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Minerals Yearbook

1986

Volume III

AREA REPORTS: INTERNATIONAL

Prepared by staff of the

BUREAU OF MINES

UNITED STATES DEPARTMENT OF THE INTERIOR • Donald Paul Hodel, Secretary

BUREAU OF MINES • T S Ary, Director

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

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Foreword

This edition of the Minerals Yearbook discusses the performance of the worldwide minerals industry during 1986 and provides background information to assist in interpreting developments during the year being reviewed. Content of the individual volumes follows:

Volume I, Metals and Minerals, contains chapters on virtually all metallic and industrial mineral commodities important to the U.S. economy. In addition, it includes a statistical summary chapter, a chapter on mining and quarrying trends, and a chapter discussing the statistical surveying methods used by the Bureau of Mines.

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

Volume III, Area Reports: International, contains the latest available mineral data on more than 150 foreign countries and discusses the importance of minerals to the economies of these nations. A separate chapter reviews the international minerals industry in general and its relationship to the world economy.

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

T S Ary, *Director*

Acknowledgments

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

The text and tables of this volume were prepared by the staff of the Division of International Minerals, Assistant Directorate, Minerals Information. Final correlation and checking of this volume was performed by the Division of Publication.

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

Ebraham Shekarchi, *Chief, Division of International Minerals*

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Minerals in the World Economy

By Charles L. Kimbell[1] and William L. Zajac[2]

The year 1986 was not a good year for the world's mineral industry from several viewpoints. Levels of production, both of crude minerals and processed forms, registered declines in the cases of a greater number of commodities than the number that recorded increases. The overall value of world crude mineral production was estimated to have increased, but only very slightly in terms of constant dollars to nearly $997 billion. Although there were modest increases in the consumption of all major fuels and most major metals, the latter at least apparently resulted more from drawdowns of inventories than from increased production (fuel consumption increases did come from higher output levels), and consumption of most major fertilizer and chemical commodities (nitrogen, phosphate, and sulfur) were at lower levels than those in 1985. Prices for a number of mineral commodities declined, headed by the very substantial drop in world crude petroleum prices, but also including downturns for a number of metals and industrial minerals as well.

There was insufficient information to reliably fix the level of the dollar value of world trade in minerals, for while output was up in the case of some large-volume materials such as iron ore, coal, and crude and refined petroleum, suggesting that the volume of trade in physical units may have increased, declining prices may well have offset quantitative gains.

The levels of mineral industry development activity around the world, of course, were not uniform from area to area, nor were they uniform for all commodities. Limited reporting on investment in centrally planned economy countries suggests continued growth, although often short of planned goals, and overall investment expenditures for the steel industry in major market economy steel-producing countries showed an increase, but these seemingly brighter aspects had to be viewed against evidenced downturns elsewhere.

In the case of shipping involved in moving mineral commodities, there were downturns in both the number of vessels and the aggregate tonnage for all major classes of ships—bulk carriers, freighters, and tankers.

Almost without doubt, the single most noteworthy mineral industry news item in 1986 was the nuclear powerplant disaster at Chernobyl, in the Ukrainian region of the U.S.S.R., on April 26. While the officially reported death toll of 31 made the disaster minor by comparison with airplane crashes, the long-term effect, particularly in the immediate vicinity of the plant but also extending across virtually all of the European U.S.S.R., all of the East European countries, all of West Europe (save for Belgium, Ireland, Luxembourg, the Netherlands, Portugal, Spain, and the United Kingdom), and even reaching to Iceland, was yet to be truly and completely assessed. Neither could one assess the impact of the disaster on future nuclear powerplant development, but surely there has been an impact, both on the desirability of such plants and on the design of the plants and the safety provisions concerning them.

Elsewhere, the Iran-Iraq war assuredly impacted on the world's mineral industry. Both nations attacked each other's oil production, handling, processing, and loading facilities as well as each other's tankers, but Iran's efforts spread to boarding and searching vessels other than Iraqi vessels in international waters, and to firing on some neutral vessels there. Aside from these

events involving other nations, the war efforts of the two adversaries clearly sapped their own efforts at industrial development.

In Afghanistan, continued hostilities between the Soviet-backed central Government and dissident citizens of that country seemingly led to virtual paralyzation of development projects. A copper mine and smelter, reportedly ready to operate in late 1985, showed no sign of activity in 1986, and other projects backed and assisted by the U.S.S.R. and other East European countries similarly seemed to have failed to achieve production status. In Central America, although there seemed to be a reduction of guerrilla activities in Costa Rica, Honduras, and El Salvador, conflicts continued in Nicaragua, and the development of the whole region was presumably inhibited because of the general unsettled state of affairs.

Lack of foreign investment capital clearly served to retard mineral industry development in areas such as Brazil and Mexico, where already existing international indebtedness played a role in curtailing further expenditures. Falling oil prices undoubtedly impacted some other countries as well—those dependent upon oil revenues to finance such development.

In Africa, probably the most consistently newsworthy events involving mineral industry activities were the disinvestment efforts by companies involved in the Republic of South Africa and the continued state of unrest in the population of that country. Also noteworthy was the disaster at the Kinross gold mine, about 100 kilometers east of Johannesburg. There, a welder's torch ignited plastic wiring and polyurethane wall sealant, producing toxic fumes that killed 177 miners, the world's most costly mine disaster of the year.

Guerrilla warfare continued to inhibit mineral industry development in both Angola and Mozambique, and the U.S. retaliatory air strike against Libya posed a certain degree of threat to oil and gas loading activities there although the loading facilities themselves were not attacked.

PRODUCTION

The estimated value of world crude mineral production in 1986 was nearly $997 billion in terms of constant 1983 dollars, only slightly over two-tenths of 1 percent above the revised 1985 level, and still far short of the historic high set in 1980, as shown in the following tabulation, which is based heavily upon the data for 53 mineral commodities compiled for and published in the authoritative French language mineral industry journal, "Annales des Mines," for the year 1983:[3]

Year	Value of 53[1] major crude mineral commodities[2] (billion current dollars)	Billion constant 1983 dollars	
		Value of 53[1] major crude mineral commodities[2]	Value of all crude mineral commodities[3]
1950	25.9	103.5	117.9
1953	37.0	135.1	155.3
1958	50.0	173.5	208.5
1963	59.0	192.0	235.3
1968	77.9	222.3	269.8
1973	159.2	357.3	430.0
1978	477.0	728.5	824.1
1979	656.5	901.2	1,006.5
1980	951.2	1,150.9	1,269.2
1981	1,024.8	1,126.0	1,226.3
1982	892.6	922.1	991.9
1983	930.4	930.4	988.7
1984[r]	973.7	938.1	996.9
1985[r]	1,004.2	935.9	994.5
1986	1,032.8	938.1	996.9

[r]Revised.

[1]The list of commodities included appears in table 3 of the 1985 edition of this chapter; one commodity covered in 1950-68 (beryl) is excluded from the 1973-85 figures, but the overall impact of this omission is regarded as insignificant.

[2]Data for 1950, 1953, 1958, 1963, 1968, 1973, 1978, and 1983 are as reported in Annales des Mines, July-Aug.-Sept. 1985, p. 9. Data for 1979-82 have been derived from figures appearing in Annales des Mines, Nov.-Dec. 1981, pp. 198-199; Oct.-Nov. 1983, pp. 210-211; and Nov.-Dec. 1984, pp. 206-207, using appropriate price deflators. Constant dollar data for 1984-86, inclusive, are extrapolated from the 1983 Annales des Mines figures on the basis of the United Nations index of extractive industry production in the United Nations Monthly Bulletin of Statistics, May 1987, p. 256. Current dollar data for 1984-86, inclusive, are computed from the constant dollar extrapolated figures using the reciprocals of the most recent available implicit price deflators.

[3]Data extrapolated from values for 53 commodities to compensate for other (additional) mineral commodities. For details on the basis for this extrapolation, see accompanying text under "Value of World Mineral Production."

Using the data in the foregoing tabulation, and appropriate price inflators, the 1986 value of total world crude mineral production would be nearly $1,098 billion in terms of 1986 dollars, or 2.8% above the 1985 value of about $1,067 billion in terms of 1985 dollars.

Any presentation, however, such as the foregoing, which reflects only the value of crude mineral production, falls far short of adequately depicting the role of the entire minerals industry in the world economy, because such a presentation shows only the value of these materials as they are extracted from the earth, with nothing to demonstrate the value added to these materials through their beneficiation, smelting, refining, and other downstream processing while they remain within facilities that are commonly accepted to be mineral industry plants. Comprehensive world data on the value added by such processing are not available, but a total on the order of $2,400 billion (constant 1983 dollars) would be a conservative estimate of the value of the products of the world's mineral industry plants that were derived wholly from primary or newly mined materials only. To this, an additional unestimated increment should be added for the processed minerals and metals derived from secondary raw materials—scrap and other reclaimed substances.

It should be stressed that crude and processed mineral commodities constitute not only the overwhelmingly dominant share of the total raw materials supply for all manufacturing operations, but also, in the form of fertilizers and other soil treatment materials, are indispensable raw materials to ensure continued high production by the agricultural-forestry sector. Moreover, the mineral industry, through its output of the various fuel materials, provides all significant supplies of energy for the transportation of all goods from the crude agricultural and mineral materials through their finished products.

PRODUCTION INDEX PATTERNS

The following tabulation summarizes the development pattern in the world extractive mineral industry output over recent years, as reflected by United Nations industrial production indexes:

Year	Index numbers (1980=100)			
	Coal	Crude petroleum and natural gas	Metals	Extractive industry total
Annual averages:				
1978	93.6	r104.4	r97.5	r101.8
1981	100.3	r89.0	r100.0	r92.1
1982r	101.9	80.6	95.1	85.5
1983r	101.3	79.2	95.1	84.7
1984r	99.9	79.3	99.1	85.4
1985r	105.0	77.7	101.1	85.2
1986e 1	106.8	77.8	104.8	85.7
Quarterly results:				
1985:				
1st quarterr	103.4	80.7	100.5	86.7
2d quarterr	103.9	74.0	102.4	82.8
3d quarterr	105.6	76.2	100.1	84.1
4th quarter	107.2	79.8	101.6	87.0
1986:				
1st quarter	110.4	80.8	103.2	88.2
2d quarter	105.5	73.6	106.9	83.2
3d quarter	105.1	76.6	103.4	84.8
4th quartere	106.2	80.1	105.5	86.6

eEstimated. rRevised.
1Calculated from reported data for the 1st through the 3d quarters and estimates for the 4th quarter.

Source: United Nations. Monthly Bulletin of Statistics. V. 41, No. 5, May 1987, p. 256. Estimates are by the senior author.

The foregoing tabulation reflects a number of revisions from its corresponding version published in the previous issue of this chapter. Preliminary figures available when the preceeding edition was prepared suggested that 1985 was marginally a better year than 1984; the addition of more information reversed this pattern, and the above tabulation indicates that from the viewpoint of the extractive industry as a whole, there was a downturn between 1984 and 1985, the result of a substantial shortfall in the petroleum and natural gas sector; coal and metals mining recorded improvements.

For 1986, we again have indications of some improvement with respect to 1985, this with each of the three separately listed components, but the increases are small, with a midyear slump.

Comparison of the data in the foregoing tabulation with the following tabulation of indexes from the same source for certain processing sectors of the mineral industry demonstrates some interesting contrasts. Although the extraction of petroleum and natural gas showed only a tiny upturn in terms of the annual index, that for the processing of chemicals, petroleum, coal, and rubber products registered a substantial growth. On the other hand, metals extraction recorded a fairly significant gain while base metals production logged a very poor record, turning downward rather than up. The fabrication of nonmetallic mineral products edged upward. Annual and quarterly results for the processing industries were as follows:

Year	Index numbers (1980=100)		
	Non-metallic mineral products	Chemicals, petroleum, coal, rubber products	Base metals
Annual averages:			
1978	r95.7	95.6	99.8
1981	r98.0	r100.9	99.2
1982r	94.7	99.7	88.7
1983r	96.8	104.8	91.2
1984r	99.9	111.2	98.4
1985r	101.2	114.8	99.0
1986e 1	103.7	118.9	97.8
Quarterly results:			
1985:r			
1st quarter	94.5	115.0	100.2
2d quarter	105.3	116.2	101.9
3d quarter	102.6	113.1	95.2
4th quarter	102.4	115.1	98.6
1986:			
1st quarter	96.8	118.3	101.1
2d quarter	107.1	120.3	100.9
3d quarter	105.3	118.2	92.7
4th quarter e	105.4	118.6	96.5

eEstimated. rRevised.
1Calculated from reported data for 1st through 3d quarters and estimates for 4th quarter.

Source: United Nations. Monthly Bulletin of Statistics. V. 41, No. 5, May 1987, p. 257. Estimates are by the senior author.

Particularly noteworthy was the sharp drop registered for base metals in the third quarter of each year for which quarterly results are shown; the drop in 1986 was more substantial in terms of percentage than that in 1985, but the recovery in the fourth quarter of 1986 was also percentagewise more substantial. In the case of the chemical, petroleum, coal, and rubber products industries, the third quarter in both 1985 and 1986 also showed a notable slump, but the recovery in 1985 in the fourth quarter was much more significant than that registered in 1986.

Both of the foregoing tabulations of indexes reflect the aggregation of results from many world areas that individually showed quite variable results, both from area to area and across the years from quarter to quarter, as well as from sector to sector. For regional details too extensive to include here, the reader is referred to the source publication for these tabulations.

QUANTITATIVE COMMODITY OUTPUT

Of the 97 distinct mineral commodities and/or subdivisions of mineral commodities for which total world production, as measured by the U.S. Bureau of Mines, is presented in table 1 for 1982-86,[4] only 42 registered increases in 1986 relative to the 1985 level of production. Of the remainder, 53 showed declines and 2 were essentially unchanged from the 1985 levels. These results were clearly less satisfactory than those of 1985 when gains over 1984 output were registered for 67 of the 97 commodities, were much worse than in 1984 when gains relative to 1983 output were recorded for 80 of the 97 commodities, and were not as good as in 1983 when gains relative to 1982 output were noted for 51 of the 97 commodities. Indeed, only the very depressed year of 1982 was less satisfactory than 1986; in 1982, only 30 of the 97 commodities logged increases with respect to 1981 output levels, with 67 recording declines.

Of the 42 commodities for which output increases were logged between 1985 and 1986, 10 registered declines between 1984 and 1985, 6 showed gains for the second consecutive year, 9 recorded gains for the third year in a row, 6 registered higher output levels for the fourth consecutive year, and 11 showed continuous growth in output for 5 years or more. The latter group included the following, with the number of years of continually upward output: gem diamond, industrial diamond, byproduct sulfur, anthracite coal, and bituminous coal, 5 years each; gold, 7; secondary smelter copper, 8; cement and feldspar, 11 each; natural gas liquids, 12; and lignitic coal, 14. Of the 53 commodities reporting declines in output between 1985 and 1986, 34 had registered increases between 1984 and 1985, 16 recorded declines for the second consecutive year, and 3 recorded declines for the

third consecutive year. Of the two commodities for which 1986 output was on a par with that of 1985, one had recorded a downturn between 1984 and 1985, while the other showed an increase between those years.

Of the 50 listed metallic commodities, only 17 were produced in greater quantities in 1986 than in 1985, output of 32 declined and 1 was unaltered. Downturns in production of pig iron and crude steel were attended by declines in output of the ferroalloying ores—chromite, manganese, molybdenum, nickel, titanium (ilmenite), tungsten, and vanadium—although iron ore output was up marginally. Somewhat similarly, output of bauxite and alumina advanced while aluminum ingot output fell. In the case of copper, mine output was up, total smelter production dropped slightly where gains in secondary recovery failed to match declines in primary production, and refinery output advanced slightly with both primary and secondary output contributing to the growth. With lead, mine output, total smelter output, and total refined output were all lower than in 1985, although smelter recovery from secondary materials increased fractionally and secondary refinery output was unchanged. Tin output at both the mine and smelter stage fell, and the zinc industry registered no advance in output at any stage of production. Among the precious metals, only gold showed an upturn; production of both silver and platinum-group metals fell. Considering the metal production trends from the viewpoint of mine products as opposed to processed forms, only 9 of 27 mine products registered gains, and only 8 of 23 processed forms did so, with output of 1 processed form remaining unchanged.

Of the 36 nonmetallics grouped under the heading "Industrial Minerals," 17 recorded production increases between 1985 and 1986, while 18 registered declines and 1 was essentially unchanged. Key construction materials such as cement and gypsum continued to show increases, and natural diamond output showed phenomenal growth on the basis of Australia's huge increase, but agricultural fertilizer raw materials—nitrogenous, phosphatic and potassic—all declined, as did lime, used both as a fertilizer and a construction and chemical raw material. There was a small drop in total sulfur production, when a decline in elemental sulfur output was not matched by the increases attributed to production from pyrite and byproduct sources. Salt, the other key industrial chemical, as well as essential for the food industry, registered a very small growth.

The overall performance of the nonfuel mineral industry can only be summarized in terms of value of production, and for these commodities, exactitudes on a worldwide basis on a commodity-by-commodity basis are not available for any year subsequent to 1983 (see "Value of World Mineral Production"). Among fuel commodities, however, the overall pattern of output level changes and their interrelationships can be demonstrated by United Nations data, in which production results for each of the forms of primary energy are adjusted to a common energy equivalent basis. The following tabulation summarizes world energy commodity output for 1981-85 as reported by the United Nations, for the first time in this chapter's history distinguishing separately electricity produced by nuclear powerplants from that produced by hydroelectric and geothermal plants; the tabulation also includes U.S. Bureau of Mines estimates for 1986:

Year	Million metric tons of standard coal equivalent					
	Coal	Crude petroleum and natural gas liquids	Natural gas	Primary electricity		Total
				Hydro and geothermal	Nuclear	
1981	2,635	4,250	1,859	220	99	9,063
1982[r]	2,712	4,027	1,844	226	107	8,916
1983[r]	2,720	3,989	1,864	236	124	[1]8,932
1984[r]	2,840	4,078	1,998	244	149	[1]9,310
1985	2,978	4,024	2,052	249	178	9,481
1986[e]	3,037	4,209	2,099	255	205	9,805

[e]Estimated. [r]Revised.
[1]Data do not add to total shown because of independent rounding.

Sources: 1981—United Nations. 1984 Energy Statistics Yearbook. New York, 1986, p. 2; 1982-85—United Nations. 1985 Energy Statistics Yearbook. New York, 1987, pp. 2, 380; and 1986—U.S. Bureau of Mines estimates.

Electricity produced by nuclear plants and that produced by hydroelectric and geothermal plants was separated in the foregoing tabulation to clearly demonstrate the substantially higher growth rate for the former relative to that for the latter. Between 1981 and 1986, the production of primary electricity by nuclear plants has increased by 107%, while that by hydroelectric and geothermal plants has increased by only 16%. Annual increases for nuclear plant output varied from a low of 8.1% (1981-82) to a high of 20.2% (1983-84), in comparison with a low of 2.0% (1984-85) and a high of 4.4% (1982-83) for hydroelectric and geothermal plants. Although the aggregate contribution of these sources of primary electricity to total energy production reached only 4.7% in 1986, compared with 3.5% in 1981, and thus remains only a small fraction of total energy production, the rate of growth seems noteworthy when viewed against the changes registered for the other energy sources, particularly the liquid fuel sources, which registered a 1% decline, comparing 1981 results with those for 1986. Also deserving of comment is the 15% increase in coal-derived energy between 1981 and 1986, and the 13% increase in energy produced with natural gas. In comparison, the increase in total primary electricity (nuclear plus hydroelectric and geothermal) between 1981 and 1986 was over 44%. Nuclear plants produced nearly 45% of total primary electricity in 1986, compared with about 31% in 1981.

VALUE OF WORLD MINERAL PRODUCTION

The value of world crude mineral production in 1986 was estimated at $996.9 billion in constant 1983 dollars. Details on the methodology employed to prepare this estimate are summarized in the 1985 edition of this chapter, to which the reader is referred.

GEOGRAPHIC DISTRIBUTION OF WORLD MINERAL OUTPUT VALUE

Available information is inadequate to reliably extrapolate to 1986 the 1983 data on geographic distribution of world crude mineral output value published in the July-September 1985 edition of "Annales des Mines," and reproduced in summary form in the 1985 edition of this "Minerals Yearbook" chapter. These data for 1983 appear in the 1985 "Minerals in the World Economy" chapter together with corresponding figures for 1950 and 1978, together with some textual comments on this material. The reader is referred to this publication, as well as to its original source for further information.

COMMODITY DISTRIBUTION OF WORLD MINERAL OUTPUT VALUE

As was the case with geographic distribution of world mineral output value, the inadequacy of data precludes any reliable extrapolation to 1986 of the various commodities' shares of the totals shown for 1983 in the 1985 edition of this chapter. Clearly some major shifts in percentage shares, if not in ranking, will have occurred as a result of price changes—for example, the huge drops in crude oil prices and the upturn in gold's unit price. For details on the 1983 distribution of the total, the reader is referred to the 1985 edition of this chapter, particularly to table 3, and to the source publication for that table.

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

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum:					
Bauxite, gross weight[2] thousand metric tons	80,917	80,218	89,355	85,894	87,524
Alumina, gross weight do	27,972	29,514	33,533	31,617	32,309
Unalloyed ingot metal do	13,433	13,908	15,707	15,351	15,314
Antimony, mine output, Sb content metric tons	55,457	50,694	54,711	56,094	59,892
Arsenic, trioxide[3] do	43,572	42,126	48,402	54,731	55,456
Beryl concentrate, gross weight[3] do	8,167	9,026	8,936	8,140	8,958
Bismuth[4] do	4,109	3,981	3,745	4,762	4,066
Cadmium, smelter do	16,387	17,444	19,114	18,634	18,257

See footnotes at end of table.

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

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS —Continued					
Chromite, gross weight[3] thousand metric tons	8,480	8,222	9,758	10,551	10,336
Cobalt:					
Mine output, Co content metric tons	24,567	23,722	32,549	36,391	36,151
Metal, refined do	19,293	17,585	23,128	26,300	27,508
Columbium-tantalum concentrate[3 5] do	25,455	21,146	35,724	38,185	36,277
Copper:					
Mine output, Cu content thousand metric tons	7,622	7,662	7,974	8,088	8,156
Metal:					
Smelter:					
Primary[6] do	7,367	7,514	7,682	7,673	7,617
Secondary[7] do	584	622	722	911	937
Refined:					
Primary[6] do	7,738	7,983	7,983	8,084	8,218
Secondary[7] do	1,264	1,266	1,158	1,321	1,331
Gold, mine output, Au content thousand troy ounces	43,105	44,996	46,475	48,673	50,937
Iron and steel:					
Iron ore, iron ore concentrates, iron ore agglomerates, gross weight thousand metric tons	780,778	740,043	834,913	851,106	861,526
Metal:					
Pig iron do	457,428	462,883	496,005	503,866	495,774
Ferroalloys do	13,148	13,035	14,981	14,817	14,609
Steel, crude do	643,975	662,784	710,245	716,709	707,451
Lead:					
Mine output, Pb content do	3,448	3,358	3,252	3,394	3,247
Metal:					
Smelter:					
Primary do	3,211	3,247	3,170	3,394	3,247
Secondary do	2,054	1,992	2,269	2,207	2,211
Refined:					
Primary do	3,172	3,233	3,151	3,365	3,191
Secondary do	2,043	2,024	2,294	2,288	2,288
Magnesium metal, smelter, primary metric tons	253,920	260,140	327,003	328,739	325,521
Manganese ore, gross weight thousand metric tons	24,223	21,906	23,683	24,414	24,236
Mercury, mine output, Hg content 76-pound flasks	197,901	180,835	195,331	195,823	175,820
Molybdenum, mine output, Mo content metric tons	94,976	63,782	97,194	98,141	91,581
Monazite concentrate (source of rare-earth metals and thorium) do	16,459	26,044	28,784	30,205	17,904
Nickel:					
Mine output, Ni content thousand metric tons	621	675	770	802	784
Metal, smelter do	586	646	712	732	735
Platinum-group metals, mine output thousand troy ounces	6,424	6,525	7,648	7,938	7,834
Selenium, smelter[3 5] metric tons	1,119	1,323	1,379	[4]1,176	[4]1,074
Silver, mine output, Ag content thousand troy ounces	371,159	386,533	412,069	421,041	419,781
Tellurium, smelter[3 4 5] metric tons	100	87	100	97	86
Tin:					
Mine output, Sn content do	219,463	196,641	198,422	188,653	180,237
Metal, smelter do	221,032	200,124	201,055	196,633	189,933
Titanium concentrate, gross weight:					
Ilmenite[8] thousand metric tons	3,029	[4]2,674	[4]3,442	[4]3,441	[4]3,402
Rutile[3 4] do	339	310	341	376	398
Titaniferous slag do	1,050	1,052	1,143	1,279	1,285
Tungsten, mine output, W content metric tons	47,027	40,925	46,172	46,535	42,474
Uranium oxide, mine output, U_3O_8 content[3 5] do	46,380	42,388	42,105	41,621	43,788
Vanadium, mine output, V content do	32,771	28,054	31,108	30,208	29,756
Zinc:					
Mine output, Zn content thousand metric tons	6,125	6,368	6,602	6,857	6,853
Metal, smelter:					
Primary[6] do	5,532	5,887	6,162	6,502	6,463
Secondary[7] do	362	362	360	352	321
Zirconium concentrate[4] do	710	668	735	746	703
INDUSTRIAL MINERALS					
Asbestos do	4,559	4,729	4,659	4,678	4,522
Barite do	7,259	5,374	5,805	5,985	4,902
Boron minerals do	2,271	2,235	2,518	3,069	3,206
Bromine[3] do	383	364	397	381	371
Cement, hydraulic do	887,358	916,613	940,754	957,751	997,811

See footnotes at end of table.

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

Commodity	1982	1983	1984	1985[p]	1986[e]
INDUSTRIAL MINERALS —Continued					
Clays:[3]					
Bentonite thousand metric tons	8,050	8,095	8,749	8,702	8,383
Fuller's earth[5] do	1,975	2,208	2,235	2,370	2,210
Kaolin do	17,935	19,313	20,667	22,311	22,619
Corundum, natural metric tons	18,795	14,643	9,222	9,257	9,217
Diamond:					
Gem[e] thousand carats	10,243	23,039	26,073	26,320	39,157
Industrial[e] do	30,188	32,353	37,354	39,825	52,676
Total do	40,431	55,392	63,427	66,145	91,833
Diatomite[3] thousand metric tons	1,715	1,702	1,750	1,817	1,789
Feldspar[3] do	3,523	3,566	3,831	4,079	4,201
Fluorspar do	4,534	4,225	4,786	4,874	4,869
Graphite[4] metric tons	562,390	602,398	618,937	610,181	610,388
Gypsum thousand metric tons	72,476	78,485	80,747	85,129	87,594
Iodine metric tons	12,254	12,541	12,437	12,707	12,852
Lime[3] thousand metric tons	109,110	110,182	113,960	112,034	110,523
Magnesite[4] do	11,389	11,114	11,945	14,267	12,351
Mica[3] do	216	243	276	253	263
Nitrogen: N content of ammonia do	75,919	79,438	86,122	87,977	87,041
Perlite do	1,660	1,545	1,640	1,635	1,631
Phosphate, gross weight:					
Phosphate rock do	127,382	139,388	150,163	146,664	137,063
Thomas slag do	2,825	2,384	2,637	2,625	2,389
Guano do	20	6	6	9	9
Potash, marketable, K_2O equivalent do	24,510	27,418	29,334	29,051	28,248
Pumice[3 5] do	11,688	11,903	11,278	10,963	10,451
Salt do	164,265	159,121	172,543	173,785	174,381
Sodium compounds, n.e.s.:[3]					
Carbonate do	26,807	27,892	28,245	28,240	28,452
Sulfate do	4,381	4,234	4,247	4,389	4,298
Strontium minerals[3 5] metric tons	139,463	150,582	139,512	165,472	166,055
Sulfur, elemental basis:					
Elemental[9] thousand metric tons	13,829	12,699	14,035	14,997	14,255
From pyrites do	9,748	9,721	9,502	9,938	10,091
Byproduct[10] do	26,982	27,878	28,959	29,652	29,815
Total do	50,559	50,298	52,496	54,587	54,161
Talc, soapstone, pyrophyllite do	7,062	7,059	7,616	7,857	7,737
Vermiculite[3 5] metric tons	508,387	444,215	494,023	504,372	516,929
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[3 5] thousand metric tons	4,022	4,295	4,347	4,441	4,370
Coal:					
Anthracite million metric tons	228	298	310	317	323
Bituminous do	2,658	2,665	2,798	2,961	3,028
Lignite do	1,027	1,047	1,096	1,143	1,157
Total do	3,913	4,010	4,204	4,421	4,508
Coke:[11]					
Metallurgical thousand metric tons	340,649	330,442	341,463	349,106	343,254
Other do	11,578	11,681	11,839	11,824	11,821
Gas, natural, marketed billion cubic feet	54,477	54,669	59,463	61,656	63,060
Natural gas liquids[3] million 42-gallon barrels	1,393	1,439	1,626	1,608	1,645
Peat thousand metric tons	257,093	255,971	251,848	241,587	246,608
Petroleum:					
Crude million 42-gallon barrels	19,414	19,233	19,807	19,471	20,369
Refined do	20,830	20,449	22,172	21,361	22,106

[e]Estimated. [p]Preliminary.

