Sharjah was resolved by a revenue-sharing agreement. The Umm al Qaiwain claim was not resolved by yearend.

Umm al Qaiwain.—No commercial mineral production was reported in the 777-square-kilometer sheikhdom during 1973. Umm al Qaiwain awarded Occidental Petroleum Corp. a concession including offshore waters to the median line with Iran. Abu Musa Island located between Iran and the Arabian Peninsula is shared by Sharjah, a neighboring sheikhdom, and Iran. Sharjah and Iran claim a 12-mile territorial water zone around the island; Umm al Qaiwain contends that 3 miles is the legal limit. Petroleum has been discovered in the 9-mile belt claimed by all parties. Buttes Oil and Gas Co. has developed the disputed Mubarek Field, and production for Iran and Sharjah is anticipated in 1974. Occidental Petroleum Corp. has announced its intention to claim ownership of any crude exported from the Mubarek Field. The claim was not resolved by yearend.

YEMEN ARAB REPUBLIC

The mineral industry of the Yemen Arab Republic is limited to the production of several nonmetallic minerals and the manufacture of cement. Most nonmetallic minerals are mined for local consumption; these include unreported quantities of building stone, limestone, and gypsum; however, rock salt is mined at Salif in commercial quantities for export to Japan. The manufacture of cement began in late 1972 when the 50,000-ton-per-year capacity Bajil cement plant was commissioned. Operating at half capacity levels during the year, the plant covered most of the domestic production requirements for cement in 1973.

Domestic petroleum product requirements are met entirely through imports. Product distribution was conducted by Yemeni Fuels Co. until the September 1973 formation of the Yemen National Petroleum Co. (YNPC). The latter is a semipublic corporation with 51% equity held by the Government and 49% equity held by the Yeman Bank for Reconstruction and Development. The company is committed to secure and distribute liquid fuel requirements for the nation. The YNPC estimated product imports at nearly 1.5 million barrels in 1973. Imports by product are estimated as follows in barrels:

Motor gasoline	387,000
Aviation gasoline	23,000
Kerosine	284,000
Jet fuel	31,000
Diesel oil	623,000
Fuel oil	130,000

Product imports for 1974 are expected to increase by 20% placing a heavy burden on the nation's extremely limited port, storage, and distribution facilities. The port at Hadeida can only accommodate tankers of 4,000-deadweight-ton capacity. Product storage capacity is limited to approximately 1 month's national supply or 125,000 barrels. Distribution by tanktruck is hampered by lack of secondary roads. Distribution network improvements were in the planning stage by yearend.

The Mineral Industry of Other Far Eastern and South Asian Areas

By Staff, Bureau of Mines

CONTENTS

AFGHANISTAN [1]

In 1973 the Afghan minerals industry produced significant quantities of hydraulic cement, coal and coal briquets, natural gas, salt, and marble. Minor quantities of lapis lazuli and iron ore were also produced although production data are not available. Cement showed a substantial increase over 1972 production, while coal and natural gas production decreased. Salt and marble production was essentially unchanged.

Natural gas continued to be primary mineral commodity in Afghanistan. Production decreased 3 billion cubic feet to about 99 billion cubic feet in 1973. Most of the gas was exported to the U.S.S.R.; the remaining production was consumed domestically. Gas exports provide a major source of revenue. This revenue will increase substantially under a new agreement whereby the U.S.S.R. will double the price paid to Afghanistan for the gas. A recently completed pipeline across the Oxus River will facilitate the transport of the gas to the U.S.S.R. Drilling operations have led to an increase in the estimates of gas reserves in the Asek and Juma Fields to 413 billion cubic feet.

The extent of the petroleum reserves discovered in the Jarqduq Area of Jowzjan Province is not known, but more drilling is being planned to delineate the actual volume of these reserves. About 7 million tons of petroleum was discovered in the Angut Area of Sar-e Pol District, of which an estimated 2 million tons is recoverable.

The Government of Czechoslovakia granted Afghanistan a $20 million credit to be used for development of several industries. Part of the loan is to be used for constructing a cement plant, exploiting coal reserves in Herat, developing the Sari Souf coal mining district, and purchasing gas and steam electric generators.

In the last 10 years, surveys have been conducted that have located occurrences of coal, iron ore, copper, lead, nickel, tin, tungsten, beryl, lithium, mercury, gold, bauxite, sulfur, pyrite, fluorite, celestite, talc, salt, lapis lazuli, dolomite, hard clay, and marble. Two regions have been selected for iron ore and copper mining on a small scale. The iron ore deposit in the Hajjiak Region will supply domestic needs but owing to the high extraction costs, will not be exported.

An area of about 400 square kilometers has been selected in the Aynak Area of Lowgar Province for exploration and development of known copper deposits.

[1] Prepared by Stanley K. Haines, geologist, Division of Nonmetallic Minerals—Mineral Supply.

Table 1.—Other Far Eastern and South Asian Areas: Production of mineral commodities

Area,[1] commodity, and unit of measure	1971	1972	1973 [p]
AFGHANISTAN [2 3]			
Cement, hydraulic ____ thousand metric tons	91	99	141
Coal, bituminous ____ do	135	[e] 135	114
Fuel briquets (produced from a portion of domestically mined coal) [1] ____ do	[e] 30	NA	10
Gas, natural, marketed production ____ million cubic feet	[r] 93,054	102,200	98,881
Gem stones, lapis lazuli [4] ____ kilograms	[e] 10,000	NA	NA
Natural gas liquids ____ thousand 42-gallon barrels	[e] 12	[e] 12	13
Salt, all types ____ thousand metric tons	[e] 38	[e] 38	38
Stone:			
Marble "traso" [4] ____ thousand cubic meters	[e] 5	NA	NA
Marble, n.e.s.[4] ____ do	[e] 30	NA	NA
BANGLADESH [2]			
Cement, hydraulic [5] ____ thousand metric tons	64	23	30
Clays, kaolin (china clay) ____ metric tons	[e] 1,800	[e] 2,000	6,000
Fertilizer materials, manufactured: [5]			
Gross weight ____ thousand metric tons	54	47	211
Nitrogen content ____ do	25	22	98
Gas, natural, marketed production [5] ____ million cubic feet	20,000	26,000	32,000
Iron and steel:			
Crude steel ____ thousand metric tons	[e] 100	[e] 41	61
Mild steel products [5] ____ do	52	49	136
Petroleum refinery products:			
Gasoline ____ thousand 42-gallon barrels	751	386	259
Jet fuel ____ do	206	73	--
Kerosine ____ do	1,469	1,268	613
Distillate fuel oil ____ do	612	763	576
Residual fuel oil ____ do	2,132	2,294	1,656
Other:			
Naphtha ____ do	295	314	232
Unspecified ____ do		300	185
Refinery fuel and losses ____ do		458	423
Total ____ do	5,914	5,856	3,943
Salt, marine [e] ____ thousand metric tons	130	315	757
Stone, limestone, industrial ____ do	[r e] 138	[r e] 50	64
BRUNEI [2]			
Gas, natural:			
Gross production ____ million cubic feet	[e] 120,000	148,066	204,099
Marketed production ____ do	7,769	15,763	30,488
Natural gas liquids:			
Condensate ____ thousand 42-gallon barrels	NA	149	1,253
Natural gasoline ____ do	NA	430	420
Liquefied petroleum gas ____ do	NA	178	180
Total ____ do	[e] 700	757	1,853
Petroleum:			
Crude ____ do	47,482	67,008	78,673
Refinery products:			
Gasoline ____ do	[e] 98	[e] 122	133
Distillate fuel oil ____ do	[e] 216	[e] 217	203
Residual fuel oil ____ do	[e] 4	[e] 2	1
Other ____ do	[e] 14	[e] 19	38
Refinery fuel and losses ____ do	[e] 48	[e] 32	[e] 37
Total [e] ____ do	380	[r] 392	412
HONG KONG [2]			
Cement, hydraulic ____ thousand metric tons	512	408	441
Clays, kaolin ____ metric tons	[r] 2,540	3,162	6,753
Feldspar ____ do	1,145	1,149	1,340
Iron ore and concentrate, gross weight ____ do	[r] 162,740	162,282	150,713
Quartz ____ do	5,151	3,631	991
KHMER REPUBLIC [2]			
Cement, hydraulic ____ thousand metric tons	59	46	[e] 50
Gem stones:			
Ruby ____ carats	1,612	NA	NA
Sapphire ____ do	879	NA	NA
Zircon ____ do	1,630	NA	NA
Gold, mine output, metal content [4] ____ troy ounces	4,000	4,000	4,000
Petroleum refinery products:			
Gasoline ____ thousand 42-gallon barrels	21	--	NA
Jet fuel ____ do	--	--	NA

See footnotes at end of table.

Table 1.—Other Far Eastern and South Asian Areas: Production of mineral commodities—Continued

Area,[1] commodity, and unit of measure	1971	1972	1973 [p]
KHMER REPUBLIC [2]—Continued			
Petroleum refinery products—Continued			
Kerosine ---- thousand 42-gallon barrels	--	--	NA
Distillate fuel oil ---- do	82	--	NA
Residual fuel oil ---- do	43	--	NA
Other ---- do	14	--	NA
Refinery fuel and losses ---- do	51	--	NA
Total ---- do	211	--	NA
Phosphate rock ---- metric tons	16,011	--	--
Salt ---- do	130,000	36,300	[e] 40,000
LAOS [2]			
Salt, rock ---- do	400	7,776	8,640
Tin:			
Mine output, metal content ---- long tons	774	[e] 820	[e] 900
Metal, smelter ---- do	696	[e] 817	[e] 820
MONGOLIA [2]			
Cement, hydraulic ---- thousand metric tons	95	141	[e] 150
Coal:			
Anthracite and bituminous ---- do	101	106	[e] 110
Lignite and brown ---- do	[r] 1,980	2,147	[e] 2,290
Total ---- do	[r] 2,081	2,253	2,400
Fluorspar, all grades [e] ---- metric tons	80,000	[r] 100,000	100,000
Gypsum [e] ---- do	25,000	25,000	25,000
Lime, quicklime and hydrated [e] ---- do	40,000	40,000	40,000
Petroleum refinery products:			
Gasoline ---- thousand 42-gallon barrels	128	[e] 140	[e] 150
Jet fuel and kerosine ---- do	62	[e] 70	[e] 75
Distillate fuel oil ---- do	52	[e] 60	[e] 65
Residual fuel oil ---- do	[r] 186	[r e] 200	[e] 210
Total [7] ---- do	[r] 428	[e] 470	[e] 500
Salt ---- metric tons	9,000	10,000	[e] 11,000
SINGAPORE [2]			
Cement, hydraulic ---- thousand metric tons	613	1,009	1,028
Iron and steel:			
Crude steel ---- do	124	190	204
Semimanufactures (rolled only) ---- do	161	194	302
Petroleum refinery products:			
Gasoline ---- thousand 42-gallon barrels	[r] 9,636	10,900	3,164
Jet fuel ---- do	[r] 14,805	28,251	3,251
Kerosine ---- do	[r] 4,850	9,435	4,445
Distillate fuel oil ---- do	[r] 19,231	32,434	11,243
Residual fuel oil ---- do	[r] 53,542	76,891	30,356
Lubricants ---- do	2,553	795	1,097
Other:			
Liquefied petroleum gas ---- do	985	1,317	730
Naphtha ---- do	6,167	11,726	5,092
Asphalt ---- do	454	2,478	844
Unspecified ---- do	3	424	270
Refinery fuel and losses ---- do	[r] 3,681	5,093	2,832
Total ---- do	[r] 115,907	179,744	63,324
Stone, granite, broken ---- thousand cubic meters	[r] 1,665	1,833	1,778
Sulfur, byproduct from oil refining ---- metric tons	685	5,612	4,289
SRI LANKA			
Cement, hydraulic ---- thousand metric tons	386	383	422
Clays:			
Ball ---- metric tons	226	--	1,090
Kaolin ---- do	3,165	3,946	13,881
Other ---- do	[r] 66,043	70,162	--
Coke, gashouse ---- thousand metric tons	8	7	--
Feldspar, crude and ground ---- metric tons	258	579	625
Garnet, not further described ---- do	NA	14	--
Gem stones, precious and semiprecious, except diamond ---- thousand carats	[9] 126	179	478
Graphite, all grades ---- metric tons	7,186	6,156	7,811
Mica, scrap ---- do	[9] 315	194	272
Petroleum refinery products:			
Gasoline ---- thousand 42-gallon barrels	966	1,130	1,041
Jet fuel ---- do	141	322	326
Kerosine ---- do	1,545	1,912	1,954

See footnotes at end of table.

Table 1.—Other Far Eastern and South Asian Areas: Production of mineral commodities—Continued

Area,[1] commodity, and unit of measure	1971	1972	1973 [p]
SRI LANKA—Continued			
Petroleum refinery products—Continued			
Distillate fuel oil ---- thousand 42-gallon barrels	2,474	3,076	3,035
Residual fuel oil ---- do	4,472	4,580	4,452
Other ---- do	803	1,124	1,293
Refinery fuel and losses ---- do	[r] 722	851	837
Total ---- do	[r] 11,123	12,995	12,938
Rare-earth minerals, monazite concentrate, gross weight ---- metric tons	6	--	--
Salt, marine ---- do	86,144	157,676	123,041
Sand and gravel, glass sand ---- do	2,607	188	NA
Stone:			
Dolomite ---- do	6,950	2,800	6,102
Limestone ---- thousand metric tons	551	592	697
Quartz, massive ---- metric tons	1,531	1,657	434
Titanium:			
Ilmenite concentrate, gross weight ---- do	92,892	82,503	93,482
Rutile concentrate, gross weight ---- do	2,586	2,151	2,252
Zirconium concentrate, zircon, gross weight ---- do	139	30	28
VIETNAM, NORTH [10]			
Cement, hydraulic [e] ---- thousand metric tons	500	[r] 250	500
Coal, anthracite [e] ---- do	3,200	2,000	3,000
Fertilizer materials, crude, phosphatic, phosphate rock [e] ---- do	550	[r] 280	500
Salt [e] ---- do	150	[r] 150	150
Tin:			
Mine output [e] ---- long tons	100	120	120
Smelter output [11] ---- do	14	121	[e] 120
VIETNAM, SOUTH			
Cement, hydraulic ---- thousand metric tons	263	243	265
Clays:			
Kaolin [e 12] ---- metric tons	1,000	1,000	1,000
Lateritic ---- thousand cubic meters	394	400	394
Other ---- do	418	795	836
Gypsum [e] ---- metric tons	7,000	7,000	7,000
Salt, marine ---- thousand metric tons	[r] 134	192	200
Sand and gravel:			
Silica sand [e] ---- thousand cubic meters	195	195	195
Other sand and gravel [e] ---- do	1,013	1,095	1,085
Stone: [13]			
Basalt, rhyolite ---- do	23	22	22
Granite and porphyry [e] ---- do	433	433	433
Limestone ---- do	1,497	1,395	1,550
Sandstone ---- thousand metric tons	15	100	[e] 100
Schist ---- thousand cubic meters	8	60	80
Quartz ---- do	1	1	1

[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, and 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] Estimate based on production data published in 1970 by the Afghanistan Government.

[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] Total of listed figures only; no allowance is made for other products (if any) nor for refinery fuel and losses.

[8] For cement production only.

[9] Based on exports of the given commodity.

[10] 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.

[11] From official import statistics of the U.S.S.R.

[12] The South Vietnam Directorate of Natural Resources estimate a kaolin production level of 420,000 cubic meters annually for the years 1971–73, but the figure is inordinately high for true marketable china clay-grade kaolin.

[13] Additional varieties of stone presumably are produced, but production statistics are not available, and general information is inadequate to make reliable estimates of output levels.

Table 2.—Afghanistan: Imports of petroleum refinery products
(Thousand 42-gallon barrels)

Commodity	1971	1972 [e] [1]	1973 [e]
Gasoline, all grades	[2] 969	[r] 1,020	1,100
Jet fuel and kerosine	[2] 31	[r] 47	50
Distillate fuel oil	[2] 684	[r] 550	650
Residual fuel oil		[r] 225	250
Lubricants	[e] 36	38	40
Other	[e] 44	[r] 50	60
Total	1,764	[r] 1,930	2,150

[e] Estimate. [r] Revised.
[1] Estimates revised to conform with 1971 reported figures and 1972 estimates published in source cited in footnote 2.
[2] Figures reported by Statistical Office of the United Nations, World Energy Supplies, 1969–72. Statistical Papers, Series J. No. 17, New York, 1974, 195 pp.

BANGLADESH [2]

Mineral production in Bangladesh increased in 1973. Steel led with a 21,738 ton increase in crude steel ingots and production of 111,300 tons of mild steel products. Other commodities showing increases were hydraulic cement, kaolin (china clay), fertilizer, salt, limestone, and natural gas.

Natural gas production increased from 26 billion cubic feet in 1972 to 32 billion cubic feet in 1973. Geologic and seismic teams have been actively exploring for gas in many parts of the country. Most of the equipment for the surveys and exploration was obtained from the U.S.S.R. Gas pipeline mileage was increased by 27 miles from early 1973 to April 1974. Three additional pipelines are under study, but delays due to lack of funds have held up construction.

Bangladesh's only oil refinery showed a 300,000-ton drop in production to 525,282 tons. The decrease was due to the shortage of crude and nonscheduled maintenance that resulted in about 207 days downtime. Feasibility studies were initiated for an asphaltic bitumen plant, a liquefied petroleum gas plant, and an offshore oil terminal. India supplied most of Bangladesh's oil in the late months of 1973 from its imports of Arabian crude oil.

In cooperation with the Government of Australia, plans to explore and exploit deposits with various combinations of zircon, monazite, mullite, ilmenite, and titanium were drawn up. The Australian Government has agreed to invest $145,000 toward the setup of a pilot plant in the Cox's Bazar Area on the Bay of Bengal in southern Bangladesh. Reserves are estimated at 1 million tons but are not broken down by mineral content.

The uncertain status of the weather and economy have been major problems in the development of Bangladesh's mineral resources. Qualified personnel and training facilities are scarce, further hindering economic development.

BRUNEI [3]

Brunei's benefits from the production of hydrocarbons increased significantly in 1973. The big new liquefied natural gas (LNG) plant completed its first full year of operation, and crude petroleum prices shot upward as the result of supply restrictions in the Middle East. These two factors caused a doubling of the estimated total value of the country's mineral production. Since over 90% of the value of Brunei's exports and about 80% of its gross national product (GNP) are derived from oil and gas production, the impact on the country's income and government revenue was quite sizable. Another large boost can be expected in 1974 when LNG production will be stepped up and major increases in world petroleum prices come into effect.

Attempts to discover additional mineral resources met with no success during the year. The three wildcat petroleum wells that were drilled all came up dry, and there was no exploration activity in con-

[2] Prepared by Stanley K. Haines, geologist, Division of Nonmetallic Minerals—Mineral Supply.
[3] Prepared by David G. Willard, economist, Division of Monmetallic Minerals—Mineral Supply.

nection with any other minerals. In an attempt to provide additional resources for the day when the oil wells run dry (which is at least 20 years away), the Government joined with 22 other Asian nations in setting up a Resources Development Center, which will provide scientific equipment and expertise to its members. The center, which will be located temporarily in Bandung, Indonesia, until a permanent site is found, will be equipped to carry out studies in geophysics, geochemistry, hydrogeology, mineral economics, and laboratory methods, in addition to serving as a data processing and regional computer sharing center.[4] Since Brunei currently has no known mineral resources other than oil and gas and beach sands, and practically no agricultural and industrial exports, the center's services may prove to be of considerable value.

PRODUCTION AND TRADE

Sales of LNG to Japan, which commenced in late 1972, gave mineral production in Brunei a major boost during 1973. Gross production of natural gas rose 38% to 204 billion cubic feet, from 148 billion cubic feet in 1972; gas sales of 10.9 billion cubic feet were six times the 1972 sales of 1.8 billion cubic feet. Since a large part of Brunei's natural gas is associated with petroleum, gross production still vastly exceeded sales, and its rise was related more to increased crude oil output than to the demand for gas. Oil production, mostly from the Southwest Ampa Field, was up 17% to 78,673,000 barrels in 1973, from 67,008,000 barrels in 1972. No other mineral production was recorded during the year.

Total value of the country's mineral output was boosted an estimated 115%, from $177 million in 1972 to $380 million in 1973, by the combination of increased production and higher prices. Petroleum value rose by $107 million due to both greater output and higher crude oil prices, and LNG sales brought the country $96 million of additional income. Petroleum refinery products and natural gas liquids, most of which are consumed locally, accounted for the remaining small mineral values.

Further growth in mineral production and value is practically certain in 1974. Natural gas sales are scheduled to rise as construction of the five liquefaction trains is completed and the project's seven specially designed ocean carriers are delivered. Higher petroleum prices and worldwide shortages of oil should also result in maximum output from the country's oilfields.

Exports of crude oil rose to 67 million barrels in 1972, reflecting the 41% jump in production from the year before. Data on export value were not yet available, but export value would have approximated the $173 million value of petroleum production in that year. Shipments of petroleum refinery products (mostly reexports of products from the refinery at Lutong, Sarawak) increased in value to slightly over $1 million in 1972, from $900,000 in 1971, primarily as a result of higher prices.

Sales of LNG to Japan began in December 1972 and added approximately $1 million to the trade balance for the year. This shipment marked the first significant export of Brunei's natural gas resource and was the forerunner of sales that are expected to reach $72.5 million annually by 1977.[5]

Brunei exports no mineral products other than petroleum and LNG, and these normally account for more than 90% of the value of all exports. Imports were expected to have returned to a normal level in 1972 after a large increase in the previous year resulting from purchase of equipment and supplies for the LNG plant, which gave the country a rare deficit in its balance of payments.

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[4] Engineering and Mining Journal. News Briefs. V. 175, No. 1, January 1974, pp. 119-120.

[5] U.S. Embassy, Kuala Lumpur, Malaysia. State Department Airgram A-44. March. 22, 1973, p. 5.

Table 3.—Brunei: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum metal, including alloys, semimanufactures	1	32	Malaysia 16; United Kingdom 15.
Copper metal, including alloys, semimanufactures	17	6	Malaysia 4.
Iron and steel metals:			
Scrap	2,095	3,770	Taiwan 2,032; Singapore 1,703.
Semimanufactures	1,092	4,246	Malaysia 3,932; Singapore 302.
Nickel metal, including alloys, semimanufactures	--	12	All to Malaysia.
Other:			
Oxides, hydroxides, and peroxides of metals, n.e.s	32	69	Mainly to Malaysia.
Metals, including alloys, all forms:			
Nonferrous scrap	327	1,076	Taiwan 713; Singapore 347.
Base metals, n.e.s	(1)	4	Malaysia 2; United Kingdom 1; Singapore 1.
NONMETALS			
Cement	706	833	Mainly to Malaysia.
Clays and clay products	11	10	Malaysia 7; Singapore 3.
Lime	(1)	4	All to Malaysia.
Salt	7	4	Do.
Sodium compounds, n.e.s., caustic soda	23	62	Do.
Other:			
Crude	(1)	4	Do.
Manufactured	(1)	2	Mainly to Malaysia.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	42,476	68,431	Japan 35,053; Malaysia 12,107; United States 6,327.
Refinery products:			
Gasoline (motor and aviation) do	296	411	Mainly to Malaysia.
Kerosine and jet fuel do	3	2	All to Malaysia.
Distillate fuel oil do	15	16	Do.
Lubricants do	184	249	Malaysia 233; Singapore 16.
Other do	1	3	Mainly to Malaysia.
Total	499	681	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	4	--	

[1] Less than ½ unit.

Table 4.—Brunei: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Oxide and hydroxide	5	1	Mainly from United States.
Metal, including alloys, unwrought and semimanufactures	224	134	United Kingdom 40; Japan 37; Singapore 26.
Copper metal, including alloys, unwrought and semimanufactures	242	213	Japan 148; United States 26; United Kingdom 14.
Iron and steel metal:			
Scrap	--	8	All from Malaysia.
Pig iron, sponge iron, powder and shot	11	4	Japan 3.
Steel, primary forms	104	17	Mainly from Singapore.
Semimanufactures:			
Bars, rods, angles, shapes, sections	9,849	6,375	Japan 2,132; Hong Kong 2,075; Singapore 1,031.
Universals, plates, sheets	6,760	1,436	Japan 1,015; Singapore 327.
Tubes, pipes, fittings	71,722	31,519	Japan 26,692; United States 2,081; West Germany 913.
Other	1,153	641	United Kingdom 217; Malaysia 124; Singapore 100.
Total	89,484	39,971	
Lead metal, including alloys, unwrought and semimanufactures	36	26	Singapore 14; Hong Kong 4; Japan 3.
Mercury 76-pound flasks	7	1	Mainly from United Kingdom.
Nickel metal, including alloys, unwrought and semimanufactures	86	22	United States 16; United Kingdom 4.
Silver metal, including alloys, unwrought troy ounces	--	12,833	All from Hong Kong.
Tin metal, including alloys, unwrought and semimanufactures long tons	46	13	United Kingdom 7; Singapore 3.
Zinc metal, including alloys, unwrought and semimanufactures	17	3	Japan 2.
Other:			
Oxides, hydroxides, and peroxides of metals, n.e.s	775	355	Malaysia 128; Singapore 126; West Germany 38.
Metals, including alloys, all forms:			
Alkali, alkaline earth, rare-earth metals	1	1	Mainly from United Kingdom.
Base metals, including alloys, all forms, n.e.s	(1)	2	All from United Kingdom.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc.	10	1	Mainly from Japan.
Grinding and polishing wheels and stones	20	28	Singapore 11; United Kingdom 6.
Cement	66,048	79,741	Malaysia 24,416; Philippines 21,566; Taiwan 16,997.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	1,546	3,115	Japan 1,690; Algeria 500; United States 472.
Products:			
Refractory (including nonclay bricks)	180	41	Netherlands 23; Japan 15.
Nonrefractory	1,192	500	People's Republic of China 290; Singapore 183; Japan 52.
Fertilizer materials:			
Crude:			
Nitrogenous	44	1	Mainly from United Kingdom.
Phosphatic	46	9	Christmas Island 5; Portugal 4.
Other (guano)	135	163	All from Malaysia.
Manufactured:			
Nitrogenous	118	18	Christmas Island 10; Malaysia 5.
Phosphatic	4	25	Malaysia 16; Christmas Island 5.
Other, including mixed	101	130	West Germany 59; Singapore 42; Malaysia 28.
Ammonia	9	6	Singapore 4.
Graphite, natural	(1)	7	Mainly from Malaysia.
Gypsum and plasters	14	3	Mainly from United Kingdom.

See footnotes at end of table.

Table 4.—Brunei: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Lime	80	40	Singapore 34; United Kingdom 4.
Mica, crude, including splittings and waste	72	61	United States 31; United Kingdom 30.
Pigments, mineral, including processed iron oxides	4	17	West Germany 12; Kenya 3.
Salt	1,439	1,945	West Germany 1,043; India 605; Thailand 132.
Sodium and potassium compounds, n.e.s.	184	94	Netherlands 75; West Germany 5; Singapore 4.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	42,503	1,686	Malaysia 1,464; Singapore 214.
Worked	1,083	1,052	Taiwan 1,016; Singapore 21.
Dolomite, chiefly refractory grade	12	16	All from Malaysia.
Gravel and crushed rock, n.e.s	66,994	62,389	Singapore 30,447; Malaysia 30,377; Hong Kong 1,499.
Limestone (except dimension)	10	7	Malaysia 5; Singapore 2.
Quartz and quartzite	--	103	Mainly from West Germany.
Sand, excluding metal bearing	2,980	760	Malaysia 508; Singapore 152; West Germany 100.
Sulfur:			
Elemental, all forms	1	2	Mainly from Singapore.
Sulfuric acid	18	28	Singapore 16; United Kingdom 9.
Talc, steatite, soapstone, and pyrophyllite	9	(1)	All from United Kingdom.
Other nonmentals, n.e.s:			
Crude [2]	13,638	19,614	Australia 16,957; United States 1,656; Singapore 1,000.
Slag, dross and similar waste, not metal bearing	2	1	All from Singapore.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	3,037	1,826	Malaysia 1,440; Singapore 336.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1	(1)	All from People's Republic of China.
Carbon black and gas carbon	42	11	Mainly from Singapore.
Coal and coke	3	6	Singapore 5; Hong Kong 1.
Petroleum refinery products:			
Gasoline (motor and aviation) 42-gallon barrels	38,832	50,441	All from Singapore.
Kerosine do	7,481	9,977	Singapore 7,450; Malaysia 2,370.
Distillate fuel oil do	17,671	16,466	Mainly from Malaysia.
Residual fuel oil do	1	--	
Lubricants do	16,661	18,240	Malaysia 7,929; Singapore 7,639; United Kingdom 2,485.
Other:			
Mineral jelly and wax do	10	10	Singapore 9.
Nonlubricating oils, n.e.s. do	1,645	1,554	Singapore 603; Malaysia 559; United Kingdom 366.
Bitumen and bituminous mixtures n.e.s do	23,466	33,267	Singapore 31,524; Japan 736.
Unspecified do	17	155	Singapore 148; United States 6.
Total do	105,784	130,110	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	88	6	Malaysia 4; Singapore 1.

[1] Less than ½ unit.
[2] Includes broken pottery.

COMMODITY REVIEW

Mineral Fuels.—*Natural Gas.*—Construction of Brunei's LNG plant, currently the world's largest, and the ocean carriers needed to transport its output, proceeded according to schedule. Four of the five production trains were expected to be on-stream by the end of 1973, with the final one to be added in 1974. Startup of the plant had so far encountered no unusual problems; however, cost estimates had risen considerably over those in the original plans. Total cost of the plant, including the added fifth liquefaction train, was currently set at $445 million—almost three times the $150 million estimated for the original four-train plant. A further expenditure of $325 million was anticipated for purchase of the seven ocean carriers required to transport the LNG to Japan, bringing the overall total cost to $770 million.

Total sales value is projected at between $1.5 billion and $2.0 billion over the 20-year life of the project. Revenues are expected to follow a rising schedule, beginning at $3.0 million in 1972 and reaching $72.5 million by 1977.[6]

Petroleum.—The Government of Brunei obtained a 25% participation in Brunei Shell Petroleum, the Shell Oil Co. subsidiary that accounts for all of the country's oil production, as the result of negotiations that began in the latter part of 1973. No further details of the agreement were announced. The Government also holds a 10% equity in the LNG plant at Lumut, which it owns jointly with Shell and Mitsubishi Corporation.[7]

Shell continued exploration of its 1,470-square-mile concession on Brunei's Sabah shelf, spudding a wildcat by drill ship late in the year.[8] Onshore, success still eluded the combine of Sun Oil Co., Clark Oil Co., and Superior Oil Co., which drilled three dry holes during the year. The group had previously relinquished all but 363 square miles of its concession in the Tutong Area, 10 miles from Shell's Seria Field. No plans for further drilling were announced.[9]

HONG KONG[10]

The year 1973 was, on the surface, a year of continued prosperity and growth for Hong Kong. Total exports rose approximately 6% in volume; the entrepôt trade as measured by reexports increased considerably more; employment in manufacturing industries was up 8%; and arrivals of tourists were running 19% ahead of the 1972 figure. Nevertheless, a host of problems had arisen by yearend to dampen the economic outlook, compounded by inflation, tight money, shortages of raw materials, and the threat of restricted petroleum supplies.

Mineral production increased slightly as gains in cement, kaolin, and feldspar offset reduced output of iron ore and quartz. Total value of mineral production in 1973 was 8% greater than that in 1972. Hong Kong's commodity trade showed a strong growth during the year, with exports exceeding the 1972 level by 34% and imports registering a 33% gain. Detailed figures on mineral trade were not yet available for 1973, but in 1972 they revealed a mixed picture with increased trade in base metals, gem stones, and some building materials, a reduction in gold trade, an accumulation of silver, less domestic consumption of building materials, and a switch from solid to liquid fuels.

The metals processing industry in Hong Kong continued to make progress as employment in basic metal plants rose 7% to a total of 3,058 workers. Despite increasing competition, the steel-rolling industry maintained its output level at approximately 200,000 tons.[11]

Prospects for 1974 took on a note of increasing uncertainty because of the problems mentioned earlier. Although the outlook was not clearly unfavorable, it had become considerably less predictable.

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[6] Farrar, G. L. Brunei LNG Project Ahead of Schedule. Oil and Gas J., v. 71, No. 38, Sept. 17, 1973, pp. 61–66.
Petroleum Times. World LNG Imports by Project. V. 77, No. 1970, Oct. 5, 1973, p. 41.
Work cited in footnote 5.
[7] Oil and Gas Journal. Brunei Offered Stake in Shell Firm. V. 71, No. 47, Nov. 19, 1973, p. 46.
Oil and Gas Journal. International Briefs. V. 72, No. 1, Jan. 7, 1974, p. 32.
[8] Oil and Gas Journal. Other Exploration News. V. 71, No. 45, Nov. 5, 1973, p. 46.
[9] Oil and Gas Journal. Other Exploration News. V. 71, No. 33, Aug. 13, 1973, p. 56.
[10] Prepared by David G. Willard, economist, Division of Nonmetallic Minerals—Mineral Supply.
[11] Hong Kong Government Press 1974. Hong Kong 1974, pp. 14, 230.

In the financial realm, the Hong Kong dollar remained strong in spite of a severe stock market crash in the spring. The resulting tight money supply caused the collapse of numerous small firms but had little effect on large and well-financed businesses. Growing raw material shortages and higher prices became a more serious matter, as did the surging cost of living (19% increase in 1973) with its attendant pressures on labor costs. Finally there appeared the darkest cloud on the horizon—the threatened petroleum shortage. Although Hong Kong figured to be less severely affected by the oil crisis than were many countries, its economy remained particularly vulnerable to restricted fuel supplies; government actions were taken immediately to meet the situation (see Government Policies and Programs). Both inflation and material shortages raised a pair of fundamental questions regarding the future: How will the local industries be affected relative to their competitors, and what kind of impact will these problems have on the economies of Hong Kong's customers? [12]

Government Policies and Programs.—With the threat of an economic squeeze coming from several sources, the Government was compelled to expand its activities in some areas that affected mineral-related industries. All such activities were for the purpose of supplying transportation and utility services.

Work continued on three water supply projects. Despite delays caused by the weather and by a strike in June, construction of the High Island complex was on schedule at yearend. Upon its completion in another 6 years, Hong Kong's water storage capacity will be approximately doubled to a total of 127.5 billion gallons. Work also moved ahead on the $460-million Castle Peak desalting plant, which is conceded to be uneconomic but is considered necessary to assure an adequate water supply. Partial operation of the plant was expected to begin in 1974. In addition, the expansion of Plover Cove reservoir by 13.5 billion gallons, to a total capacity of 52 billion gallons, was nearing completion.

The Kwai Chung container port was officially opened in January; but it soon became apparent that the port's capacity was already insufficient to meet the rapidly growing demand for container shipping. In August, therefore, one of the three private shipping companies using the port announced plans to expand its own facilities.