[1]Incorporates numerous revisions from the table corresponding to this table in previous editions of this chapter. Figures generally conform to those published in appropriate commodity chapters of volume I of the "Minerals Yearbook," 1986 edition.

[2]Includes bauxite equivalent of nepheline syenite concentrate and alunite ore produced in the U.S.S.R. (the only producer on record of such materials as a source of aluminum).

[3]Excludes data for China (no adequate basis for estimation available).

[4]Excludes data for the United States (withheld to avoid disclosing company proprietary data).

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

[6]Includes all metal clearly identified as primary as well as all metal that cannot be subdivided clearly between primary and secondary (see footnote 7).

[7]Includes only that metal that is clearly identified as secondary. Some countries do not distinguish between primary and secondary, and for some of these, no basis is available for estimating the breakdown of total production. For such countries, the total has been included under "Primary" (see footnote 6).

[8]Includes leucoxene.

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

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

[11]Production of coke other than metallurgical by China and the U.S.S.R. is included with "Coke: Metallurgical."

TRADE

In 1985, the aggregate value of total world international trade in mineral commodities was estimated at $602.6 billion (current dollars), about 4.6% below the 1984 level, and 24.7% below the historic record high set in 1980. Comparable data for 1986 were not available in time for inclusion in this chapter, but incomplete results suggest that the 1986 level will prove to be below that registered for 1985, again as a result of declining values for energy commodities. The following tabulation summarizes the decline in mineral commodity export values from the peak year of 1980 through 1985, and clearly shows the consistent decline in the role of that trade in total commodity trade:

Year	Estimated value of all mineral commodities traded (million current dollars)	Change from previous year (percent)	Mineral commodities' share of all commodities traded (percent)
1980[r]	$800,500	+37.7	40.0
1981	764,600	[r]-4.5	38.9
1982[r]	693,900	-12.7	37.5
1983[r]	631,700	-9.0	34.8
1984[r]	631,600	-.0	33.1
1985	602,600	-4.6	31.7

[r]Revised.

Table 2, which serves as the basis for the estimates of total mineral trade that appear in the foregoing tabulation, provides reported data on the value of major mineral commodity groups' trade and total commodity trade for 1980-85. Details on major mineral commodity trade by region, such as was provided in tables 8 through 10 in the 1976 edition of this chapter, may be obtained for more recent years from the United Nations "Monthly Bulletin of Statistics" for May 1987.

Table 3 demonstrates the declining role of major mineral commodity trade accounted for by mineral fuels since the recent peak years of 1981 and 1982. Percentage changes in the dollar values for the major mineral commodity groups are given in table 6.

CONSUMPTION

NONFUEL MINERAL COMMODITIES

In contrast to the pattern of world mineral production, in which more commodities recorded declines between 1985 and 1986 than registered increases, available statistics on consumption suggest a general pattern of increase in 1986; of the commodities listed in table 5, only iron and steel scrap, nickel, nitrogenous fertilizers, phosphatic fertilizers, and sulfur registered declines, and only in the case of iron ore was the consumption level estimated to be on a par with that of 1985. The other metals and potassic fertilizers all showed increases for 1986. Examining the nonferrous metals, for which the distribution of consumption has been provided between market economy countries and centrally planned economy countries, there were differences in trends between the two areas in the cases of lead, magnesium, and tin. Increases in lead consumption in market economy countries were sufficient to compensate for a small downturn in that of centrally planned economy countries, and the world total increased. Similarly, a slight downturn in market economy country consumption of magnesium was more than compensated in the world total by increases in that of centrally planned economy countries, and a consumption decline in tin in centrally planned economy countries was less than the growth in use in market economy countries, so the world total here too advanced. Only in the case of nickel was consumption adjudged to be down between 1985 and 1986 for both major world areas.

These nonferrous metal consumption figures have been reported in this fashion, separating use by the two major country groups both because of the often disparate

patterns and because there are substantial differences between production estimates for these commodities made for the centrally planned economy countries by the U.S. Bureau of Mines and by Metallgesellschaft AG, the source for these consumption statistics. Inasmuch as such production figures are used to calculate the apparent consumption statistics published, a considerable difference would result if Bureau production estimates were to be substituted for those of Metallgesellschaft. For instance, if the Bureau estimates of aluminum production were substituted, the use of that metal in centrally planned economy countries would be lower by more than 100,000 tons from the figure given in table 5. Similarly, copper consumption, lead consumption, and zinc consumption would be lower. Figures for cadmium, magnesium, nickel, and tin, however, would be but little altered.

MINERAL FUEL COMMODITIES

Table 5 also includes data on consumption of energy, subdivided by energy source, but with all figures expressed in terms of standard coal equivalent (SCE) so as to make interfuel comparisons readily possible and to facilitate aggregation to make clear the picture of total energy consumption. From the data, it is evident that energy consumption advanced in 1986, both in terms of the total, and in terms of each of the four primary energy sources listed. It should be noted that worldwide energy consumption in all forms reached a new high in 1986, although the liquid fuel component was 6.3% below the historical high of 3,947 million metric tons SCE for that fuel set in 1979. Each of the other forms of primary energy listed reached a new record high in 1986.

INVESTMENT

Comprehensive world mineral industry investment data do not exist, but limited material published on aggregates of investment in some elements of the world mineral industry suggest an upturn in the investment level, at least in market economy countries in 1985 and 1986. Steel industry investments in Organization for Economic Cooperation and Development (OECD) countries are not yet available for 1986 but, as shown in table 6, increased almost 40% in 1985 for the organization as a whole with only Greece, Ireland, Portugal, and Turkey reporting slight decreases in their investments for the year. Included in table 6 this year for the first time are data on investment in the steel industry by the countries of Latin America. Although the pattern of increases and decreases in these investment levels in Latin America do not follow those of the OECD countries, it should be noted that the level of investment has been fairly stable for the past few years except in Brazil, where the investment level dropped by 64% in 4 years. If data for the world steel industry as a whole, including those of the centrally planned economy countries, were available, they would presumably show the same pattern as those reported, that is, with a general increase despite declines in some countries. However, the lack of comprehensive information on the centrally planned economy countries makes it impossible to determine whether the overall trend was up or down despite recorded increases or decreases in production of the materials involved.

Market economy petroleum industry investment as reported by the Energy Economics Group of the Chase Manhattan Bank, and as presented for 1980-84 in table 7 of the 1984 edition of this chapter, have not been updated by the source in sufficient time for inclusion here; thus, no table similar to that appearing in the 1984 edition has been included this year. Considering the plight of the petroleum industry, however, and considering the smaller number of working oil and gas drilling rigs in the United States alone in recent years, it would seem highly unlikely that investment in 1986 in the world petroleum industry reached the levels of even the early years of the 1980's. Even though there may have been a slight increase in total money invested in the petroleum industry in 1986, generally higher operating and nonoperating costs would have probably lowered the net amounts invested. With the petroleum industry, as with the steel industry, it is almost assured that the investment rate in centrally planned economy countries exceeded that of the rest of the world.

Data presented on U.S. foreign investment in mineral industry activity in earlier editions of this chapter are not comparable to those presented in table 7 of this chapter because of changes in 1986 in reporting by the source agency. These new data, however, indicate that while U.S. direct foreign

investment in the petroleum industry continues to rise somewhat each year, the opposite is true for direct foreign investment in the mining, smelting, and refining industries. The reverse, however, is the case for income from U.S. direct foreign investment with the income from the petroleum industry dropping each year while the income from investments in the foreign mining, smelting, and refining industries has increased almost tenfold in the past 4 years.

TRANSPORTATION

MARINE TRANSPORT

Bulk carriers, freighters, and tankers are the three classes of marine vessels engaged in transporting mineral commodities. It should be noted that vessels in each of these categories are not devoted wholly to mineral commodity transport. Bulk carriers move agricultural products as well as crude minerals and mineral fertilizers, while freighters, because of their great variety, can be devoted wholly to hauling mineral products or wholly to moving nonmineral goods, as well as carrying mixed mineral and nonmineral cargoes. Tankers, although largely engaged in moving crude oil and refinery products, also transport liquid chemicals, molasses, wine, and other fluids.

Although physical characteristics of vessels—size, draft, age, crew requirements, type of propulsion system, etc.—as well as fuel costs have an undeniable influence on shipping industry performance, problems of and changes in the quantity and quality and types of material moved also significantly affect the shipping sector of the world economy. Unfortunately, comprehensive data in this regard are not available.

Bulk Carriers.—During the first half of 1986, the world's bulk carrier fleet decreased relative to that at the end of 1985 by 73 vessels, compared with vessel increases of 227 and 176 in 1985 and 1984, respectively. During the first half of 1986, there was a slight decrease in the total deadweight tonnage of bulk carriers in contrast to that of 1985, each of which had an increase in total deadweight tonnage. The following tabulation shows the distribution of the bulk carrier fleet of the world for the first half of 1986:

Country of registry	Number of vessels	Deadweight tonnage (thousand long tons)
Liberia	708	37,364
Panama	944	31,039
Japan	478	25,800
Greece	699	24,905
Philippines	195	8,177
Korea, Republic of	169	7,374
China	189	6,243
Cyprus	187	5,733
U.S.S.R.	228	5,497
Italy	100	5,420
Norway	74	5,081
India	115	5,080
Brazil	92	4,768
Singapore	88	4,362
United Kingdom	88	4,091
Taiwan	62	4,075
Belgium	33	2,664
Romania	66	2,574
Poland	92	2,370
Spain	73	2,309
Turkey	61	2,228
Yugoslavia	66	2,010
Australia	33	1,805
Malta	58	1,776
Other	816	32,681
Total	5,714	235,426

Freighters.—The world's freighter fleet decreased during the first half of 1986 by 193 vessels compared with decreases of 82 vessels during 1985 and 249 during 1984. In contrast to the decrease in the number of vessels, both the average gross and the average deadweight tonnages again increased, continuing the trend of the past several years. The following tabulation shows the distribution of the freighter fleet of the world for the first half of 1986:

Country of registry	Number of vessels	Deadweight tonnage (thousand long tons)
Panama	2,025	18,102
U.S.S.R.	1,808	12,146
United States	419	7,459
Greece	643	7,286
China	714	7,241
Japan	636	6,248
Liberia	351	4,447
Germany, Federal Republic of	416	3,751
Cyprus	465	3,477
Singapore	278	3,125
United Kingdom	188	2,614
Netherlands	357	2,413
India	167	2,232
Taiwan	130	1,889
Yugoslavia	183	1,881
France	138	1,861
Denmark	160	1,823
Korea, Republic of	237	1,798
Italy	236	1,642
Philippines	209	1,548
Poland	178	1,537
Brazil	164	1,529
Other	3,642	29,133
Total	13,744	125,182

Tankers.—During the first half of 1986, the world's tanker fleet decreased by 51 vessels, almost twice as many as during the entire year of 1985, and the average gross and the average deadweight tonnages decreased by 3.1% and 3.7%, respectively, continuing the trend of the past several years to the use of medium-size tankers. The following tabulation presents the distribution of the tanker fleet of the world for the first half of 1986:

Country of registry	Number of vessels	Deadweight tonnage (thousand long tons)
Liberia	674	66,805
Japan	442	27,009
Greece	305	24,344
Panama	586	19,912
United States	257	15,485
United Kingdom	204	11,009
Norway	136	9,047
Bahamas	81	8,397
Cyprus	105	8,330
U.S.S.R.	452	7,661
France	76	6,414
Spain	95	5,098
Italy	225	5,007
Denmark	74	4,260
Brazil	85	3,725
Singapore	98	3,632
Saudi Arabia	67	3,362
Kuwait	34	3,301
India	59	3,156
Other	1,350	42,817
Total	5,405	278,771

The decline in the overall size of the world's tanker fleet, measured in terms of the deadweight tonnage, continued in 1986 and reached a low of 241 million tons, a small decrease below the 1985 level and 27.5% below the total deadweight tonnage in 1977 of 332.5 million tons. The decline in the size of individual tankers also continued in 1986 with those 200,000 tons and over accounting for 47.3% of the total compared with 48.9% of the total during 1985. As the total deadweight tonnage has decreased for ships over 200,000 tons, the percentage of tankers under 200,000 tons has steadily increased, and the total deadweight tonnage of these tankers increased in 1986 slightly, the first increase in several years. The following tabulation, which is based on data published on page 20 in the British Petroleum Co. PLC (BP) annual publication "BP Statistical Review of World Energy," June 1987, shows the variations in the world tanker fleet by size categories for the past 5 years.

Size group (deadweight long tons)	Percent of total				
	1982	1983	1984	1985	1986
10,000-25,000	4.4	4.6	4.7	5.0	5.2
25,000-45,000	9.0	9.7	9.8	10.5	10.9
45,000-65,000	5.3	5.4	5.8	6.1	5.9
65,000-125,000	17.1	17.1	17.1	18.0	19.3
125,000-200,000	9.9	10.2	10.7	11.5	11.4
200,000-320,000	44.3	42.5	41.4	38.4	37.6
320,000 and over	10.0	10.5	10.5	10.5	9.7

The same source shows that there was a significant decrease in the deadweight tonnage of tankers scrapped in 1986, the first decrease in 7 years. The 13.0 million tons scrapped during 1986 was 50.9% less than was scrapped during 1985, the peak year of

the past 11 years. As in every year since 1980, the vast majority of the deadweight tonnage scrapped during 1986 was accounted for by vessels over 160,000 deadweight tons. The 9.0 million tons scrapped in this category accounted for 69.2% of the total but was 53.4% less than the 19.3 million tons scrapped in this category during 1985. The deadweight tonnage of tankers under construction and on order at yearend 1986 totaled 7.3 million tons, of which 3.0 million tons was in vessels of 65,000 to 125,000 tons, 2.1 million tons was in vessels of 200,000 to 320,000 tons, 1.3 million tons was in vessels of 25,000 to 45,000 tons, 0.5 million tons was in vessels of 45,000 to 65,000 deadweight tons, and 0.4 million tons was in vessels of 10,000 to 25,000 tons. For the first year since the 1960's, there were no tankers built in 1986 of the two size categories of 125,000 to 200,000 tons and 320,000 tons and over. At the end of 1986, there were no tankers of 320,000 tons and over on order or being built, the first year this has occurred since the early 1970's, when the supertankers were first built.

OCEAN FREIGHT RATES

Data on ocean freight rates, last published by the United Nations in its "Monthly Bulletin of Statistics" for December 1984 and updated in the December 1985 issue of that periodical through the third quarter of 1985, have not been updated by that source to provide a continuation of the information normally presented in this section of this chapter. Other sources that report on ocean freight rates, however, show that although rates for dry cargo fluctuated during the year, which is normal owing to seasonal demand, they ended the year, in general, higher. In some cases, the increase was substantial, reaching 50% or more for comparable sized cargoes being shipped comparable distances. Although the rates themselves fluctuate according to seasonal demand, other factors also determine ups and downs in the rates. Some of these factors are the size of the ship, the availability of the different size ships, cost of marine diesel fuel, and general economic conditions in the importing countries. An example of one of these factors was a reversal during 1986 of rates for Panama Canal-size ships and Capesize ships. Owing to the shortage of Capesize ships, which were being utilized by the oil trade later in the year, the normally higher rate Panama Canal-size ships were moving cargo more than $1.00 per long ton less than the Capesize vessels. Indeed, the shortage of the larger ships caused some charterers to split Capesize cargoes into several smaller shipments from Australia to Europe.

Indications also showed that tanker rates generally followed the same fluctuations as those for dry cargo, ending the year somewhat higher. An additional factor in tanker rates, however, was the increase in insurance charged some tanker owners, the result of increased military action against neutral shipping in the Persian Gulf.

PANAMA AND SUEZ CANALS

Data on 1986 mineral commodity shipments through the Panama Canal were not available in time for inclusion in this chapter, but data on 1985 shipments showed that the total shipments of mineral commodities increased by a small amount from the level of 1984, as shown in the following tabulation:

	Fiscal year[1]				
	1981	1982	1983	1984	1985
Number of transits:					
Commercial ocean traffic	13,884	14,009	11,707	11,230	11,515
Other traffic	1,166	1,262	1,247	1,293	1,251
Total	15,050	15,271	12,954	12,523	12,766
Cargo moved (thousand metric tons):					
Commercial ocean traffic:					
Mineral commodities	99,969	111,468	r72,219	r72,210	74,128
Other commodities	74,001	76,961	r75,708	r70,515	66,740
Subtotal	173,970	188,429	147,927	142,725	140,868
Other traffic	308	291	364	336	265
Total	174,278	188,720	148,291	143,061	141,133

rRevised.
[1]Year ending Sept. 30 of that stated.

In fiscal year 1985, mineral commodities accounted for 52.6% of all commercial traffic through the Panama Canal, a figure somewhat higher than the 50.6% recorded for 1984 but still lower than the level before the substantial drop recorded in 1983. Table 9 shows mineral commodity trade through the canal during 1981-85 by major mineral group.

In terms of major mineral commodity groups, fuels remained dominant in 1985 but were only 52.5% of the total compared with 57.2% of the total in 1984 and 62.8% in 1983. Metallic commodities remained in second place and accounted for 24.1% of total mineral commodity tonnage compared with 22.4% and 18.5% in 1984 and 1983, respectively. Industrial minerals again ranked third with 23.4% (20.3% in 1984). Iron and steel ingots and semimanufactures remained the dominant single metals class; fertilizer materials were again the overwhelmingly dominant industrial minerals class; refined petroleum was again for the second year the dominant fuel commodity. The rise in the level of total mineral commodity traffic again was chiefly the result of lower total commercial cargo coupled with increases in transits of metal commodities by 10.2% and industrial mineral commodities by 18.3% and despite the drop of 5.8% in the level of mineral fuels transited compared with those of 1984.

For greater detail on mineral movements through the Panama Canal, including direction of movements to and from the canal, the reader is referred to the "Panama Canal Annual Report."

The reports that present the information on movement of goods through the Suez Canal were not available to the authors in time for inclusion into this edition of this chapter; therefore, there is no table comparable to table 12 in the 1985 edition of this yearbook.

OVERLAND TRANSPORT

The paucity of detailed information available has prevented a detailed study of the overland international transport of mineral commodities. Large-scale international rail shipments of mineral commodities were confined chiefly to movements between the United States and Canada and Mexico and to transfers of materials within Europe south of the Baltic Sea. Notable exceptions continued to be the shipment of large quantities of iron ore from Sweden to Narvik, Norway, for loading on vessels for export through that port and to the flow of a variety of minerals from several southern African nations through the Republic of South Africa for export through that country's ports.

Major international pipeline movements of crude petroleum and natural gas in 1986 were, in general, confined to the same areas cited as the centers of rail movements of mineral commodities. Noteworthy here, however, was the continuing operation of the pipelines for both oil and natural gas from the U.S.S.R. to the other centrally planned economy countries and on to some market economy countries of Europe. Despite the continued military conflict in the Middle East, more and more reliance was being placed on the movement of crude oil through pipelines, partly a response to the continuing military action against tankers in the Persian Gulf. During 1986, expansion was begun on an existing pipeline carrying crude oil from the Kirkuk Oilfields in northeastern Iraq to Ceyhan, Turkey. The expanded system can now move 1.5 million barrels of oil per day, up from 700,000 barrels per day in early 1985. Also in the past 2 years, Saudi Arabia has increased the capacity of its own pipeline system so that it now has a capacity of moving 3 million barrels per day of crude oil from its oilfields on the Persian Gulf to the Port of Yenbu on the Red Sea, thus avoiding the military threat in the Persian Gulf area.

Information on rail and pipeline transport of mineral commodities within certain individual countries is provided in the appropriate country chapter.

PRICES

Comprehensive data on market prices for crude minerals and mineral products for the world as a whole do not exist, and even the data that are available and published are not comparable between countries, particularly between the market economy countries and the centrally planned economy countries. The regularly published prices for selected major commodities in major market areas can be regarded as indicative of general world price trends. Tables 10, 11, and 12 summarize prices for selected metals in the United States, the United Kingdom, and Canada, respectively,

for 1982-86, inclusive, with monthly data provided for 1986. Overall, the picture was none too bright; of 20 prices listed in the tables, comparing 1985 averages with those for 1986, 12 showed declines and 1 was unchanged, leaving 7 recording gains. Aluminum declined sharply in the United States but rose marginally in the United Kingdom; copper declined in the United States and the United Kingdom and advanced only very fractionally in Canada; zinc and silver prices fell in all three markets; tin prices fell precipitously in both the United States and the United Kingdom to levels of 56% and 49%, respectively, of the 1985 average; cobalt dropped slightly in the U.S. market (other prices not available); and nickel officially was unchanged, but, because of modest inflation, was proportionally at a lower level. Only in the case of lead did all three market areas register gains, and it might be noted that this came only at the end of generally declining prices from 1981 (despite a slight upturn in 1984).

In the United Kingdom the annual average gold price advanced nearly 16%, a decided difference from the trend for the other metals, but the marginal gain registered for the U.S. cadmium price barely compensated for inflation.

Among the industrial minerals and their chemical derivatives, contract prices for export sulfur were from $5.00 to $16.00 per ton lower in the second half of 1986 than in the first half of the year, with considerable variance between the major export centers. In the United States, gulf coast prices that ranged from $134 to $136 per ton in the first half of 1986 fell to $130 to $136 per ton in the second half. Canadian prices, f.o.b. Vancouver, dropped from a range of $135 to $139 per ton in the first half of the year to $125 to $135 in the second semester. The sharpest drop was recorded in the Middle East, where during the first semester, prices ranged from $133 to $136 per ton, but were reported at $120 per ton for the second half of the year. In the case of Polish sulfur, f.o.b. Gdánsk, the drop was from a range of $144 to $150 to a range of $135 to $145.

Urea export prices, which ranged from about $85 to $100 per ton at the start of 1986, tended downward generally through the year, but at yearend seemed destined to edge upward in response to a tightness of supply brought on by reduced availability in Eastern Europe. This was occasioned chiefly by the diversion of natural gas from an industrial feedstock to heating, as a result of severe weather, and by increased Chinese purchases. At yearend, the East European price was about $65 per ton, f.o.b. in bulk, while the U.S. gulf coast bulk f.o.b. price was about $85 per ton, just below the Middle East bagged f.o.b. price.

In the case of ammonia, prices declined sharply in the early months of 1986, falling, for example, from about $150 to $110 per ton, c.i.f., northwest Europe, between January and April, and from about $112 to $85 per ton, f.o.b. Caribbean during the same period. There was a small but significant increase at midyear, followed by a very slight drop between July and November, at which point both prices just cited turned upward, with good prospects for continued gains in early 1987, probably eliminating the declines across 1986, this again in response to the relatively tight supply of nitrogenous raw materials.

The picture was not so bright for potassic fertilizers in 1986; for example, the price for potassium chloride, standard, f.o.b. Vancouver, British Columbia, Canada, fell from about $75 per ton in December 1985 to about $72 per ton in February, then held level until July, when a sharp decline set in, bottoming at about $56 per ton in October. A slight recovery to about $59 per ton was recorded between October and November, and that price held through yearend.

Phosphatic materials showed a mixed pattern across 1986, with triple superphosphate, f.o.b. U.S. gulf in bulk, trending upward from about $132 per ton in January to the year's high of about $136 per ton in March and April, and thence sharply downward to about $101 per ton by August. There was a slight recovery through September and October to about $115 per ton, followed by another downturn ending the year at about $102 per ton. Diammonium phosphate seemed to follow the same pattern, but with "peaks and valleys" in the price slightly offset, but across the year, the per ton f.o.b. U.S. gulf price fell from about $170 in December 1985 to about $135 at yearend 1986. In contrast, phosphoric acid prices, measured in terms of dollars per ton of P_2O_5 content, f.o.b. U.S. gulf, edged up from about $280 in December 1985 to $300 in January and then remained but little changed until June, at which point they fell sharply to under $250 by August, and after a slight resurgence in September to the $250 level, again slumped, ending the year at about $240.

With regard to world petroleum prices,

detailed reporting for the year 1986 seems almost pointless; the systems of "official" or "contract" prices disappeared or nearly so, and have been almost wholly replaced by either simple spot market pricing or by a system under which the crude petroleum seller receives a proportion of the income received from sale of refined products produced by the buyer of the crude. Regardless of what system is used, however, the drastic decline in crude oil prices can be seen in such data compilations as the U.S. Department of Energy's tabulation of landed cost of U.S. crude oil imports from selected countries. This data assemblage, covering receipts from nine major countries, logged 1985 average landed costs ranging from a low of $24.43 per barrel to a high of $38.96 per barrel, levels that fell to $11.55 to $15.28 per barrel for the 1986 average, despite the modest, but nonetheless present inflation rate. Although the general pattern in such costs was downward through midyear, with upturns in the last half of the year, costs in December were substantially below those of January.

STATISTICAL SUMMARY OF WORLD PRODUCTION AND TRADE OF MAJOR MINERAL COMMODITIES

The final 24 tables of this chapter, tables 13-36, extend the statistical series on production that was started in the 1963 edition of the "Area Reports: International" volume of the "Minerals Yearbook" and was subsequently updated and expanded in the 1965 and 1976-85 editions. They are primarily a supplement to other statistical data within this chapter but also serve as a summary of international production data for major mineral commodities covered in greater detail, on a commodity basis in volume I of the 1986 "Minerals Yearbook" and on a country basis in volume III.

In this edition, the data presented in these tables, in most instances, correspond with the data in the individual commodity world production tables appearing in volume I and may differ somewhat from a total that might be obtained by adding figures presented for any single commodity in each of the country chapters of volume III. This apparent disparity results from problems of scheduling the compilation of tables in the numerous commodity and country chapters in the two volumes. In an effort to provide the user with the most up-to-date information possible, data received after completion of worldwide commodity production tables (volume I) have been included in many of the individual country production tables (volume III). Limitations of time, however, have prevented the incorporation of these revisions in the abbreviated versions of the world commodity tables included here. Thus, a more precise figure for total world production of any commodity could be obtained by adding figures presented in the individual country chapters. For summary purposes, however, it is felt that tables of this chapter are sufficiently correct without the inclusion of these generally minor revisions.

The series of data on world trade in major mineral commodities that appeared in earlier editions of this chapter (tables 57-69 in the 1976 edition) could not be included owing to scheduling problems.

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[1]Senior foreign mineral specialist, Division of International Minerals.

[2]Chief, Branch of Geographic Data, Division of International Minerals.

[3]Callot, F. Production et consommation mondiales de minerals en 1983. Annales des Mines, Nos. 7, 8, 9, July-Aug.-Sept. 1985, pp. 3-123.

[4]Table 1 contains 100 data lines, but 3 of these are totals of others; these total lines are not included in the total of 97 distinct commodities or forms of commodities counted here.