Although the cutback in Middle East petroleum production did not have any immediate effect on oil shipments to Hong Kong, the Government quickly began setting up administrative machinery to deal with the potential crisis. All electric power and means of transportation in Hong Kong are fueled by petroleum products, which are supplied entirely by imports since there is no local refinery. The Oil Policy Committee, consisting of oil and power company representatives, was setup in November to advise the Government on strategy and control policies; the Oil Distribution Committee, made up of representatives from the oil companies and consuming industries, was established in the same month to suggest priorities and allocation plans. Supplies remained normal at yearend, and no mandatory restrictions had been imposed, aside from limitations on fuel for visiting ships and aircraft. A favorable status accorded the United Kingdom and its dependencies and the possibility of supplies from the People's Republic of China reduced the likelihood that a serious shortage would occur.

PRODUCTION AND TRADE

Hong Kong's small mineral output expanded slightly in 1973. Greater production of cement, kaolin (clay), and feldspar provided the increase; output levels of iron ore and quartz were both somewhat lower. Continued construction work on government transportation and utility projects and further, although slower, expansion of private industry investment together maintained the demand for cement. The other mineral commodities are mostly consumed locally, except for iron ore, which is exported to Japan. The continued progress made by local industry during the year partly accounts for the gains; however, the amounts produced are small enough that their annual fluctuations may result from minor market irregularities as well as major economic changes.

The total value of Hong Kong's mineral production, excluding cement, reached $1.3 million in 1973, up 8% from the 1972 total value of $1.2 million. Since the

[12] U.S. Consulate, Hong Kong. State Department Airgram A-054, Apr. 11, 1974, 10 pp.

cement plant now processes only imported clinker and uses no local raw materials, most of the value of cement production is not attributable to local output. Statistics on Hong Kong's mineral production are included in table 1.

Despite the numerous problems referred to earlier, Hong Kong's total commodity trade rose to a record high level in 1973. Total exports were up 34% to $5,113 million from $3,815 million in 1972, and a similar increase was registered in total imports, which grew by 33%, from $4,280 million in 1972 to $5,704 million in 1973. A measure of the importance of Hong Kong's entrepôt trade is the fact that reexports increased as a percent of total exports to 25% in 1973 from 21% in 1972. The commodity trade balance remained negative; imports exceeded exports by 12% in each year.

Hong Kong's mineral trade is largely unrelated to domestic mining because reexports comprise the vast majority of mineral exports. Export categories showing significant increases in 1972 were aluminum, copper, and lead metal, cement, clay products, and precious and semiprecious stones other than diamond. Major declines occurred in gold, silver, and stone. Large gains in imports were registered in the same categories as in exports except cement, with the addition of silver and fuel oil. Import declines showed a different pattern from exports, the major decreases being in gold, gypsum and plasters, and coal and related fuels. The increase in the local silver supply and the decline in gold trade may have had a monetary significance, but the rise in fuel oil imports probably reflected the continuing growth in population and electric power consumption.

Tables 5 and 6 show mineral trade figures for Hong Kong for 1971 and 1972.

Table 5.—Hong Kong: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Bauxite and concentrates	200	440	All to Taiwan.
Oxide and hydroxide	54	70	Indonesia 52; Taiwan 6; Thailand 5.
Metal, including alloys, all forms	9,137	11,783	Japan 2,907; Taiwan 1,767; United Kingdom 1,259.
Arsenic, trioxide, pentoxide, and acids	39	100	Mainly to Taiwan.
Chromium oxide and hydroxide	18	18	Taiwan 10; Indonesia 6; Singapore 1.
Cobalt oxide and hydroxide	3	3	Mainly to Thailand.
Copper:			
Oxide and hydroxide	5	5	West Malaysia 3; Thailand 1.
Metal, including alloys, all forms	7,319	11,553	Japan 7,234; Taiwan 3,339; United Kingdom 204.
Gold metal, unworked or partly worked thousand troy ounces	1,000	580	Macau 396; United Kingdom 183.
Iron and steel:			
Ore and concentrate thousand tons	180	173	All to Japan.
Scrap do	202	189	Taiwan 80; People's Republic of China 66; Thailand 29.
Semimanufactures do	39	41	Indonesia 11; Fiji 7; Mauritius 3.
Lead:			
Oxide	--	31	Singapore 16; Indonesia 15.
Metal, including alloys, all forms	2,030	5,349	Japan 3,288; Taiwan 1,641; Republic of Korea 394.
Magnesium metal, including alloys, all forms	1	--	
Manganese:			
Ore	--	1	All to South Vietnam.
Oxide	100	82	Indonesia 71; Khmer Republic 6; Taiwan 5.
Mercury 76-pound flasks	3	--	
Nickel:			
Oxide and hydroxide	7	3	Mainly to Thailand.
Metal, including alloys, all forms	27	30	United States 15; Taiwan 5; Indonesia 3.
Silver metal, including alloys thousand troy ounces	189	97	United Kingdom 86; Singapore 7; Taiwan 4.
Tin metal, including alloys, all forms long tons	121	449	Taiwan 267; Singapore 91; United Kingdom 47.
Titanium:			
Ore	40	10	All to South Vietnam.
Oxide	751	780	Indonesia 519; West Malaysia 112; Singapore 42.
Tungsten, scrap	1	1	All to United Kingdom.
Zinc:			
Oxide	75	95	Indonesia 37; Taiwan 25; Singapore 17.
Metal, including alloys, all forms	188	58	Taiwan 21; Indonesia 13; Singapore 13.
Other:			
Oxides, hydroxides, and peroxides of metals n.e.s	1	7	Malagasy Republic 3; Singapore 2.
Metals, including alloys, all forms:			
Metalloids	3	1	Mainly to Indonesia.
Base metals, including alloys, all forms	46	31	Netherlands 20; Singapore 8; Khmer Republic 2.
NONMETALS			
Abrasives:			
Natural, n.e.s	52	58	Taiwan 16; Japan 10; Singapore 10.
Grindings and polishing wheels and stones	188	171	Indonesia 82; Thailand 29; Philippines 23.
Asbestos	2	7	Singapore 5; West Malaysia 2.
Barite and witherite	51	21	Mainly to Taiwan.
Cement, hydraulic	3,919	8,401	Indonesia 4,501; Oceania n.e.s. 1,600; Macau 719.
Chalk	3	5	All to West Malaysia.
Clays and clay products (including all refractory brick):			
Crude, n.e.s	13,819	18,557	Taiwan 15,631; Japan 1,200; Philippines 621.
Products value, thousands	$198	$289	Nigeria 67; Indonesia 67; Macau 43.
Cryolite and chiolite	--	9	All to Thailand.

Table 5.—Hong Kong: Exports and reexports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Diamond:			
Gem not set or strung thousand carats	282	320	Japan 81; Israel 75; Belgium 55.
Industrial value, thousands	$178	$64	United States 39; Japan 13; United Kingdom 12.
Diatomaceous earth	22	30	Indonesia 9; India 5; Thailand 8.
Feldspar and fluorspar	379	234	Indonesia 112; Thailand 112; West Malaysia 10.
Fertilizer materials:			
Crude	181	536	Sarawak 408; Khmer Republic 100; United States 14.
Manufactured fertilizer, all forms	7	317	Sarawak 287; Macau 23; Singapore 7.
Ammonia	4	2	Mainly to Mauritius.
Graphite, natural	35	870	United States 778; Indonesia 92.
Gypsum and plasters	102	172	Khmer Republic 146; Singapore 16; Sabah 6.
Lime	1,258	308	Sabah 128; Indonesia 90; Macau 26.
Mica, all forms	24	86	Japan 68; Taiwan 14; West Germany 2.
Pigments, mineral, including processed iron oxide	115	427	Taiwan 243; Indonesia 72; Singapore 52.
Precious and semiprecious stones, including synthetic, other than diamond value, thousands	$46,839	$76,078	Japan 54,270; United States 11,345. Switzerland 2,315.
Salt and brine	975	6,287	Philippines 6,010; Sarawak 230; Sabah 37.
Sodium and potassium compounds, n.e.s.	2,007	1,735	Mainly to Indonesia.
Stone, sand and gravel:			
Dimension stone	1,374	999	Indonesia 518; Thailand 319; Taiwan 89.
Gravel and crushed rock	22,332	30	Sabah 10; Indonesia 8; Thailand 5.
Quartz and quartzite	1,371	1,043	Thailand 753; Indonesia 88; Ivory Coast 81.
Sulfur:			
Elemental, all forms	126	145	Macau 71; Republic of Korea 55; Indonesia 8.
Sulfuric acid	6	11	Tanzania 7; Singapore 100; Nigeria 1.
Talc, steatite, soapstone, pyrophyllite	1,772	851	Indonesia 635; Singapore 100; Khmer Republic 65.
Other nonmetals, n.e.s.:			
Crude	381	144	Taiwan 124; Thailand 11; Lebanon 6.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	80	63	Indonesia 55; Philippines 6; South Vietnam 2.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black and gas carbon	25	22	Indonesia 20; West Malaysia 1.
Coal and coke, including briquets	15	7	Macau 5; Sabah 2.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	35	38	All to Macau.
Kerosine and jet fuel do	52	70	Japan 36; Macau 34.
Distillate fuel oil do	281	226	All to Macau.
Residual fuel oil do	18	69	Do.
Lubricants do	115	119	Taiwan 48; Thailand 37; U.S. Oceania 27.
Mineral jelly and wax do	85	71	Peru 48; South Vietnam 12; Taiwan 6.
Other:			
Pitch do	(1)	(1)	Mainly to Indonesia.
Bitumen and other mixtures do	1	1	Mainly to Macau.
Bitumenous mixtures, n.e.s. do	(1)	2	Do.
Liquified petroleum gas do	14	17	All to Macau.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	(1)	2	All to Taiwan.

[1] Less than ½ unit.

Table 6.—Hong Kong: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite and concentrates	447	505	All from People's Republic of China.
Oxide and hydroxide	356	314	West Germany 180; Japan 71; People's Republic of China 50.
Metal, including alloys, all forms	23,864	29,315	Canada 6,260; Australia 5,211; Japan 4,175.
Arsenic:			
Natural sulfides	10	--	
Trioxides, pentoxides, acids	65	19	People's Republic of China 14; West Germany 5.
Chromium oxide and hydroxide	114	64	United Kingdom 41; West Germany 22.
Cobalt oxide	31	46	United Kingdom 20; Australia 19; Belgium 7.
Copper:			
Copper sulfate	76	65	United Kingdom 55; Republic of South Africa 9; New Zealand 1.
Oxides and hydroxides	192	106	West Germany 75; Australia 24; Norway 4.
Metal, including alloys, all forms	17,696	21,777	Japan 9,131; South Vietnam 2,920; Australia 2,756.
Gold: Metal unworked and partly worked thousand troy ounces	1,880	951	United Kingdom 612; Australia 309; Netherlands 30.
Iron and steel:			
Scrap thousand tons	114	52	Taiwan 17; United Kingdom 15; West Germany 6.
Pig iron, ferroalloys and similar material do	19	10	People's Republic of China 6; North Korea 2; United Kingdom 1.
Steel, primary forms do	55	41	Australia 34; Taiwan 4; Japan 2.
Semimanufactures do	473	534	Japan 277; People's Republic of China 103; Taiwan 29.
Lead:			
Oxides, n.e.s	181	188	West Germany 61; People's Republic of China 45; Australia 38.
Metal, including alloys, all forms	2,365	4,247	South Vietnam 3,768; Canada 328; United Kingdom 87.
Magnesium metal, including alloys, all forms	5	15	Canada 14.
Manganese:			
Ore and concentrate	340	461	Thailand 460.
Oxides	3,712	2,974	Japan 2,171; People's Republic of China 365; Mozambique 297.
Mercury 76-pound flasks	581	668	United Kingdom 407; Singapore 100; Netherlands 90.
Nickel:			
Oxides	23	36	United Kingdom 22; France 14.
Metal, including alloys, all forms	559	434	Finland 98; France 62; Norway 52.
Platinum-group metals, including alloys, all forms thousand troy ounces	120	131	West Germany 60; Netherlands 28; United Kingdom 22.
Rare-earth oxides	9	15	Japan 9; United States 5; United Kingdom 1.
Silver metal, including alloys, all forms thousand troy ounces	122	168	West Germany 84; North Korea 33; United States 26.
Tin metal, including alloys, all forms long tons	401	924	West Malaysia 801; People's Republic of China 72; Singapore 20.
Titanium:			
Ore and concentrate	186	97	All from Australia.
Oxides	3,886	4,408	Japan 1,618; Australia 983; United Kingdom 697.
Tungsten metal, including alloys, all forms	8	1	Mainly from the United States.
Zinc:			
Oxides	1,075	958	France 336; India 212; Australia 157.
Metals, including alloys, all forms	9,248	10,883	Australia 5,621; Canada 2,401; North Korea 1,102.
Other:			
Ashes and residues containing nonferrous metals	2,060	267	South Vietnam 250; Macau 17.
Oxides, hydroxides, and peroxides of metals	24	28	Japan 13, United Kingdom 10; People's Republic of China 2.

Table 6.—Hong Kong: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Other—Continued			
Metals, including alloys, all forms:			
Metalloids	17	11	Japan 7; West Germany 3; People's Republic of China 1.
Base metals, including alloys, all forms	59	128	Austria 50; People's Republic of China 34; Belgium 22.
NONMETALS			
Abrasives:			
Natural, n.e.s	929	475	Japan 268; United States 71; People's Republic of China 43.
Dust and powder of precious stones values	--	$531	All to Australia.
Grinding and polishing wheels and stone	549	489	Japan 224; United Kingdom 76; People's Republic of China 49.
Asbestos	114	141	Canada 69; People's of China 45; Japan 11.
Barite and witherite	118	214	People's Republic of China 168; West Germany 31; United Kingdom 15.
Boric acid	172	223	United States 211; People's Republic of China 11; United Kingdom 1.
Cement, hydraulic thousand tons	793	932	People's Republic of China 488; Taiwan 261; Republic of Korea 85.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s	9,615	7,193	United States 4,408; People's Republic of China 1,576; Japan 965.
Products value, thousands	$7,920	$10,256	People's Republic of China 5,128; Japan 3,006; United Kingdom 530.
Cryolite and chiolite	--	14	All from Denmark.
Diamond:			
Gem thousand carats	855	989	Belgium 345; Israel 254; India 171.
Industrial value, thousands	$210	$65	Netherlands 38; Belgium 13; United States 11.
Diatomaceous earth	250	227	United States 180; Japan 46; United Kingdom 1.
Feldspar and fluorspar	904	2,470	People's Republic of China 2,168; Thailand 302.
Fertilizer materials:			
Crude	547	1,002	People's Republic of China 546; Taiwan 178; France 120.
Manufactured:			
Nitrogenous	2,806	1,895	Japan 1,702; Taiwan 176; West Germany 12.
Phosphatic	70	387	North Vietnam 287; United States 100.
Potassic	14	13	West Germany 12; Japan 1.
Other, including mixed	7,986	5,351	West Germany 4,773; Belgium 302; Taiwan 109.
Ammonia	405	506	Japan 436; United Kingdom 61; Singapore 1.
Graphite, natural	270	1,046	People's Republic of China 1,041; Japan 5.
Gypsum and plasters	25,185	15,418	Mexico 10,302; People's Republic of China 3,169; United Kingdom 810.
Lime	56,247	56,957	People's Republic of China 33,484; Taiwan 9,260; North Vietnam 7,133.
Magnesite	393	373	People's Republic of China 203; Japan 100; Austria 70.
Mica, all forms	43	110	India 96; West Germany 9; Japan 5.
Pigments, mineral, including processed iron oxides	439	681	West Germany 473; United Kingdom 93; Belgium 50.
Precious and semiprecious stones, including synthetic other than diamond value, thousands	$25,089	$34,169	People's Republic of China 6,797; Australia 6,060; Colombia 4,667; Japan 2,115.
Salt	39,148	44,523	People's Republic of China 30,919; Taiwan 6,735; Nethehlands 1,938.
Sodium and potassium compounds, n.e.s	17,822	20,206	People's Republic of China 11,679; Japan 4,625; Taiwan 2,459.
Stone, sand and gravel:			
Dimension stone	8,108	9,584	People's Republic of China 4,956; Italy 3,719.
Dolomite	127	254	All from People's Republic of China.