Table 2.—Value of world export trade in major mineral commodity groups[1]

(Million U.S. dollars)

Commodity group	1980[r]	1981	1982[r]	1983[r]	1984[r]	1985
Metals:						
All ores, concentrates, scrap	31,855	28,187	24,481	23,296	25,320	24,484
Iron and steel	75,838	73,419	68,732	61,225	66,050	68,183
Nonferrous metals	49,829	36,279	31,967	35,775	36,836	34,666
Total	157,522	137,885	125,180	120,296	128,206	127,333
Nonmetals, crude only	11,869	10,956	9,938	9,391	9,957	9,971
Mineral fuels	483,033	474,266	430,384	385,151	376,571	353,788
Grand total	652,424	623,107	565,502	514,838	514,734	491,092
All commodities	2,003,681	1,965,890	1,848,930	1,813,790	1,908,021	1,898,333

[r]Revised.

[1]Data presented are for selected major commodity groups of the Standard International Trade Classification, Revision 2 (SITC-R2) and as such exclude some mineral commodities classified in that data array together with other (nonmineral) commodities. SITC-R2 categories included are as follows: All ores, concentrates, and scrap—Div. 28; iron and steel—Div. 67; nonferrous metals—Div. 68; nonmetals (crude only)—Div. 27; and mineral fuels—Div. 3. Major items not included are the metals, metalloids, and metal oxides of Group 513; mineral tar and other coal, petroleum, and gas-derived crude chemicals of Div. 52; manufactured fertilizers of Div. 56; and nonmetallic mineral manufactures of Groups 661, 662, 663, and 667. Data include special category exports, ship stores and bunkers, and other exports of minor importance, and exclude the intertrade of the centrally planned economy countries of Asia and trade between the Federal Republic of Germany and the German Democratic Republic.

Sources: 1980 and 1982-85 data: United Nations. Monthly Bulletin of Statistics. V. 41, No. 5, May 1987, pp. 274-301. 1981 data: United Nations. Monthly Bulletin of Statistics. V. 40, No. 5, May 1986, pp. xxxiv-lxi.

Table 3.—Distribution of value of world export trade in major mineral commodity groups[1]

(Percent)

Commodity group	1980	1981	1982[r]	1983[r]	1984[r]	1985
Metals:						
All ores, concentrates, scrap	4.9	4.5	4.3	4.5	4.9	5.0
Iron and steel	11.6	11.8	12.1	11.9	12.8	13.9
Nonferrous metals	7.7	5.8	5.7	7.0	7.2	7.1
Total	24.2	22.1	22.1	23.4	24.9	26.0
Nonmetals, crude only	1.8	1.8	1.8	1.8	1.9	2.0
Mineral fuels	74.0	76.1	76.1	74.8	73.2	72.0

[r]Revised.

[1]For detailed definition of groups, see footnote 1, table 2.

Table 4.—Growth of value of world export trade in major mineral commodity groups[1]

(Percent change from that of previous year)

Commodity group	1980[r]	1981[r]	1982[r]	1983[r]	1984[r]	1985
Metals:						
All ores, concentrates, scrap	+35.2	-12.5	-13.1	-4.8	-8.7	-3.3
Iron and steel	+7.7	-3.2	-6.4	-10.9	+7.9	+3.2
Nonferrous metals	+34.2	-27.2	-11.9	+11.9	+3.0	-5.9
All metals	+20.2	-12.5	-9.2	-3.9	+6.6	-.7
Nonmetals, crude only	+23.7	-7.7	-9.3	-5.5	+6.0	+.1
Mineral fuels	+45.0	-1.2	-9.3	-10.5	-2.2	-6.1
All major mineral commodity groups	+37.7	-4.5	-9.2	-9.0	0.0	-5.6
All commodities	+22.4	-1.9	-5.9	-1.9	+5.2	-.5

[r]Revised.

[1]For detailed definition of groups, see footnote 1, table 2.

Table 5.—World consumption of selected mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity	1982[r]	1983[r]	1984[r]	1985	1986[p]
Ferrous metals: World:					
Iron ore, gross weight[e] million metric tons	776	780	860	[r]865	865
Iron and steel scrap, gross weight do	288	297	312	317	[e]305
Nonferrous metals:					
Market economy countries:					
Aluminum, refined	10,872	12,004	12,582	12,681	13,309
Cadmium	13	14	14	14	16
Copper, refined	6,776	6,822	7,666	7,326	7,672
Lead, refined	3,784	3,787	4,043	3,976	4,004
Magnesium, primary	166	179	194	189	187
Nickel[1]	457	489	582	571	523
Tin, refined	159	160	170	169	176
Zinc, slab	4,151	4,481	4,585	4,681	4,847
Centrally planned economy countries:					
Aluminum, refined	3,308	3,317	3,413	3,458	3,568
Cadmium	4	4	4	4	4
Copper, refined	2,272	2,262	2,281	2,335	2,384
Lead, refined	1,470	1,442	1,446	1,450	1,435
Magnesium, primary	83	88	94	102	105
Nickel[2]	193	201	206	213	211
Tin, refined	55	58	54	54	53
Zinc, slab	1,775	1,792	1,855	1,819	1,832
World total:					
Aluminum, refined	14,180	15,321	15,995	16,139	16,877
Cadmium	17	18	18	18	20
Copper, refined	9,048	9,084	9,947	9,661	10,056
Lead, refined	5,254	5,229	5,489	5,426	5,439
Magnesium, primary	249	267	288	291	292
Nickel[2]	650	690	788	784	734
Tin, refined	214	218	224	223	229
Zinc, slab	5,926	6,273	6,440	6,500	6,679
Industrial minerals: World:					
Fertilizers:					
Nitrogenous[3] million metric tons of contained N	60,498	61,079	67,184	70,587	70,380
Phosphatic[3] million metric tons of contained P_2O_5	30,844	30,631	32,864	34,078	[e]32,800
Potassic[3] million metric tons of K_2O equivalent	23,673	22,725	25,408	25,857	[e]26,000
Sulfur million metric tons of elemental sulfur equivalent	51,282	54,113	58,282	57,916	56,956
Mineral fuels: World:					
Solid fuels million metric tons of standard coal equivalent	2,689	2,769	2,883	3,040	3,089
Liquid fuels do	3,590	3,571	3,623	3,606	3,698
Natural gas do	1,824	1,873	1,990	2,057	2,075
Hydro, geothermal, nuclear electricity do	333	360	393	427	444
Total do	[4]8,437	8,573	8,889	9,130	9,306

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

[1]Primary and secondary combined.

[2]Nickel content of refined nickel, ferronickel, and nickel oxide.

[3]Data are for years ending June 30 of that stated.

[4]Data do not add to total shown because of independent rounding.

Sources: Based on data provided by the World Bureau of Metal Statistics (market economy countries, nonferrous metals except magnesium); Metallgesellschaft AG (centrally planned economy countries, nonferrous metals and all magnesium consumption); British Sulphur Corp. Ltd. (nonmetals); and 1985 United Nations Energy Statistics Yearbook (all mineral fuels for 1982-85). Data on iron ore and iron and steel scrap for all years and on sulfur and mineral fuels for 1986 compiled from a variety of sources by the U.S. Bureau of Mines.

Table 6.—Annual investment expenditure in the steel industry for selected countries

(Million dollars)

Country or country group	1981	1982	1983	1984	1985
Organization for Economic Cooperation and Development (OECD):					
EEC[1]	2,754	2,427	2,103	r1,965	3,295
EFTA[2]	537	291	198	r274	377
Other:[3]					
Australia	355	217	64	r96	154
Canada	698	483	156	r176	498
Japan	3,610	3,720	3,744	r2,669	2,983
Spain	183	204	131	290	396
Turkey	NA	58	232	r217	210
United States	3,365	4,203	3,137	r1,203	1,688
Total[4]	11,502	11,603	9,765	r6,890	9,601
Latin America:					
Argentina	60	47	164	147	184
Brazil	1,325	1,056	1,248	809	472
Chile	8	3	2	11	1
Colombia	22	51	24	8	13
Ecuador	1	NA	NA	NA	2
Mexico	915	387	410	526	491
Peru	13	14	5	1	4
Uruguay	3	17	9	1	1
Venezuela	134	89	90	25	25
Central America	7	6	6	(5)	--
Total[6]	2,488	1,670	7,959	1,528	1,193
Grand total	13,990	13,273	11,724	8,418	10,794

rRevised. NA Not available.

[1]Source reports that values for European Economic Community (EEC) countries are in terms of "million units of account." For this tabulation the units in the source have been converted to U.S. dollars using the following factors supplied by the International Monetary Fund: U.S. dollars per European units of account (ECU) at the end of the period: 1981—1.0852; 1982—0.9677; 1983—0.8274; 1984—0.7089; and 1985—0.8879.

[2]European Free Trade Association (EFTA) figures exclude data for Switzerland.

[3]Data for New Zealand have not been available since 1979.

[4]Sources for OECD. The Iron and Steel Industry in 1982. Paris, 1984, p. 32; The Iron and Steel Industry in 1983. Paris, 1985, p. 32; The Iron and Steel Industry in 1984. Paris, 1986, p. 32; and The Iron and Steel Industry in 1985. Paris, 1986, p. 32.

[5]Less than 1/2 unit.

[6]Source for Latin America: Instituto Latinamericano del Fierro y el Acero. Statistical Yearbook of Steelmaking and Iron Ore Mining in Latin America. Santiago, 1986, p. 185.

[7]Data do not add to total shown because of rounding.

Table 7.—Salient statistics on U.S. foreign investment in mineral industry activities

(Million dollars)

	1984r	1985r	1986
Direct foreign investment:			
Mining, smelting, refining	7,353	7,194	6,531
Petroleum	58,051	58,030	61,151
Reinvested earnings of foreign affiliates:			
Smelting and fabricated metals	2	232	519
Petroleum	2,870	2,280	828
Equity and intercompany account flows:			
Smelting and fabricated metals	32	120	-1
Petroleum	-3,434	-1,197	2,593
Income:			
Mining, smelting, refining	485	362	587
Petroleum	9,269	9,099	7,470

rRevised.

Source: U.S. Department of Commerce. Survey of Current Business, v. 66, No. 8, Aug. 1986; and v. 67, No. 8, Aug. 1987.

Table 8.—World merchant fleet distribution, by type[1]

	1982	1983	1984	1985	1986
Number of vessels:					
Bulk carriers	5,215	5,384	5,560	5,787	5,714
Freighters[2]	14,280	14,268	14,019	13,937	13,744
Tankers	5,583	5,548	5,482	5,456	5,405
Other[3]	404	379	363	375	375
Total	25,482	25,579	25,424	25,555	25,238
Gross tonnage:					
Bulk carriers, thousand long tons	119,341	124,000	129,274	135,366	135,148
Freighters[2], do	93,323	94,222	94,549	97,284	97,178
Tankers, do	180,082	173,335	164,451	158,508	152,107
Other[3], do	3,898	3,768	3,705	3,898	3,898
Total, do	396,644	395,325	391,979	395,056	388,331
Deadweight tonnage:					
Bulk carriers, do	208,153	216,468	225,496	235,833	235,426
Freighters[2], do	124,994	125,646	124,758	126,542	125,182
Tankers, do	336,142	322,617	304,589	292,345	278,771
Other[3], do	1,805	1,673	1,579	1,604	1,589
Total, do	671,094	666,404	656,422	[4]656,323	640,968

[1]Maritime Administration classification. Tankers include whaling tankers. Vessels shown here as "Other" include combination passenger and cargo and combination passenger and refrigerated cargo. Data are as of Dec. 31 of year indicated except for 1986, which are as of July 1.
[2]Includes refrigerated freighters.
[3]Excludes refrigerated freighters.
[4]Data do not add to total shown because of independent rounding.

Source: U.S. Department of Transportation, Maritime Administration. Merchant Fleets of the World. Annual issues for 1982-85 and unpublished data supplied by the same agency for Jan.-Jun. 1986.

Table 9.—Movement of mineral commodities through the Panama Canal

(Thousand metric tons)

	1983			1984			1985		
	Atlantic to Pacific	Pacific to Atlantic	Total	Atlantic to Pacific	Pacific to Atlantic	Total	Atlantic to Pacific	Pacific to Atlantic	Total
METALS									
Ore and concentrate:									
Bauxite and alumina	381	109	490	461	906	1,367	231	1,163	1,394
Chromite	--	11	11	4	72	76	4	56	60
Copper	1	421	422	--	396	396	13	422	435
Iron	70	55	125	11	74	85	110	334	444
Lead	18	126	144	11	170	181	14	146	160
Manganese	135	89	224	80	92	172	103	173	276
Tin	--	31	31	--	33	33	1	25	26
Zinc	99	476	575	133	581	714	74	471	545
Other and unspecified	58	1,666	1,724	200	1,564	1,764	293	2,077	2,370
Subtotal	762	2,984	3,746	900	3,888	4,788	843	4,867	5,710
Ingots and semimanufactures:									
Aluminum	403	58	461	r314	54	r368	260	75	335
Copper	43	1,181	1,224	34	899	933	78	831	909
Iron and steel[1 2]	3,776	3,683	7,459	4,223	5,522	9,745	5,260	5,186	10,446
Lead	14	131	145	14	86	100	5	98	103
Tin[1]	15	21	36	12	19	31	11	57	68
Zinc	13	131	144	29	106	135	37	159	196
Other	77	81	158	36	47	83	29	36	65
Subtotal	4,341	5,286	9,627	r4,662	6,733	r11,395	5,680	6,442	12,122
Total	5,103	8,270	13,373	r5,562	10,621	r16,183	6,523	11,309	17,832
INDUSTRIAL MINERALS									
Borax	12	397	409	5	421	426	--	421	421
Cement	65	7	72	177	5	182	259	5	264
Clays, fire and china	386	28	414	363	25	388	424	43	467
Fertilizer materials	8,078	1,491	9,569	8,755	1,283	10,038	9,683	2,368	12,051
Salt	124	586	710	78	707	785	78	532	610
Sulfur	11	1,976	1,987	13	2,470	2,483	16	3,100	3,116
Other[3]	146	166	312	223	164	387	209	236	445
Total	8,822	4,651	13,473	9,614	5,075	14,689	10,669	6,705	17,374
MINERAL FUELS									
Carbon black	4	1	5	4	1	5	29	5	34
Coal and coke	9,308	r1,581	r10,889	8,245	1,869	10,114	8,690	2,976	11,666
Petroleum:									
Crude	4,620	14,350	18,970	3,961	10,432	14,393	3,452	9,174	12,626
Refined	9,341	6,168	15,509	8,812	8,014	16,826	7,567	7,029	14,596
Subtotal	13,961	20,518	34,479	12,773	18,446	31,219	11,019	16,203	27,222
Total	23,273	r22,100	r45,373	21,022	20,316	41,338	19,738	19,184	38,922
Grand total	37,198	r35,021	r72,219	r36,198	36,012	r72,210	36,930	37,198	74,128

rRevised.

[1]Tinplate is included under "Tin" rather than under "Iron and steel" in source publication.

[2]Includes a category identified simply as "Scrap" in source publication, which may include scrap other than iron and steel scrap.

[3]Comprises asbestos, brick and tile, clinkers, diatomite, dross, marble and other stone, slag, and soda and other sodium compounds.

Source: Panama Canal Commission Annual Report 1984 and 1985.

Table 10.—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]	Cadmium[7]	Cobalt[8]
1982	76.000	72.909	25.542	38.473	5.869	7.947	1.113	12.50
1983	77.667	77.861	21.677	41.386	6.013	11.441	1.129	12.50
1984	81.000	66.757	25.548	48.601	5.680	8.140	1.693	12.43
1985	81.000	65.566	19.067	40.366	5.259	6.142	1.208	11.70
1986:								
January	55.250	68.481	18.354	32.868	3.693	6.053	1.000	11.30
February	56.816	66.853	17.790	30.879	4.337	5.874	1.000	11.30
March	61.571	68.744	18.202	31.224	3.186	5.639	1.000	11.30
April	59.352	67.401	18.731	32.128	2.700	5.229	1.171	11.30
May	57.774	65.685	19.384	32.971	2.566	5.115	1.350	11.30
June	56.738	66.071	22.069	36.538	2.565	5.153	1.350	11.30
July	54.125	62.415	21.940	39.548	2.554	5.049	1.350	11.30
August	54.488	60.974	22.422	40.830	2.556	5.218	1.350	11.30
September	55.405	63.444	23.429	43.704	2.583	5.683	1.350	11.30
October	53.568	62.064	25.550	45.976	2.678	5.667	1.350	11.30
November	52.500	61.456	28.006	45.765	2.876	5.596	1.350	11.30
December	52.841	62.237	28.685	43.510	3.000	5.364	1.350	11.30
Average	55.869	64.652	22.047	37.995	2.941	5.470	1.248	11.30

[1]For 1981-85 inclusive: U.S. list price, North American producer; for 1986: Metals Week U. S. market price.
[2]Electrolytic, f.o.b. refinery.
[3]Refined lead, nationwide.
[4]Prime Western, f.o.b. East St. Louis.
[5]U.S. dollars per pound, New York dealer.
[6]U.S. dollars per troy ounce, 0.999 fine, New York.
[7]U.S. dollars per pound, producer.
[8]U.S. dollars per pound, shot-cathode, 250-kilogram lots.

Source: American Bureau of Metal Statistics Inc.

Table 11.—Nonferrous metal prices in the United Kingdom[1]

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

Year and month	Aluminum[2]	Copper[3]	Gold[4]	Lead[5]	Silver[6]	Tin[7]	Zinc[8]
1982	44.966	67.192	375.792	24.656	7.920	5.810	33.734
1983	65.342	72.153	424.180	19.273	11.454	5.913	34.727
1984	56.526	62.562	360.438	20.117	8.140	5.566	40.459
1985	47.850	64.904	317.265	17.842	6.132	5.567	36.233
1986:							
January	50.768	64.344	345.377	16.694	6.060	NA	29.177
February	50.569	63.753	338.890	16.637	5.879	3.594	27.580
March	52.980	65.548	345.700	16.636	5.663	3.317	28.353
April	52.818	65.072	340.439	16.739	5.220	2.579	29.909
May	52.812	64.353	342.380	17.056	5.091	2.483	32.063
June	53.662	64.099	342.717	18.956	5.154	2.440	36.454
July	50.941	60.978	348.337	17.211	5.044	2.443	36.576
August	51.221	59.107	376.595	17.771	5.212	2.451	37.011
September	54.695	61.097	417.730	18.451	5.674	2.448	39.478
October	52.705	59.730	423.509	19.692	5.651	2.514	40.167
November	51.338	59.112	397.550	21.451	5.571	2.763	37.171
December	51.414	60.580	390.921	23.483	5.366	2.916	36.180
Average	52.179	NA	367.512	18.429	5.465	2.723	34.194

NA Not available.
[1]London Metal Exchange.
[2]Unalloyed ingot, 99.5%.
[3]For 1982 through June 1986, electrolytic wirebars, monthly average settlement price; for July 1986 through Dec. 1986, Grade A settlement price.
[4]U.S. dollars per troy ounce, final price.
[5]Refined lead, monthly average cash price.
[6]U.S. dollars per troy ounce, 0.999 fine, spot price.
[7]U.S. dollars per pound, Straits tin.
[8]Monthly average cash price: 1982—Aug. 1984 inclusive, slab; Sept. 1984—Dec. 1986, high grade.

Source: American Bureau of Metal Statistics Inc.

Table 12.—Nonferrous metal prices in Canada

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

Year and month	Copper[1]	Lead[2]	Nickel[3]	Silver[4]	Zinc[5]
1982	72.395	26.279	3.200	7.951	39.437
1983	75.936	21.929	3.200	11.458	42.329
1984	63.365	25.805	3.200	8.140	49.006
1985	64.071	19.205	3.200	6.145	41.731
1986:					
January	65.821	18.414	3.200	6.055	34.115
February	64.537	18.159	3.200	5.876	34.181
March	69.498	18.238	3.200	5.643	34.264
April	66.395	18.864	3.200	5.232	33.275
May	65.588	19.412	3.200	5.125	35.156
June	64.983	22.389	3.200	5.156	39.571
July	64.550	23.175	3.200	5.051	43.815
August	60.965	22.395	3.200	5.225	43.572
September	61.440	23.360	3.200	5.686	45.930
October	61.448	25.567	3.200	5.670	48.363
November	62.187	27.997	3.200	5.593	48.601
December	63.256	28.983	3.200	5.375	43.992
Average	64.222	22.246	3.200	5.474	40.403

[1]For 1982, Canadian domestic producer delivered price for cathode; 1983-86, Hudson Bay Mining and Smelting Co. Ltd. delivered price for cathode.
[2]Producers' price, carload quantities, pig lead, Cominco Ltd.
[3]Canadian producer price, U.S. dollars per pound.
[4]U.S. dollars per troy ounce.
[5]Producers' price, carload quantities, regular high grade, Cominco Ltd.

Source: American Bureau of Metal Statistics Inc.

Table 13.—Leading world producers of bauxite[1]

(Thousand metric tons, gross weight)

Country	1982	1983	1984	1985[p]	1986[e]
Australia	23,625	24,372	31,537	31,839	[2]32,431
Guinea	11,827	12,421	13,160	13,100	[2]12,130
Jamaica	[r]8,378	7,683	8,937	5,975	[2]6,964
Brazil	6,289	7,199	6,433	6,251	6,224
U.S.S.R.[e 3]	6,182	6,185	6,185	6,185	6,185
Suriname	4,205	3,400	3,454	[e]3,000	[2]3,847
Yugoslavia	3,668	3,500	3,347	3,250	3,300
Hungary	2,627	2,917	2,994	2,815	3,022
Greece	2,853	2,455	2,296	2,453	2,500
India	1,854	1,923	1,994	2,121	2,270
China[e]	1,500	1,600	1,600	1,650	1,650
Guyana	1,783	1,087	1,333	[e]1,675	[2]1,466
France	1,662	1,663	1,607	1,530	[2]1,379
Total	[r]76,453	76,405	84,877	81,844	83,368
Other	4,464	[r]3,813	4,478	4,050	4,156
Grand total	[r]80,917	[r]80,218	89,355	85,894	87,524

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available as of July 7, 1987.
[2]Reported figure.
[3]Includes bauxite equivalent of nepheline syenite concentrates and alunite ore (produced in the U.S.S.R. only).

Table 14.—Leading world producers of aluminum[1]

(Thousand metric tons)

Country	1982	1983	1984	1985[p]	1986[e]
United States	3,274	3,353	4,099	3,500	[2]3,037
U.S.S.R.[e]	[r]1,900	2,000	2,100	2,200	2,300
Canada	1,065	1,091	1,227	1,282	1,360
Australia	381	478	758	851	[2]882
Germany, Federal Republic of	723	743	777	745	765
Brazil	299	401	455	550	[2]762
Norway	638	[r]713	765	712	[2]712
Venezuela	274	335	386	[e]396	424
China[e]	380	400	400	410	410
Spain	367	358	381	370	375
France	390	361	342	293	310
United Kingdom	241	252	288	275	270
Yugoslavia	220	258	268	[e]270	270
Netherlands	251	235	249	251	252
Italy	233	196	230	221	[2]243
Romania	208	223	244	247	240
New Zealand	163	219	243	241	234
India	217	204	269	260	225
Indonesia	33	115	199	217	220
Total	[r]11,257	[r]11,935	13,680	13,291	13,291
Other	[r]2,176	[r]1,973	2,027	2,060	2,023
Grand total	[r]13,433	[r]13,908	15,707	15,351	15,314

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 30, 1987.
[2]Reported figure.

Table 15.—Leading world producers of chromite[1]

(Thousand metric tons, gross weight)

Country	1982	1983	1984	1985[p]	1986[e]
South Africa, Republic of	[r]2,432	[r]2,506	3,407	3,699	3,480
U.S.S.R.[e]	2,940	2,940	2,940	2,940	2,950
Albania[e]	675	685	720	825	850
India	339	422	423	560	620
Turkey	452	346	487	[r e]600	600
Zimbabwe	432	420	477	536	540
Finland	345	245	446	[e]450	450
Brazil	276	155	256	[e]275	285
Philippines	322	267	261	272	183
Total	[r]8,213	[r]7,986	9,417	10,157	9,958
Other	267	236	341	394	378
Grand total	[r]8,480	[r]8,222	9,758	10,551	10,336

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through May 5, 1987.

Table 16.—Leading world producers of mine copper[1]

(Thousand metric tons, Cu content of ore)

Country	1982	1983	1984	1985[p]	1986[e]
Chile[2]	1,242	[r]1,258	1,291	1,356	1,386
United States[2]	1,147	1,038	1,103	1,106	[3]1,147
Canada[2]	612	653	713	739	768
U.S.S.R.[e 2]	560	570	590	600	620
Zaire	519	[r]537	562	563	563
Zambia	[r]575	[r]541	533	459	450
Poland	376	402	431	[e]431	431
Peru[2]	[r]354	[r]319	354	391	[3]397
Mexico	229	196	304	276	285
Australia	245	262	236	260	[3]239
Philippines	292	271	233	222	[3]223
China[e]	175	175	180	185	185
South Africa, Republic of	189	205	198	195	[3]184
Papua New Guinea	170	202	165	175	[3]174
Total	[r]6,685	[r]6,629	6,893	6,958	7,052
Other	[r]937	[r]1,033	1,081	1,130	1,104
Grand total	[r]7,622	[r]7,662	7,974	8,088	8,156

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through July 7, 1987.
[2]Recoverable.
[3]Reported figure.

Table 17.—Leading world producers of gold[1]

(Thousand troy ounces)

Country	1982	1983	1984	1985[p]	1986[e]
South Africa, Republic of	21,355	21,847	21,861	21,565	[2]20,514
U.S.S.R.[e]	8,550	8,600	8,650	8,700	8,850
United States	1,466	2,003	2,085	2,427	[2]3,733
Canada	2,081	2,363	2,683	2,815	3,365
Australia	867	984	1,296	1,881	2,479
China[e]	1,800	1,850	1,900	1,950	2,100
Brazil[e]	1,500	1,750	1,750	2,000	2,000
Colombia	473	439	800	1,143	1,400
Philippines	834	817	827	1,063	1,295
Papua New Guinea	589	579	[e]835	1,187	1,157
Chile	544	571	541	554	[2]578
Zimbabwe	426	453	478	472	480
Total	40,485	42,256	43,706	45,757	47,951
Other	[r]2,620	2,740	2,769	2,916	2,986
Grand total	[r]43,105	44,996	46,475	48,673	50,937

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 9, 1987.
[2]Reported figure.

Table 18.—Leading world producers of iron ore, iron ore concentrates, and iron ore agglomerates[1]

(Thousand metric tons, gross weight)

Country	1982	1983	1984	1985[p]	1986[e]
U.S.S.R.	244,411	[r]245,201	247,104	247,640	249,900
Brazil	93,158	88,716	112,057	123,000	[2]132,000
Australia	87,694	71,038	94,391	92,867	90,000
China[e]	69,000	71,000	75,000	80,000	90,000
India	[r]40,911	[e]38,800	41,026	44,546	[2]47,800
United States	36,002	38,165	52,092	49,533	[2]39,448
Canada	35,592	33,495	41,065	39,502	36,070
South Africa, Republic of	24,554	16,605	24,647	24,414	[2]24,483
Sweden	16,143	[r]14,265	18,123	20,454	[2]20,489
Venezuela	11,200	9,715	13,054	16,228	19,100
Liberia	18,165	14,937	15,101	15,318	[2]15,295
France	19,391	15,930	14,839	14,447	[2]12,436
Mauritania	8,255	7,385	9,528	9,333	8,900
Korea, North[e]	8,000	8,000	8,000	8,000	8,000
Mexico	8,155	8,040	8,317	7,822	[2]7,298
Chile	6,470	5,974	7,116	6,510	[2]7,009
Yugoslavia	5,106	5,018	5,321	5,478	[2]6,681
Spain	8,370	7,449	7,261	6,463	[2]6,089
Total	[r]740,577	[r]699,733	794,042	811,555	820,998
Other	[r]40,201	[r]40,310	40,871	39,551	40,528
Grand total	[r]780,778	[r]740,043	834,913	851,106	861,526

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through July 14, 1987.
[2]Reported figure.

Table 19.—Leading world producers of crude steel[1]

(Thousand metric tons)

Country	1982	1983	1984	1985[p]	1986[e]
U.S.S.R	147,165	152,514	154,238	154,668	161,000
Japan	99,548	97,179	105,586	105,279	[2]98,275
United States	67,655	76,762	83,940	80,067	[2]73,001
China	37,160	39,950	43,370	[e]46,700	52,100
Germany, Federal Republic of	35,880	35,729	39,389	40,497	[2]37,134
Italy	23,981	21,674	24,026	23,744	[2]22,872
Brazil	13,000	14,660	18,386	20,456	[2]21,234
France	18,416	17,623	19,000	18,832	18,000
Poland	14,795	16,236	16,533	16,100	[2]17,100
Czechoslovakia	14,992	15,024	14,831	15,036	15,000
United Kingdom	13,704	14,986	15,121	15,722	[2]14,811
Romania	13,055	12,593	14,437	13,795	14,000
Canada	11,762	12,828	14,715	14,500	13,900
Korea, Republic of	11,753	11,915	13,033	13,539	13,500
Spain	13,160	12,731	13,484	14,235	[2]11,976
India	10,715	10,305	10,344	11,054	11,094
Belgium	9,916	10,157	11,303	10,683	[2]9,744
South Africa, Republic of	8,271	7,190	7,827	8,582	8,800
German Democratic Republic	7,169	7,219	7,573	7,853	7,900
Mexico	7,056	6,978	7,560	7,367	[2]7,170
Total	579,153	594,253	634,696	638,709	628,611
Other	[r]64,822	[r]68,531	75,549	78,000	78,840
Grand total	[r]643,975	[r]662,784	710,245	716,709	707,451

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Steel ingots and castings. Table includes data available through June 30, 1987.
[2]Reported figure.

Table 20.—Leading world producers of mine lead[1]

(Thousand metric tons, Pb content of ore)

Country	1982	1983	1984	1985[p]	1986[e]
U.S.S.R.[e]	430	435	440	440	440
Australia	455	481	441	498	435
United States[2]	530	466	335	424	[3]353
Canada	341	252	264	268	[3]304
China[e]	160	160	160	[r]190	[3]227
Mexico[2]	170	184	203	198	200
Peru	[r]198	[r]207	194	202	[3]194
Korea, North[e]	95	75	110	110	110
Yugoslavia	113	114	114	[e]110	110
Total	[r]2,492	[r]2,374	2,261	2,440	2,373
Other	[r]956	[r]984	991	954	874
Grand total	[r]3,448	[r]3,358	3,252	3,394	3,247

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 23, 1987.
[2]Recoverable.
[3]Reported figure.

Table 21.—Leading world producers of manganese ore[1]

(Thousand metric tons, gross weight)

Country	1982	1983	1984	1985[p]	1986[e]
U.S.S.R.	9,821	9,876	10,089	[e]9,900	9,700
South Africa, Republic of	5,217	2,886	3,049	3,601	[2]3,719
Brazil	2,341	2,092	2,693	[e]2,700	2,700
Gabon	1,512	1,857	2,119	2,340	[2]2,510
Australia	1,123	1,370	1,849	2,003	[2]1,649
China[e]	1,600	1,600	1,600	1,600	1,600
India	1,490	[r]1,281	1,130	1,240	1,300
Mexico	509	350	476	[r e]396	459
Ghana	160	173	269	[r e]290	280
Romania	55	78	66	66	65
Hungary	83	59	67	[r e]63	60
Total	23,911	[r]21,622	23,407	24,199	24,042
Other	312	284	276	215	194
Grand total	24,223	[r]21,906	23,683	24,414	24,236

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 9, 1987.
[2]Reported figure.

Table 22.—Leading world producers of mine nickel[1]

(Thousand metric tons, Ni content)

Country	1982	1983	1984	1985[p]	1986[e]
U.S.S.R.[e]	165	170	175	180	186
Canada	89	128	174	170	181
Australia	88	77	77	86	70
New Caledonia	60	46	58	[e]73	65
Indonesia	46	49	48	41	44
Cuba	36	38	32	[e]32	33
China[e]	12	13	14	25	25
South Africa, Republic of[e]	22	[r]21	25	25	25
Total	[r]518	[r]542	603	632	629
Other	[r]103	[r]133	167	170	155
Grand total	[r]621	[r]675	770	802	784

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through May 12, 1987.

Table 23.—Leading world producers of mine tin[1]

(Metric tons, Sn content of ore)

Country	1982	1983	1984	1985[p]	1986[e]
Malaysia	52,342	41,367	41,307	36,884	[2]28,072
Brazil	8,218	13,275	19,957	26,514	27,400
U.S.S.R.[e]	21,000	22,000	23,000	23,000	23,500
Indonesia	33,806	26,553	23,223	21,759	[2]22,102
Thailand	26,109	19,943	21,920	16,864	16,800
China[e]	15,000	15,000	15,000	15,000	15,000
Bolivia	26,773	25,278	19,911	16,136	11,900
Australia	12,126	9,275	7,923	6,363	[2]8,631
Peru	1,672	[r]2,808	3,314	3,779	[2]4,817
United Kingdom	4,208	4,025	5,216	5,204	[2]4,594
Zaire	2,320	2,163	2,708	3,100	2,800
Canada	135	141	217	120	2,450
South Africa, Republic of	3,035	2,668	2,301	2,153	2,100
Total	[r]206,744	[r]184,496	185,997	176,876	170,166
Other	[r]12,719	[r]12,145	12,425	11,777	10,071
Grand total	[r]219,463	[r]196,641	198,422	188,653	180,237

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 16, 1987.
[2]Reported figure.

Table 24.—Leading world producers of mine zinc[1]

(Thousand metric tons, Zn content of ore)

Country	1982	1983	1984	1985[p]	1986[e]
Canada	1,036	1,070	1,207	1,172	1,294
U.S.S.R.[e]	800	805	810	810	810
Australia	665	699	677	759	[2]662
Peru	507	576	558	589	[2]598
China[e]	160	160	160	[r]300	[2]396
Mexico	242	266	304	292	285
Spain	167	168	230	235	[2]223
Japan	251	256	253	253	[2]222
United States	326	297	278	252	[2]216
Sweden	185	[r]204	210	216	[2]214
Poland	184	189	191	191	191
Ireland	167	186	206	192	[2]182
Korea, North[e]	140	140	140	[r]180	180
Brazil	111	119	103	120	120
Germany, Federal Republic of	106	114	113	118	102
South Africa, Republic of	92	110	106	97	[2]102
Thailand	--	--	41	78	[2]97
Yugoslavia	84	87	82	[e]84	86
Zaire	82	76	75	[e]74	74
Greenland	80	[r]79	71	70	[2]62
Total	5,385	[r]5,601	5,815	6,082	6,116
Other	[r]740	[r]767	787	775	737
Grand total	[r]6,125	[r]6,368	6,602	6,857	6,853

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through July 14, 1987.
[2]Reported figure.

Table 25.—Leading world producers of hydraulic cement[1]

(Thousand metric tons)

Country	1982	1983	1984	1985[p]	1986[e]
China	94,072	108,250	121,080	[e]142,500	161,479
U.S.S.R.	123,681	128,156	129,866	130,722	135,000
United States (including Puerto Rico)	58,369	64,725	71,395	71,540	[2]72,499
Japan	80,688	80,891	78,860	72,857	[2]71,246
Italy	39,728	39,217	37,782	36,677	[2]35,340
India	22,498	25,356	29,030	33,050	32,000
Germany, Federal Republic of	30,078	30,466	28,909	25,758	26,500
Brazil	25,644	20,870	19,741	20,612	[2]25,297
Spain (including Canary Islands)	29,569	30,637	25,435	24,197	24,000
France	26,150	24,504	22,724	23,546	23,500
Korea, Republic of	17,887	21,282	20,413	20,424	[2]23,403
Mexico	19,298	17,068	18,901	21,347	[2]20,650
Turkey	15,778	13,595	15,738	17,581	20,000
Poland	16,100	16,200	16,700	15,000	[2]15,800
Taiwan	13,432	14,810	14,284	14,418	[2]14,806
Greece	12,860	14,196	13,521	13,669	13,700
United Kingdom	12,962	13,396	13,481	13,339	13,400
Iran	[e]9,500	[e]10,000	11,803	12,464	[2]13,000
Romania	14,995	13,968	14,016	12,238	12,500
German Democratic Republic	11,721	11,782	11,555	11,607	11,650
Czechoslovakia	10,325	10,498	10,530	[e]10,265	10,200
Total	685,335	709,867	725,714	743,811	775,970
Other	[r]202,023	[r]206,746	215,040	213,940	221,841
Grand total	[r]887,358	[r]916,613	940,754	957,751	997,811

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through July 7, 1987.
[2]Reported figure.

Table 26.—Leading world producers of diamond[1]

(Thousand carats)

Country	1982	1983	1984	1985[p]	1986[e]
Australia	457	6,200	5,692	7,070	[2]29,211
Zaire	6,164	11,982	18,459	20,159	[2]23,304
Botswana	7,769	10,731	12,914	12,635	13,110
U.S.S.R.[e]	10,600	10,700	10,700	10,800	10,800
South Africa, Republic of	9,154	10,311	10,143	10,202	10,300
China[e]	1,000	1,000	1,000	1,000	1,000
Namibia	1,014	963	930	910	950
Ghana	684	340	346	560	600
Total	[r]36,842	[r]52,227	60,184	63,336	89,275
Other	[r]3,589	[r]3,165	3,243	2,809	2,558
Grand total	40,431	55,392	63,427	66,145	91,833

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Gem and industrial grades undifferentiated. Table includes data available through June 2, 1987.
[2]Reported figure.

Table 27.—Leading world producers of nitrogen in ammonia[1]

(Thousand metric tons, N content)

Country	1982	1983	1984	1985[p]	1986[e]
U.S.S.R.[e]	14,000	[r]15,500	[r]15,800	[r]16,700	17,200
China[e]	12,711	13,776	14,000	15,000	15,400
United States	11,820	10,248	12,127	12,009	[2]10,432
India[3]	3,469	3,565	3,975	4,324	4,800
Canada	2,062	2,888	3,493	3,620	3,500
Romania	2,587	2,727	2,861	2,880	2,900
Indonesia	1,028	1,150	1,658	2,055	2,100
Netherlands	1,655	[r]1,744	2,312	2,386	2,100
France[e]	2,000	[r]2,000	[r]2,400	[r]2,000	2,000
Mexico	2,030	1,936	1,773	1,859	1,900
Germany, Federal Republic of	1,570	1,703	1,963	1,908	1,600
United Kingdom	1,716	1,720	1,836	1,767	1,600
Japan	1,652	1,545	1,668	1,628	1,550
Poland	1,380	1,425	1,494	[e]1,254	1,250
German Democratic Republic	[r]1,163	[r]1,206	1,203	1,206	1,200
Italy	1,046	1,060	1,210	1,217	1,200
Bulgaria	1,032	1,123	1,138	1,138	1,140
Pakistan	937	1,098	1,128	1,107	1,100
Trinidad and Tobago	701	993	1,080	1,086	1,100
Total	[r]64,559	[r]67,407	73,119	75,144	74,072
Other	[r]11,360	[r]12,031	13,003	12,833	12,969
Grand total	[r]75,919	[r]79,438	86,122	87,977	87,041

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through May 12, 1987.
[2]Reported figure.
[3]Data given are for years beginning Apr. 1 of that stated.

Table 28.—Leading world producers of phosphate rock[1]

(Thousand metric tons, gross weight)

Country	1982	1983	1984	1985[p]	1986[e]
United States	37,414	42,573	49,197	50,835	[2]38,710
U.S.S.R.[e]	31,300	31,600	31,900	32,200	32,500
Morocco[3]	17,754	20,106	21,245	20,737	[2]21,178
China[e]	11,720	12,500	[r]11,800	[r]6,970	6,700
Jordan	4,390	4,749	6,263	6,067	6,249
Tunisia	4,196	5,924	5,346	4,530	[2]5,951
Brazil	2,732	3,208	3,855	4,214	[2]4,509
Israel	2,148	2,969	3,312	[e]4,076	[2]3,673
South Africa, Republic of	3,161	2,887	2,585	2,433	[2]2,920
Togo	2,800	2,081	2,696	[e]2,452	[2]2,314
Total	117,615	128,597	138,199	134,514	124,704
Other	[r]9,767	[r]10,791	11,964	12,150	12,359
Grand total	[r]127,382	[r]139,388	150,163	146,664	137,063

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Includes only phosphate rock; Thomas slag and guano are excluded. Table includes data available through Apr. 14, 1987.
[2]Reported figure.
[3]Includes output from Western Sahara.

Table 29.—Leading world producers of marketable potash[1]

(Thousand metric tons, K_2O equivalent)

Country	1982	1983	1984	1985[p]	1986[e]
U.S.S.R.	8,079	9,294	9,776	10,367	9,600
Canada	5,309	6,938	7,527	6,661	[2]6,969
German Democratic Republic	3,434	3,431	3,465	3,465	3,450
Germany, Federal Republic of	2,056	2,419	2,645	2,583	2,165
France	1,704	1,536	1,739	1,750	[2]1,617
Israel	1,004	[e]1,000	[e]1,100	[e]1,100	[2]1,255
United States	1,784	1,429	1,564	1,296	[2]1,202
Total	23,370	26,047	27,816	27,222	26,258
Other	[r]1,140	1,371	1,518	1,829	1,990
Grand total	[r]24,510	27,418	29,334	29,051	28,248

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Apr. 28, 1987.
[2]Reported figure.

Table 30.—Leading world producers of salt[1]

(Thousand metric tons)

Country	1982	1983	1984	1985[p]	1986[e]
United States (including Puerto Rico)	[r]34,391	31,393	35,612	36,380	[2]33,296
China	16,384	[e]16,130	[e]16,284	14,446	17,300
U.S.S.R.[e]	15,800	16,200	16,500	[r]16,100	16,100
Germany, Federal Republic of	[r]11,749	[r]10,868	12,212	13,070	11,158
Canada	7,940	8,602	10,235	10,085	[2]11,088
India	7,042	7,013	7,728	9,878	9,983
France	6,703	6,951	7,149	7,113	[2]7,083
United Kingdom	7,637	6,311	7,126	7,146	7,076
Mexico	5,561	5,703	6,167	6,467	6,532
Australia	4,811	5,170	5,695	[r e]6,200	6,200
Romania	4,756	4,596	4,874	5,019	4,990
Poland	3,856	[e]3,630	4,711	4,865	4,900
Italy	4,463	4,189	3,978	3,746	4,030
Netherlands	3,191	3,124	3,674	4,154	[2]3,763
Brazil	3,724	[3]4,187	4,527	4,729	3,538
German Democratic Republic	3,115	[e]3,126	[e]3,133	3,138	[2]3,133
Spain	3,289	3,158	3,389	3,240	3,100
Japan	966	921	955	[e]1,200	[2]1,370
Turkey	1,314	1,261	1,290	1,066	1,180
Total	[r]146,692	[r]142,533	155,239	158,042	155,820
Other	[r]17,573	[r]16,588	17,304	15,743	18,561
Grand total	[r]164,265	[r]159,121	172,543	173,785	174,381

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through July 7, 1987.
[2]Reported figure.
[3]Sales.

Table 31.—Leading world producers of elemental sulfur[1]

(Thousand metric tons)

Country	1983				1984			
	Native	From pyrites	Byprod-uct	Total	Native	From pyrites	Byprod-uct	Total
United States	[2]3,202	W	6,088	9,290	[2]4,193	W	6,459	10,652
U.S.S.R.[e]	[3]2,600	3,400	3,650	9,650	[3]2,600	3,400	3,700	9,700
Canada	--	[e]9	6,568	6,577	--	[e]10	6,596	6,606
Poland[e]	[3]4,960	--	220	5,180	[3]4,990	--	220	5,210
China[e]	200	2,300	350	2,850	200	2,100	350	2,650
Japan	--	272	2,341	2,613	--	259	2,333	2,592
Mexico	[2]1,225	--	[e]477	[e]1,702	[2]1,364	--	[e]621	[e]1,985
Germany, Federal Republic of[e]	--	--	1,322	1,322	--	--	[r]1,481	[r]1,481
Spain	--	1,073	[e]131	[e]1,204	--	1,094	[e]137	[e]1,231
France	--	--	1,910	1,910	--	--	1,862	1,862
Saudi Arabia	--	--	695	695	--	--	833	833
South Africa, Republic of	--	474	[e]157	631	--	464	[e]121	585
Iraq[e]	[2]300	--	40	340	[2]500	--	70	570
Yugoslavia	--	298	[e]183	[e]481	--	301	[e]163	[e]464
Finland	--	224	312	536	--	211	310	521
Italy	9	271	[e]210	[e]490	8	192	[e]200	[e]400
Sweden	--	208	[e]145	353	--	202	[r e]185	387
Brazil	[2]1	55	260	316	[e 2]1	[e]55	[e]260	[e]316
German Democratic Republic[e]	--	--	360	360	--	--	350	350
Romania[e]	--	200	150	350	--	200	150	350
Norway	--	179	[e]103	282	--	215	[r e]58	273
Belgium[e]	--	--	250	250	--	--	240	240
Netherlands[e]	--	--	205	205	--	--	245	245
Korea, North[e]	--	200	30	230	--	200	30	230
Philippines	--	29	57	86	--	38	95	133
Greece	--	67	[e]120	[e]187	--	78	[e]125	[e]203
Australia	--	--	183	183	--	--	203	203
Iran[e]	20	--	[r]16	[r]36	30	--	[r]130	[r]160
United Kingdom	--	--	127	127	--	--	147	147
Total	12,517	[r]9,259	[r]26,660	[r]48,436	13,886	9,019	27,674	50,579
Other	182	[r]462	[r]1,218	[r]1,862	149	483	1,285	1,917
Grand total	12,699	[r]9,721	[r]27,878	[r]50,298	14,035	9,502	28,959	52,496

See footnotes at end of table.

Table 31.—Leading world producers of elemental sulfur[1]—Continued

(Thousand metric tons)

Country	1985[p]				1986[e]			
	Native	From pyrites	Byproduct	Total	Native	From pyrites	Byproduct	Total
United States	[2]5,011	W	6,598	11,609	[2 4]4,043	W	[4]7,044	[4]11,087
U.S.S.R.[e]	[3]2,550	3,350	3,825	9,725	[3]2,575	3,300	3,950	9,825
Canada	--	[e]10	6,660	[r e]6,670	--	10	6,506	6,516
Poland[e]	[3]4,876	--	220	5,096	[3]4,900	--	220	5,120
China[e]	300	2,200	400	2,900	300	2,500	300	3,100
Japan	--	253	2,245	2,498	--	158	2,203	2,361
Mexico	[2]1,551	--	[e]629	[r e]2,180	[2 4]1,592	--	573	2,165
Germany, Federal Republic of[e]	--	--	[r]1,569	[r]1,569	--	--	1,575	1,575
Spain	--	1,231	[r e]124	[r e]1,355	--	[4]1,195	115	1,310
France	--	--	1,723	1,723	--	--	1,306	1,306
Saudi Arabia	--	--	1,100	1,100	--	--	1,300	1,300
South Africa, Republic of	--	562	[r e]185	[r e]747	--	[4]602	200	802
Iraq[e]	[2]500	--	70	570	[2]600	--	70	670
Yugoslavia	--	323	[e]173	[e]496	--	300	203	503
Finland	--	[e]210	[e]305	[e]515	--	210	290	500
Italy	1	280	[e]200	[e]481	--	[4]309	185	494
Sweden	--	207	[r e]186	393	--	216	184	400
Brazil	[e 2]2	[e]60	[e]275	[e]337	[2]2	65	295	362
German Democratic Republic[e]	--	--	330	330	--	--	315	315
Romania[e]	--	200	150	350	--	150	140	290
Norway	--	191	[r e]72	263	--	200	70	270
Belgium[e]	--	--	[r]250	[r]250	--	--	260	260
Netherlands[e]	--	--	250	250	--	--	250	250
Korea, North[e]	--	200	30	230	--	200	30	230
Philippines	--	77	[e]100	[r e]177	--	100	120	220
Greece	--	[e]78	[r e]135	[r e]213	--	75	135	210
Australia	--	--	[e]203	[e]203	--	--	203	203
Iran[e]	30	--	[r]150	[r]180	30	--	150	180
United Kingdom	--	--	149	149	--	--	175	175
Total	14,821	9,432	28,306	52,559	14,042	9,590	28,367	51,999
Other	176	506	1,346	2,028	213	501	1,448	2,162
Grand total	14,997	9,938	29,652	54,587	14,255	10,091	29,815	54,161

[e]Estimated. [p]Preliminary. [r]Revised. W Withheld to avoid disclosing company proprietary data.

[1]Includes all recorded production of sulfur, regardless of the form in which it is recovered. Thus, it includes elemental sulfur, whether mined by conventional methods or by the Frasch process, as well as (1) elemental sulfur and the S content of compounds such as H_2S, SO_2, and H_2SO_4 recovered as a principal product of pyrite mining and as a byproduct of the recovery of crude oil and natural gas and as a byproduct of petroleum refining, coal treatment, and metal smelting and/or refining, and (2) sulfur recovered from tar sands, spent oxides, and other miscellaneous sources. Table includes data available through June 2, 1987.

[2]Entirely Frasch process sulfur.

[3]Includes Frasch process sulfur as follows, in thousand metric tons: Poland (estimated): 1983—4,460; 1984—4,500, 1985—4,386, and 1986—4,400; the U.S.S.R. (estimated): 1983—800, 1984—800, 1985—850, and 1986—875; and total of individually listed countries and grand total: 1983—9,988, 1984—11,358, 1985—12,300 (revised), and 1986—11,512.

[4]Reported figure.

Table 32.—Leading world producers of coal (all grades)[1]

(Million metric tons)

Country	1983			1984			1985[p]			1986[e]		
	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total
China	(2)	715	715	(2)	772	772	(2)	850	850	(2)	870	870
United States	52	658	710	57	756	813	66	736	802	69	738	[3] [4]808
U.S.S.R	158	558	716	156	557	713	157	569	726	159	592	751
German Democratic Republic	278	--	278	296	--	296	312	--	312	315	--	315
Poland	43	191	234	50	192	242	58	192	250	[4]67	[4]192	[4]259
Australia	34	120	154	35	139	174	37	158	195	[4]38	[4]170	[4]208
Germany, Federal Republic of	124	82	206	127	79	206	121	82	203	115	80	195
South Africa, Republic of	--	145	145	--	163	163	--	174	174	--	[4]177	[4]177
India	7	136	143	8	146	154	8	149	157	8	163	171
Czechoslovakia	r99	26	r125	103	26	129	100	26	126	[4]101	[4]26	[4]127
United Kingdom	r(5)	119	119	(5)	50	50	(5)	92	92	(5)	[4]106	[4]106
Yugoslavia	58	(5)	r [3]59	65	(5)	65	69	(5)	69	[4]70	([4] [5])	70
Canada	8	37	45	10	48	58	10	60	70	[4]8	58	66
Romania	37	r8	r45	36	8	44	38	9	47	38	9	47
Turkey	24	7	31	27	7	34	36	9	45	36	9	45
Spain	25	15	40	24	15	39	24	16	40	[4]22	[4]16	38
Greece	31	--	31	32	--	32	36	--	36	37	--	37
Korea, North[e]	(5)	36	36	(5)	36	36	(5)	36	36	(5)	36	36
Korea, Republic of	--	20	20	--	21	21	--	24	24	--	[4]25	[4]35
Bulgaria	32	(5)	32	32	(5)	32	31	(5)	31	32	(5)	32
Hungary	22	3	25	22	3	25	21	3	24	[4]21	[4]2	23
Total	r1,032	r2,876	r [3]3,909	1,080	3,018	4,098	1,124	3,185	4,309	1,136	3,269	[3]4,406
Other	r15	r87	r102	16	90	106	19	93	112	21	82	103
Grand total	r1,047	r2,963	r [3]4,010	1,096	3,108	4,204	1,143	3,278	4,421	1,157	3,351	[3]4,508

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Oct. 15, 1987.
[2]Output small; included under "Bituminous and anthracite."
[3]Data do not add to total shown because of independent rounding.
[4]Reported figure.
[5]Less than 1/2 unit.

Table 33.—Leading world producers of marketed natural gas[1]

(Billion cubic feet)

Country	1982	1983	1984	1985[p]	1986[e]
U.S.S.R	17,700	18,900	20,700	22,700	[2]24,200
United States	17,758	16,033	17,392	16,382	[2]16,036
Canada	2,683	2,465	2,506	2,831	[2]2,696
Netherlands	2,544	2,703	2,728	2,851	2,600
United Kingdom	[r]1,336	[r]1,367	1,361	1,517	1,600
Algeria	1,048	1,427	1,545	1,320	1,320
Romania	1,011	1,100	1,127	1,126	1,120
Indonesia	926	1,032	1,386	1,449	[2]1,113
Mexico	1,279	1,274	1,194	1,145	[2]1,062
Norway	925	[r]932	964	983	[2]973
Saudi Arabia	316	155	253	716	848
Argentina	334	464	486	550	606
Malaysia (Sarawak)	32	131	325	437	570
Italy	512	459	489	503	[2]564
Germany, Federal Republic of	569	622	563	511	550
Australia	409	420	446	475	[2]519
United Arab Emirates	336	120	430	499	[2]492
China	414	431	438	455	485
Venezuela	527	508	518	498	[2]476
German Democratic Republic	286	353	459	459	459
Total	[r]50,945	[r]50,896	55,310	57,407	58,289
Other	[r]3,532	[r]3,773	4,153	4,249	4,771
Grand total	[r]54,477	[r]54,669	59,463	61,656	63,060

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

[1]Comprises all gas collected and utilized as a fuel or a chemical industry raw material as well as that used for gas lift in fields, including gas used in oilfields and/or gasfields as a fuel by producers even though it is not actually sold. Excludes gas produced and subsequently vented to the atmosphere, flared, and/or reinjected to reservoirs. Table includes data available through Oct. 15, 1987.

[2]Reported figure.

Table 34.—Leading world producers of natural gas liquids[1]

(Million 42-gallon barrels)

Country[2]	1982	1983	1984	1985[p]	1986[e]
United States	566	569	597	586	[3]566
U.S.S.R.[e]	145	155	160	175	180
Saudi Arabia	[r]157	119	124	123	[3]150
Mexico	[e]95	[r]105	136	[e]123	[3]129
Algeria	73	92	119	122	122
Canada	117	114	139	125	[3]120
United Arab Emirates (Abu Dhabi, Dubai, Ras al-Khaimah)	72	92	[r e]94	[r e]78	80
United Kingdom	34	47	55	55	67
Total	[r]1,259	[r]1,293	1,424	1,387	1,414
Other	[r]134	[r]146	202	221	231
Grand total	[r]1,393	[r]1,439	1,626	1,608	1,645

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

[1]Every effort has been made to include only those natural gas liquids produced by natural gas processing plants and to exclude natural gas liquids obtained from field treatment facilities including wellhead separators, because the latter are normally blended with crude oil and thus are included in crude oil output statistics. In some cases, however, sources do not clearly specify whether data presented represent only output of natural gas processing plants or if they include field output. Thus, some of the figures may include field condensate. Table includes data available through Oct. 15, 1987.

[2]In addition to the countries listed, China, Czechoslovakia, the German Democratic Republic, the Federal Republic of Germany, and Italy may also produce natural gas liquids in substantial quantities, but available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

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

(Million 42-gallon barrels)

Country	1982	1983	1984	1985[p]	1986[e]
U.S.S.R.	4,500	4,530	4,500	4,380	[2]4,520
United States	3,157	3,171	3,250	3,274	[2]3,168
Saudi Arabia[3]	[r]2,366	1,657	1,702	1,237	[2]1,841
China	745	774	836	874	954
Mexico	1,002	973	983	960	[2]886
United Kingdom	[r]732	[r]809	885	894	[2]884
Iran	[r]808	[r]891	794	803	[2]686
Venezuela	692	657	658	614	[2]654
Iraq	310	[e]400	438	521	[2]617
Canada	464	495	526	538	[2]534
Nigeria	472	452	508	544	[2]534
Kuwait[3]	300	385	424	374	519
United Arab Emirates (Abu Dhabi, Dubai, Sharjah)	[r]460	[r]420	391	439	498
Indonesia	488	490	517	484	[2]459
Libya	[e]418	402	391	387	376
Total	[r]16,914	[r]16,506	16,803	16,323	17,130
Other	[r]2,500	[r]2,727	3,004	3,148	3,239
Grand total	[r]19,414	[r]19,233	19,807	19,471	20,369

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Oct. 15, 1987.
[2]Reported figure.
[3]Includes the country's share of production from the Kuwait-Saudi Arabia Divided Zone.