Table 6.—Hong Kong: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Stone, sand and graved—Continued			
Gravel and crushed rock	3,567	26,506	Macau 20,777; People's Republic of China 5,000; Japan 497.
Limestone, except dimension	30,951	122	People's Republic of China 100; Japan 22.
Quartz and quartzite	3,436	3,174	People's Republic of China 3,123; Macau 51.
Sand, excluding metal bearing	4,595	4,566	People's Republic of China 4,348; Taiwan 80; Japan 75.
Sulfur:			
Elemental, all forms	1,650	2,505	Japan 987; Singapore 511; West Germany 396.
Sulfuric acid	1,054	720	Taiwan 579; United Kingdom 92; Japan 42.
Talc and related materials	5,780	2,266	People's Republic of China 1,974; Italy 120; India 81.
Other nonmetals, n.e.s.:			
Crude	3,292	5,532	People's Republic of China 5,246; Mozambique 167; Macau 45.
Mineral waste	493,272	224,633	Republic of Korea 88,547; Taiwan 73,380; Japan 61,274.
Oxides, hydroxides and peroxides of strontium, barium, and magnesium	49	14	Japan 5; United States 5; People's Republic of China 2.
Fluorine, bromine and iodine	1	1	Mainly from Japan.
Building materials of asphalt, abestos, fiber materials and unfired nonmetals	17,148	16,808	United Kingdom 8,307; People's Republic of China 3,348; Taiwan 1,940.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen natural	9	384	West Germany 203; People's Republic of China 100; Singapore 60.
Carbon black and gas carbon	914	624	Japan 279; Taiwan 227; United States 73.
Coal, coke and peat, including briquets	38,756	26,459	People's Republic of China 14,194; Republic of South Africa 4,689; Japan 3,993.
Petroleum refinery products:			
Gasoline, including natural thousand 42-gallon barrels	1,030	1,009	Singapore 468; Bahrain 298; Iran 243.
Kerosine, aviation, industrial and white spirits do	5,419	4,952	Singapore 2,073; Iran 1,490; Saudi Arabia 406.
Diesel and distillate fuel do	5,446	6,223	Singapore 2,612; Saudi Arabia 1,567; Philippines 599.
Fuel oil do	16,550	19,837	Singapore 11,962; Saudi Arabia 4,879; Bahrain 1,250.
Lubricants do	313	357	Japan 151; United States 56; Singapore 44.
Mineral jelly and wax do	117	106	Indonesia 38; People's Republic of China 31; Singapore 26.
Other:			
Pitch do	1	1	Mainly from Japan.
Bitumen and other mixtures do	85	112	Singapore 86; Japan 16; Republic of Korea 7.
Bitumen mixtures, n.e.s. do	1	6	Taiwan 2; United Kingdom 2.
Liquefied petroleum gas do	541	685	Singapore 293; Japan 105; Republic of Korea 98.
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	308	286	Japan 221; United Kingdom 51; West Germany 5.

COMMODITY REVIEW

Iron Ore.—Production at the Ma On Shan mine, now operating entirely underground, decreased 13% in 1973 compared with that of 1972. Since the mine's entire output is marketed in Japan, the reduction reflected the lower demand for iron ore by Japanese steel mills, which reduced their purchases from all suppliers on a fairly proportionate basis.

Petroleum.—A group of independent consultants who were commissioned to study the environmental implications of Shell Oil Co.'s proposed refinery, tanker terminal, and storage facility at the north end of Lamma Island submitted a report in July that gave qualified approval to the project. The report recommended several modifications to the original plan, including a shift of the refinery site to the northwest side of the island where it would cause less disturbance to local villages and recreation areas, further studies of the specific environmental effect of certain facilities, and the passage of additional regulatory legislation. In August, a rival proposal was submitted by the combine of the Textile Alliance (Hong Kong) and TOA Oil Co. (Japan) for a $3 billion complex that would include a refinery and petrochemical plant, and the Government commissioned an environmental impact study to be made of that proposal. Since the second study will not be completed until the early part of 1974, and since the environmental criticisms aroused by both proposals have induced the Government to proceed slowly, no decision was expected for several months.

KHMER REPUBLIC [13]

Mineral production in the Khmer Republic in 1973 was probably confined to cement, gem stones, salt, silica sand, phosphate rock, and nonmetal construction materials; however, no data on the magnitude of production were available.

The oil refinery at Kompong Som has been inoperative since mid-1971, and no crude oil was imported by the Khmer Republic in 1973.

In mid-1973, an agreement was signed between the Khmer Republic and Marine Associates (H.K.), Ltd., Singapore, for oil exploration in an area of 17,000 square kilometers on the country's Continental Shelf. The exploration area is outside the zones already established for the French company Essence et Lubrifiant de France–Enterprise de Recherches et d'Activitiés Pétrolières (Elf–ERAP).

Plans for construction of an aluminum smelter and a small steel mill to produce wire bar from scrap metal have been delayed because of reported political instability.

LAOS [14]

The signing of a cease-fire protocol on February 4, 1973, ended active hostilities in Laos that had persisted for over a decade, and the recent formation (April 1974) of a new coalition government paved the way for a period of transition of wartime disruption to normal peacetime development. Some progress was made during 1973 in expanding local industries with the opening of four new factories; however, only one—a steel sheet plant—was mineral industry oriented. Mining of tin in 1973 continued to be the chief mineral activity in the country. Rock salt production for local consumption was the only other mineral commodity reported.[15]

The lack of sufficient resources in Laos was still sharply apparent in 1973 in terms of refugee support requirements, budgetary imbalance, heavy foreign trade deficit, and continued need for significant stabilization assistance. In addition, rising prices (27% in 1972 and 43% in 1973) continued to erode the country's standard of living. Much of the more recent price inflation resulted from high supply costs for imports,

[13] Prepared by Arthur C. Meisinger, industry economist, Division of Nonmetallic Minerals—Mineral Supply.

[14] Prepared by Arthur C. Meisinger, industry economist, Division of Nonmetallic Minerals—Mineral Supply.

[15] U.S. Embassy, Vientiane. CERP-4291 Minerals Questionnaire, April 22, 1974. U. S. Embassy, Vientiane. State Department Airgram A-2761, Apr. 4, 1972, 2 pp.

particularly for petroleum products, which Laos was little able to compensate for by high export earnings. Although the U.S. Commercial Import Program (USIP) ended in 1972, the Foreign Exchange Operations Fund (FEOF), supported by the United States, Australia, France, Japan, the United Kingdom, and Laos, continued to play a major role in 1973 in restraining inflationry pressures and in financing the country's trade deficit.

COMMODITY REVIEW

Metals.—In response to higher price levels and profit margins, gold reexports from Saigon and Bangkok through Vientiane to Europe increased sharply from 48,000 troy ounces in 1972 to 534,000 troy ounces in 1973.[16]

Japanese assistance was requested by Laos during the year to exploit two iron ore deposits in Xieng Khouang Province. A preliminary survey to evaluate the two deposits would most likely be completed in 3 years.

Production of corrugated galvanized steel sheets for roofing and other light construction uses was initiated on November 30, 1973, and constituted the first production in Laos of this previously imported commodity. The plant, located on the outskirts of Vientiane, is owned and operated by Société Sangkasi Sengfah, Ltd., a Laotian-Japanese firm incorporated in March 1973, and constructed with Japanese technical and financial support. The building and machinery reportedly cost $1,230,000.[17]

The plant can produce 1,400 tons of sheeting per month but is currently operating at a monthly rate of only 500 tons. Reportedly, 1 ton of metal will yield 420 sheets. Raw materials that include steel sheets, zinc for the galvanizing process, and processing chemicals are presently imported from Japan.

In 1972, Laos imported 620 tons of corrugated steel sheets from Japan and Thailand. It is anticipated that the Sengfah plant should be able to meet the entire future demand for this product in Laos.

Tin metal content of mined ore was about 900 long tons in 1973 compared with 820 long tons the previous year.

No details were available, but a substantial amount of new and replacement machinery was reported to have been installed in the Phon Tiou and Nong Sun tin mines during the year.

Nonmetals.—The quantity of rock salt produced from brine operations near Vientiane increased 11% from approximately 7,800 tons in 1972 to 8,600 tons in 1973.

MONGOLIA [18]

Continued progress apparently was made by Mongolia's small mineral industry in 1973; various sectors and important facilities reportedly met or overfulfilled their goals. Estimated gains over 1972 amounted to approximately 12.3% for all mining, 10% for the fuels, 5.7% for the construction materials industries, and 10% for electric power generation.

Presently, coal production accounts for an estimated 60% of Mongolia's mineral output by value. During the year, coal output increased about 7% over that of 1972 and apparently surpassed the 1973 target. Most production came from the large Sharyn Gol surface coal mine, which has an annual capacity of about 1.4 million tons. Nalaikha, the country's only other important coal mine, which has failed to achieve targets in recent years, is being modernized by Soviet technicians. Presently 17 coal deposits scattered throughout the country are being exploited, primarily by open pit methods.

The important construction materials sector reportedly exceed its goal with a 5.7% increase over that of 1972. Specific information was not available on cement; however, plans call for doubling production by 1975.

All of the fluorspar and tungsten concentrate, Mongolia's only mineral export items of consequence, are shipped to the U.S.S.R. Based on U.S.S.R.'s import statistics, Mongolia's fluorspar production apparently remained unchanged from 1972. Expansion and reconstruction work was

[16] U.S. Embassy, Vientiane. Foreign Economic Trends Report for Laos. State Department Airgram A-4778, June 6, 1973, 10 pp.

[17] U.S. Embassy, Vientiane. New Factory Produces Galvanized Steel Sheeting. State Department Airgram A-127, Dec. 11, 1973.

[18] Prepared by Donald C. Wininger, physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

carried out with Soviet aid, at the Berhin fluorite mine. The capacity of the Burentsogt tungsten mine was double during the year as a result of expansion and reconstruction work carried out with aid from East Germany.

Initial development continued during the year, with Soviet aid, on the development of the rich copper-molybdenum deposit near Erdenetiyn Oboo. Initial preparations were completed during the year for starting production at a gold placer mine in Tolgoyt.

No official Mongolian trade data are available; however, overall trade reportedly increased 20% and mineral exports increased by 70% over those of 1972. Because at least 85% of the total Mongolian trade is with the U.S.S.R., officially recorded Soviet trade statistics are believed to be highly indicative of total Mongolian mineral commodity trade. Soviet imports of Mongolian fluorspar were given as 76,200 tons in 1971 and 96,300 tons n 1972. Imports of ferrous scrap were given as 12,800 tons in 1971 and 14,800 tons in 1972. Small quantities of unspecified ores and concentrates including tungsten are also imported. Iron and steel exports from the U.S.S.R. to Mongolia were 19,479 tons in 1971 and 22,011 tons in 1972. Small quantities of Soviet nonferrous metals, refractories, coal and coke also were imported.

Cement imports, from the U.S.S.R., totaling 25,000 tons in 1971 and 20,000 tons in 1972, indicate that the Darkhan cement plant was still unable to meet domestic requirements. The principal Soviet contribution to Mongolian mineral economy was still petroleum. In fact, the greater part of Mongolia's oil demand has been met by Soviet refined petroleum. The U.S.S.R. also has been supplying enough crude oil to keep the small Dzuun Bayan refinery operating at full capacity. Exports of refined petroleum and crude oil from the U.S.S.R. to Mongolia totaled about 2.11 million barrels in 1971.

NEPAL [19]

The contribution of the mineral industries to the Nepal GNP is minute. During fiscal year 1972–73, mineral production was valued at approximately $75,000 of an estimated GNP of $1,000 million.

The mineral resources of Nepal have not been fully explored. However, discoveries of several mineral commodities have been reported including copper, lead, bismuth, iron, tin, gold, beryl, molybdenum, magnesite, limestone, mica, marble, slate, graphite, and salt. Increased funds for the development of the mineral industries have been made available under the Government's fourth national development plan (1970–75).

Ore reserve estimates for the magnesite ore body discovered several years ago have increased from earlier reports of 46 million tons to 180 million tons. This deposit is estimated to have 66 million tons of high-grade refractory magnesite. Work to prove the total extent of the deposit was scheduled to have been completed in June 1973. The West German Government has been aiding in a total feasibility study of the deposit. The large estimates of ore tonnage have led to consideration of establishing dead burned magnesia and bonded brick manufacturing plants providing acceptable arrangements can be made for foreign investment.[20]

Deposits containing approximately 300,000 tons of various grades of talc have been discovered in Kharidhunga, Sindu Palchok District.[21]

The Himal Cement Co. is constructing Nepal's first cement factory. Production is expected to begin in late 1974 with a capacity of 48,000 tons.

The remoteness of Nepal has resulted in the slow development of large-scale mineral industries. Development of a year-round road or rail system, especially with respect to access to India, is essential to economic exploitation of the mineral resources.

[19] Prepared by Stanley K. Haines, geologist, Division of Nonmetallic Minerals—Mineral Supply.
[20] Mining Magazine. Nepal Magnesite. V. 128, No. 5, May 1973, p. 393.
[21] Work cited in footnote 20.

SINGAPORE [22]

Singapore achieved a 22.7% rate of economic growth; the GNP in 1973 reached an estimated $3.973 billion.[23] Even discounting inflation (cost of living went up 23%), the real gain of GNP was 11% over 1972. These achievements were made despite unstable monetary conditions worldwide, commodity shortages, and the oil crisis in the last quarter. Gross capital formation gained 12% compared with 25% (revised) in 1972. New investments were large, nonetheless, with manufacturing, including oil and related ventures, and shipping and services leading the way. Per capita income established the new record of $1,806. Construction was up 9.1%, to $247 million, although slightly down in real terms. Foreign investment commitments totaled $242 million, up $91 million from yearend 1972.

Manufacturing, which encompasses fields like petroleum refining, metal fabrication, cement, and chemicals, gained ground as the leading component of the GNP. Manufacturing output, measured in terms of value added, increased to $955 million (2.49 rate of exchange) as compared with $657 million (2.79 rate of exchange) in 1972; even the real gain was 17%. Approximately 30% of manufacturing in 1973 was petroleum refining, and 45% of the manufactured products were exported.

Singapore's shipbuilding and ship repair industries accounted for about one-sixth of the value added in manufacturing during 1972–73. In addition to servicing the many ships passing through the world's No. 4 port, Singapore's activities related to oil exploration support vessels and construction of drydock to handle mammoth supertankers were also important.

Petroleum activities continued to occupy a special role in the economy. Singapore supplied 32 million barrels of fuel oil for bunkering international ships and 1.5 million barrels of jet fuel for servicing airplanes in 1972. Oil imports were over 220 million barrels valued at about 1.6 billion Singapore dollars during 1973, including 160 million barrels of crude oil valued at S$1.14 billion. Only a small part of the imported petroleum was consumed internally. Five refineries were in existence, and almost all of these were being expanded. Plans underway would bring Singapore's daily oil refining capacity to more than 1 million barrels in the near future. Half of U.S. investments of about $580 million were in petroleum refining, and another 15%, in other areas of the oil enterprise. Singapore was very important as a support base for oil exploration and production in other countries of Southeast Asia, particularly Indonesia.

During the oil crisis, Singapore was very concerned about the economic well-being of various industrialized countries, particularly Japan, because difficult times in these countries could halt their new investments in the small republic. Since Singapore has a large oil refining capacity, it does not fear inadequate fuel supplies for the local economy. Nevertheless, the Government urged voluntary restraint and was able to bring down fuel consumption by 10% to 15% during the months at the turn of the year. Bunkering demands were generally met. Prices also became a concern; however, increases could be passed on. Although not compensating for the higher fuel rates, more active oil exploration in Southeast Asia stimulated by the crisis should benefit Singapore.

PRODUCTION

Singapore's output of refined petroleum products was of some importance by world standards; fuel oil led the way, followed by kerosine and jet fuel, gasolines and naphthas. Crude oil processed in 1973 was approximately 160 million barrels, slightly higher than that in 1972. In addition, significant quantities of semiprocessed oil were also refined. Ingot steel was of some consequence; production surpassed 200,000 tons for the first time. Construction continued at high levels, and this sustained cement output at more than 1 million tons for the second year in a row. Singapore produced 1.8 milion cubic meters of granite in 1972. The country's mineral production statistics are shown in table 1.

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[22] Prepared by K. P. Wang, supervisory physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

[23] Where necessary, 1973 values have been converted from Singapore dollars (S$) to U.S. dollars at the rate of S$2.49=US$1.00. In 1972, the average exchange rate was about S$2.79=US$1.00.

TRADE

Singapore's total foreign trade increased to $8.60 billion in 1973, compared with $5.62 billion in 1972 when the U.S. dollar was worth more. Exports (f.o.b.) rose 44.8% to $3.58 billion and imports (c.i.f.) rose 31.0% to $5.03 billion. The trade deficit was more than offset by income from services such as tourism, banking, insurance, shipping, and capital inflow from abroad to register a net balance-of-payments surplus of $134 million. The aforementioned figures do not include trade with Indonesia. Although much of the increase in both imports and exports can be attributed to rising commodity prices, Singapore's actual volume of cargo handled rose by 9.1% reaching 62.3 million freight tons. Entrepôt trade continued to represent the lifeblood of Singapore's economy.

During January to September 1973 before the Mideast oil crisis, Singapore imported about 165 million barrels of oil valued at 1.174 billion Singapore dollars (converts to $471 million at S$2.49=US $1.00). About 72% of the aforementioned quantity was high-sulfur crude oil, mainly from Kuwait, Saudi Arabia, and Iran; about 16% was fuel oil, and 12% other refined petroleum products. In 1972, total oil imports were close to 200 million barrels valued at 1.383 billion Singapore dollars (converts to $496 million at S$2.79= US$1.00). The last quarter value figures for 1973 were abnormal, showing the steep rise in oil prices, along with trading repercussions. After Singapore refines the crude, most of the locally produced refined oil products plus the imported refined products are then exported or sold for bunkering. In recent years, Singapore's petroleum exports have been about four-fifths that of the petroleum imports. Singapore's importance as a petroleum distribution center is self-evident.

Singapore's imports of iron and steel products were worth S$384 million ($138 million in 1972 and S$556 million ($223 million) in 1973. During 1972–73, steel exports were equivalent to about 15% of the steel imports. Singapore's cement clinker imports were valued at S$34 million in 1972 and S$42 million in 1973. Imports of copper and aluminum products were just under cement in value for both items.