Table 36.—Leading world producers of refined oil[1]

(Million 42-gallon barrels)

Country	1982	1983	1984	1985[p]	1986[e]
United States (including Puerto Rico and Virgin Islands)	5,113	4,998	5,223	5,179	5,501
U.S.S.R.[e]	3,393	3,454	3,445	3,445	3,522
Japan	1,337	1,308	1,399	1,304	[2]1,272
Germany, Federal Republic of	719	687	683	665	830
China[e]	475	500	550	655	700
United Kingdom	[r]597	[r]600	618	610	[2]627
Italy	693	649	629	595	[2]597
France	617	564	570	603	[2]584
Canada	589	[r]549	560	569	[2]565
Mexico	462	467	502	519	505
Netherlands	365	402	407	364	[2]430
Brazil	[e]410	[e]395	[e]405	429	425
Venezuela	318	323	325	379	[2]391
Saudi Arabia[3]	311	314	320	363	363
Spain (including Canary Islands)	337	337	327	351	336
India	240	263	252	267	335
Singapore	305	306	293	[e]294	287
Total	[r]16,281	[r]16,116	16,508	16,591	17,270
Other	[r]4,549	[r]4,333	5,664	4,770	4,836
Grand total	[r]20,830	[r]20,449	22,172	21,361	22,106

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Oct. 15, 1987.
[2]Reported figure.
[3]Includes the country's share of production from the Kuwait-Saudi Arabia Divided Zone.

The Mineral Industry of Albania

By Walter G. Steblez[1]

Albania's centrally planned economy and mineral industry performed marginally better in 1986 than in 1985. Planned production goals for chromite, coal, copper, pig iron, nickeliferous iron ore, steel, and electric power were met, although the petroleum sector continued to stagnate. Overall, industrial production grew by 6.4% compared with that of 1985 but was still about 1% short of the planned output level. Mineral industry investments during the year included ongoing facility expansion at a number of chromite and copper mines, the continuing construction of a nickel-cobalt refinery at Elbasan, and the startup of a second turbine of the Enver Hoxha hydroelectric power station at Koman.

The first year of the eighth 5-year plan was 1986, and although, as in previous years, actual production and trade results in gross weight terms were not published, plan results and future plan targets for 1986, 1987, and 1986-90 were provided in official sources as percentage increases over those of past years. Albania had been publishing statistical handbooks every 5 years that have provided only limited production data in gross weight terms.

Government Policies and Programs.—At yearend, Albania published goals for the eighth 5-year plan (1986-90) for the country's economy and mineral industry. Owing to serious shortfalls in mineral exploration programs, production, and export during the seventh 5-year plan (1981-85), the new 5-year plan stressed the need for more extensive exploration of both fuel and nonfuel minerals, as well as for more accurate marketing studies to improve export. The new 5-year plan called for a net 45-million-ton increase in mineral and mineral fuel reserves. Mining and extraction would rise by 32% over the total output of the seventh 5-year plan. The production of chromite by 1990 was planned to grow 34% to 36% compared with that of 1985; that of copper and nickeliferous iron ore, by 40% to 42% and 27% to 29%, respectively. During the same period, the output of sheet steel was to be increased by 30% to 32%, and blister copper, by 34%. Planned output targets for petroleum and coal for the end of 1990 indicated a respective increase of 34% and 43% over the production levels of 1985, and the production of natural gas was to increase by 160%.

Investments in the mineral industry during the eighth 5-year plan were to include the construction of 10 beneficiation plants for chromite, coal, and copper that would have a total annual throughput of over 1.8 million tons. Also, new ferrochromium capacities would be added that, together with the plant at Burrel, would increase ferrochromium output by about 44%. Projects carried over from the seventh 5-year plan period that would be completed included the Milot-Rreshen-Klos Railroad, which would service Albania's largest chromite mining district at Bulquizë, and the lubricating oil and nickel-cobalt plants.

The plan for 1987 called for a 7.4% increase in industrial production compared with that of 1986 and for slightly higher increases for several other unspecified branches of the mining and processing sectors.

PRODUCTION

Although Albania's economy showed some improvement in 1986 compared with that of 1985, serious shortcomings such as low productivity and transportation bottlenecks remained. To improve efficiency in the minerals sector of the economy, which was largely labor intensive, Albania required large-scale investments of new technology and equipment. Owing to a policy that prohibited foreign credit borrowing, the country's only means to obtain foreign technology had been to sell sufficiently large amounts of chromite and petroleum products to generate hard currency for needed imports. In recent years, the market downturn for both chromite and petroleum had negatively affected the country's production and commerce. While chromite production showed some recovery in 1985 and 1986, production shortfalls in the petroleum sector, owing to managerial and technical factors, continued in 1986, resulting in increased imports of needed fuels and a decline in available investment capital.

Table 1.—Albania: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
Asphalt and bitumen, natural[e 3] thousand tons	1,000	1,000	900	900	950
Cement, hydraulic[e] do	830	840	840	850	850
Chromium:[e]					
Chromite, gross weight do	900	914	[4]960	[4]1,100	1,200
Marketable ore do	675	685	720	825	850
Coal: Lignite[e] do	1,640	1,779	[4]2,010	2,195	2,200
Cobalt, mine output, Co content[e 5]	400	450	600	600	650
Copper:					
Ore:					
Gross weight	826,000	891,000	[4]1,007,000	[e]1,010,000	1,100,000
Cu content	13,200	[r]14,300	16,100	[e]16,200	17,600
Metal, primary:					
Smelter	10,200	11,000	[4]12,600	[e]12,600	13,700
Refined	9,500	10,500	11,500	[e]11,500	11,700
Gas, natural, gross production[e 6] million cubic feet	14,500	14,000	17,500	13,500	16,000
Iron and steel:					
Iron ore, nickeliferous:					
Gross weight	702,000	850,000	[4]1,082,000	[e]1,130,000	1,200,000
Fe content	234,000	283,000	360,000	[e]376,000	400,000
Ferroalloys, ferrochromium	30,000	35,000	40,000	[e]43,000	45,000
Nickel, mine output, Ni content[e]	6,000	7,200	9,200	9,600	9,700
Nitrogen: N content of ammonia[e]	76,000	76,000	80,000	80,000	80,000
Petroleum:[e]					
Crude:					
Weight thousand tons	1,700	1,500	1,400	1,400	1,500
Converted thousand 42-gallon barrels	11,300	9,900	9,800	[r]9,800	9,900
Refinery products	11,200	9,000	9,000	9,000	9,000
Salt[e]	66,500	70,000	70,000	70,000	70,000
Sodium compounds, n.e.s.: Carbonate, calcined (soda ash)[e]	25,000	25,000	25,000	31,000	33,000

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

[1]Table includes data available through July 1987.

[2]In addition to the commodities listed, a variety of industrial minerals and crude construction materials (bauxite, common clay, dolomite, olivinite, quartz, sand and gravel, stone, and titanomagnetite) are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels. Also, metallic nickel production reportedly began in 1978, but data on the level of production are not available.

[3]Includes petroleum-refinery-produced asphalt and bitumen.

[4]Reported figure.

[5]Calculated from reported and estimated weight of nickeliferous ore; the amount of cobalt recovered, if any, is conjectural.

[6]Separate data on marketable production are not available, but gross and marketed output are regarded as nearly equal.

TRADE

Commercial agreements reached in 1986 for 1987 on mineral trade with planned economy countries included an agreement with Bulgaria that would provide for exports of Albanian bitumen, copper cable, nickeliferous iron ore, and electric power in exchange for capital goods and steel semimanufactures and pipes. In 1986, Bulgaria became Albania's third largest trading partner in terms of trade volume after Yugoslavia and Czechoslovakia among the centrally planned economy countries. The German Democratic Republic continued to be one of Albania's major suppliers of advanced capital equipment and chemicals. Both countries signed a 5-year trade agreement that allowed for Albanian exports of metallurgical-grade chromite and consumer goods to the German Democratic Republic in exchange for a wide variety of producer durables.

Albania reported concluding trade agreements with China and North Korea for 1987. The agreement with North Korea called for Albanian exports of chromite, rolled copper, and consumer goods in exchange for sheet iron, lead ingots, and rolled steel. The trade agreement with China provided for Albanian imports of coking coal, graphite electrodes, capital equipment, and chemicals in exchange for bitumen, chromium ore and concentrate, and copper cable.

Albania planned to increase its total foreign trade turnover in 1990 by 34% to 36% compared with that of 1985; exports were planned to increase between 44% and 46%. Apart from traditional mineral exports, Albanian sources reported that greater effort would also be made to increase exports of blister copper and dolomite.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS				
Chromium: Ore and concentrate	691,360	543,453	15,503	Yugoslavia 136,870; Japan 94,123; Italy 92,936.
Copper: Metal including alloys:				
Scrap	--	279	--	All to West Germany.
Semimanufactures	349	278	--	All to Yugoslavia.
Iron and steel: Metal:				
Ferroalloys:				
Ferrochromium	24,595	850	--	All to Italy.
Unspecified	777	4,774	--	Sweden 3,209; Belgium-Luxembourg 1,521; West Germany 44.
Steel, primary forms	11,393	NA		
Semimanufactures:				
Wire	20	NA		
Tubes, pipes, fittings	--	1,017	--	All to Jordan.
Nickel:				
Matte and speiss	313	489	--	All to Japan.
Ash and residue containing nickel	252	NA		
Platinum-group metals: Waste and sweepings value, thousands	$169	$315	--	All to Italy.
Zinc: Metal including alloys, unwrought	59	NA		
Other: Ores and concentrates	4,503	34	--	Italy 33; Greece 1.
INDUSTRIAL MINERALS				
Cement	88,932	7,776	--	Yugoslavia 7,749; Austria 27.
Clays, crude	2,025	NA		
Kyanite and related materials	1,217	NA		
Magnesium compounds	--	1,553	--	All to Italy.
Pyrite, unroasted	31,489	24,592	--	Italy 17,854; Hungary 6,738.
Salt and brine	3,495	5,776	--	All to Yugoslavia.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	5,960	1,805	--	Poland 1,577; Italy 189; Greece 39.
Worked	7	2	--	All to Yugoslavia.
Gravel and crushed rock	17	NA		
Quartz and quartzite	782	NA		
Sulfur:				
Elemental:				
Crude including native and byproduct	487	1,164	--	Italy 1,000; Yugoslavia 164.
Colloidal, precipitated, sublimed	60	20	--	All to Yugoslavia.

See footnotes at end of table.

Table 2.—Albania: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Sulfur —Continued				
Sulfuric acid	--	101	--	All to Yugoslavia.
Other: Crude	--	51	--	All to Italy.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	500	142	--	All to Yugoslavia.
Coal:				
Anthracite and bituminous	--	25,670	--	All to Belgium-Luxembourg.
Lignite including briquets	10	NA		
Coke and semicoke	--	13,520	--	All to Greece.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	17	11	--	All to Yugoslavia.
Gasoline do	671	131	--	Italy 88; Hungary 43.
Kerosene and jet fuel do	2	2	--	All to Hungary.
Distillate fuel oil do	85	NA		
Residual fuel oil do	--	18	--	All to Italy.
Bitumen and other residues do	53	8	--	All to Greece.
Unspecified do	174	175	--	All to Poland.

[p]Preliminary. NA Not available.

[1]Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Albania, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Unwrought	727	1,066	--	Hungary 937; Yugoslavia 94; Greece 35.
Semimanufactures	1,326	1,319	--	Hungary 756; Yugoslavia 362; West Germany 107.
Cobalt: Oxides and hydroxides	40	NA		
Copper: Metal including alloys:				
Unwrought	14	86	--	All from West Germany.
Semimanufactures	365	400	--	Yugoslavia 180; Greece 175; West Germany 42.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	29,010	NA		
Pyrite, roasted	42,062	NA		
Metal:				
Pig iron, cast iron, related materials	2,010	1,308	--	All from Italy.
Ferroalloys:				
Ferrochromium	--	20	--	All from Yugoslavia.
Ferromanganese	533	625	--	Do.
Ferrosilicon	--	1,349	--	Do.
Unspecified	13	NA		
Steel, primary forms	--	10	--	All from West Germany.
Semimanufactures:				
Bars, rods, angles, shapes, sections	7,375	3,409	--	Yugoslavia 2,211; Hungary 739; West Germany 414.
Universals, plates, sheets	7,403	7,525	--	Poland 3,958; Hungary 2,316; Yugoslavia 556.
Hoop and strip	256	676	--	West Germany 577; Greece 98; Sweden 1.
Rails and accessories	941	442	--	Poland 392; West Germany 32; Yugoslavia 18.
Wire	458	459	--	West Germany 235; Austria 94; Yugoslavia 90.
Tubes, pipes, fittings	8,677	11,935	--	Austria 4,358; West Germany 2,331; Hungary 1,366.

See footnotes at end of table.

Table 3.—Albania: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Semimanufactures —Continued				
Castings and forgings, rough	158	NA		
Unspecified	37,218	34,698	--	Czechoslovakia 18,000; Poland 16,698.
Lead:				
Oxides	133	NA		
Metal including alloys:				
Unwrought	33	8	--	All from West Germany.
Semimanufactures	40	NA		
Mercury 76-pound flasks	174	NA		
Nickel: Metal including alloys:				
Unwrought	5	NA		
Semimanufactures	7	2	--	West Germany 1; Italy 1.
Tin: Metal including alloys, scrap	48	61	--	All from West Germany.
Titanium:				
Ore and concentrate	--	30	--	All from Italy.
Oxides	22	NA		
Tungsten: Metal including alloys, all forms	--	2	--	West Germany 1; Italy 1.
Zinc:				
Oxides	6	50	--	All from Italy.
Metal including alloys, unwrought	25	10	--	All from West Germany.
Other:				
Ores and concentrates	--	18	--	All from Italy.
Ashes and residues	--	7	--	All from West Germany.
Base metals including alloys, all forms	4	NA		
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Artificial: Corundum	273	294	--	Yugoslavia 174; Hungary 120.
Grinding and polishing wheels and stones	18	36	--	Italy 32; United Kingdom 4.
Asbestos, crude	1,699	1,523	--	Yugoslavia 1,483; Italy 24; Greece 16.
Barite and witherite	58	4,600	--	All from Italy.
Boron materials: Oxides and acids	6	NA		
Cement	60	60	--	All from Yugoslavia.
Clays, crude	182	48	--	Yugoslavia 24; West Germany 20.
Diamond: Gem, not set or strung value, thousands	$63	$19	--	All from United Kingdom.
Diatomite and other infusorial earth	10	15	--	All from West Germany.
Feldspar, fluorspar, related materials	1,192	48	--	All from Yugoslavia.
Fertilizer materials: Manufactured:				
Phosphatic	--	25	--	All from Belgium-Luxembourg.
Potassic	--	5	--	All from West Germany.
Graphite, natural	59	7	--	West Germany 6; Italy 1.
Magnesium compounds	500	2,431	--	Yugoslavia 2,393; Greece 20; West Germany 18.
Mica: Worked including agglomerated splittings	3	3	--	Yugoslavia 2; West Germany 1.
Phosphates, crude	58,100	39,200	--	All from Morocco.
Sodium compounds, n.e.s.: Carbonate, manufactured	1,500	2,500	--	All from Yugoslavia.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	74	37	--	All from Italy.
Worked	51	37	--	Do.
Gravel and crushed rock	--	23	--	Do.
Sand other than metal-bearing	3,250	2,669	--	Yugoslavia 2,647; Belgium-Luxembourg 22.
Sulfur: Sulfuric acid	7	NA		
Talc, steatite, soapstone, pyrophyllite	86	40	--	All from Italy.
Other: Crude	97	253	--	All from Greece.
MINERAL FUELS AND RELATED MATERIALS				
Coal: Anthracite and bituminous	270,560	275,098	210,838	Poland 63,000; West Germany 1,260.
Petroleum refinery products:				
Gasoline 42-gallon barrels	7,761	4,956	--	All from Italy.
Mineral jelly and wax do.	2,534	2,070	--	Yugoslavia 1,968; West Germany 87; Austria 15.
Lubricants do.	16,072	18,354	--	Yugoslavia 6,944; Switzerland 4,557; Hungary 3,731.
Bitumen and other residues do.	6	NA		

[p]Preliminary. NA Not available.

[1]Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Albania, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

COMMODITY REVIEW

METALS

Chromite.—The country's output of chromite rose modestly. Reportedly, during the eighth 5-year plan, existing mines would be expanded and new capacities, between 35,000 and 40,000 tons per year, would be added for the production of ferrochromium. Albania planned to raise the production and export of both chromite and high-carbon ferrochromium substantially by the end of the current 5-year plan.

Copper.—Copper production rose by approximately 9% in 1986 compared with that of 1985. The country's copper industry was fully integrated, and exports included copper wire and semimanufactures. The industry announced plans to increase annual output during the eighth 5-year plan period by about 6% per year and to increase its marketable product range.

Iron and Steel.—Developments in the industry in 1986 included the startup of a 15,000-ton-per-year, 2.5-millimeter steel wire drawing mill at the Elbasan iron and steel works. As raw material, the mill would use 6.5-millimeter rod produced at the Elbasan rolling mill. Plans for 1987 called for a 32% increase in the production of iron ore concentrates at Elbasan as well as a 41% increase in the output of pig iron and a 12% increase in the production of coking coal compared with those of 1986.

INDUSTRIAL MINERALS

Although production and trade data have not been made available, Albania reported continued production of dolomite, olivinite, quartz, and titanomagnetite. The country also reported having discovered unspecified deposits of kaolin and phosphate.

MINERAL FUELS

Bitumen.—The Selenica bitumen mine reported exceeding production plans in 1986 by about 8%. The mine had been producing over 100,000 tons per year of bitumen, bituminous gravel, and dolomite.

Coal.—To reduce reliance on petroleum, Albania planned to increase coal production 42% to 44% by 1990 compared with 1985 production. The increase in production would be achieved by facility expansion at existing mines in the Tirana, Memaliaj, Korçë, and Pogradec coal basins. Also, new coal beneficiation plants were planned, along with storage and transportation infrastructure.

Petroleum and Natural Gas.—Shortfalls in the production of petroleum continued in 1986, although gas output was reportedly substantially increased during the year. To improve the performance of the petroleum sector, the Albanian foreign trade organization Makinaimport signed an agreement with the Yugoslav firm Energoinvest to purchase about $1.5 million in oil drilling equipment during 1986. The petroleum industry indicated that additional purchases of oilfield equipment would be made during the eighth 5-year plan to help reverse decreasing production.

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The Mineral Industry of Algeria

By Kevin Connor[1]

The sharp drop in petroleum and natural gas prices worldwide caused severe budgetary problems for Algeria in 1986. Throughout the year, the Government's national hydrocarbon agency, Société Nationale pour la Recherche, la Production, le Transport, la Transformation, et la Commercialisation des Hydrocarbures (SONATRACH), was involved in price disputes over long-term natural gas contracts between itself, the gas supplier, and its Western European customers. SONATRACH's main gas customers in Western Europe were Belgium, France, and Spain, and all were asking for reduced contractual gas prices as a fair adjustment in light of the depressed state of world natural gas spot prices and short-term contracts.

The Algerian economy depended almost solely on natural gas and oil exports for trade revenues, which dropped an estimated 40% in 1986. The hydrocarbon sector was accountable for as much as 30% of the country's gross domestic product (GDP) throughout the last half of the 1970's and the first half of the 1980's but was estimated at only one-half that level for 1986. The slump was expected to drop the country's annual GDP growth by 2%, to about 4.5%. At yearend, Algeria's external debt was estimated at $15 billion.[2]

Government Policies and Programs.—The National Assembly passed a law in July amending a 1982 law regarding joint ventures in Algeria. As with the old law, joint ventures involving foreign companies may only be formed with Algerian public entities. Additional guarantees for repatriation of invested capital was considered the biggest change in the investment law, and in general, the 1986 law was considered an improvement by international mining companies. However, further incentives were needed before foreign investors were expected to change their views toward mineral investment in Algeria, and the National Assembly was expected to consider such changes in 1987. A related finance law, also amended in 1986, improved tax incentives for investment in certain high-priority areas, one of which was industrial investments in underdeveloped geographic areas.

PRODUCTION AND TRADE

Algeria continued to be a major world producer of natural gas and condensates, by far the largest producer within the Organization of Petroleum Exporting Countries cartel. Except for the country's natural gas and petroleum industries, Algeria's minerals sector was small by international standards, with only iron ore, mercury, and phosphate rock produced in significant amounts. Other minerals produced included barite, celestite, clays, lead-zinc ores, and salt. Production of phosphate rock leveled off in 1986, with a substantial portion of the output remaining dust-free rock with 63% to 65% bone phosphate of lime, produced from the Djebel Onk open pit mine in southeastern Algeria. Iron ore production, produced solely from the Ouenza open pit mine, was mostly consumed by the El Hadjar steelworks. Along with the planned erection of a 1.1-million-ton-per-year steelworks at Bellara as part of an industry

expansion program, a new port at Djendjen for the import of iron ore and the export of steel products was to be constructed. Work on both projects was to begin before the end of 1987.

Table 1.—Algeria: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Cadmium, refined[e]	30	30	24	[r]24	24
Copper concentrate:					
Gross weight	627	600	820	--	--
Cu content	144	130	115	--	--
Iron and steel:					
Iron ore, gross weight thousand tons	3,892	3,684	3,664	3,776	[3]3,360
Metal:					
Pig iron do	1,097	1,100	[e]1,100	[e]1,100	1,100
Steel, crude[e] do	575	600	700	750	750
Lead concentrate, Pb content[e]	5,000	3,000	4,000	[r]3,800	3,600
Mercury 76-pound flasks	11,000	[e]10,000	23,000	23,000	[3]22,000
Silver[e] thousand troy ounces	110	120	120	120	120
Zinc:					
Concentrate, Zn content	11,100	12,100	14,600	13,500	12,000
Smelter	28,500	31,200	35,000	35,700	34,500
INDUSTRIAL MINERALS					
Barite, crude	102,000	[e]110,000	88,000	60,000	[3]60,000
Cement, hydraulic[e] thousand tons	4,400	4,800	5,500	[r]6,096	6,500
Clays:					
Bentonite	[e]35,000	[e]30,000	24,500	33,000	[3]30,000
Fuller's earth[e]	5,100	5,000	[3]3,500	3,500	3,500
Kaolin	[e]15,000	[e]17,000	8,000	13,000	[3]14,200
Diatomite	[e]4,500	[e]4,500	1,600	2,600	[3]4,000
Gypsum and plaster[e 4] thousand tons	200	250	250	250	275
Lime, hydraulic[e] do	40	40	40	40	40
Nitrogen, N content of ammonia	164,000	131,500	146,300	150,000	[3]150,000
Phosphate rock thousand tons	947	893	1,000	1,207	[3]1,203
Salt do	140	[e]150	175	168	[3]190
Sodium compounds: Caustic soda[e]	700	700	700	700	700
Strontium minerals: Celestite, gross weight[e]	5,400	5,400	5,400	5,400	5,400
Sulfur, elemental[e]	10,000	15,000	20,000	20,000	20,000
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural:					
Gross million cubic feet	2,898,000	3,173,000	3,223,000	[e]3,350,000	3,350,000
Marketed (including liquefied) do	1,048,000	1,427,000	1,545,000	1,320,000	1,320,000
Natural gas plant liquids (condensate) thousand 42-gallon barrels	73,000	91,500	118,950	122,275	122,000
Petroleum:					
Crude do	259,150	240,900	233,508	234,095	234,000
Refinery products:					
Gasoline do	14,235	12,045	12,045	[e]13,000	13,000
Kerosene and jet fuel do	6,205	4,745	4,745	[e]5,500	5,500
Distillate fuel oil do	41,975	52,925	52,925	[e]53,000	53,000
Residual fuel oil do	28,105	34,675	35,040	[e]37,000	37,000
Lubricants do	1,095	365	730	[e]350	350
Other do	40,150	40,515	52,560	[e]37,500	37,500
Refinery fuel and losses do	6,570	7,300	6,205	[e]9,000	9,000
Total do	138,335	152,570	164,250	[e]155,350	155,350

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

[1]Table includes data available through June 30, 1987.

[2]In addition to the commodities listed, secondary aluminum, secondary lead, and secondary copper may be produced in small quantities; crude construction materials presumably are produced for local consumption, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Includes approximately 50,000 tons of plaster each year.

COMMODITY REVIEW

METALS

Iron and Steel.—The U.S.S.R.'s Technoexport had a contract with Algeria's state steel agency, Entreprise Nationale de Siderurgie (Sider), to build five workshops at El Hadjar, the country's sole steelworks, for fabricating spare parts and equipment to be used at the El Hadjar complex. Sider officials estimated the workshops would produce 7,000 tons of spares annually for the El Hadjar operations. Sider was also seeking experienced foreign technicians for El Hadjar as part of building a preventive maintenance program for the complex. The agency hoped that a strong technical staff would increase El Hadjar's output from the estimated 750,000 tons of raw steel produced in 1986 to the complex's designed capacity of 2.4 million tons per year.

In September, Sider issued a request for technical and cost proposals to construct a planned 1.1-million-ton-per-year steel plant at Bellara, east of Algiers. The estimated cost of the Bellara complex was between $1.5 billion and $2.0 billion. Japan's Nippon Steel Corp. worked up the preliminary plans on the Bellara complex for Sider. The plant was expected to be a direct-reduction operation, using any one of three processes: the Nippon Steel process, the Midrex process, or the HYL process offered by the Federal Republic of Germany's Gutehoffnunghutte Aktienverein. Sider planned to fuel the complex with nearby natural gas.

Preparation was continuing throughout the year for Sider to issue a request for technical and cost proposals for an estimated $170 million project to build a steel rolling mill at Barik, south of Setif. Sider's preliminary plans called for a rod and bar mill with a capacity of 400,000 tons per year. The planned steel plant at Bellara was expected to supply the raw metal for the rolling mill. The Barik project was the first of three mills planned for construction to process steel manufactured at Bellara.

Mercury.—Algeria's mercury producer, Entreprise Nationale des Nonferreux et Substances Utiles (Enof), reported a loss of approximately $3 million for 1986. Average production costs of $300 per flask were more than $100 per flask higher than the average selling price for the year. Oversupply was the major reason cited for the exceptionally low mercury prices on the international market. World consumption of mercury was approximately 220,000 flasks for the year, with Algeria supplying about 10% of this figure. Only Spain and the U.S.S.R. were bigger producers of mercury in 1986. To curb the decline in international market prices and turn them around, Spain's major mercury producer, Minas de Almadén y Arrayanes S.A., and Algeria's Enof were planning at yearend to sign an agreement to suspend spot mercury sales in 1987 and refuse to sell any mercury, even on a contractual basis, for less than $220 per flask.

INDUSTRIAL MINERALS

Cement.—Algeria's annual cement production showed another healthy increase in 1986. At Ain Touta, a new 1-million-ton-per-year plant operated by Société Nationale des Matériaux de Construction started production operations during the year. F. L. Smidth of the United Kingdom supplied the major equipment, which included two Unax kilns with four-stage preheaters, two raw mills, and two cement mills.

Fertilizer Materials.—Planning continued throughout the year for a phosphate fertilizer complex at Bir-el-Ater, near Tebessa. The state fertilizer agency, Entreprise Nationale Asmidal (ENA), decided in 1985 to revive construction plans for the works, originally envisioned to be built in the latter 1970's. ENA issued a request for technical and cost proposals for the construction project in the first half of 1986. The work entailed building support infrastructure for the fertilizer plant as well as the four-unit fertilizer complex, which, upon completion, was to have the capacity to produce 1,600 tons of sulfuric acid per day, 500 tons of phosphoric acid per day, 1,200 tons of triple superphosphate per day, and 120 tons of sodium tripolyphosphate per day.

MINERAL FUELS

Natural Gas.—As in previous years, the giant Hassi R'Mel natural gas field dominated the country's production. SONATRACH continued to operate the field at reduced capacity because of depressed international market prices. Construction work on the Hassi R'Mel-Skikda natural gas pipeline continued during 1986 and was expected to be completed in 1988. The design capacity of the line was to be 250 billion cubic feet per year and was to supply gas to the Skikda liquefied natural gas complex. A

950-kilometer, 48-inch pipeline stretching from the Alrar Field near the Libyan border to the Hassi R'Mel Field was activated early in 1986.

Petroleum.—*Condensate.*—Continued favorable export markets for liquefied petroleum gas (LPG) during the 1980's resulted in Algeria investing heavily in the construction of a major LPG recovery plant at Bethioua near Arzew. Construction work on the plant was completed, and the complex became commercially operational late in 1986. The design capacity of the plant was 1.2 million tons per year, bringing Algeria's total annual LPG production capacity to 4 million tons. Approximately 600,000 tons was used domestically in Algerian industry, with the rest exported through port terminals at Skikda and Bethioua, and sold mainly to customers throughout Europe.

Crude.—Discussions were under way at yearend between Compagnie Française des Pétroles-TOTAL (CFP-TOTAL) of France and SONATRACH over possible extension of CFP-TOTAL's production-sharing agreement for the Mereksen Oilfield. CFP-TOTAL held production rights in Mereksen, the largest of the remaining three oilfield concessions in Algeria involving participation by foreign firms, although SONATRACH had been the field operator since 1979. The Mereksen Field, situated in the Stah area, was estimated to have produced 12,800 barrels of crude per day in 1986, or about 2% of the country's total. CFP-TOTAL's original agreement with the Government of Algeria was signed in 1975, and the company was understood to be asking for a 5-year extension to the 12-year agreement that was to run out in March 1987. CFP-TOTAL had production rights at Hassi Messaoud, Haoud Berkaoui, and Stah until 1980, at which time the entitlements expired and SONATRACH took over 100% ownership.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Algerian dinars (DA) to U.S. dollars at the rate of DA4.70=US$1.00.

The Mineral Industry of Angola

By Thomas O. Glover[1]

In 1986, Angola was engaged in a struggle for economic development because it was a victim of falling oil prices in the international marketplace and a civil war that had devastated the country for 11 years. The Government of Angola, based at Luanda, spent over one-half of its national budget on the armed forces. One-half of Angola's $2.7 billion[2] foreign debt was also related to military expenditures.

Angola's petroleum industry was the only bright spot in the economy, supplying more than 90% of sorely needed foreign exchange. Approximately 70% of Angola's petroleum was produced by Cabinda Gulf Oil Co. (CABGOC), which was absorbed by Chevron Oil Corp. in 1984 when Chevron acquired all assets of Gulf Oil Corp. worldwide.

The only other mineral of importance as a foreign exchange earner was diamond. However, diamond operations ceased during late 1986 because of accumulated fiscal losses from 1982-85, a decrease in diamond production due to the civil war, and the steady decline in the average diamond price from $179 per carat in 1979 to $40 per carat in 1985.

Angola exported approximately 270,000 barrels of crude oil per day. Exports of crude oil were approximately 23% higher in 1986 compared with those of 1985. The increased crude oil production came from new offshore wells. A major new field responsible for the increased production of crude oil was the Pacassa Field about 30 miles off northern Angola. In addition, two smaller fields were tested during the year. The Pacassa Field, under the supervision of Elf Aquitaine Angola, had a production capacity of 55,000 barrels per day.

Reliable information on mineral industry projections and production was difficult to obtain owing to the constant internal turmoil created by the civil war in Angola. Even with the minimal reports that were available, it was evident that the mineral industry production, other than crude oil, continued to deteriorate. Crude oil production was the only bright spot in the economy and even that dimmed somewhat under lower crude prices.

Soviet geologists made a geological survey of western Angola and plotted a list of useful minerals on a geologic map. They also drew up a structural tectonic chart of western Angola. In the energy area, the U.S.S.R. established a new system for the management of the country's energy services. The U.S.S.R. carried out studies on a development plan for the energy sector with an intent to create a national powerplant grid system. The Soviet Union also completed the turnkey construction of two petroleum product depots in Malange and in Porto Amboim.

PRODUCTION AND TRADE

In 1986, petroleum sales brought approximately $1.2 billion in revenue. This represented a drop of over 50% in revenues from those of 1985 due to falling crude oil prices. Crude oil exports accounted for more than 90% of the country's export revenue. Angolan officials decided not to have the country become a member of the Organization of Petroleum Exporting Countries (OPEC), in an official meeting of African oil-producing

nations, conveying a message that they would first stabilize their oil industry before joining OPEC. Angola proposed that, rather than joining OPEC, oil-producing countries in Africa form their own organization.

The state-run organization Sociedade Nacional de Combustiveis de Angola (SONANGOL) announced that oil production by yearend was 300,000 barrels per day and that, by 1990, it should reach 500,000 barrels per day. Of the 300,000 barrels per day, 63% came from the Cabinda enclave, with the remaining 37% produced from other offshore oilfields and from reservoirs on the mainland. CABGOC was owned by Chevron, 49%, and by SONANGOL, 51%. A natural gas pipeline system was scheduled to be installed between 1987 and 1989 from the Cabinda enclave.

Eleven years after Angola's independence, the country had no diplomatic ties with the United States, although the United States was Angola's largest trading partner in 1986. Angola was the United States' third largest trading partner in sub-Saharan Africa after Nigeria and the Republic of South Africa. About 60% of the crude oil from the Cabinda enclave was exported to the United States. Crude oil was also exported to France, the German Democratic Republic, and Portugal.

Reliable information on production and trade statistics continued to be unavailable. Production data were estimated on the basis of the best available information.

Table 1.—Angola: Production of mineral commodities[1]

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
Asphalt and bitumen, natural[e] metric tons	25,000	25,000	25,000	25,000	25,000
Cement, hydraulic[e] thousand tons	250	220	350	350	350
Diamond:					
Gem[e] thousand carats	915	775	[r]750	375	240
Industrial stones[e] do.	310	259	[r]250	250	10
Total do.	1,225	1,034	1,000	625	250
Gas, natural:[e]					
Gross million cubic feet	52,000	55,000	55,000	55,000	55,000
Marketable do.	2,500	2,500	2,500	2,500	2,500
Gypsum[e] metric tons	20,000	20,000	20,000	20,000	20,000
Iron and steel: Steel, crude[e] do.	10,000	10,000	10,000	10,000	10,000
Petroleum:					
Crude thousand 42-gallon barrels	50,700	58,400	73,000	89,060	102,200
Refinery products[e] do.	7,240	NA	10,000	10,000	10,000
Salt[e] metric tons	58,000	55,000	50,000	10,000	10,000

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

[1]Table includes data available through May 6, 1987.

[2]In addition to the commodities listed, a variety of crude construction materials (clays, sand and 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[1]

(Metric tons unless otherwise specified)

Commodity	1980	1981	Destinations, 1981	
			United States	Other (principal)
Cement	82,861	5,208	--	Nigeria 3,700; São Tomé and Principe 1,420.
Diamond: Gem, not set or strung value, thousands	$241,894	$222,543	--	All to United Kingdom.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	NA	298,466	--	All to Austria.
Metal: Semimanufactures, bars, rods, angles, shapes, sections	142	--		
Petroleum:				
Crude thousand 42-gallon barrels	39,653	37,156	16,865	Bahamas 4,057; Netherlands Antilles 3,606.
Refinery products:				
Gasoline, motor do.	193	227	--	Mainly for bunkers.
Kerosene and jet fuel do.	18	23	--	All to São Tomé and Principe.
Distillate fuel oil do.	407	804	--	Mainly for bunkers.
Residual fuel oil do.	2,370	4,484	2,645	Sweden 1,284.
Salt and brine	2,400	1,600	--	All to Zaire.
Stone, sand and gravel: Dimension stone, crude and partly worked	2,696	7,193	--	West Germany 2,853; Italy 2,792; Japan 1,548.

NA Not available.

[1]Data for imports were not available at the time of publication. Table prepared by Virginia A. Woodson.

COMMODITY REVIEW

METALS

The United Nations Development Program and the United Nations Industrial Development Organization planned a construction project for a second scrap iron utilization and recycling plant in Angola. The new plant, designed to produce 29,000 tons of metal per year, was to be in Lobito. The first plant, in Luanda, commenced operating in 1985 at a designed capacity of 31,000 tons per year. When both plants operate at full capacity, there will be no need to import iron metal into Angola.

INDUSTRIAL MINERALS

Companhia de Diamantes de Angola (DIAMANG), operator of the diamond mines in Angola, was dissolved in mid-July under pressure from the majority shareholder, state-owned Empresa Nacional de Diamantes de Angola (ENDIAMA). Sabotage, hostagetaking, tumbling prices, and diamond smuggling all contributed to the company's demise. ENDIAMA implemented a new policy under which foreign companies enter into production-sharing agreements on contracted blocks as had previously been agreed upon in Angola's oil sector. Gross receipts for DIAMANG were reduced 86% between 1980 and 1985, while the diamond selling price per carat fell 72% during the same period. DIAMANG's ownership at the time of its dissolution consisted of the state-owned company ENDIAMA, 77.21%; the Belgium Société Générale des Mines, 17.44%; and various British, Swiss, and U.S. companies, 5.35%. The Government of Angola, the major stockholder, made the decision to dissolve and liquidate DIAMANG. The foreign stockholders agreed to Angola's decision, owing to the nonprofitability of the operation and the inability to have proper security for the mines since 1983. DIAMANG was the largest employer in Angola, utilizing more than 20,000 workers. Almost all of DIAMANG's concessions were in Lunda Norte Province, and the area still held sizable primary and secondary deposits that contained an estimated 80% to 90% small and large gems.

Under new governmental regulations, the risk for unsuccessful prospecting and exploration was to be borne totally by foreign companies over 3 to 5 years from the beginning of the operations. In the absence of positive results, foreign investors shall not be reimbursed for their expenses incurred. If prospecting and exploration for diamond were successful and mining was indicated, a contract shall be negotiated between the Angolan Government and the foreign investor on a percentage arrangement. Negotiations were under way to resume production in the Cuango mining division, the coun-

try's richest diamond division.

Angola possesses massive diamond reserves. Past production came from alluvial deposits with kimberlite deposits still untouched. Although past production of diamond came only from Lunda Norte Province, diamond deposits also occur in Bié, Huambo, Cuando Cubango, Cuanza Norte, Luanda Sul, Malange, Moxico, Namibe, and Uige Provinces.

MINERAL FUELS

Petroleum.—*Production.*—Crude oil production in Angola was estimated to be about 280,000 barrels per day in 1986, an increase of 14.8% over that of 1985. Total crude production was approximately 102 million barrels, resulting in export earnings of only $1.2 billion, which represented a 52% loss in earnings. Angola's recoverable oil reserves were estimated at 2 billion barrels, with investments in the oil sector that should amount to approximately $1 billion during the next 3 years.

CABGOC had almost completed preparations for the exploitation of its new Takula Oilfield by yearend. The development of the Takula Field was to require considerable investment funding, and late in 1985, SONANGOL and CABGOC received bank credits for development of the field totaling $352.7 million. None of the credits were from the U.S. Export-Import Bank, which was banned by the U.S. Congress from lending funds to Angola.

In the Cabinda enclave, CABGOC discovered another field, Numbi, which was believed to be smaller than the Takula Field. Exploratory drilling was scheduled for 1987 on the Numbi Field. The installation of a drilling platform was also planned for this field.

Production outside the Cabinda enclave amounted to 110,000 barrels per day, of which 70,000 barrels per day came from the Palanca and Pacassa Fields. These two fields were under the supervision of Elf Aquitaine Angola, which controlled 50% of the operations.

Altogether there were 13 offshore oil concession blocks, as well as the concession blocks of the Congo and Cuanza Basins on the mainland. In the Cuanza Basin concession, SONANGOL and Fina Petroleos de Angola (FPA), a subsidiary of the Belgian firm Petrofina S.A., Brussels, held interests of 51% and 49%, respectively. Partners in the Congo Basin concession were SONANGOL with 51%, FPA with 32.66%, and Texaco Inc. of the United States with 16.34%.

Japan's Mitsubishi Corp. purchased Mobil Oil Co.'s share (25%) in Block 3 of Angola's offshore fields. Mitsubishi formed a new subsidiary to operate in Angola, Angolan Japan Oil Co., that will manage the area.

Texaco Angola Prospecção e Pruducas (Teipac) S.A.R.L. tested its third oil strike in the southern part of the 1-million-acre Block 2 off Angola. The No. 1 Cavala wildcat, 17 miles offshore, flowed at an average rate of 2,675 barrels per day. Texaco Inc. had a 40% interest in the production sharing on Block 2. Texaco Inc. evaluated the second 1986 oil discovery, No. 1 Sulele South, in Block 2. The discovery well, drilled to 8,399 feet, flowed at a stable rate of 2,735 barrels per day.

Refining.—Cia. de Petróleos de Angola (Petrangol) operated the only refinery in Angola in consortium with FPA and SONANGOL. FPA controlled 60% and SONANGOL, 40%, of Petrangol. The crude oil refinery, which had a processing capacity of 1.5 million tons annually, processed 1.45 million tons of crude oil during the year. The refinery's output capacity had been expanded by 3,000 barrels per day to 5,000 barrels per day in recent years.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been estimated to be convertible from Angolan kwanzas (Kz) to U.S. dollars at the rate of Kz29.918=US$1.00 for 1986.

The Mineral Industry of Argentina

By Pablo Velasco[1]

Despite extensive mineral potential, the mineral industry is only slightly developed and makes a very modest contribution to Argentina's economy. The mineral contribution to the gross domestic product (GDP) ranges from 0.3% to 0.4% annually. The mining sector provides 0.4% to 0.6% of the country's total exports and provides employment to about 0.2% to 0.3% of the population. Argentina also imports from $800 to $1,300 million worth of minerals each year, which is 15% to 20% of all imports. Expansion of the mining industry is considered desirable because of the multiple effect into other areas of the economy. The Government of Argentina, through the Secretary of Mining, has decided to reorient this economic activity by reorganizing the minerals sector to increase production. To do this, a mining expansion plan was prepared in 1984 called Plan de Expansión Minera (PEM). This plan is an element of an overall strategic development plan, which has a fundamental goal of achieving a level of mining productivity compatible with the mining potential of the country.

Full achievement of PEM's objectives would provide an increase in mineral production value from $32 million in 1985 to $1.1 billion in the year 2000.

The country's economy showed a marked improvement since the Government introduced radical new economic measures in 1985. Beginning in the fourth quarter of 1985, economic activity rebounded, and expansion continued through 1986, with real growth of 0.7% in the first quarter, 6.0% in the second quarter, and 11.8% in the third quarter, compared with that of the same quarters in 1985. In the fourth quarter of 1986, activity began to slip in many areas compared with that of the previous quarter, mainly because of tight credit. Nevertheless, the GDP growth rate for 1986 as a whole was about 5.5% over that of 1985.

The GDP grew despite a downturn in agricultural export volume caused mainly by poor weather and floods, coupled with lower world prices for agricultural commodities. The GDP growth was derived principally from strong performance by the manufacturing and construction industries.

The anti-inflationary success obtained in 1985-86 with the Plan Austral began slipping in the fourth quarter of 1986 when an expansionary monetary policy and significant wage increases lifted retail inflation to a peak of 8.8% in August and an overall 82% for 1986. This still can be considered a major achievement in Argentine terms, compared with the 385% inflation recorded in 1985 and 688% in 1984.

Federal and Provincial officials of the mining sector were active again in 1986 trying to develop foreign interest and generate investment capital for exploration and also for the development of some well-known but low-grade mineral deposits. There were many foreign delegations visiting Argentina, and several feasibility studies were completed for Provincial governments in La Rioja, Catamarca, Neuquén, and Santa Cruz, but no substantial commitment was made for large-scale investment.

Government Policies and Programs.—The Secretary of Mining of Argentina in 1986 concentrated on continuing structural changes introduced in 1984 under PEM. Prospection and exploration activity under the state has been stimulated by the Triennial Plan 1987-89, which is being conducted by the Dirección Nacional de Minería y Geología.

The long-term triennial plan was design-

ed to generate 122 basic geological studies, reaching an exploration area of 682,000 square kilometers with an investment of about $4.2 million; 70 preliminary exploration projects over an area of 7,300 square kilometers, with an investment of about $2.6 million; and 140 previously evaluated projects with an overall investment of approximately $1.0 million.

In the short term, the priority exploration projects were Valle del Cura gold deposit in San Juan Province; Huemules gold deposit in Chubut Province; and sulfur in Catamarca, Neuquén, and Salta Provinces.

In addition to the usual credits given by the Banco Nacional de Desarrollo to the small- and medium-size industrial and mining companies, the Secretary of Mining approved five projects for borates, marble, salt, and sulfur in the Provinces of Córdoba, Jujuy, La Pampa, and Salta, with a combined investment of $36.5 million. Also, five other projects were approved to receive credit under the Mining Promotion Fund (Fondo de Fomento Minero). These projects were Mogote del Río Blanco deposit in La Rioja Province (gold), Mina Ethel deposit in Mendoza Province (manganese), Lixivia deposit in San Juan Province (gold), La Poma deposit in Salta Province (gold and lead), and Bajo La Alumbrera deposit in Catamarca Province (gold).

Foreign investments under discussion and being negotiated in 1986 were as follows: A Spanish company will be doing gold exploration in the Valle del Cura deposit in San Juan Province; negotiations continued between a U.S. mining company and the state consortium, Dirección General de Fabricaciones Militares (DGFM), to explore a salt deposit in Catamarca Province; and a French company was negotiating to explore a potassium salt deposit in Mendoza Province.

With respect to international technical cooperation in the mineral area, the Government of Argentina signed agreements with Canada, the Federal Republic of Germany, Japan, Spain, Switzerland, the United Nations Revolving Fund, and the U.S.S.R. In addition, an agreement was signed with France for the exploration of metals in La Rioja Province. Argentina was also studying another agreement with Italy for the construction of a quarry pilot plant to exploit granite and marble and with the European Economy Community for exploration, mining, and marketing of special minerals in Misiones Province.

A new revision of the current mining code was submitted for consideration and approval to the Argentine Congress. The proposed reforms that would be incorporated in the mining code were written by a commission composed of various professional associations as well as the public sector. The reforms are aimed at ending the current lack of development of mining projects. Argentina has approximately 30,000 registered mines, which are idle and for which the owners have been unable to demonstrate the technical and economic capability to develop these mineral properties. In the proposed revised mining code, it is required to demonstrate through exploration that the deposit is technically and economically exploitable before the concession title for the mineral property will be granted. In this way, the numerous paper mining concessions will either be developed or returned to the state. Under the revised mining code, exploration concessions may be granted for up to 20,000 hectares and 5 years for disseminated deposits and up to 5 hectares and 3 years for vein-type deposits.

Exploitation concessions may be granted for up to 10,000 hectares for disseminated ore bodies and up to 2,000 hectares for others, and are for an unlimited time, but require the submission of a detailed program, which must be adhered to. It considers mining concessions to be real property that can be bought, sold, mortgaged, leased, etc.

The new revision introduces two significant new legal forms:

1. Royal contract, whereby a concession holder transfers exploitation rights to a third party, obtaining in return a participation in money or in kind.

2. Risk contract, whereby a third party, at its own cost and risk, contracts with the concession holder to perform technical and economic feasibility studies, and is given an exclusive option to exploit the mine through a joint company with the concession holder. Exploitation rights are not transferred under this legal form.

PRODUCTION

The total production of metals in Argentina during 1986 was 8.0% lower than that of 1985. The modest amount of metals produced reached 677,300 tons, which included beryllium, gold, iron ore, lead, manganese, silver, tin, tungsten, uranium, and zinc. The industrial minerals and the construction materials output also declined 7.2% and 5.2%, respectively, compared with those of 1985.

Argentina produced enough industrial minerals and construction materials to meet domestic demand and provide some exports but continued importing large quantities of alumina, beryllium, copper, iron ore, lead, magnesium, nickel, iron ore pellets, pig iron, sponge iron, steel, tin, zinc, and other metals, as well as metal and industrial mineral products and coal.

The aluminum industry output increased 7% over that of 1985. Domestic consumption also increased as well as exports of primary and semimanufactured aluminum products.

Raw steel output was up 11% compared with that of 1985. Production of rolled steel maintained almost the same level of output as that of 1985. The steel industry performance improved substantially during the third quarter of 1986 owing to an increase in domestic consumption and the opening of new markets. Deliveries of cement increased 19% over that of 1985 because of the official housing programs established by the Government in 1986 as well as the construction of the new hydroelectric plant in La Pampa Province and the new petrochemical plant in Bahía Blanca. In addition, there was an expansion in the gas pipeline from Loma de la Lata Gasfield and the new airport at Ushuia, and the modernization of La Plata and Lujan de Cuyo oil refineries. Because of all these projects, it appears expanded cement output will continue in 1987. However, cement producers were still operating their plants at 45% to 50% of capacity.

Yacimientos Carboníferos Fiscales (YCF), the Government coal company at Río Turbio, reported an 8.7% decline in the production of coal in 1986 compared with that of 1985 owing to operational and financial difficulties. Natural gas and crude oil production continued its downtrend from the previous years, declining in 1986 to 667 billion cubic feet and 158 million barrels, respectively. Production of uranium concentrate increased 15.5% over that of 1985.

Table 1.—Argentina: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum:					
Primary	137,600	132,800	137,821	139,947	150,000
Secondary	6,000	7,000	7,000	6,000	7,000
Beryllium: Beryl concentrate:					
Gross weight	6	24	25	15	32
BeO content	1	2	3	1	2
Cadmium: Smelter	21	r21	46	46	47
Copper: Mine output, Cu content	r308	318	223	390	370
Gold: Mine output, Au content ___troy ounces	r22,248	r24,660	22,120	28,614	28,936
Iron and steel:					
Iron ore and concentrate, gross weight thousand tons	r583	r590	572	578	600
Metal:					
Pig iron and sponge iron ___do___	r1,896	1,862	1,799	2,999	2,600
Ferroalloys, electric-furnace:					
Ferromanganese	24,201	25,004	23,976	23,663	23,000
Silicomanganese	15,679	13,523	13,336	7,493	8,000
Ferrosilicon	16,870	15,454	19,932	18,790	19,000
Other	4,246	264	3,939	4,892	4,500
Total	60,996	54,245	61,183	54,838	54,500
Steel, crude ___thousand tons	2,913	2,943	2,647	2,945	3,275
Semimanufactures[3] ___do___	2,735	2,864	2,456	2,314	2,735
Lead:					
Mine output, Pb content	r32,776	31,684	28,542	28,582	428,735
Metal:					
Smelter, primary	r15,942	r15,200	16,300	15,088	20,000

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS —Continued					
Lead —Continued					
Metal —Continued					
Refined:					
Primary	[r]15,942	[r]15,200	16,300	15,088	20,000
Secondary	[r]14,617	[r]16,070	15,000	13,575	15,000
Total	[r]30,559	[r]31,270	31,300	28,663	35,000
Manganese ore and concentrate:					
Gross weight	3,900	6,926	8,291	7,500	8,000
Mn content	789	1,463	1,751	1,600	1,700
Silver, mine output, Ag content thousand troy ounces	2,684	2,500	1,984	2,170	2,283
Tin:					
Mine output, Sn content	[r]342	291	274	451	260
Metal, smelter	216	254	292	135	365
Tungsten, mine output, W content	17	41	37	17	25
Uranium, mine output, U_3O_8 content kilograms	[r]674,000	135,000	94,430	87,450	101,000
Zinc:					
Mine output, Zn content	[r]36,635	36,586	34,909	35,713	40,100
Metal, smelter, primary	28,900	[r]30,000	27,725	30,377	29,123
INDUSTRIAL MINERALS					
Asbestos	1,218	1,240	1,093	1,244	1,100
Barite	36,597	61,094	44,170	62,329	50,000
Boron materials, crude	123,492	113,123	142,880	127,277	130,000
Cement, hydraulic thousand tons	5,624	5,623	5,120	4,646	5,535
Clays:					
Ball clay (plastic clay), n.e.s do	1,362	1,853	1,870	1,347	1,500
Bentonite	123,254	135,569	81,534	159,206	100,000
Foundry earth	91,533	115,260	124,023	53,300	60,000
Fuller's earth (decolorizing clay)	11,795	6,741	3,611	5,000	5,500
Kaolin	72,421	145,098	90,545	106,006	100,000
Laterite (aluminous)	7,060	23,881	NA	NA	NA
Refractory	99,959	73,352	70,250	96,928	80,000
Other[5]	372,807	459,208	665,615	339,000	400,000
Diatomite	6,729	10,981	5,227	7,879	10,000
Feldspar	15,091	20,065	17,948	8,442	10,000
Fluorspar	23,727	28,985	23,157	31,842	24,000
Graphite	12	20	15	18	15
Gypsum, crude	615,540	578,188	566,943	581,000	550,000
Lithium: Spodumene, amblygonite, gross weight	113	152	22	20	20
Mica:					
Sheet	24	28	12	318	250
Waste and scrap	218	285	278	277	275
Nitrogen: N content of ammonia	58,000	57,500	49,300	64,900	50,000
Phosphates: Thomas slag[6]	600	600	500	500	600
Pigments, mineral, natural: Ocher	932	853	757	3,000	2,000
Precious and semiprecious stones: Amethyst kilograms	23,043	26,000	NA	NA	NA
Pumice and related volcanic materials	53,540	68,624	54,257	13,167	15,000
Salt:					
Rock thousand tons	1	1	1	1	1
Solar do	594	677	937	1,336	850
Total do	595	678	938	1,337	851
Sand and gravel:					
Sand:					
Construction do	14,297	12,524	11,399	11,162	11,000
Ferruginous-titaniferous	1	--	NA	NA	NA
Silica sand (glass sand) thousand tons	227	314	306	219	300
Gravel do	8,240	5,878	4,301	3,873	4,000
Stone:					
Basalt do	4,182	2,894	3,302	980	1,000
Calcareous:					
Calcite, nonoptical	6,789	7,520	7,100	3,000	3,500
Calcium carbonate (chalk)	17,604	8,325	8,585	10,409	18,012
Dolomite	257,158	239,496	211,270	241,867	200,000
Limestone thousand tons	12,651	12,318	11,167	8,719	9,000
Marble:					
Aragonite, broken	3,323	4,782	2,603	703	1,000
Onyx, in blocks and broken	11,420	16,359	13,542	6,877	8,000
Travertine, in blocks and broken	14,399	5,686	4,447	20,758	21,000
Unspecified, in blocks and broken	51,342	74,284	92,282	52,050	60,000
Flagstone	114,519	80,508	41,180	70,768	70,000
Granite:					
In blocks	33,374	41,554	25,359	30,300	30,000
Crushed thousand tons	5,439	5,712	4,144	3,510	3,900
Quartz, crushed	76,149	81,615	96,420	47,965	50,000
Quartzite, crushed thousand tons	1,048	765	996	1,105	1,000
Rhodochrosite	35	45	23	30	35
Sandstone	NA	28	200	76	100
Serpentine, crushed	21,284	22,460	5,146	13,440	15,000

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
INDUSTRIAL MINERALS —Continued					
Stone —Continued					
Shell, marl	819,009	718,000	556,949	316,000	400,000
Tuff and tufa thousand tons	1,135	1,031	458	1,876	1,500
Strontium minerals: Celestite	776	673	400	1,248	500
Sulfates, natural:					
Aluminum (alum)	3,850	12,983	11,583	9,807	10,000
Magnesium (epsomite)	2,321	828	5,930	7,000	6,500
Sodium (mirabilite)	42,257	45,065	32,626	31,258	35,000
Talc and related materials:					
Pyrophyllite	2,687	4,925	5,012	5,000	5,000
Steatite	1,490	1,387	NA	280	300
Talc	24,716	23,379	22,774	15,917	20,000
Total	28,893	29,691	27,786	21,197	25,300
Vermiculite	3,354	3,951	4,451	4,887	4,000
Water, mineral-containing	88,476	76,819	85,436	212,000	150,000
Zeolite	50	60	90	105	100
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural	2,480	2,912	994	1,000	1,000
Coal, bituminous thousand tons	515	486	509	400	365
Coke, all types, including breeze do	536	450	466	696	500
Gas, natural:					
Gross million cubic feet	548,190	606,742	662,645	709,317	667,407
Marketed do	333,848	78,651	78,081	78,081	78,211
Natural gas liquids:					
Butane thousand 42-gallon barrels	2,261	2,374	2,605	3,132	3,170
Propane do	2,973	3,193	3,497	2,996	3,030
Total do	[r]5,234	5,567	6,102	6,128	6,200
Peat, agricultural (Turba)	3,800	3,726	2,308	3,917	2,500
Petroleum:					
Crude thousand 42-gallon barrels	179,072	179,097	175,097	167,781	158,467
Refinery products:					
Gasoline do	44,315	43,663	43,817	34,785	31,351
Kerosene do	3,387	4,095	3,549	3,449	3,675
Jet fuel do	5,104	4,852	5,143	4,685	5,028
Distillate fuel oil do	56,095	56,342	57,265	48,801	51,429
Residual fuel oil do	46,835	43,285	38,448	17,485	21,447
Lubricants do	2,199	1,968	1,883	1,593	1,792
Other do	13,966	7,145	8,565	10,417	16,148
Refinery fuel and losses do	11,284	14,612	11,766	43,982	25,337
Total do	183,185	175,962	170,436	165,197	156,207

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

[1]Table includes data available through June 30, 1987.