Table 7.—Singapore: Exports of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS			
Aluminum:			
Bauxite and concentrate	2	400	All to Taiwan.
Oxide and hydroxide	1,244	1,503	Mainly to West Malaysia.
Metal, including alloys, all forms	1,093	1,046	West Malaysia 591; Japan 230; Brunei 64.
Chromium oxide and hydroxide	7	18	West Malaysia 16; Sarawak 1.
Cobalt oxide and hydroxide	--	1	Mainly to West Malaysia.
Copper:			
Ore and concentrate	1,787	700	All to Japan.
Metal, including alloys, all forms	840	1,423	West Malaysia 877; Japan 305; Hong Kong 120.
Gold bullion troy ounces	--	2,215	United States 2,068; West Germany 135.
Iron and steel:			
Ore and concentrate	38,711	13,761	Mainly to Japan.
Metal:			
Scrap	565	4,237	West Malaysia 3,308; Taiwan 336; Japan 288.
Pig iron, ferroalloys, and similar materials	110	346	West Malaysia 300; Brunei 26.
Steel, primary forms	3,614	2,150	West Malaysia 1,355; Sarawak 321; Sabah 281.
Semimanufactures:			
Bars, rods, angles, shapes, sections	25,429	21,936	West Malaysia 15,276; Sabah 2,160; Brunei 1,764.
Universals, plates, sheets	35,283	42,866	West Malaysia 31,479; Sarawak 4,002; Sabah 3,654.
Hoop and strip	1,484	1,670	West Malaysia 1,461; Sarawak 125.
Rails and accessories	703	2,519	West Malaysia 2,381.
Wire	2,443	2,138	Sarawak 760; Sabah 754; West Malaysia 480.
Tubes, pipes, fittings	40,416	29,274	Africa (not further identified) 10,719; West Malaysia 9,838; Brunei 1,547.

Table 7.—Singapore: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
METALS—Continued			
Iron and steel—Continued			
Metal—Continued			
Semimanufactures—Continued			
Castings and forgings, rough	631	421	West Malaysia 222; Sarawak 90; Sabah 46.
Total	106,389	100,824	
Lead:			
Ore and concentrate	51	3	Mainly to India.
Oxides	15	17	Mainly to West Malaysia.
Metal, including alloys, all forms	437	675	West Malaysia 429; Japan 151; Sabah 24.
Manganese:			
Ore and concentrate	737	1,095	Sri Lanka 542; West Malaysia 282; Iran 170.
Oxides	863	38	Thailand 20; West Malaysia 12; Hong Kong 5.
Mercury 76-pound flasks	15	104	Hong Kong 100.
Nickel metal, including alloys, all forms	22	28	Mainly to West Malaysia.
Platinum-group metals and silver:			
Waste and sweepings kilograms	325	2,436	Hong Kong 2,332; United Kingdom 104.
Metals, including alloys:			
Platinum group troy ounces	222	1,671	United Kingdom 1,479; West Malaysia 192.
Silver thousand troy ounces	646	495	United Kingdom 490.
Tantalum ore	16	--	
Tin:			
Ore and concentrate long tons	2,545	2,276	Spain 786; Mexico 752; Belgium-Luxembourg 433.
Metal, including alloys, all forms do	491	349	Hong Kong 119; West Malaysia 72; Taiwan 68.
Titanium:			
Ore and concentrate:			
Ilmenite	14	--	
Other	1	4	All to West Malaysia.
Oxides	506	714	West Malaysia 713.
Tungsten ore and concentrate	172	47	Netherlands 27; West Germany 20.
Zinc:			
Ore and concentrate value	--	$364	All to West Malaysia.
Oxide and peroxide (except hydroxide)	106	83	West Malaysia 77.
Metal, including alloys, all forms	2,111	1,259	West Malaysia 791; South Vietnam 375.
Other:			
Ore and concentrate of base metals, n.e.s. (excluding iron and magnesium)	238	208	Belgium-Luxembourg 126; India 66.
Ash and residue containing nonferrous metals	1,389	430	Japan 180; Taiwan 70; Sweden 53.
Oxides, hydroxides and peroxides of metals, n.e.s	77	53	West Malaysia 43; Thailand 9.
Metals, including alloys, all forms:			
Scrap, nonferrous	7,603	9,852	Japan 6,587; West Malaysia 471; Hong Kong 402.
Metalloids	5	4	Mainly to West Malaysia.
Alkali, alkaline earth, and rare-earth metals	30	10	Do.
Base metals, including alloys, all forms, n.e.s	1,076	176	Canada 37; West Malaysia 21.
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	20	35	Mainly to West Malaysia.
Dust and powder of precious and semiprecious stones value	$675	--	
Grinding and polishing wheels and stones	87	[1] 140	West Malaysia 113.
Asbestos	14	82	West Malaysia 81.
Cement	7,790	11,977	Australia 3,848; Sabah 2,315; West Malaysia 1,349.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Kaolin	492	191	West Malaysia 165; Taiwan 25.
Other	7,388	6,862	Brunei 3,198; West Malaysia 1,046; Australia 915.

Table 7.—Singapore: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
NONMETALS—Continued			
Clays and clay products (including all refractory brick)—Continued			
Products:			
Refractory (including nonclay bricks)	3,089	962	West Malaysia 879; Sabah 47.
Nonrefractory	2,920	[2] 4,325	West Malaysia 1,258; Canada 1,015; Sabah 540.
Diamond:			
Gem, not set or strung value, thousands	$1,832	$1,895	West Malaysia $1,770.
Industrial value	$385	$14,897	United States $12,840; Australia $2,057.
Feldspar and fluorspar	2,815	2,768	All to West Malaysia.
Fertilizer materials:			
Crude:			
Nitrogenous	16	24	West Malaysia 19; Sri Lanka 5.
Phosphatic	17,460	24,733	West Malaysia 23,649; Sabah 1,001.
Manufactured:			
Nitrogenous	29,362	83,429	South Vietnam 53,551; West Malaysia 11,896; Africa (not further identified) 10,000.
Phosphatic	13,603	18,164	Bangladesh 12,238; West Malaysia 4,966.
Potassic	95,363	121,064	West Malaysia 111,665; Sabah 5,913.
Other, including mixed	19,635	24,917	West Malaysia 11,087; Afghanistan 5,000; Sarawak 3,048.
Ammonia	8	305	West Malaysia 273; Sarawak 17.
Graphite, natural	8	10	West Malaysia 7; Sabah 2.
Gypsum and plasters	1,018	1,726	South Vietnam 1,270; West Malaysia 297; Thailand 107.
Lime	2,081	3,311	West Malaysia 2,265; Sabah 500; Brunei 498.
Magnesite	722	608	Sarawak 474; West Malaysia 68; Pakistan 45.
Mica, all forms	91	18	Brunei 5; South Korea 5; Papua New Guinea 5.
Pigments, mineral:			
Natural, crude	569	633	Burma 345; West Malaysia 233; Philippines 50.
Iron oxides, processed	137	241	West Malaysia 210; Brunei 13.
Precious and semiprecious stones, including synthetic, except diamond value, thousands	$285	$497	Hong Kong $312; Japan $126.
Salt	10,119	14,108	West Malaysia 6,583; Philippines 5,000; India 1,021.
Sodium and potassium compounds, n.e.s	2,618	2,881	West Malaysia 2,445; Burma 241.
Stone, sand and gravel:			
Dimension stone	185	265	Brunei 91; West Malaysia 73; Sarawak 50.
Dolomite, chiefly refractory grade	--	2	All to Sarawak.
Gravel and crushed rock	30,603	28,818	Brunei 28,423.
Limestone	295	561	West Malaysia 412; Sarawak 60.
Quartz and quartzite	7	1	All to West Malaysia.
Sand, excluding metal bearing	2,636	2,685	Sabah 2,176; Burma 146; West Malaysia 112.
Sulfur:			
Elemental:			
Other than colloidal	9,858	12,274	Mainly to West Malaysia.
Colloidal	2,077	1,608	South Vietnam 770; Hong Kong 502; Sri Lanka 260.
Sulfur dioxide	--	1	Mainly to West Malaysia.
Sulfuric acid	1,653	2,657	South Vietnam 1,849; Sri Lanka 610.
Talc, steatite, soapstone, pyrophyllite	1,472	1,579	West Malaysia 1,360; Thailand 105.
Other nonmetals, n.e.s.:			
Crude	14,017	16,732	West Malaysia 9,165; Philippines 3,830; Brunei 1,530.
Slag, dross and similar waste, not metal bearing	1	11	Mainly to West Malaysia.
Oxides and hydroxides of magnesium, strontium, and barium	2	2	Do.
Bromine, iodine and fluorine value	$1,236	$849	Do.
Building materials of asphalt, asbestos, and fiber cement, and unfired nonmetals, n.e.s	9,071	10,221	West Malaysia 4,378; Sarawak 3,948; Brunei 777.

See footnotes at end of table.

Table 7.—Singapore: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal destinations, 1972
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	4	32	All to West Malaysia.
Carbon black and gas carbon:			
Carbon black	921	1,087	West Malaysia 996; India 50; Sabah 19.
Gas carbon	1	--	
Coal, all grades, including briquets	1,278	342	Burma 205; Australia 45; Philippines 31.
Coke	1,025	1,486	West Malaysia 1,322; Thailand 110; South Vietnam 25.
Hydrogen, helium and rare gases value, thousands	$58	$195	Brunei $129; West Malaysia $41; Republic of Korea $10.
Petroleum:			
Crude and partly refined 42-gallon barrels	793,614	465,155	Philippines 314,675; Australia 104,531; Hong Kong 45,949.
Refinery products:[3]			
Gasoline:			
Aviation thousand 42-gallon barrels	2,847	2,650	Thailand 1,079; South Vietnam 987; Australia 175.
Motor do	15,159	15,454	Japan 7,386; South Vietnam 3,838; Australia 969.
Kerosine and jet fuel do	24,654	26,790	South Vietnam 8,344; Thailand 6,182; United States 3,267.
Distillate fuel oil do	21,573	22,026	South Vietnam 6,032; West Malaysia 3,995; Hong Kong 2,850.
Residual fuel oil do	47,843	48,574	Japan 19,462; Hong Kong 10,820; Australia 9,763.
Lubricants do	665	928	Thailand 230; South Vietnam 175; West Malaysia 149.
Mineral jelly and wax do	154	190	South Vietnam 64; West Malaysia 26; Hong Kong 17.
Other:			
Nonlubricating oils, n.e.s do	17	15	West Malaysia 12; Thailand 1.
Pitch and petroleum coke do	6	3	Mainly to West Malaysia.
Bitumen and bituminous mixtures, n.e.s do	1,318	1,076	Australia 440; South Vietnam 296; Hong Kong 107.
Other do	r 334	4,378	Thailand 3,551; South Vietnam 270; United Kingdom 145.
Total do	r 114,570	122,084	
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals thousand tons	211	[4] 255	Australia 105; New Zealand 74; Japan 20.

r Revised.
[1] Excluded from this total are hand polishing stones valued at $73,313 for 1972.
[2] Excluded from this total are bricks of baked clay valued at $22,684 for 1972.
[3] In addition to the products listed, liquefied petroleum gas valued at $2,344,000 in 1971 and $2,672,425 in 1972 was also exported.
[4] Excluded from this total are benzole and creosote oil.

Table 8.—Singapore: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS			
Aluminum:			
Bauxite and concentrate	--	1,153	Mainly from People's Republic of China.
Oxide and hydroxide	7,429	7,451	Italy 3,803; People's Republic of China 3,430; Taiwan 200.
Metal, including alloys, all forms	10,753	10,901	Japan 4,207; West Malaysia 1,113; Hong Kong 931.
Chromium oxide and hydroxide	161	49	West Germany 31; United Kingdom 6; Belgium-Luxembourg 5.
Cobalt oxide and hydroxide	7	(1)	NA.
Copper:			
Ore and concentrate	1,271	255	All from West Malaysia.
Metal, including alloys, all forms	6,175	7,436	Japan 2,412; Australia 2,330; United States 910.

Table 8.—Singapore: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Gold bullion ____ troy ounces __	41,250	26,638	United Kingdom 21,570; Switzerland 4,000; United States 1,068.
Iron and steel:			
Ore and concentrate ____	62,133	2,952	West Malaysia 2,907; United States 45.
Metal:			
Scrap ____	59,249	106,354	Australia 72,762; United States 18,183; South Vietnam, 5,158.
Pig iron, including cast iron __	20,077	32,470	India 22,630; Japan 4,084; People's Republic of China 2,420.
Sponge iron, powder and shot _	188	252	Japan 150; India 66; United Kingdom 27.
Ferroalloys:			
Ferromanganese ____	964	1,070	Japan 1,052; Taiwan 12; United Kingdom 5.
Other ____	793	453	Japan 317; Taiwan 88; Austria 24.
Steel, primary forms ____	46,416	17,390	Japan 7,190; Belgium-Luxembourg 3,642; North Korea 3,406.
Semimanufactures:			
Bars, rods, angles, shapes, sections ____	227,976	248,380	Japan 149,380; Australia 32,965; West Malaysia 26,822.
Universals, plates, sheets ____	298,978	340,780	Japan 299,489; Australia 10,907; United Kingdom 9,859.
Hoop and strip ____	16,076	20,234	Japan 18,715; West Germany 480; United States 347.
Rails and accessories ____	4,046	10,988	Netherlands 5,002; Australia 2,328; United Kingdom 1,332.
Wire ____	28,537	29,912	People's Republic of China 17,169; Japan 9,484.
Tubes, pipes, fittings ____	120,606	110,285	Japan 79,876; United Kingdom 5,627; United States 4,569.
Castings and forgings, rough __	704	1,395	India 494; Japan 329; Taiwan 163.
Total ____	696,923	761,974	
Lead:			
Ore and concentrate ____	10	--	
Oxides ____	218	270	Australia 128; India 52; People's Republic of China 52.
Metal ____	1,395	1,646	Australia 1,316; United Kingdom 110.
Manganese:			
Ore and concentrate ____	11,351	200	All from Japan.
Oxides ____	978	590	Japan 428; West Malaysia 87; People's Republic of China 74.
Mercury ____ 76-pound flasks __	12	293	Spain 150; United States 109.
Nickel metal, including alloys, all forms	85	690	Australia 512; United Kingdom 82; Belgium-Luxembourg 51.
Platinum-group metals and silver:			
Waste silver and platinum troy ounces __	--	643	All from Japan.
Metals, including alloys:			
Platinum group ____ do ____	4,465	5,433	United Kingdom 5,015; Switzerland 386.
Silver ____ do ____	61,633	108,315	Australia 38,580; United Kingdom 20,479; France 17,554.
Thorium ore ____ value __	$222	--	
Tin:			
Ore and concentrate __ long tons __	856	253	West Malaysia 121; Burma 98; Thailand 21.
Oxides ____ do ____	(1)	(1)	NA.
Metals, including alloys, all forms do ____	898	731	West Malaysia 414; United States 93; United Kingdom 54.
Titanium:			
Ore and concentrate:			
Ilmenite ____	10	595	All from West Malaysia.
Other ____	48	--	
Oxides ____	2,014	2,692	Japan 1,288; Australia 1,127.
Tungsten ore and concentrate ____	76		
Zinc:			
Ore and concentrate ____	1	(1)	NA.
Oxides and peroxides, except hydroxides ____	566	878	India 289; Australia 173; People's Republic of China 168.
Metal, including alloys, all forms __	9,627	7,992	Japan 3,709; Canada 2,655; Australia 1,248.
Zirconium, zircon ____	99	65	Australia 60; West Malaysia 5.

Table 8.—Singapore: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
METALS—Continued			
Other:			
Ore and concentrate of base metals, excluding iron and magnesium	226	197	Sarawak 161; Australia 36.
Ash and residue containing nonferrous metals	146	13,971	Mainly from Australia.
Oxides, hydroxides and peroxides of metals, n.e.s	173	185	West Malaysia 50; United Kingdom 39; Norway 20.
Metals, including alloys, all forms:			
Scrap, nonferrous	4,617	16,762	West Malaysia 11,631; South Vietnam 3,324.
Metalloids	18	6	Mainly from Japan.
Alkali, alkaline earth, rare-earth metals	56	8	Mainly from United Kingdom.
Pyrophoric alloys	95	88	Austria 51; Japan 29.
Base metals, including alloys, all forms, n.e.s	1,757	3,787	Hong Kong 1,781; Austria 1,458; Taiwan 258.
NONMETALS			
Abrasives natural, n.e.s.:			
Pumice, emery, natural corundum, etc	68	71	United States 15; Netherlands 12; United Kingdom 11.
Dust and powder of precious and semiprecious stones value	$2,923	$4,173	Australia $3,582; United States $463.
Grinding and polishing wheels and stones	400	² 455	Japan 169; People's Republic of China 86; Italy 34.
Asbestos	3,533	2,523	Canada 1,529.
Cement thousand tons	889	1,031	Japan 364; Philippines 167; Thailand 151.
Clays and clay products (including all refractory brick):			
Crude clays, n.e.s.:			
Kaolin	2,710	1,568	West Malaysia 707; United Kingdom 483; Japan 141.
Other	28,106	36,983	United States 30,700; West Malaysia 3,643; United Kingdom 1,787.
Products:			
Refractory (including nonclay bricks)	7,350	11,766	United Kingdom 4,997; Japan 1,962; Austria 1,645.
Nonrefractory	21,802	² 23,833	Japan 6,990; West Malaysia 6,553; People's Republic of China 3,647.
Diamond:			
Gem, not set or strung value, thousands	$2,374	$4,308	India $1,132; Israel $1,046; Belgium-Luxembourg $752.
Industrial value	$702	$128,358	Belgium-Luxembourg $100,555; United States $21,534.
Diatomite and other infusorial earth	242	364	Japan 199; United States 131; West Malaysia 18.
Feldspar and fluorspar	5,063	4,418	India 3,277; United Kingdom 765; People's Republic of China 374.
Fertilizer materials:			
Crude:			
Nitrogenous	167	87	Chile 58; People's Republic of China 29.
Phosphatic	19,695	29,828	Christmas Island 29,494.
Manufactured:			
Nitrogenous	112,329	116,029	United States 71,597; Japan 37,824.
Phosphatic	5,040	52,298	United States 40,828; Christmas Island 5,284; Morocco 3,150.
Potassic	117,765	129,531	Israel 76,127; United States 41,756; Canada 10,882.
Other, including mixed	18,846	35,222	United States 9,460; West Germany 9,430; Belgium-Luxembourg 6,500.
Ammonia	468	516	West Malaysia 318; Japan 93; Taiwan 39.
Graphite, natural	128	232	People's Republic of China 139; Japan 50; United Kingdom 29.
Gypsum and pasters	26,473	38,482	Australia 25,720; Japan 9,637; People's Republic of China 2,361.
Lime	5,842	3,973	West Malaysia 3,829; People's Republic of China 100.
Magnesite	67	695	Austria 536; West Germany 107.
Mica, all forms	1,321	999	United States 910; United Kingdom 69.