[2]In addition to the commodities listed, bismuth, carbon black, columbite, lime, natural gasoline, perlite, and potassium sulfate (kalinite) are or are believed to be produced, but output is not reported quantitatively and available information is inadequate to make reliable estimates of output levels.

[3]Hot-rolled semimanufactures only; excludes castings and cold-rolled semimanufactures produced from imported hot-rolled semimanufactures.

[4]Reported figure.

[5]Includes plastic, semiplastic, and/or ferruginous clays used totally in the manufacture of portland cement.

[6]Thomas slag production was estimated from the Thomas crude steel reported in La Siderurgia Argentina annual publication and from reports published by the Instituto Argentino de Siderurgia.

TRADE

Argentina exported 177.5 million tons of metallic and industrial minerals for a total value of $33.4 million. Exports of minerals were mainly borate products, barite, cement (clinker), common salt, granite in blocks, lead concentrate, and tin-silver concentrates. Imports of metals were valued at $568.4 million or 78% of the total of minerals imported in 1986, which amounted to $731.5 million. The metals imported were mainly alumina, copper, crude steel, iron ore, iron ore pellets, nickel, tin, zinc, and other metals.

Imports of iron and steel products were valued at $459,000, and exports reached 1.1 million tons, which went mainly to China and the United States.

During the first 11 months of the year, the value of exports of mineral fuels, crude oil, and refinery products declined 78% compared with that of the same period in 1985 to $131.7 million. During the same time period, imports of coal, lubricants, liquefied gas, and natural gas declined

slightly from those of 1985 to 395.4 million.

During 1986, Argentina's balance of payments deteriorated following a strong performance in 1985. The current account deficit, estimated at $2.7 billion, was more than double that of 1985. The value of Argentina's agricultural exports decreased sharply, owing to both low world prices and reduced output. Because of an economic rebound, imports to Argentina increased about 20% over those of 1985 to $4.6 billion. About 17% of Argentina's imports were from the United States. Argentina's principal mineral imports from the United States were bituminous coal, fuels, and lubricants. Exports were down about 18% from those of 1985 to $6.9 billion. The U.S. market share of Argentina's exports was about 10%.

Argentina's principal mineral exports to the United States were beryllium, granite in blocks, iron and steel plates and sheets, marble onyx (broken and in blocks), rhodochrosite, and zinc. Most major projects were partially financed by foreign sources. Three large hydroelectric projects were under construction: (1) Yacreta, a 2,400-megawatt project financed by the Export-Import Bank, the International Bank for Reconstruction and Development (World Bank), and the Inter-American Development Bank (IDB); (2) Piedra del Aguila, a 1,400-megawatt project financed for $400 million by IDB; and (3) Uruguay I, a 160-megawatt project financed for $80 million by IDB. Also, there were natural gas production and transportation systems and petroleum development projects under construction.

The U.S. and Argentine Governments were discussing the reopening in Argentina of the Overseas Private Investment Corp. (OPIC) activities.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Beryllium: Ore and concentrate	72	31	31	
Iron and steel: Iron ore and concentrate	1,000	2	--	All to Bolivia.
Lead: Ore and concentrate	14,611	17,046	--	U.S.S.R. 8,503; France 5,000; West Germany 2,500.
Tin:				
Ore and concentrate	2,252	1,030	--	Netherlands 751; Belgium-Luxembourg 279.
Metal including alloys, semimanufactures	1	NA		
Zinc:				
Ore and concentrate	470	4,458	--	Brazil 3,001; Belgium-Luxembourg 1,457.
Oxides	15	NA		
Metal including alloys, all forms	4	4,572	1,502	China 2,051; Republic of Korea 499.
Other: Ashes and residues	--	6	--	All to France.
INDUSTRIAL MINERALS				
Asbestos, crude	4	21	--	Uruguay 20; Cuba 1.
Barite and witherite	5	17	--	All to Uruguay.
Boron materials:				
Crude natural borates	r6,273	6,138	NA	NA.
Oxides and acids	3,233	4,124	--	Brazil 3,978; Uruguay 110; Netherlands 36.
Cement	66,483	82,248	--	Paraguay 72,062; Chile 5,525; Bolivia 4,637.
Clays, crude	6,685	8,974	--	Colombia 5,107; Brazil 2,443; Chile 999.
Diatomite and other infusorial earth	59	44	--	Mainly to Uruguay.
Fluorspar	80	113	--	Chile 100; Uruguay 10; Ecuador 3.
Graphite, natural	6	9	--	Chile 5; Uruguay 4.
Gypsum and plaster	5,012	7,709	NA	NA.
Lime	954	3,883	--	Chile 3,861; Paraguay 22.
Mica: Crude including splittings and waste	22	18	--	Chile 13; Paraguay 4; Uruguay 1.
Pigments, mineral: Iron oxides and hydroxides, processed	63	86	--	Colombia 65; Uruguay 14; Panama 3.
Salt and brine	12,550	8,413	--	Paraguay 8,275; Uruguay 138.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Sodium compounds, n.e.s.:				
Carbonate, manufactured	340	NA		
Sulfate, manufactured	361	140	--	Bolivia 90; Uruguay 50.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	3,424	2,976	161	Italy 1,502; Singapore 462; Spain 381.
Worked	1,416	932	463	Japan 348; Australia 71.
Dolomite, chiefly refractory-grade	1,933	483	--	Chile 463; Uruguay 20.
Gravel and crushed rock	306	NA		
Quartz and quartzite	2	12	--	Bolivia 8; Paraguay 4.
Sand other than metal-bearing	6	7	--	Chile 5; Uruguay 2.
Sulfur:				
Elemental: Crude including native and byproduct	786	552	--	Paraguay 530; Chile 20; Uruguay 2.
Sulfuric acid	11,111	NA		
Talc, steatite, soapstone, pyrophyllite	4	51	--	Chile 50; Bolivia 1.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	527	470	--	Chile 450; Brazil 20.

[r]Revised. NA Not available.

[1]Table abbreviated owing to the lack of data for 1985. No import data for 1985 were available at the time of publication. Table prepared by H. D. Willis.

COMMODITY REVIEW

METALS

Aluminum.—Production at the Aluminios Argentinos S.A.I.C. (ALUAR) smelter in Puerto Madryn, Chubut, reached a record-high level of 150,000 tons in 1986, an increase of about 7% over that of 1985. The increased output was attributed to $15 million in major technical improvements introduced at ALUAR's plant. Another planned $60 million, 4-year investment project to further increase ALUAR's production capacity was postponed because of a slow increase in domestic market outlook, including exports. ALUAR is 52.1% owned by the state and 47.9% by private interests. The smelting process is continuous and is heavily power intensive. Refinerías de Metales Uboldi S.A.'s production rate at the Puerto Madryn plant continued to improve, which provided greater export volumes. Metalúrgica Oliva S.A.'s $2 million investment project in a new rolling and aluminum foundry works continued as planned at Puerto Madryn. Domestic consumption of aluminum increased by 80% over that of 1985 to 57,500 tons, and exports of primary and semimanufactured products reached 35,000 and 61,000 tons, respectively.

Copper.—The Secretary of Mining announced that negotiations with the Federal Republic of Germany were at an advanced stage for the granting of a $12 million loan to finance the exploitation of the Bajo de la Alumbrera copper and gold deposit in Catamarca Province. Feasibility studies were being carried out on the upper layer of the deposit for a possible heap-leaching operation. If the project is successfully completed over the next 3 years, the Secretary indicated that it would be possible to double the present gold production from the deposit. The Secretary also indicated that Yacimientos Mineros de Agua de Dionisio (YMAD), which was mining the Farallón Negro deposit at the rate of 17,000 troy ounces of gold and 96,000 troy ounces of silver per year, was the only state company making a profit.

An international tender was being prepared for the development of the Capillitas copper-lead-zinc deposit in Catamarca Province; also, exploration work was being done in the nearby Alto de la Blenda deposit by Japanese, West German, and Argentine groups.

Gold and Silver.—The United Nations Revolving Fund for Natural Resources Exploration is to contribute $370,000 to finance the final exploration stage of the

Huemules gold-silver deposit near Esquel in the Province of Chubut. The Argentine Secretary of Mining has also provided funds for the project to ensure that the exploration can be completed and to reduce the risks involved for private investors that may wish to undertake exploitation of the deposit. In an earlier call for tender, potential investors failed to meet the deadline, which was January 30, 1986, in returning their bid documents because the project was considered to be too high risk. However, the Secretary of Mining was considering having a new call for tenders late in the year or in mid-1987.

Official gold production continued to be above 28,400 troy ounces in 1986, most of it coming from the Farallón Negro deposit in Catamarca and from the Angela Mine in Chubut. Farallón Negro also produced over 96,000 troy ounces of silver and was carrying out a project to develop the copper-gold deposit of Bajo de la Alumbrera. Ten tons of silver was produced in lead concentrates from the Aguilar Mine in Jujuy. These concentrates were exported.

Exploration was intensified at the La Estrechura site and other areas in the Famatina region in La Rioja Province, where there are several alluvial gold deposits. Two of these deposits, the Offir and La Majicana, were being studied by the Swedish Geologic Survey (Sveriges Geologiks).

Corporación Minera de Neuquén, a state-owned company, and a Chinese group, China National Nonferrous Metals Corp., were conducting exploration work at the Erika and Sofía gold-silver deposits in Neuquén Province. Activities also intensified at the border between San Juan Province and Chile, because it was observed that Chilean citizens had been carrying out very profitable gold panning operations in the Valle del Cura, and there was no Argentine operations. The Secretary of Mining indicated that a Spanish company was granted the right to explore for gold in the Valle del Cura area.

Iron Ore.—Production of iron ore concentrate stayed at the 1985 level of about 600,000 tons. Production of pellets from Hierro Patagónico S.A. Minera (HIPASAM) reached 676,000 tons, a 36.6% increase over that of 1985. All concentrate is pelletized and sent to Sociedad Mixta Siderúrgica Argentina S.A. (SOMISA), which also purchases 30% of its pellet requirements from Brazil and Peru. The pelletizing plant is at Punta Colorada and is composed of four production lines with a total installed capacity of 2 million tons per year. HIPASAM reportedly operated at only 50% of its plant capacity. Imports of iron ore and pellets came almost entirely from Brazil. They totaled 2.6 million tons, which was used in the production of primary pig iron and sponge iron. Primary iron production decreased from 3.0 million tons in 1985 to 2.6 million tons in 1986. The Director of Mining from the Salta Province indicated that an agreement was signed with Argentina's General Council of Mining for the exploitation of the Unchime iron ore deposit, near the town of General Guemes, whose reserves were estimated at 200 million tons. HIPASAM was undertaking a project to study the recovery of phosphorus from its tailings.

Iron and Steel.—Crude steel production increased for the second consecutive year to 3.3 million tons in 1986, an 11% increase over that of 1985. The output of hot-rolled steel products maintained the same level as that of 1985. Steel production remained at about 50% of plant capacity.

In 1984, the Argentine steel industry suffered from internal price control measures, which seriously eroded its sales income. For most of 1985-86, Argentine business had to abide by strict price guidelines set by the Government, which was concerned primarily with inflation. Small companies found ways of avoiding the freeze but large industries, like steel, had to adhere to it. Toward the end of 1986, the Government began easing the price controls and the steel industry saw profits recover, largely because of the increase in domestic consumption produced by the Plan Austral and the opening of new export markets. The export sector seems to offer the steel industry its only alternative for improved profits.

Industria Argentina de Aceros ACINDAR S.A., the largest private steelmaker in Argentina, reported to shareholders that domestic sales were up sharply and that the price freeze had seriously eroded profits. SOMISA, the state steel giant, reportedly faced the same predicament. ACINDAR and SOMISA have asked to participate in the Government's incentive program for new industrial exports. The U.S. International Trade Commission ruled in favor of Argentina in a case that charged that cold-rolled carbon sheet plates and sheets were being dumped on U.S. markets.

The Argentine Government decided to privatize the steel concern SOMISA. There-

fore, discussion continues as to whether the company should be wholly or partially sold off and on what basis. Those in favor of complete privatization claim that private investors would not be interested in a mixed enterprise as such projects in the past have not been entirely successful in Argentina. If the firm were placed on a total private basis, SOMISA would be able to select more objectively the type of raw materials and technology it requires for its General Savio plant in San Nicolas.

SOMISA at present receives about 70%—about 700,000 tons per year—of its iron ore requirements (pellets, sinter feed, and graded ore) from its state-owned sister concern HIPASAM. This figure, however, is expected to rise to 900,000 tons in 1987 and 1,200,000 tons in 1988. The remaining 30% (pellets) comes from Brazil's Cía. Vale do Rio Doce and Peru's Minero Perú Comercial. Coking coal for the plant comes both from mines in Río Turbio operated by the state-owned YCF and from the United States, Poland, and other countries.

Dálmine Siderca S.A.I. y C., Argentina's third largest iron and steel company, has been granted a loan of $40 million from the IDB. This loan will help finance the planned modernization of its seamless steel tube and pipe plant at Campana, Buenos Aires, which will allow the plant to be more competitive. A prefeasibility study was under way at Siderúrgica del Sur S.A. in San Antonio Oeste in the Province of Río Negro, for the installation of a 500,000-ton-per-year direct-reduction unit.

Tin.—The tin industry of Argentina is currently represented by the Sociedad Minera Pirquitas-Picchetti y Cía. S.A., the second largest private mining operation in the country after St. Joe International Corp.'s (United States) Aguilar Mine. Both mine enterprises are in the Province of Jujuy, in the northern part of the country. The mineral operations of Minera Pirquitas-Picchetti were impacted severely by the October 1985 collapse of the international tin market. Low-priced tin imports from Brazil's low-cost alluvial operations dominated Argentina's domestic markets and Pirquitas lost most of its customers. Argentina's new economic policies, known as Plan Austral, provided little assistance to the domestic mining industry.

Since tin could be imported from Brazil or Bolivia at lesser costs, the Pirquitas Mine and the two associated smelters, La Cuprífera Argentina S.A.I.C. and the Estansa S.A., encountered financial difficulties. They instituted an emergency plan, which included legal action to protect their operations from being shut down. One important long-term hope for the Pirquitas mineral operation is the fact that their mineral deposits contain bismuth, gallium, germanium, and indium, associated with the tin and silver mineralization. Possible recovery of these important byproducts has aroused interest among international mining concerns.

The complex tin ore concentrate from Pirquitas is blended at its Río Blanco plant. The low-grade tin concentrates are roasted and volatilized at La Cuprífera fuming furnaces to concentrate the tin prior to smelting. This concentrate is then processed at the Estansa smelter utilizing the United Kingdom's Capper Pass tin refining technology, to obtain three products: tin dust grading 40% to 50% tin and 0.4 to 1.0 kilogram of silver per ton (12.9 to 32.2 troy ounces per short ton), tin matte containing 10 kilograms of silver per ton (321.5 troy ounces per short ton), and tin slags containing 0.3% tin and less than 100 grams of silver per ton.

The high-grade tin concentrates, grading 40% to 50% tin and 0.3 to 0.7 kilogram of silver per ton (9.7 to 22.5 troy ounces of silver per short ton), are also processed at the Estansa smelter in Palpala, Jujuy, by direct-reduction methods to obtain tin metal, which is further refined by an electrolytic process. The total production of tin at Pirquitas in 1985 was 624 tons of concentrate, 240 tons of tin, and 10 tons of silver. About 80% of the concentrates are processed in the two smelters with an 80% to 85% recovery; the slags are exported to Belgium. In 1986, the Pirquitas Mine and the two smelters were operating at less than 50% capacity. Several tin deposits in the Province of Catamarca have received new attention, but current market conditions for this metal have not justified their investment and development.

INDUSTRIAL MINERALS

An Argentine company was to construct an $8 million chemical plant to recover lithium, magnesium, and potassium salts from El Salar del Rincon, near Campo Quijano in Salta Province. Production of an estimated 6,000 tons per year of potassium salts was scheduled for the end of 1986, with startup of an initial production of 800 tons of lithium carbonate per year forecast for

late 1987.

Potassium salts will be used in domestic fertilizer and explosive industries, and lithium carbonate in the atomic energy, glass, and lubricants sectors.

The state-owned DGFM signed an agreement with Government representatives for an international call for tender for the exploration and development of the Catamarca salt deposits. These are in the Salar del Hombre Muerto, south of the Salar del Rincon, which also contain lithium, potassium, and magnesium salts.

MINERAL FUELS

Coal.—YCF, after 40 years of operation in Río Turbio, was facing operational and financial difficulties. Assistance appears to be coming in the form of a new energy policy devised by the Ministry of Energy in conjunction with YCF authorities, which would give priority to coal rather than nuclear energy from the present time until the year 2000.

YCF's coal output in 1986 declined for the second consecutive year to 365,000 tons of washed coal. After allowing for YCF's own consumption, sales amounted to 300,000 tons. YCF currently was facing debts amounting to $360 million, and all the equipment, with the exception of the washing plant, was in desperate need of repair or replacement. Even if production was increased to 500,000 tons per year, with coal prices currently at $39 per ton, the company would be running a deficit of $200 million. Production of coal in Argentina compares favorably with other domestic fuels on a cost basis. The dilemma is that although imported coal is less expensive, it requires the use of hard currency. Therefore, YCF decided to continue plans to further expand output to 1.7 million tons per year by 1989, when the new second stage of the Bahía Blanca power station starts up. SOMISA, the steel producer, imported coke from the United States (70%), Poland (20%), and Río Turbio (10%).

Natural Gas.—Natural gas production declined 5.9% to 667,407 million cubic feet compared with that of 1985. In addition to domestic natural gas production, Argentina imported 78,211 million cubic feet from Bolivia, slightly more than that of 1985, for a total value of $342.2 million or 8% less in value than that of 1985.

From the total production of natural gas during the year, 565,550 million cubic feet was injected into natural gas pipelines for delivery to domestic consumers. The remainder, 101,857 million cubic feet, was reinjected to the wells for repressuring, vented, flared, used in field operations, or lost during transportation.

There was considerable activity in gas pipeline installations during the year. A pipeline will be built between the Loma de la Lata Gasfield in Neuquén to Buenos Aires via Bahía Blanca. The initial flow rate will be 200 million cubic feet per day, and later, it will be raised to 500 million cubic feet per day. Work is expected to be finished in 1988.

The Secretary of Energy and the Dutch-owned gas company, COGASCO S.A., have agreed that Argentina owes COGASCO $1 billion for the construction of the Centro-Oeste gas pipeline in the early 1980's. The payment of the debt will be made through a loan package financed by the World Bank, which will include an expansion of the Centro-Oeste gas pipeline capacity under a contract with terms similar to those originally awarded to Cogasco.

Petroleum.—Crude oil production in Argentina continued its downward trend since 1980. Production declined 5.6% from that of 1985 to 158 million barrels.

The Government of Argentina's petroleum investment policy, first announced in December 1984, was reaffirmed in March 1985 in Houston, Texas, where the Government invited foreign investors to meet with them and assist Argentina begin a new program of petroleum exploration. A model exploration contract was developed after a long period of negotiations with potential investors and reviewed and signed by the Government in August 1985.

The following month, the Government made its first public call for bids on selected oil exploration areas. Bids were open in January 1986 and awards made by March. Shortly thereafter, the Government made its second call for bids on another group of exploration areas. The opening of these bids, however, has been repeatedly delayed.

The awards of exploration and development rights for 10 of the 32 areas represent an investment of $38 million. Esso Cía. Exploradora Productora S.A., Chevron Oil Co., and Shell Cía. Argentina de Petróleo S.A. were awarded rights for 3 offshore tracts included among the 10 first-round areas. All of these tracts were designated high-risk areas. The three blocks were identified as Rawson offshore basin (Cuenca Rawson Marina) CRM-1, CRM-2, and CRM-

3. They are 150 to 450 kilometers off the coast of the Province of Chubut and contain a total area of about 40,000 square kilometers.

Following the signing of the above contract, YPF signed three more with the consortium of Australia's Broken Hill Pty. Co. Ltd. (BHP) and PLUSPETROL S.A. Investment over the 7-year exploration contracts is to total $49 million. The contracted areas are Chirete, Morillo, and Olleros. All are in Salta Province. BHP is the first foreign firm without prior oil exploration experience in Argentina.

YPF awarded a contract for exploitation of the Hidra offshore oilfield to a French-West German-Argentine consortium. Hidra is about 13 kilometers off the eastern coast of Tierra del Fuego, near the town of Río Grande, and has estimated reserves of 45 million barrels. This will be Argentina's first offshore oil project.

The consortium was comprised of the French Compagnie Française des Pétroles S.A. (CFP)-TOTAL, the West German company Deminex Argentina S.A., and Cía. Bridas Exploraciones y Producciones S.A. of Argentina. Development, extraction, pipeline, and refining facilities were expected to cost $250 million. Production could be started by yearend 1988 at a rate of 28,000 barrels per day. This project when completed will improve Argentina's energy supply significantly.

Bids worth slightly over $56 million were submitted for private sector oil exploration and production contracts. All but one of the offers were for 17 onshore blocks under the Government's second round of oil bids. The Cuenca Salada marina in southern waters attracted a $1.2 million plan from Amoco Andina Production Co. and its local partner Cía. Naviera Perez Companc S.A. Bidding was, however, dominated by Shell Capsa, the local subsidiary of the Royal Dutch/Shell giant in partnership with an Argentine company, Pecten. The group offered $10.3 million on the Governador Ayala block in the western Provinces of Mendoza and La Pampa.

Other bids came from Argentine private sector companies including Astra C.A.P.S.A., Bridas, PLUSPETROL, Petrolera Perez Companc S.A., and Petroquímica Comodoro Rivadavia. The Government classified nine of the blocks, including the offshore concession as "high risk" and others as "medium risk."

Uranium.—Production of uranium concentrate increased by 15.5% over that of 1985 to 101,000 tons. There are five centers for the production of uranium concentrate in Argentina, four of which are owned by the Comisión Nacional de Energía Atómica (CNEA). These four centers have a total annual capacity of 200 to 260 tons of uranium concentrate, depending on the ore grade processed. The fifth plant is privately owned and has an annual capacity of 80 tons of uranium concentrate. At the present, two of the CNEA production centers, with an annual capacity of 90 to 120 tons of uranium concentrate, are not operating.

A new uranium concentrate plant with a 400-ton-per-year production capacity was planned for 1987 at the Sierra Pintada region. This would process ore from the El Tigre I and La Terraza deposits, in San Rafael, south of the Province of Mendoza. The government of the Province of San Luis was to sign an agreement with CNEA for the development of La Estela uranium mine and the processing facilities at Villa Larca. The agreement should assure the Province of approximately $1.5 million per year of the country's total uranium royalty earnings. Both of these operations were to be managed by private companies.

The Los Gigantes nuclear energy plant in Córdoba Province was operated in 1986 at reduced capacity during most of the year when acid effluents from the plant contaminated the San Roque Lake, a major tourist area of Argentina. Completion of the country's third nuclear reactor, Atucha II, which will have a planned capacity of 690 megawatts, was scheduled for 1992. The plant is being built by the West German firm Kraftwerk Union. However, budget cuts announced by CNEA for the 1985 nuclear energy program brought the amount invested in 1985 down to $420 million from the previous budget of $550 million. This reduction in the overall nuclear program reduced the funds provided for Atucha II to about $330 million, with the remainder going to a heavy water plant at Arroyito in Neuquén Province. It appears that this budgetary cut indicates an overall change of orientation in Argentina's energy policies with lesser priority being given to nuclear and more to Argentina's abundant hydropower resources.

The CNEA selected the southern Province of Chubut as the site for a nuclear waste disposal facility for nuclear power stations. The plant at Gastre, Chubut, was scheduled to be completed in 2005 at an estimated cost of $500 million. The Gastre site was selected after CNEA studied 150 possible locations and will not be opened to nuclear waste from other countries.

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The Mineral Industry of Australia

By Travis Q. Lyday[1]

Owing to substantial resources of some of the world's most important mineral commodities, Australia has become a principal source of many basic raw materials, including bauxite, coal, copper, diamond, gem stones, gold, iron ore, lead, manganese, mineral sands, nickel, silver, tantalum, tungsten, uranium, and zinc, and in 1986 was an emerging source of lithium. Australia continued to be one of the world's major producers and suppliers of ores, concentrates, and refined metals to the international marketplace. Although the world market for many minerals and metals continued to be depressed, the Australian minerals industry has fared comparatively well with those of other countries owing to the depreciation of the Australian dollar relative to the U.S. dollar, in which most mineral commodities were sold and traded. The country was also relatively unimportant as a mineral consumer and, therefore, was a prominent exporter.

Australia was virtually self-sufficient in most of the major mineral commodities, with the indicative exceptions being chromium, mercury, petroleum, phosphate rock, platinum, potassium fertilizers, and sulfur. However, the country continued to supply 80% to 85% of its domestic needs of crude petroleum, abundant but undeveloped domestic phosphate and sulfur (metallic sulfide) deposits exist, and extensive platinum deposits were beginning to be identified in Western Australia.

The mineral industry remained a significant factor in the Australian economy. The mining and minerals processing sectors of the national economy accounted for approximately 8% of the country's gross domestic product (GDP), estimated at $155 billion.[2] The estimated value of Australia's nonfuel mineral production ranked fifth in the world after that of the U.S.S.R., the United States, the Republic of South Africa, and Canada. Including the fuel minerals, the estimated value of production ranked 10th in the world.

Australia's largest primary sector of the economy, that of the mineral industry, was heavily export oriented, and more than 80% of its output was destined for the international market, accounting for an estimated 47% of total export earnings. The country was estimated to rank 17th among the trading nations of the world, with mineral commodities exported to more than 100 countries. Moreover, Australia remained one of the few market economy countries to be a net exporter of mineral fuels, using abundant coal, liquefied petroleum gas, and uranium supplies to retain a favorable trade balance in energy products.

Government Policies and Programs.—The Australian Constitution contains no specific reference to natural resources, and like the U.S. Constitution, all powers not specifically assigned to the Commonwealth automatically reside with the States. Therefore, the ownership of mineral resources in Australia generally reside with the State or Territory in which they occur. Two major exceptions are the uranium resources in the Northern Territory, where the Commonwealth Government has retained the ownership, and offshore resources beyond the 3-mile territorial limit, where Commonwealth jurisdiction prevails. Thus, the individual States and Territories administer the minerals industries within their borders, including issuing exploration and development permits; overseeing mining operations; ensuring compliance with health, safety, and environmental regulations; and

levying royalties and taxes.

In August, the Australian Government lifted its embargo on uranium exports for end use in France. The original prohibition was imposed in 1983 as a protest against French testing of nuclear weapons in the South Pacific. France had been using the uranium for power generation. The Government had been buying and stockpiling the uranium contracted for export from Queensland Mines Ltd. (QML).

After a lengthy review, the Government of Australia decided near yearend 1986 to continue the exemption from company tax, introduced in 1924, on the income from gold mining.

In September, the Government substantially eased controls on the export of a range of mineral commodities, including alumina, bauxite, coal, petroleum, and tungsten. The relaxation was essentially the deletion of the requirement for prior approval by the Government of export prices before companies started sales negotiations, thus enabling the commodities to be sold at more favorable values. The Government, however, reserved the right of veto if the negotiated prices were not commensurate with the national interest.