See footnotes at end of table.

Table 8.—Singapore: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
NONMETALS—Continued			
Pigments, mineral:			
Natural, crude	2,294	111	People's Republic of China 70; Spain 25.
Iron oxides, processed	646	1,009	West Germany 464; People's Republic of China 439.
Precious and semiprecious stones, except diamond, worked and unworked:			
Natural value, thousands	$1,486	$2,051	Hong Kong $900; People's Republic of China $767; India $219.
Manufactured do	$364	$129	India $52; Thailand $41; France $19.
Salt and brine	46,844	55,074	Thailand 15,403; India 12,293; Burma 9,127.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	9,332	6,618	West Germany 1,892; Japan 1,266; United Kingdom 1,121.
Caustic potash, sodic and potassic peroxides	429	348	Belgium-Luxembourg 110; Japan 55; France 28.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	1,765	54,527	West Malaysia 52,079; Taiwan 1,602; People's Republic of China 533.
Worked	3,579	3,191	People's Republic of China 1,157; Italy 859; Taiwan 654.
Dolomite, chiefly refractory grade	2,641	2,598	West Malaysia 2,498; Austria 100.
Gravel and crushed rock	124,187	414,466	West Malaysia 413,247.
Limestone (except dimension)	23,382	21,846	West Malaysia 19,316; Japan 2,440.
Quartz and quartzite	222	12	United Kingdom 9; Hong Kong 2.
Sand, excluding metal bearing	41,679	48,253	West Malaysia 46,727.
Sulfur:			
Elemental:			
Other than colloidal	10,223	10,370	Iran 10,193.
Colloidal	10,259	224	West Germany 79; Poland 50; Japan 46.
Sulfur dioxide	5	6	Mainly from United Kingdom.
Sulfuric acid	140	76	West Malaysia 59; West Germany 10; United Kingdom 4.
Talc, steatite, soapstone, pyrophyllite	6,767	8,756	People's Republic of China 6,738; South Korea 627; India 533.
Other nonmetals, n.e.s.:			
Crude	49,589	49,123	Thailand 22,000; United States 10,265; West Germany 8,428.
Slag, dross and similar waste, not metal bearing	33	17	Mainly from India.
Oxides and hydroxides of magnesium, strontium and barium	235	193	Japan 180.
Bromine, iodine, fluorine value	$8,424	$10,643	United Kingdom $5,872; United States $1,805; West Germany $1,727.
Building materials of asphalt, asbestos and fiber cement, and unfired nonmetals, n.e.s	10,542	9,805	West Malaysia 5,848; Thailand 2,218; United States 598.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	2,171	108	United States 68; Taiwan 40.
Carbon black	4,537	4,347	Japan 2,620; Israel 648; Australia 536.
Coal, all grades, including briquets	3,275	1,068	United States 1,014.
Coke	6,461	4,630	Taiwan 4,225; Japan 201; West Germany 104.
Hydrogen, helium, rare gases value, thousands	$214	$435	Japan $293; United States $40.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	113,202	138,940	Kuwait 65,489; Iran 28,257; Saudi Arabia 23,804.
Refinery products:[4]			
Gasoline:			
Aviation do	2,899	2,337	Iran 1,986; Saudi Arabia 182; Netherlands Antilles 158.
Motor do	4,325	4,333	Iran 1,557; Sarawak 1,235; Bahrain 423.
Kerosine do	2,244	2,373	Sarawak 1,531; Saudi Arabia 404; Iran 177.
Jet fuel do	9,042	7,168	Sarawak 5,528; Saudi Arabia 794; Iran 281.

Table 8.—Singapore: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1971	1972	Principal sources, 1972
MINERAL FUELS AND RELATED MATERIAL—Continued			
Petroleum—Continued			
Refinery products [4]—Continued			
Distillate fuel oil thousand 42-gallon barrels	10,139	6,056	Sarawak 1,635; Bahrain 1,500; Philippines 1,100.
Residual fuel oil ----- do ----	20,587	26,523	Saudi Arabia 10,294; Bahrain 7,881; Kuwait 2,345.
Lubricants ---------- do ----	1,275	815	Netherlands Antilles 495; Japan 154; West Malaysia 73.
Mineral jelly and wax - do ----	37	40	Burma 23; People's Republic of China 12.
Other:			
Nonlubricating oils, n.e.s ---------- do ----	14	15	United Kingdom 4; Japan 3; West Malaysia 2.
Pitch and petroleum coke do ----	4	5	United States 3; Australia 1.
Bitumen and bituminous mixtures, n.e.s -- do ----	36	16	West Malaysia 7; Netherlands 2; United Kingdom 2.
Other ---------- do ----	r 198	517	Saudi Arabia 358; Sarawak 96; Iran 54.
Total --------- do ----	r 50,800	50,198	
Mineral tar and other coal-, petroleum- or gas-derived crude chemicals ------	NA	[5] 466	United Kingdom 340; Japan 47; Taiwan 25.

r Revised. NA Not available.
[1] Less than ½ unit.
[2] Excluded from this total are hand polishing stones valued at $122,728 for 1972.
[3] Excluded from this total are bricks of baked clay valued at $858,105 and imported in 1972 from West Malaysia.
[4] In addition to the products listed, liquefied petroleum gas valued at $44,000 in 1971 and $40,967 in 1972 was also imported.
[5] Creosote oil is excluded from this total.

COMMODITY REVIEW

Metals.—*Iron and Steel.*—Singapore's steel imports surpassed 1 million tons in 1973, indicating that consumption is higher. Steel ingot production (derived from scrap) and output of reinforcing bars probably both exceeded 200,000 tons in 1973. Exports have been nominal. Japan has been by far the leading supplier of steel products to Singapore, furnishing 658,000 tons in 1971, 603,000 tons in 1972, and 774,000 tons in 1973. About two-thirds of the steel imports from Japan consisted of shapes, plates, and pipes and tubing.

Singapore has a few small steel producers. The National Iron & Steel Mills, Ltd. (NISM), with a plant at Jurong, has electric furnaces, merchant bar mills, and a wire rodmill that turn out about 170,000 tons of steel products annually. A second and even smaller producer is the Malaysian Iron & Steel Mills, Ltd. NISM and the Japanese trading firm Mitsui & Co. have jointly organized the Eastern Wire Manufacturing Co.

Various ideas for building large steel plants in Singapore or nearby emerged in 1973. Mitsui & Co. believed a steel plant producing 300,000 to 500,000 tons of plates may be economically viable and organized a Japanese steelmakers' mission to visit Singapore and determine the feasibility of setting up such a steel mill in the Jurong Industrial Estate. Meanwhile, the Singapore Economic Development Minister Lee suggested that Singapore, Japan, Australia, and Indonesia might jointly build a modern integrated steel plant in Indonesia.

Nonmetals.—*Cement.*—Singapore's three cement plants were operating at nearly full capacity in 1973. All are grinding operations, relying totally on imports of clinker. In 1972, Singapore's imports of such clinker was 988,456 tons, and in 1973, 1,020,721 tons. During 1972–73, the Asia Cement (Malaysia), Ltd., plant at Jurong producing about 42% of Singapore's total cement; Singapore Cement Manufacturing Co., Ltd. 32%; and Pan-Malaysia Cement Work Ltd., plant at Jurong, 26%. Singapore also imported finished cement—about 43,000 tons in 1972 and 160,000 tons in 1973. Singapore's cement consumption can be

estimated on the basis of these figures. Output of finished cement in 1972 and 1973 was just above 1 million tons.

Mineral Fuels.—*Petroleum.*—Developments at yearend 1973 indicated that Singapore's program to sharply expand oil refining capacity may be stabilizing after attaining the daily level of just over 1 million barrels throughput. Factors to be considered for further expansion would include the dependability and future growth of the export market, in view of the cessation of the Vietnam war; Japan's policy on importing large quantities of refined oil from Singapore; competition from other areas in Asia where refineries can be built; and the need for building low-sulfur (that is, to process Indonesian crude) or "sweet" oil refineries. It became evident that little additional U.S. investment in Singapore's refineries would be forthcoming for the immediate years after 1973. However, Singapore's bunkering and entrepôt trade clearly should continue to grow, and industrial demand for petroleum should also increase.

Other developments point to Singapore's special significance in the oil business. Shipping is so heavy that the Singapore Parliament was considering the passage of the Civil Liability (Oil Pollution) Act, 1973. A floating oil storage terminal called the Baraka I was recently completed for the Cresent Petroleum Co.—a consortium of five U.S. oil firms. Gardner-Denver Co. of Dallas was preparing to convene a conference at the U.S. Trade Center in Singapore to promote the sale of oil exploration and drilling equipment. Many kinds of offshore oil exploration and development barges and equipment are built, assembled, and serviced in Singapore. The small country houses the headquarters of many international oil companies working in Southeast Asia.

Shell Eastern Petroleum Ltd., was roughly on schedule in expanding its already-large refinery on Pulau Bukum from 350,000 to 530,000 barrels per day by yearend 1974. A $400 million joint venture petrochemical plant in Jurong, involving the Royal Dutch/Shell Group, Mitsubishi Corporation, Sumitomo Chemical Co., Ltd., and the Singapore Government, to possibly utilize naphtha from the "Shell" refinery, was being seriously considered at yearend.

Two wholly American-owned refineries under Esso Singapore Pte. Ltd. and Mobil Oil Singapore Pte. Ltd. virtually completed their expansion programs. Esso's refinery on Pulau Ayer will be rated at 231,000 barrels per day, and Mobil's refinery in the Jurong Industrial Estate, at 175,000 barrels per day. The joint venture firm Singapore Petroleum Co. Ltd. completed a 65,000-barrel-per-day refinery on Pulau Merlimau near Esso's refinery. The fifth refinery is small and cannot be expanded because of land space limitations.

SRI LANKA [24]

Mineral production in Sri Lanka increased for almost all commodities. The largest increase was gem stone production due mainly to a government gem-income amnesty program. Other commodities showing increases were hydraulic cement, dolomite, feldspar, graphite, ilmenite, limestone, mica, and rutile. Production deceases were reported for massive quartz, common salt, and zircon.

Gem stone production increased from 178,889 carats in 1972 to 478,457 carats in 1973. The increase was due primarily to a 6-month amnesty period from May 1973 to August 1973 and an exemption from certain taxes. The Government passed legislation that provided amnesty for any illegal earnings from gem stones. In addition, sales to overseas buyers and to tourists were exempted from income or business taxes as long as the income was related to the purchase and resale of gem stones. The State Gem Corp. operates retail outlets for gem stones but has not attempted to monopolize the trade. Sales have been further increased by government encouragement to sell more gems to tourists. Sri Lanka received a $44,000 grant from the U.N. Industrial Development Organization to open a factory using modern techniques to produce precision cut gem stones.[25]

The primary gem stones mined are sapphires, rubies, aquamarine, and topaz.

Graphite production increased 27% from 1972 to 7,811 tons in 1973. U.S. imports of Sri Lanka graphite were 2,661 tons. The Rangala Graphite Mines Co. was

[24] Stanley K. Haines, geologist, Division of Nonmetallic Minerals—Mineral Supply.
[25] Washington Post. Nov. 22, 1973, p. 61.

started by the State Graphite Corp. to work the recently proven Siyambalawela deposit.[26]

The Joseph Dixon Crucible Co. has been negotiating with the State Graphite Corp. to provide technical advice and aid in the setup of a colloidal graphite plant. The American company plans to aid in the marketing of the graphite product. Primary markets will be in India and southeast Asia.[27]

The Pulmoddai mineral sands yielded increased quantities of ilmenite and rutile. There was a small decrease in zircon production. Ilmenite production increased 13% to 93,482 tons, and rutile increased 5% to 2,252 tons. The mineral sands, which extend for about 4½ miles and are about 100 yards wide, contain about 80% rutile and ilmenite. The average composition of the Pulmoddai sands is ilmenite, 50% to 75%; rutile, 10% to 12%; zircon, 8% to 10%; and sillimanite and monazite, about 1%. Spinel garnet and tourmaline are also present in very small quantities. The China Bay plant was processing at half capacity due to a number of technical problems. Sri Lanka exported most of its production of ilmenite, rutile, zircon, and monazite to Japan.[28]

The Sri Lanka Geological Department discovered an estimated 25 million tons of rock phosphate near Eppawala in the north central provice of Sri Lanka. Production has started and is expected to be about 50,800 tons this year. The rock phosphate is about 35% P_2O_5. The deposit could lead to the building of a phosphate fertilizer plant. Sri Lanka currently imports $1.8 million worth of phosphate fertilizer.[29]

The Sri Lanka Geologic Department is conducting surveys to locate resources of mica and iron ore.

The petroleum industry was dependent on imports for all crude oil. Refinery input in 1973 was reported at 1,770,255 tons.

New mineral laws in 1973 included the passing of a bill stating that absolute ownership of all minerals is held by the Government. In addition to his other duties, the Director of the Geological Survey was made responsible for issuance of mining licenses as well as the safety, health, and welfare of miners.

Detailed trade data for 1972 and 1973 were not available at the time that this chapter was written. The latest trade statistics available are those for 1971, and are contained in the 1972 Minerals Yearbook chapter.

NORTH VIETNAM [30]

Economic and industrial rehabilitation were the main goals of North Vietnam during 1973. It was reported that North Vietnam made rapid progress after the cessation of the war in aiding industrial relocation and production, regional rehabilitation, and countrywide reconstruction. Almost all the industrial plants evacuated and dispersed during the war were said to have been moved back to their original sites. Major industrial sites, centered around the capital city of Hanoi, the area hardest hit by U.S. bombing in 1972, had been partially restored. It was also reported that the country's electrical and coal sectors had reached the planned output levels for 1973, and most of the Haiphong cement plant kilns had been repaired. Substantial capital, with the help of foreign assistance, was invested in 1973 to restore damaged projects, resume construction of projects temporarily suspended because of the war, and start new projects. However, the economy of the country in 1973 was still affected primarily by inflation, low labor productivity, and a foreign trade imbalance.

Data on output of mineral commodities have not been reported by North Vietnam in recent years, but the country possesses substantial resources of phosphate rock, coal, iron ore, salt, and a variety of nonmetallic construction materials.

COMMODITY REVIEW

Metals.—The Thai Nguyen Iron and Steel Works, North Vietnam's major steel plant, resumed production in 1973. The plant's No. 1 blast furnace and coke furnace were reported to have been restored

[26] World Mining. Sri Lanka. V. 27, No. 7, June 25, 1974, pp. 116–117.
[27] Mining Journal. New Graphite Plant Planned. Jan. 11, 1974, p. 22.
[28] Industrial Minerals. Pulmoddai Mineral Sands. No. 77, February 1974, p. 27.
[29] Work cited in footnote 26.
[30] Prepared by Arthur C. Meisinger, industry economist, Division of Nonmetallic Minerals—Mineral Supply.

after being heavily damaged during the war.

A steel rolling mill at Gia Sang in Thai Nguyen Province was under construction and, when completed, will provide steel sheets and rods for use in the construction industry.

North Vietnam signed an agreement with two Hungarian agencies, Chemo Komplex and the Aluminum Industrial Planning Institute, for assistance in developing the country's bauxite resources. The agreement also includes plans for an alumina plant.

Nonmetals.—North Vietnam annually produces nonmetallic minerals that include cement, lime, sand and gravel, silica brick, and stone, primarily for use in the construction industry. Although no data on output were available in 1973, sufficient quantities are produced to meet domestic requirements under normal conditions. The war, however, had caused heavy damage to the building materials industry, and restoration and expansion of many plants and quarry sites were the primary goals in 1973.

The country's cement industry was heavily damaged by bombing in 1972, and output was probably half of the estimated 500,000 tons produced in both 1970 and 1971. The largest cement plant at Haiphong was reported to be repaired and in operation in 1973. Cement output from 14 smaller plants was estimated to be 23,000 tons during the year.

An asphalt-concrete producing plant—the first to be constructed in North Vietnam—began operations in 1973.

Phosphate fertilizer production was estimated to be 500,000 tons in 1973. The Lam Thao superphosphate plant was reportedly enlarged during the year, and the Van Dien phosphate plant in Hanoi was expanded from 20,000-ton-per-year capacity to 40,000-ton-per-year capacity. Two new high-temperature furnaces were installed in the plant to double the capacity.

Output of salt was probably at the same level (150,000 tons) as in 1972.

Mineral Fuels.—Coal production, constantly interrupted by the war in 1972, was probably back to normal in 1973. No production data were available, but most likely the quantity of anthracite produced, primarily from the Hongay mines, was increased over the 1972 estimated figure of 2 million tons.

Exports of Hongay anthracite to Japan were resumed in August 1973, and shipments totaled nearly 185,000 tons at year-end, compared with only 67,411 tons in 1972.

Nippon Electrode Co., Tokyo, Japan, announced plans to construct a coal processing plant (at the request of the Government of North Vietnam) to improve the quality of anthracite exported from the Hongay mines. Planned capacity of the plant is 100,000 tons per year.

SOUTH VIETNAM [31]

Although an agreement to end the war and restore peace was signed in January 1973, South Vietnam's general economy and industrial base showed little improvement during 1973. The effects of a recession in 1972, inflation in 1973, dependence on outside financial assistance, and an unfavorable trade balance continued to be major problems for the country's government during the year.

A new 8-year reconstruction and development plan (1973–1980) was announced by the Government of South Vietnam in May 1973 to replace the unrealistic 4-year plan (1972–1975) initiated in 1972. Under the new plan, emphasis in the first 2 years will be on agriculture and the resettlement of refugees rather than any immediate attempt to build up labor-intensive industries. The second phase (1975–76) of the plan will focus on consolidating progress made in the first phase (1973–74). The third phase (1977–80), although not spelled out, will most likely emphasize industrial development in the country's current three industrial estates, the largest of which is at Bien Hoa near Saigon.

Nonmetallic minerals produced in South Vietnam in 1973 included cement, various types of stone, sand and gravel (including silica sand), clays, and gypsum. Most of the domestic requirements for mineral commodities such as fertilizers, iron and steel products, nonferrous metals, and petroleum products were supplied by imports.

[31] Prepared by Arthur C. Meisinger, industry economist, Division of Nonmetallic Minerals—Mineral Supply.

COMMODITY REVIEW

Metals.—Roundbar (rebar) was produced in 1973 at the Bien Hoa plant. The plant has an annual capacity to produce 20,000 tons of roundbar fabricated from scrap metal. Two other mills in South Vietnam also produce roundbar. A small amount of roundbar (quantity unknown) was reportedly exported to Indonesia, Singapore, Laos, and the Khmer Republic in 1973.

A proposal to establish a primary aluminum smelter in South Vietnam was initiated by the Economic Committee for Asia and the Far East (ECAFE) in 1973 with technical and financial assistance from Japan. At the request of the ECAFE Mekong Committee, the Japanese Government was reported to have sent a project research team to study the proposal.[32]

Nonmetals.—Cement production in 1973 totaled 265,000 tons, compared with 243,000 tons in 1972. South Vietnam also imported cement to help meet the growing demand, which is currently about 1 million tons.

To meet the estimated demand for cement of 1.5 million tons by 1975, the South Vietnam and French Governments announced a financial agreement for a fourfold production increase of the Ha Tien Cement Co. facilities. A French corporation, Polysius, S.A., will be responsible for the design and construction of the expansion project. The existing facility for final grinding and bagging near Saigon will be supplemented by a similar facility at the Ha Tien site, and also a distribution center will be established in Can Tho to serve the Delta Area of South Vietnam. At present, clinker must be shipped to Saigon and finished cement must be shipped back for the Delta Area.

Nonmetallic mineral construction materials produced in 1973 were various types of stone, sand and gravel, silica sand, clays, and gypsum. Small increases were reported in 1973 production for limestone and clays, compared with the quantities produced in 1972.

The quantity of salt produced for local consumption was 200,000 tons in 1973, compared with 192,000 tons the previous year.

Plans for the construction of a large chemical fertilizer production complex, which would save foreign exchange and insure adequate supply to the growing agriculture sector, was still high on the list of development projects for South Vietnam in 1973. The project involves three construction phases. The first phase is a 550-ton-per-day mixed fertilizer granulation plant and bagging facilities at Vung Tan to handle both the plant output and an additional 700-ton-per-day quantity of bulk urea. The second phase, planned for 1976, will involve the construction of a 600-ton-per-day ammonia plant and a 700-ton-per-day plant for converting urea solution into bulk urea. The third phase is planned for 1980 and will undertake to double output capacity of the plants in phases one and two.

Mineral Fuels.—South Vietnam continued to rely heavily on imports in 1973 to meet all domestic requirements for petroleum products. Petroleum products imported included gasoline, kerosine, aviation gas and jet fuel, diesel and fuel oils, lubricants, additives, asphalt, and liquefied petroleum gas (LPG). Sources of the imports were Singapore, Bahrain, Republic of Korea, and the United States.

Detailed seismic surveys were begun by Exxon in 1973 in South Vietnam's offshore oil concession area in the South China Sea.

[32] Japan Metal Bulletin. Aluminum Refinery on Cam Ranh Bay planned. July 14, 1973, p. 5.

The Mineral Industry of Other South Pacific Islands

By Staff, Bureau of Mines

CONTENTS

BRITISH SOLOMON ISLANDS [1]

Mineral activity in 1973 in the British Solomon Islands Protectorate (BSIP), if any, went unreported in available journals. The BSIP Director of Geological Surveys reported production of 520 troy ounces of gold of 80% purity, and 100 troy ounces of silver alloyed with the gold. Gold production (mostly from Guadalcanal) for the past 5 years was as follows, in troy ounces:

Year	Quantity
1969	413
1970	291
1971	444
1972	200
1973	520

The Geological Survey director reported that there was no production of manganese ore in 1973, but that bauxite production was imminent.

[1] Prepared by Robert A. Clifton, physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

Table 1.—Other Pacific Islands: Production of mineral commodities

Area and commodity		1971	1972	1973 p
BRITISH SOLOMON ISLANDS [1]				
Gold	troy ounces	444	200	520
Silver	do	--	--	100
CHRISTMAS ISLAND [1]				
Phosphate rock (shipments)	thousand metric tons	991	1,074	1,493
FIJI ISLANDS				
Cement, hydraulic	metric tons	78,091	89,293	91,445
Gold, mine output, metal content	troy ounces	89,129	81,590	79,983
Lime	metric tons	--	3,801	3,153
Manganese ore, gross weight	do	7,657	--	--
Silver, mine output, metal content	troy ounces	19,893	23,681	29,530
Sand and gravel and stone:				
Coral sand for cement manufacture	metric tons	92,040	100,964	106,814
River sand for cement manufacture	do	NA	NA	60,670
River sand and gravel	cubic meters	262,698	282,433	227,190
Coral sand and limestone	do	NA	NA	396
Limestone	metric tons	4,621	5,897	NA
Other quarried stone	cubic meters	158,091	215,782	218,879
NAURU AND OCEAN ISLAND [1]				
Phosphate rock, marketable (exports):				
Nauru	thousand metric tons	1,867	1,340	2,323
Ocean Island	do	620	512	742
NEW CALEDONIA [1]				
Cobalt contained in metallurgical products of nickel:				
In ferronickel e	metric tons	870	1,090	1,070
In matte e	do	110	140	150
Total e	do	980	1,230	1,220
Gioberite	do	1,432	--	--
Jade ("Ouen Island jade")	kilograms	550	1,400	1,280
Nickel:				
Ore:				
Gross weight	thousand metric tons	r 7,772	5,512	5,850
Metal content [2]	metric tons	r 101,336	88,918	98,887
Metallurgical products, nickel content: [3]				
In ferronickel	do	r 28,983	36,171	35,759
In matte	do	r 16,026	20,059	21,476
Total	do	r 45,009	56,230	57,235
NEW HEBRIDES [1]				
Manganese:				
Ore	do	NA	NA	186,006
Concentrate, gross weight	do	15,002	28,247	30,133
PAPUA NEW GUINEA [1]				
Copper, mine output, metal content	do	NA	123,959	153,953
Gold, mine output, metal content	troy ounces	24,071	409,125	566,216
Silver, mine output, metal content	do	17,451	995,443	1,196,383

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

[1] Undoubtedly, this area produces crude construction materials (common clays, sand, gravel, and/or stone in addition to the listed commodities, but output is unrecorded and information is inadequate to make reliable estimates of output levels.

[2] Nickel-cobalt content of metallurgical plant products, plus estimated recoverable nickel-cobalt in exported ores.

[3] Series revised to exclude cobalt content of both ferronickel and matte.

CHRISTMAS ISLAND [1]

The only mineral commodity produced on Christmas Island, an Australian external territory south of Java, is phosphate rock and dust.

Production of phosphate rock increased about 40% in 1973 as a result of strongly increased demand in Australia and New Zealand, the principal markets. Phosphate dust, produced in screening the rock, was sold chiefly to Malaysia, where it was used on plantations for direct application as a fertilizer.

The present capacity of mining operations on Christmas Island is being expanded to over 2 million tons per year.[2]

[1] Prepared by William F. Keyes, physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

[2] Industrial Minerals. No. 80, May 1974, p. 35.

Table 2.—Christmas Island: Shipments of phosphate rock by destination

(Thousand metric tons)

Destination	Fiscal year		
	1971	1972	1973
Australia	659	487	991
Indonesia	12	22	11
Malaysia and Singapore:			
Malaysia	75	109	150
Singapore	15	25	--
New Zealand	242	292	341
Total	1,003	935	1,493

Sources: 1971–72: The British Phosphate Commissioners; 1973: The International Superphosphate Manufacturers Association.

FIJI ISLANDS [4]

The value of minerals produced in Fiji in 1973 was $10.5 million, up 39% from the 1972 value.[5] Gold accounted for $7.9 million, or 75% of total mineral revenues. Sand and gravel accounted for $1.1 million, and stone accounted for $1.1 million. All other minerals accounted for only $400,000.

Gold output of the sole producer, Emperor Gold Mining Co. Ltd., dropped 2% in 1973, but higher prices enabled the mine to operate at a profit. The mine also yielded a small amount of byproduct silver. The company continued development work at the mine and, in pursuit of diversification, it was exploring a manganese prospect near Sigatoka and the Colo-i-Suva copper-zinc prospect (with two U.S. companies). The firm was also prospecting in Australia and New Zealand.[6]

The nonmetallic minerals mined in Fiji were used domestically. Production of stone and cement increased 1% and 2% respectively, whereas production of sand and gravel and lime decreased 20% and 17% respectively.

Three Japanese companies that had been developing a 250,000-metric-ton-per-year bauxite mine on Vanua Levu abandoned the project because of a combination of economic factors.[7] However, it was reported that other firms of several nationalities are actively exploring for petroleum and minerals in Fiji.

[4] Prepared by William C. Butterman, physical scientist, Division of Nonferrous Metals—Mineral Supply.

[5] Where necessary, values have been converted from Fiji dollars (FD) to U.S. dollars at the rate of FD1 = US$1.27.

[6] Mining Journal (London). 1974 Mining Annual Review. June 1974, pp. 396–397.

[7] Engineering & Mining Journal. V. 174, No. 6, June 1973, p. 285.

Table 3.—Fiji Islands: Exports and reexports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity		1971	1972
METALS			
Aluminum metal, including alloys:			
Scrap		83	33
Unwrought and semimanufactures	value	$2,955	$459
Copper metal, including alloys, all forms		145	186
Gold:			
Ore		14	--
Bullion	troy ounces	87,630	81,269
Iron and steel:			
Scrap		9	112
Pig iron, ferroalloys, similar materials		12	--
Steel, primary forms		14	4
Semimanufactures		r 701	861
Lead metal, including alloys:			
Scrap		18	37
Unwrought and semimanufactures		22	4
Manganese ore and concentrate		6,177	--
Silver bullion	troy ounces	19,721	22,183
Zinc metal, including alloys, unwrought and semimanufactures	value	--	$510
Other:			
Ore and concentrate	do	$118	$7
Ash and residue containing nonferrous metals		68	780
Metals, including alloys, all forms:			
Pyrophoric alloys	value	$183	$969
Base metals, including alloys, all forms, n.e.s	do	--	$2,085
NONMETALS			
Abrasives, natural, n.e.s.:			
Pumice, emery, natural corundum, etc	do	--	$7
Grinding and polishing wheels and stones	do	$864	$502
Cement		r 24,666	14,075
Clays and clay products:			
Refractory, including nonclay brick	value	$289	$6,377
Nonrefractory	do	$158	$4,796
Fertilizer materials:			
Crude, nitrogenous		7	3
Manufactured:			
Nitrogenous		2	38
Phosphatic		(1)	27
Potassic		--	31
Other, including mixed	value	$8	--
Gypsum and plasters	do	$15	$34
Sodium and potassium compounds, n.e.s., caustic soda		4	4
Stone and sand and gravel:			
Crude and partly worked	value	--	$236
Gravel and crushed rock	do	$472	$12
Quartz and quartzite	do	$130	--
Sand, excluding metal bearing	do	--	$27
Other nonmetals, n.e.s.:			
Slag, dross, similar waste, not metal bearing, from iron and steel manufacture		--	71
Building materials of asphalt, asbestos, fiber cement, and unfired nonmetals, n.e.s	value	$176	$178
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural		13	(2)
Petroleum refinery products: [3]			
Gasoline, including natural:			
Motor	thousand 42-gallon barrels	56	64
Aviation	do	83	107
Kerosine and jet fuel	do	893	902
Distillate fuel oil	do	261	296
Residual fuel oil	do	178	18
Lubricants	do	7	16
Other:			
White spirit	do	4	5
Liquefied petroleum gas	do	(2)	1
Total	do	1,482	1,409
Mineral tar and other coal-, petroleum-, or gas derived crude chemicals	42-gallon barrels	6	(2)

r Revised.
[1] Value only reported at US$33.00.
[2] Less than ½ unit.
[3] Includes bunkers.

Table 4.—Fiji Islands: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972
METALS		
Aluminum metal, including alloys:		
Scrap ---value--	$11	$498
Unwrought and semimanufactures ---value, thousands--	$254	$282
Copper metal, including alloys:		
Scrap ---value--	$2,107	$1,065
Unwrought and semimanufactures	r 1,245	110
Gold metal:		
Unworked and partly worked ---troy ounces--	549	417
Waste and sweepings ---do---	--	15
Iron and steel metal:		
Scrap	39	9
Pig iron, including cast iron	149	280
Ferroalloys and similar materials ---value--	$7,914	$68
Steel, primary forms	868	373
Semimanufactures:		
Bars, rods, angles, shapes, sections	8,279	11,734
Universals, plates, sheets	7,152	7,963
Hoop and strip	37	21,439
Rails and accessories ---value, thousands--	$106	$248
Wire	1,458	1,368
Tubes, pipes, fittings [1]	907	1,055
Castings and forgings, rough ---value--	$8,022	$14,802
Lead metal, including alloys:		
Scrap	(2)	1
Unwrought	10	74
Semimanufactures ---value--	$68,529	$64,507
Magnesium metal, including alloys, all forms ---do---	$78	$16
Nickel metal, including alloys:		
Scrap ---do---	$3,777	--
Unwrought and semimanufactures ---do---	$4,978	$3,098
Platinum-group metals and silver, including alloys:		
Platinum group ---troy ounces--	9	160
Silver ---value--	$2,851	$5,585
Tin metal, including alloys:		
Scrap ---do---	$21,611	$17,895
Unwrought and semimanufactures ---do---	$23,075	$18,814
Titanium oxides	149	175
Zinc metal, including alloys:		
Scrap	7	10
Blue powder ---value--	$10,312	$12,822
Unwrought	42	63
Semimanufactures ---value--	$2,705	$4,956
Other:		
Oxides, hydroxides, peroxides of metals, n.e.s ---do---	$59,898	$60,228
Metals, including alloys, all forms, pyrophoric alloys ---do---	$3,370	$5,577
NONMETALS		
Abrasives, natural, n.e.s.:		
Pumice, emery, natural corundum, etc	7	(3)
Dust and powder of precious and semiprecious stones ---value--	--	$220
Grinding and polishing wheels and stones ---do---	$23,214	$32,266
Asbestos	1	(2)
Barite and witherite	11	100
Cement	257	5,662
Chalk, earth colors, etc	86	82
Clays and clay products (including all refractory brick):		
Crude clays, n.e.s	71	51
Products:		
Refractory, including nonclay brick ---value--	$91,044	$144,394
Nonrefractory ---do---	$157,810	$279,391
Diamond, industrial ---do---	$2,876	$2,743
Diatomite and other infusorial earth	55	42
Fertilizer materials:		
Crude:		
Nitrogenous	--	1,370
Potassic	5	30
Other	663	124
Manufactured:		
Nitrogenous	18,153	32,155
Phosphatic	1,552	5,629
Potassic	255	487
Other, including mixed	122	160
Graphite, natural ---value--	$405	$508
Gypsum and plasters	3,390	3,094
Lime	27	3
Magnesite	(2)	7

See footnotes at end of table.

Table 4.—Fiji Islands: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1971	1972
NONMETALS—Continued			
Mica:			
Crude, including splittings and waste		3	116
Worked, including agglomerated splittings	value	$288	$64
Precious and semiprecious stones, except diamond	do	r $31,818	$6,858
Salt		r 2,205	1,309
Sodium compounds, caustic soda		335	593
Stone and sand and gravel:			
Dimension stone:			
Crude and partly worked		13	(2)
Worked	value	$7,716	$19,200
Gravel and crushed rock	do	$152	$2,144
Sand, excluding metal bearing		94	159
Sulfur:			
Elemental, all forms		44	(2)
Sulfuric acid and oleum	value	--	$27,646
Talc, steatite, soapstone, pyrophyllite		6	(2)
Other nonmetals, n.e.s.:			
Slag, dross, similar waste, not metal bearing	value	$81	$101
Building materials of asphalt, asbestos, fiber cement, and unfired nonmetals, n.e.s	do	$436,701	$474,310
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural		22,544	840
Coal, coke, peat		1,697	300
Hydrogen, nitrogen, rare gases	value	$5,737	$11,202
Petroleum:			
Crude and partly refined	thousand 42-gallon barrels	--	1
Refinery products:			
Gasoline, including natural:			
Motor	do	303	338
Aviation	do	11	30
Kerosine and jet fuel	do	1,003	1,231
Distillate fuel oil	do	861	871
Residual fuel oil	do	384	273
Lubricants, including grease	do	26	26
Other:			
Liquefied petroleum gas	do	10	9
Naphtha	do	20	29
Unspecified	do	r 4 9	4 11
Total	do	r 2,627	2,818
Mineral tar and other coal-, petroleum-, or gas-derived crude chemicals	42-gallon barrels	4 766	4 112

r Revised.
1 Excludes tube and pipe fittings valued at $167,280 in 1971 and $346,917 in 1972.
2 Less than ½ unit.
3 Value only reported at US$85.00.
4 Partial figure.

NAURU AND OCEAN ISLAND [8]

The Republic of Nauru and Ocean Island (the latter a member of the Gilbert and Ellice Islands) lie northeast of Australia about 160 miles apart. The production of phosphate rock is the sole industry on both islands; the entire output is exported. During 1973 their total production increased 65% over that of 1972 owing to increased demand by Australia and New Zealand, which take over 95% of the output.

A 32,000-deadweight-ton bulk carrier was launched in Japan late in 1972 for service between Nauru and Australia. It was the largest yet to be employed in that phosphate-shipping trade.[9]

The Nauru Phosphate Corp., which succeeded the British Phosphate Commission when the island attained independence, was installing a calcination plant during 1973 that was scheduled to be in operation by 1975. Surface rock not presently exported will be treated in the new plant; the product is expected to be lower in both carbon and cadmium than the untreated rock. Capacity of the two calciners in the plant is expected to be approximately 400,000 tons per year.

[8] Prepared by William F. Keyes, physical scientist, Division of Nonmetallic Minerals—Mineral Supply.
[9] Phosphorus & Potassium (London). No. 63, January–February 1973, p. 7.

A phosphatic fertilizer plant was to be built in Gresik, eastern Java, by the Mitsubishi group of Japan; the plant will use rock from Nauru and will produce 200,000 to 275,000 tons per year of triple superphosphate.

It was estimated that reserves of phosphate rock on Ocean Island would be exhausted by 1980 at the present rate of mining, and the island would then be abandoned.[10]

NEW CALEDONIA [11]

In 1973, New Caledonia was the second largest producer of nickel among market economy countries. The island's principal nickel producer for over 90 years has been Société Le Nickel S.A. (SLN). Nevertheless, significant quantities of ore, mainly for export, have been produced by a group of small operators known as Le Syndicat Indépendant des Mines. Overall nickel production in 1973 increased 11% compared with that of 1972. More specifically, ore production increased 6%, matte production increased 5%, and ferronickel production decreased 1%. Exports of nickel ore to Japan increased 27%. Development plans for New Caledonian laterite deposits were either delayed or revised in 1973. International Nickel Co. of Canada, Ltd. (INCO) was again unable to secure an agreement with the French Government for rights to develop laterite deposits in New Caledonia. Kaiser Aluminum and Chemical Corp. was apparently successful in dissolving their partnership with SLN in the jointly owned New Caledonian Nickel Co.

PRODUCTION

Nickel ore production increased in 1973 to 5,850,000 tons compared with the 5,512,298 tons produced in 1972, but this amount was still far short of the record high of 7,722,277 tons produced in 1971. SLN was again the island's principal producer. SLN's Doniambo refinery produced 57,235 tons of nickel in 1973 (21,476 tons in matte and 35,759 tons in ferronickel), compared with 56,230 tons of nickel produced in 1972 (20,059 tons in matte and 36,171 tons in ferronickel).

A small quantity of jade (1,280 kilograms) was produced in 1973, down 9% from that produced in 1972.

TRADE

Mineral exports, principally nickel ore, ferronickel, and nickel-cobalt matte, were valued at about $177.3 million in 1973, compared with $194.8 million in 1972. Exports of nickel ore, mainly to Japan, increased from 2.2 million tons in 1972 to 2.8 million tons in 1973. The nickel content of ore exported in 1973 averaged 2.46% nickel plus cobalt. Exports of ferronickel and matte in 1973 totaled 50,142 tons (nickel content), compared with 58,676 tons in 1972. The 50,142 tons of nickel exported in 1973 consisted of 33,358 tons in ferronickel and 16,784 tons in matte. Most of the exported ferronickel (63%) and matte (63%) went to France. The remaining ferronickel was exported to the United States (27%), Japan (5%), the Netherlands (3%), and Austria and Australia (2%). Of the remaining matte, Japan and the United States received 22% and 15%, respectively.

[10] Work cited in footnote 3.

[11] Prepared by John D. Corrick, physical scientist, Division of Ferrous Metals—Mineral Supply.

Table 5.—New Caledonia: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1971	1972	1973
Nickel ore ---------- thousand tons--	3,832	2,224	2,803
Smelter products, nickel-cobalt content: [1]			
Ferronickel:			
Electric grade (FN4 grade, 25.1% nickel-cobalt) ----------	11,042	14,714	9,028
Sulfur extracted grade (FN3 grade, 24.5% nickel-cobalt) --	9,006	14,219	7,786
Refined grade (FN2 grade, 26.3% nickel-cobalt) ----------	557	598	527
Overrefined grade (FN1 grade, 27.5% nickel-cobalt) --------	8,446	9,826	7,518
Other (FNC grade, nickel-cobalt content not specified) ------	--	--	8,499
Nickel matte (79% nickel-cobalt) ----------	15,796	20,645	16,784

[1] Data for 1973 represent contained nickel only.
Source: Mines Service of New Caledonia.

Table 6.—New Caledonia: Imports of selected mineral commodities

(Metric tons)

Commodity	1971	1972
Cement, hydraulic	124,606	[1] 55,385
Coal and coke	210,914	122,000
Petroleum refinery products	518,978	519,000

[1] Partial figure; from selected industrial countries reported in World Trade Annual of 1972, V. 3, Statistical Office of the United Nations, New York, 1974.

COMMODITY REVIEW

Nickel.—Production of nickel ore in New Caledonia in 1973 was 6% greater than that of 1972. Nickel smelter production in 1973 increased 2% over that of 1972. More specifically, ferronickel output decreased by 1%, whereas matte production increased by 5%. With a settlement of price differences between Japanese consumers and the independent mining industry in New Caledonia, exports of nickel ore to Japan increased 7% in 1973.

New Caledonia's principal nickel producer, SLN, experienced considerable difficulties in 1973. Major problems were export duties, averaging 11% ad valorem, and the revaluation of the franc by 20% against the U.S. dollar in 1973. At yearend, the French Government had proposed that the New Caledonian administration reduce the tax burden on SLN in 1974 by about $13 million. The French Government also proposed that the New Caledonian Power Utility (ENERCAL) buy SLN's power station for approximately $45 million.

At yearend, Kaiser Aluminum and Chemical Corp. announced an agreement whereby SLN would purchase Kaiser's 50% interest in the New Caledonian Nickel Co. This would give SLN full ownership of the company. The transaction was contingent upon necessary government approvals and actions.

Early in 1973, SLN suffered the partial loss of one of its electric furnaces at the Doniambo refinery. The loss occurred when water entered the furnace. No casualties were reported. Another accident at the beginning of 1973 resulted in an explosion that killed four workers and injured several others. At midyear, SLN installed its third 33,000-kilowatt furnace at Doniambo. The new addition increased SLN's smelter capacity to about 85,000 tons per year of nickel contained in ferronickel and matte. The company commissioned a new mine at Si Reiss II during 1973. When the new mine reaches capacity, the mining complex will be able to produce 2.4 million tons per year of ore. In addition to ore supplied to the Doniambo refinery, SLN exported 744,317 tons of ore to Japan, which was 26.5% of the total ore exported from New Caledonia. SLN and two independent mining companies accounted for over 60% of the ore exported in 1973; the remaining 40% was divided between 11 other independent companies.

INCO submitted a proposal in February 1973 for mining a low-grade lateritic ore body near Goro on the island's southernmost extremity; the proposal had not been acted upon by the French at yearend. If the proposal is approved, INCO expects to produce approximately 20,000 tons per year of nickel and 400 tons per year of cobalt by 1978. Capital investment in the project had been estimated at $275 million. The company planned to more than double the output of nickel to 45,000 tons per year at a later date. The project was dependent upon INCO acquiring mining rights to the Goro deposits, which are presently held by the French State Bureau de Recherches Géologiques et Minières (BRGM). Another project involving the Goro deposit was submitted by Freeport Minerals Corp. of the United States and Société Nationale des Pétroles d'Aquitaine (SNPA) of France. The Freeport-SNPA proposal called for using Freeport's acid leach process (originally developed to treat Cuban lateritic ores). Discussions held early in 1973 between Freeport, SNPA, and INCO for the joint development of the Goro deposits failed to produce any significant results.

A third project still active at yearend was the proposal of two French firms, Compagnie Française d'Entreprises Minières Metallurgiques et d'Investissements (COFREMMI) and Péchiney Ugine Kuhlmann, and the Swedish Gränges AB to develop garneritic ores at Tiebaghi in northwestern New Caledonia. COFREMMI, a Patino subsidiary, was to operate the mine and sell

the ore at a profit to the smelter, which was to be owned by all three partners. Near yearend, Péchiney and Gränges withdrew from the Tiebaghi project. Nevertheless, COFREMMI indicated it planned to proceed on its own. Reportedly, government approval had been received and financing was being arranged at yearend. The project was tentatively scheduled for completion by 1975 and would have a capacity of 36,000 tons per year of nickel in ferronickel.

During 1973, a delegation representing the Japanese ferronickel smelting industry attempted to negotiate a price reduction on imports of New Caledonian ore into Japan. The delegation reportedly claimed that Indonesian ore was proving cheaper than New Caledonian ore. Japan remained the principal market for New Caledonian ore in 1973, although the French reportedly have been exploring the possibility of selling ore to the People's Republic of China. At midyear, Japanese stockpiles of New Caledonian ore were estimated at about 800,000 tons.

NEW HEBRIDES [12]

During 1973, the New Hebrides reported no new activities in the mineral industry. The Forari mine on Efate (Vate) Island remained active and produced 16% more manganese than in 1972. The manganese was exported as a 42% concentrate. Production and export data for the past 10 years are as follows, in metric tons of contained manganese:

Year	Production	Exports
1964	23,454	25,607
1965	26,229	31,629
1966	29,553	25,236
1967	27,658	27,948
1968	21,306	17,432
1969	--	--
1970	5,948	11,057
1971	5,811	5,776
1972	10,942	14,548
1973	12,674	NA

NA Not available.

PAPUA NEW GUINEA [13]

Two significant events occurred in the Australia-administered territory of Papua New Guinea during 1973. First, self-government was granted in December, and full independence was scheduled for late 1974. Secondly, 1973 marked the first full year of operation at the massive copper mine at Panguna on Bougainville Island; commercial production had started in April 1972. The open pit mine and auxiliary installations involved an initial investment of about $400 million [14] financed through both private banks and public institutions. The mine, operated by Bougainville Copper Pty. Ltd. (BCP), had a substantial impact on the Papua New Guinea economy. The country's total export earnings in 1973 were $420 million, of which BCP exports accounted for $275 million. Bougainville Mining Ltd. holds 80% of the stock in BCP; the remaining 20% is held in trust by the Administration of Papua New Guinea. In turn, Conzinc Riotinto of Australia Ltd. (CRA) owns two-thirds of the stock of Bougainville Mining, and New Broken Hill Consolidated Ltd. owns the remaining one-third.

Despite its impact on the economy, the Bougainville mine did not make a major contribution to employment in Papua New Guinea, although it did constitute a significant share on the island of Bougainville. Employment at the mine totaled about 3,500, compared with the total adult male population of 21,000 on Bougainville Island. BCP has a well-developed training program, including a mine training center, an apprenticeship program, and scholarships at colleges and institutes. The company also continued to develop housing and other amenities at the mine and the coastal town of Arawa.

Another significant copper mine may be developed in Papua New Guinea if agreement is reached between the Papua New Guinea Government and Kennecott Pacific Pty. Ltd. (Australian subsidiary of Kenne-

[12] Prepared by Robert A. Clifton, physical scientist, Division of Nonmetallic Minerals—Mineral Supply.

[13] Prepared by Charlie Wyche, physical scientist, Division of Nonferrous Metals—Mineral Supply.

[14] Where necessary, values have been converted from Australian dollars ($A) to U.S. dollars at the rate of $A1=US$1.43.

cott Copper Corp.) on the OK Tedi copper project in northwestern Papua New Guinea. Mineral output on the small offshore islands of New Britain, New Ireland, Manus, Misima, and many smaller islands remained insignificant.

PRODUCTION

The mineral production for Papua New Guinea is shown in table 1.

COMMODITY REVIEW

Metals.—*Copper.*—Although the magnitude of the BCP operation at Panguna was anticipated in advance, the actual production figures were still impressive. The mine, plant, and ancillary facilities operated efficiently throughout the year, but the most important factor that contributed to BCP's high earnings was the large increases in world metal prices. In mid-December, the official price for electrolytic copper wire bars on the London Metal Exchange was $1,778 per ton, up from $826 per ton at the beginning of the year. During 1973, about 29 million tons of ore was milled at a head grade of 0.73% copper and 0.032 ounce of gold per ton. This was well in excess of the mine reserve grade of 0.48% copper and 0.018 ounce of gold per ton in the 900-million-ton ore body.

The Panguna mineralization is predominantly in the form of chalcopyrite with some bornite, principally in long thin veins. Some intrusive rock contains minor amounts of disseminated chalcopyrite. The chalcopyrite contains gold and silver. Pyrite and magnetite are present along veins and in disseminated form, and a small quantity of molybdenite is present. The primary ore is covered by secondary and oxidized ore and in some places by boulders, volcanic ash, and alluvium. There are two main zones of higher grade mineralization, Panguna Hill and Barapinang River. The reserves in these areas are estimated at 770 million tons, containing 0.47% copper, and 0.02 troy ounce of gold per ton.

The most encouraging aspect of BCP's operation was the increased copper recovery, resulting from mining primary sulfides. The daily mill tonnage throughput during the year approached design capacity. Several modifications were made in concentrate processing that contributed to the successful production. The plant modifications enabled the concentrator to maintain capacity when treating harder ore that had caused slower crushing rates and higher in-plant circulating loads. The addition of a 7-foot Symons Standard secondary cone crusher and two 7-foot Symons Short Head tertiary cone crushers made a total of 7 secondary and 14 tertiary cone crushers in operation in the fine crushing plant. The fitting of finer cloths to the tertiary screens provided finer ball mill feed and increased ball mill capacity. Five conveyors were increased in speed to handle the higher circulating loads with a greater degree of safety. The addition of an 18- by 24-foot Allis-Chalmers overflow ball mill to the grinding section in the concentrator building made a total of nine of large ball mills in operation. To accommodate the additional ball mill, the storage capacity for recovered fine ore was increased to 75,000 tons.

All buyers under sales agreement with BCP received deliveries at the contracted level during the year. These deliveries absorbed virtually all of the available production, and no additional concentrate sales were made. Total sales for the year amounted to 637,652 dry tons of concentrate containing 176,541 tons of copper, 634,558 ounces of gold, and 1,390,775 ounces of silver. During the year, requests were received from Japanese buyers, from Norddeutsche Affinerie (West Germany), and from Rio Tinto Patiño S.A. (RTD) (Spain) for an adjustment in treatment charges to compensate for the adverse changes in major international currencies.

Kennecott Copper Corp. continued studies to determine whether it should develop its remote OK Tedi deposit. This deposit, with proven reserves of 151 million tons assaying about 0.75% copper and 0.17 ounce of gold per ton is near the headwaters of the Fly River. An open pit mine to produce 30,000 tons of ore per day has been proposed. At this mining and milling rate, about 95,000 tons of copper in concentrate and 240,000 ounces of gold would be produced annually during the early years of operation. Kennecott submitted a detailed set of conditions to the Papua New Guinea Government under which it is prepared to develop the deposits. The firm proposed that the Government advance $70 million of the estimated $395 million cost. Japan is the anticipated market for the concentrate.

Kenneco Explorations (Australia) Pty.

Ltd., subsidiary of Kennecott Copper Corp., reported encouraging diamond drilling results at its Yandara porphyry copper deposits on the north slope of the Bismark Range. Core from one hole over a length of 673 feet assayed 0.46% copper and 0.12% molybdenum sulfide. The best section, 217 feet long, assayed 0.68% copper and 0.33% molybdenum sulfide.

Another promising porphyry copper deposit is located on Manus Island, and is known as Arie. The deposit is on a 29-square-mile claim block held by Exoil N.L. and Trans-Oil N.L. The two partners (70% Exoil) have drilled a number of holes and found encouraging copper mineralization. Other copper mineralization has been found cropping out, but has not been diamond drilled by the partnership.

At the Frieda copper prospect, geological work continued under the program to determine the viability of this large but low-grade deposit.

At Porgera, in the western highlands of Papua New Guinea, Mount Isa Mines Ltd. found 1.8 million cubic meters of gold-bearing alluvials. Permission to develop the area was received from the Papua New Guinea Government and production should start in early 1974. A major drilling program on the lateritic nickel deposit in the Ramu area was undertaken.

Mineral Fuels.—*Petroleum.*—Australasian Petroleum Co. Pty. Ltd. (APC), a subsidiary of Oil Search Ltd. of Sydney, continued to conduct extensive exploration work in the Gulf of Papua. Two U.S. companies, Phillips Petroleum Co. and Texaco, Inc., were also active in the gulf region. Elsewhere, Shell Development (Australia) Pty. Ltd. and Australian Gulf Oil Co., conducted a second-phase marine seismic survey in December in the offshore Bougainville area. The exploration program will be continued when results of that survey are interpreted.