PRODUCTION

The mining industry in Australia generally experienced a difficult time in 1986 owing to the depressed world market and low prices for many of its minerals and metals. However, mainly because of the depreciating value of the Australian currency, production levels did not always reflect these adversities. Significant increases in production were recorded for some, such as alumina, aluminum, coal, gold, tin, and uranium; others, for instance, bauxite, iron ore, and steel, were able to sustain their approximate production standings; and several exhibited production decreases, copper, lead, manganese, nickel, and zinc, for example. Of the major mineral commodities, alumina, aluminum, coal, and natural gas had record-high production years, gold reached the highest level of output since 1913, and diamond production, which just came into a full year's hard-rock production, dominated world output, in terms of volume.

Raw and processed mineral products, including petroleum products and its derivatives, accounted for an estimated 8% of the GDP, 47% of the export value, and 12% of the Federal Government revenues.

Table 1.—Australia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum:					
Bauxite, gross weight ----- thousand tons	23,625	24,372	32,537	31,839	[2]32,431
Alumina ----- do	6,631	7,230	8,781	8,792	[2]9,243
Metal, refined:					
Primary	380,796	478,190	757,798	851,286	[2]881,910
Secondary	40,700	37,700	43,000	34,100	34,000
Antimony, Sb content of antimony and lead concentrates	1,146	[r]538	1,149	1,437	1,000
Bismuth, mine output, Bi content[e 3]	1,500	[4]1,410	[4]1,350	[4]1,400	[4]1,000
Cadmium:					
Mine output, Cd content	2,193	2,275	2,315	2,751	2,000
Metal, smelter (refined)	1,010	1,121	1,082	910	1,000
Cobalt:					
Mine output, analytic content of:					
Nickel ore	[r]2,518	[r]1,634	1,551	2,456	2,000
Nickel concentrate	[r]534	[r]477	520	--	--
Zinc concentrate	[r]80	[r]85	54	72	50
Total	[r]3,132	[r]2,196	2,125	2,528	2,050
Recoverable cobalt	1,480	1,100	936	[e]830	800
Columbium-tantalum concentrate, gross weight	[r]166	117	145	[r e]159	89

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS —Continued					
Copper:					
Mine output, Cu content	245,322	261,476	235,671	259,765	[2]239,001
Metal:					
Smelter:					
Primary	175,536	173,619	179,822	167,669	[2]168,855
Secondary	4,809	8,202	8,138	[e]8,000	8,000
Refined:					
Primary	160,195	168,533	171,180	163,833	[2]162,604
Secondary	[r]10,808	[r]27,388	18,561	20,000	20,000
Gold:					
Mine output, Au content troy ounces	866,815	983,522	[5]1,295,963	[6]1,881,491	2,479,000
Metal, refined (excluding recovery from scrap) do	826,627	953,140	1,189,672	1,743,307	[2]2,642,337
Iron and steel:					
Iron ore:					
Gross weight thousand tons	87,694	71,038	94,406	92,859	90,000
Fe content do	55,566	[r]45,298	56,313	[r e]58,500	56,700
Metal:					
Pig iron do	5,956	5,045	5,329	5,607	[2]5,889
Ferroalloys:[7]					
Ferromanganese	54,717	53,463	70,883	69,000	58,000
Ferrosilicon	19,678	18,669	18,313	18,000	15,000
Silicomanganese	29,548	19,810	31,795	27,000	23,000
Total	103,943	91,942	120,991	114,000	96,000
Steel, crude thousand tons	6,371	[r]5,657	6,303	6,578	[2]6,705
Semimanufactures[e]	5,500	5,500	6,000	6,000	6,250
Lead:					
Mine output, Pb content	455,338	480,626	440,620	497,954	[2]434,487
Metal:					
Primary:					
Bullion, for export	181,592	[r]182,593	179,491	183,161	[2]188,277
Refined	218,812	196,335	198,847	200,147	151,510
Total	400,404	378,928	378,338	383,308	339,787
Secondary excluding remelt[e]	28,300	27,000	21,500	[r]15,600	16,700
Manganese ore (metallurgical):					
Gross weight thousand tons	1,123	1,370	1,849	2,003	1,649
Mn content do	539	684	879	[e]970	800
Nickel:					
Mine output, Ni content	87,552	76,625	76,923	85,757	78,000
Metal, smelter (refined metal and metal content of oxide)	45,931	41,800	38,660	40,807	41,950
Platinum-group metals:[8]					
Palladium, Pb content troy ounces	13,379	[3]14,825	16,815	[e]13,600	13,600
Platinum, Pt content do	2,388	[3]1,759	2,122	[e]2,400	2,400
Total do	15,767	[3]16,584	18,937	[e]16,000	16,000
Rare-earth metals, monazite concentrate:					
Gross weight	9,562	15,141	16,260	18,735	[2]10,583
Monazite content	8,889	14,005	15,101	[e]13,900	9,700
Silver:					
Mine output, Ag content thousand troy ounces	29,156	33,208	31,260	34,914	32,440
Metal, refined do	11,113	10,684	9,476	10,578	[2]9,472
Tin:					
Mine output, Sn content	12,126	[9]9,275	[9]7,939	6,363	[2]8,631
Metal, refined:					
Primary	3,105	2,913	2,899	2,683	[2]1,302
Secondary[e]	380	400	400	400	200
Titanium concentrates, gross weight:					
Ilmenite thousand tons	1,149	[r]893	1,143	1,419	[2]1,291
Leucoxene	19,739	13,358	32,110	13,809	[2]16,266
Rutile	220,697	[r]163,374	170,424	211,615	[2]220,046
Tungsten, mine output, W content	2,618	2,015	1,733	1,970	1,300
Uranium, mine output, U content	4,422	[r]3,211	4,324	3,206	[2]4,154
Vanadium, mine output, V content	23	--	--	--	--
Zinc:					
Mine output, Zn content	664,800	699,032	676,532	759,083	[2]662,258
Metal, smelter:					
Primary	291,390	[r]298,451	301,940	288,686	[2]305,654
Secondary[e]	4,500	[r]4,500	4,500	4,500	4,500

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS —Continued					
Zirconium concentrates, gross weight	462,476	r382,005	457,599	501,440	2419,290
INDUSTRIAL MINERALS					
Abrasives, natural:					
Beach pebble	1,169	e2,300	1,655	e2,500	2,000
Garnet (sales)	3,266	2,657	3,287	e3,500	3,500
Asbestos	18,969	r3,909			
Barite	28,064	11,752	19,511	22,421	21,000
Cement, hydraulic thousand tons	5,744	4,836	5,463	5,887	25,870
Clays:					
Bentonite and bentonitic clay	29,212	30,026	39,172	e30,000	30,000
Brick clay and shale thousand tons	8,210	6,203	7,898	8,434	8,000
Cement clay and shale[10] do	413	356	385	e400	400
Damourite clay (sales)	2,473	93	2,164	e3,000	2,000
Fire clay	1071,092	r45,710	1032,686	e60,000	60,000
Kaolin and ball clay	152,133	115,526	10218,885	e120,000	125,000
Other[10] thousand tons	1,641	r2,502	1,847	e2,000	2,000
Diamond:					
Gem thousand carats	274	3,720	3,415	4,242	213,145
Industrial do	183	2,480	2,277	2,828	216,066
Total do	457	6,200	5,692	7,070	229,211
Diatomite	1,561	7,921	6,430	6,900	7,000
Feldspar including nepheline syenite	4,335	4,244	3,898	8,400	8,000
Gem stones, other than diamond:					
Opal value, thousands	$39,861	$40,035	$35,358	$32,305	$33,800
Sapphire do	r$14,753	r$12,036	$7,846	$5,342	2$8,359
Other do	r$5,036	r$3,307	$3,196	$3,326	2$2,316
Total do	r$59,650	r$55,378	$46,400	$40,973	$44,475
Gypsum thousand tons	1,864	1,510	1,931	1,537	1,600
Lime[e 3]	948,000	r1,016,361	r1,101,000	1,100,000	1,100,000
Magnesite	29,671	r20,534	67,041	70,072	70,000
Nitrogen: N content of ammonia	244,900	385,000	375,600	401,000	375,000
Perlite, crude	1,148	2,856	3,708	e3,000	3,000
Phosphate rock	211,463	4,868	15,345	7,200	10,000
Salt thousand tons	4,811	5,170	5,695	6,200	6,200
Sillimanite	783	121	507	428	500
Sodium compounds, n.e.s.: Sodium carbonate[e] thousand tons	300	300	300	300	300
Spodumene, concentrate[3]	80	1,000	6,500	11,200	11,000
Stone, sand and gravel:					
Construction sand[10] thousand tons	28,718	23,543	24,675	e30,000	25,000
Gravel[10] do	16,813	13,931	15,031	e18,000	15,000
Dolomite do	602	585	595	623	600
Limestone:[e]					
For cement do	9,268	8,500	9,000	r10,000	10,000
For other uses do	3,430	3,800	4,000	r5,000	5,000
Silica in the form of quartz, quartzite, glass sand do	1,813	1,928	2,242	e2,000	2,000
Other:[e]					
Crushed and broken stone do	57,100	249,115	256,331	50,000	50,000
Dimension stone do	129	297	2101	100	100
Unspecified do	31,524	225,869	228,985	25,000	25,000
Sulfur: Byproduct:					
Metallurgy	146,000	170,000	190,000	r e190,000	190,000
Petroleum	17,496	12,897	13,000	13,000	13,000
Total	r163,496	r182,897	203,000	r e203,000	203,000
Talc, soapstone, pyrophyllite	152,792	176,578	186,760	138,475	150,000
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Bituminous and subbituminous thousand tons	119,015	r120,482	139,094	158,256	2170,389
Lignite do	37,811	34,191	1035,166	36,985	237,617
Total do	156,826	r154,673	174,260	195,241	2208,006
Coke, metallurgical do	r4,331	r3,374	3,606	e3,000	3,500
Fuel briquets do	854	772	810	e1,000	1,000
Gas, natural, marketed million cubic feet	409,439	420,115	445,966	475,481	2519,426

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Natural gas liquids thousand 42-gallon barrels	18,255	23,000	21,175	25,939	[2]24,723
Peat[11]	10,101	10,026	13,390	[r e]14,000	14,000
Petroleum:					
Crude thousand 42-gallon barrels	136,251	[r]154,417	181,868	209,939	[2]187,196
Refinery products:					
Gasoline:					
Aviation do	1,095	1,023	1,281	1,177	[2]1,077
Motor do	94,206	94,214	96,642	99,702	[2]96,456
Jet fuel do	15,330	14,836	16,452	16,373	[2]17,225
Kerosene do	3,084	761	812	611	[2]597
Distillate fuel oil do	53,533	53,128	55,273	54,673	[2]53,896
Residual fuel oil do	21,678	19,898	18,086	18,019	[2]13,162
Lubricants do	3,556	3,324	3,753	3,692	[2]3,358
Liquefied petroleum gas do	6,171	4,027	4,600	6,069	[2]4,848
Bitumen do	3,115	2,766	3,171	3,220	[2]3,412
Unspecified do	4,219	10,879	9,943	7,476	[2]5,716
Refinery fuel and losses do	17,696	13,433	11,872	11,739	[2]10,976
Total do	223,683	218,289	221,885	222,751	[2]210,723

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Includes data available through Sept. 5, 1987.
[2]Reported figure.
[3]Data are for years ending June 30 of that stated.
[4]Bismuth-rich residues reportedly have been stockpiled owing to weak demand and low prices.
[5]Excludes gold in bismuth concentrate.
[6]Excludes gold in gold ore and concentrate for South Australia.
[7]Data are for years ending Nov. 30 of that stated for plants owned by The Broken Hill Pty. Co. Ltd.
[8]Western Australia only. Platinum-group metals content of nickel ore.
[9]Excludes tin content of copper-tin concentrates.
[10]Excludes production from Western Australia.
[11]Excludes data from some States.

TRADE

The value of Australia's mineral exports declined slightly from the 1985 level. Of the major primary mineral commodity products, coal continued overwhelmingly to be the largest export earner, representing 35% of primary mineral exports in 1986. Iron ore was in second place with 13% of primary mineral exports, followed by alumina, 9%; aluminum, 6%; gold, 6%; crude petroleum, 4%; zinc, 3%; and nickel, 3%.

Imports of primary mineral products decreased 23% in value from the 1985 level. The largest mineral imports, in value, for 1986 were crude petroleum, representing 33%, followed by gold, 8%; phosphate rock, 6%; elemental sulfur, 5%; and diamond, 4%.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides, thousand tons	6,924	7,158	--	NA.
Metal including alloys:				
Scrap	13,246	19,175	--	Japan 16,980.
Unwrought	413,484	564,897	1,187	Japan 328,032; China 80,027; Republic of Korea 47,189.
Semimanufactures	54,800	61,300	54	NA.
Chromium: Ore and concentrate	24	9	--	Indonesia 8.
Copper:				
Ore and concentrate	217,440	291,158	1,805	Japan 250,112; China 2,447.
Matte and speiss including cement copper	3,977	8,001	--	All to West Germany.
Metal including alloys:				
Scrap	516	322	--	Belgium-Luxembourg 92; Philippines 80; United Kingdom 70.
Unwrought	81,351	73,192	198	United Kingdom 34,840; Japan 16,418; France 7,927.
Semimanufactures	36,349	27,990	839	New Zealand 14,296; Saudi Arabia 7,594.
Gold: Metal including alloys:				
Content of ores and concentrates, troy ounces	r37,166	61,761	NA	NA.
Unwrought and partly wrought, do.	979,342	1,541,883	NA	NA.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite, thousand tons	88,830	88,280	--	China 7,535; West Germany 6,605; Republic of Korea 5,343.
Metal:				
Scrap, do.	371	503	--	NA.
Pig iron, cast iron, related materials	71,010	3,640	--	Malaysia 3,057.
Ferroalloys:				
Ferromanganese	19,184	20,055	10,000	Indonesia 4,063; Qatar 3,093; Thailand 1,989.
Unspecified	27,360	55,496	51,600	Singapore 2,045; New Zealand 855.
Steel, primary forms	414,154	787,279	51	China 279,663; Malaysia 89,212; Spain 73,516.
Semimanufactures:				
Bars, rods, angles, shapes, sections	58,877	183,859	12,649	China 103,006; New Zealand 36,757; Malaysia 16,200.
Universals, plates, sheets	361,743	4,697,049	4,431,415	New Zealand 70,559.
Hoop and strip	15,623	17,278	2,035	New Zealand 8,667; Canada 4,895.
Rails and accessories	741	13,576	49	Canada 12,091.
Wire	11,002	311,622	3,493	New Zealand 300,393.
Tubes, pipes, fittings	50,600	33,632	2,149	NA.
Castings and forgings, rough	5,269	5,959	1,718	Singapore 1,672; Thailand 1,061.
Lead:				
Ore and concentrate	157,828	199,845	39,160	Japan 68,184; Belgium-Luxembourg 42,396; Republic of South Africa 15,822.
Oxides	4,416	3,688	--	Malaysia 395; Singapore 307; Bangladesh 268.
Metal including alloys:				
Scrap	9,237	19,903	--	Republic of Korea 8,812; Philippines 2,467.
Unwrought	336,158	306,254	--	United Kingdom 145,402; Japan 49,836; India 41,494.
Semimanufactures	591	2,688	--	Japan 1,807; Singapore 457.
Manganese: Ore and concentrate[2], thousand tons	1,460	1,403	NA	NA.
Nickel:				
Ore and concentrate, value, thousands	$11,195	$9,505	$9,455	Japan $27.
Matte and speiss, do.	$201,873	$231,784	--	NA.
Metal including alloys:				
Scrap	566	600	--	United Kingdom 331; Japan 213.
Unwrought and semimanufactures, value, thousands	$124,911	$106,848	--	NA.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, do.	$3,245	$1,245	$709	United Kingdom $262; Hong Kong $174.
Rare-earth metals: Monazite concentrate[2]	18,124	18,025	NA	NA.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Silver:				
Ore and concentrate[3] value, thousands	$102	$21	$14	United Kingdom $7.
Waste and sweepings[3] do	$7,307	$2,557	--	United Kingdom $1,376; Japan $734; France $370.
Metal including alloys, unwrought and partly wrought do	$55,721	$39,878	$1	United Kingdom $30,209; Japan $4,511.
Tin:				
Ore and concentrate	12,974	11,860	215	Malaysia 10,423; United Kingdom 1,218.
Metal including alloys:				
Scrap	144	73	--	NA.
Unwrought	473	437	362	New Zealand 58.
Semimanufactures	197	83	26	Papua New Guinea 57.
Titanium: Ore and concentrate[2] thousand tons	1,395	1,380	NA	NA.
Tungsten:				
Ore and concentrate	3,256	3,416	748	West Germany 594.
Metal including alloys, all forms	193	91	NA	West Germany 81.
Uranium and thorium: Ore and concentrate value, thousands	$280,390	$226,062	$74,471	West Germany $52,030; France $47,937; Canada $26,330.
Zinc:				
Ore and concentrate thousand tons	878	881	--	Japan 475; Belgium-Luxembourg 142; West Germany 111.
Oxides	203	2,938	--	China 2,354.
Metal including alloys:				
Scrap	1,020	903	--	NA.
Unwrought	215,605	209,807	34,177	Indonesia 41,410; China 19,554; New Zealand 13,572.
Semimanufactures	11,793	9,388	2	U.S.S.R. 6,000; China 2,216.
Zirconium: Ore and concentrate[2]	437,770	495,891	NA	NA.
Other:				
Ores and concentrates	1,871,503	2,854	--	Belgium-Luxembourg 1,820; France 1,034.
Oxides and hydroxides	63	39	--	New Zealand 34.
Ashes and residues	29,742	55,198	5,660	West Germany 15,227; Japan 13,727; Belgium-Luxembourg 10,523.
Base metals including alloys, all forms	1,502	855	470	Netherlands 108; India 80.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	321	2,599	226	Japan 2,093.
Artificial: Corundum	2	2	--	All to Japan.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$173	$11	$6	New Zealand $4.
Grinding and polishing wheels and stones	193	1,722	19	Malaysia 1,227; New Zealand 230.
Asbestos, crude	22	--	--	
Barite and witherite	1,682	2,041	--	New Zealand 1,599.
Cement value, thousands	$2,674	$1,534	$5	Papua New Guinea $623; Philippines $210; Singapore $181.
Clays, crude	17,030	8,576	--	Indonesia 2,371; United Kingdom 1,877; Japan 1,597.
Diamond:				
Gem, not set or strung value, thousands	$23,171	$21,077	$1,059	Belgium-Luxembourg $10,167; Switzerland $4,963.
Industrial stones do	$5,273	$2,571	$49	Belgium-Luxembourg $2,004.
Diatomite and other infusorial earth	2,512	123	NA	Philippines 38; Papua New Guinea 32; New Zealand 26.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Fertilizer materials:				
Crude, n.e.s	561	821	--	Japan 355; Malaysia 165; Bahrain 81.
Manufactured:				
Ammonia	12,278	65,963	--	India 55,505.
Nitrogenous	29,877	4,175	--	New Zealand 2,157; Malaysia 435; Fiji 431.
Phosphatic	528	158	--	Papua New Guinea 137.
Potassic	23	30	--	New Zealand 18; China 7.
Unspecified and mixed	25,020	6,084	9	Malaysia 5,487.
Graphite, natural	17	72	6	New Zealand 30.
Gypsum and plaster	732,481	520,840	16,500	Indonesia 192,849; New Zealand 143,055.
Lime	321	87	--	Papua New Guinea 74.
Magnesite, crude	3,985	5,445	234	New Zealand 5,024.
Mica: Worked including agglomerated splittings value, thousands	$42	$24	--	New Zealand $21.
Nitrates, crude	3	41	--	Thailand 35.
Phosphates, crude	26,312	10,034	--	Japan 10,000.
Pigments, mineral: Iron oxides and hydroxides, processed	85	171	--	New Zealand 100.
Potassium salts, crude	31	43	--	Vanuatu 36.
Precious and semiprecious stones other than diamond: Synthetic value, thousands	$32,162	$21,087	$2,345	Japan $6,520; Thailand $4,340; Hong Kong $3,232.
Salt and brine thousand tons	4,766	4,947	--	Japan 3,308; Republic of Korea 732.
Sodium carbonate, n.e.s.: Carbonate, manufactured	974	2,648	--	New Zealand 1,273; Fiji 873.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	4,260	2,539	--	Italy 2,364.
Worked	24	287	--	Nauru 225.
Dolomite, chiefly refractory-grade	27	36	--	Papua New Guinea 18; Tonga 18.
Gravel and crushed rock	686,632	894,993	--	NA.
Limestone other than dimension	35	76	--	Papua New Guinea 55.
Sulfur:				
Elemental: Crude including native and byproduct	320	3,934	--	New Caledonia 3,345.
Sulfuric acid	457	489	--	New Zealand 355.
Talc, steatite, soapstone, pyrophyllite	163,398	122,349	--	Japan 66,765; Belgium-Luxembourg 20,051; Republic of Korea 15,420.
Other:				
Crude	21,061	11,285	95	Netherlands 4,435; Japan 2,572; New Zealand 564.
Slag and dross, not metal-bearing	266	92	--	Papua New Guinea 51; Thailand 20.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	27,840	25,148	--	Indonesia 13,045; New Zealand 6,181.
Coal:				
Anthracite and bituminous thousand tons	77,770	88,751	63	Republic of Korea 8,496; Netherlands 3,906; France 2,643.
Lignite including briquets do	55	26	--	Republic of Korea 22.
Coke and semicoke do	65	168	--	Romania 44; Japan 34; Norway 19.
Petroleum:				
Crude thousand 42-gallon barrels	19,567	41,390	17,014	Japan 12,562; Singapore 8,981; Philippines 1,421.
Refinery products:				
Liquefied petroleum gas do	16,715	18,670	--	NA.
Gasoline do	3,553	2,700	3	New Zealand 1,409; Papua New Guinea 433; Fiji 406.
Mineral jelly and wax do	22	14	--	New Zealand 8; Malaysia 4.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Kerosene and jet fuel thousand 42-gallon barrels	6,477	5,643	197	Fiji 685; New Zealand 563; bunkers 3,849.
Distillate fuel oil ——do——	7,261	4,895	12	New Zealand 1,116; Fiji 936; bunkers 1,138.
Lubricants ——do——	1,721	1,472	237	India 284; New Zealand 263; Papua New Guinea 68.
Residual fuel oil ——do——	9,861	8,983	202	Singapore 1,780; Papua New Guinea 1,671; bunkers 4,512.
Bituminous mixtures ——do——	2	5	--	Papua New Guinea 3.

[r]Revised. NA Not available.
[1]Table prepared by Audrey D. Wilkes. Import data were not available at the time of publication.
[2]Data from Australian Mineral Industry Annual Review Preliminary Summary 1986.
[3]May include platinum-group metals.

COMMODITY REVIEW

METALS

Alumina, Aluminum, and Bauxite.—Bauxite in Australia was produced from three principal regions during the year. Alcoa of Australia Ltd. (51% Aluminum Co. of America and 49% Australian interests, including Western Mining Corp. Holdings Ltd. (WMCH), 42.5%) operated the Del Park, Huntly, Jarrahdale, and Willowdale Mines in the Darling Range of Western Australia; Reynolds Australia Alumina Ltd. operated the Mount Saddleback Mine south of Perth, also in the Darling Range of Western Australia. Two mines were operated by Comalco Ltd. (67% CRA Ltd. and 33% other Australian interests) at Weipa on the Cape York Peninsula in the far north of Queensland; and a mine at Gove in Arnhem Land, Northern Territory, was operated by Nabalco Pty. Ltd. for the Gove joint venture of Swiss Aluminium Ltd. (Alusuisse), 70%, and Gove Aluminium Ltd., 30%. Two additional major bauxite deposits, the Mitchell Plateau leases held by Mitchell Plateau Bauxite Co. Pty. Ltd., a Comalco company, in the Kimberley region of northwestern Western Australia, and the Aurukun Associates (Shell Australia Ltd., 66.67%, and Pechiney Australia Pty. Ltd., 33.33%) leases over the Aurukun area south of Weipa on the Cape York Peninsula, were not yet developed.

About 85% of Australia's bauxite production was refined into alumina by the country's six alumina refineries during the year. Alcoa of Australia operated three refineries in Western Australia: Kwinana, with bauxite transported by rail from Jarrahdale; Pinjarra, receiving bauxite by dual overland conveyors from Del Park and Huntly; and Wagerup, supplied by bauxite brought in by overland conveyor from Willowdale. Queensland Alumina Ltd. (QAL) (owned by Comalco, 30.3%; Kaiser Alumina Australia Corp., 28.3%; Alcan South Pacific Ltd., 21.4%; and Howmet Resources Corp., 20%) operated a refinery at Gladstone on the eastern coast of Queensland, which was supplied by ore mined at the Weipa Mines. Nabalco operated an on-site refinery to process bauxite at its Gove operations, and Reynolds Australia's Mount Saddleback Mine supplied bauxite to Worsley Alumina Pty. Ltd.'s Worsley refinery in Western Australia.

Five primary aluminum smelters operated in Australia throughout the year: Bell Bay in Tasmania, the oldest in Australia, owned by Comalco; Boyne Island near Gladstone, Queensland, operated by Boyne Smelters Ltd., a company owned by Comalco (30%), Kaiser Alumina (20%), and a group of Japanese companies (50%); Kurri Kurri at Newcastle, New South Wales (Alcan Australia); Point Henry at Geelong, Victoria (Alcoa of Australia); and Tomago in New South Wales, operated by Tomago Aluminium Co. Pty. Ltd., a company owned by Gove Aluminium Finance Pty. Ltd. and

Pechiney Australia (35% each), TOA Pty. Ltd. (15%), VAW Australia Pty. Ltd. (6%), VAW USA Pty. Ltd. (6%), and Hunter Douglas Ltd. (3%). A sixth smelter, at Portland, Victoria, came on-stream in November.

Australia remained the undisputed leading producer of alumina and bauxite in the world in 1986, although the production of bauxite increased only slightly compared with that of 1985. However, the production of alumina, as well as that of primary aluminum, increased to a new record-high level in 1986. The increase in alumina production was mainly the result of increased production at QAL's Gladstone refinery in response to a slightly improved world alumina market, and the production increase for aluminum represented a near-capacity utilization for the five established smelters, plus additional production from the new $1.15 billion Portland smelter, a joint venture of Alcoa of Australia (45%), the Victoria State government (35%), a public trust set up by the merchant bank First National Ltd. (10%), and the Government of China through the China International Trust and Investment Corp. (10%).

Exports of alumina, aluminum, and bauxite in 1986 generally reflected the year's production; bauxite shipments were estimated to have increased fractionally compared with those of 1985, while alumina and aluminum reached new record-high levels. Altogether, the revenue from these commodities was estimated to be about 17% of the total for all mineral primary products in 1986.

Bismuth.—Australia continued to be the world's largest miner of bismuth, although production was confined to only two sources during the year, producing an estimated 25% of world production. Bismuth was extracted as a coproduct from Peko-Wallsend Ltd.'s Warrego copper and gold mine at Tennant Creek in the Northern Territory and from The Broken Hill Associated Smelters Pty. Ltd.'s (BHAS) extraction plant at its lead refinery at Port Pirie, South Australia. The bismuth residue was being stockpiled for possible further treatment.

Copper.—Mine production of copper in Australia continued to be from operations that produced other metals, either as the primary product or as a coproduct. Some of the major copper-producing mines in 1986 were Mount Isa Mine in northwestern Queensland, Australia's largest, operated by Mount Isa Mines Ltd. (MIM), a wholly owned subsidiary of MIM Holdings Ltd.; Mount Lyell Mine, Tasmania, operated by Renison Goldfields Consolidated Ltd. (RGC) and Australia's second largest copper producer; the large CSA Mine at Cobar and the smaller Woodlawn Mine northeast of Canberra, both in New South Wales and operated by Australian Mining & Smelting Ltd. (AM&S), a wholly owned subsidiary of CRA; Que River Mine, Tasmania, owned by Aberfoyle Ltd. (90%) and Paringa Mining and Exploration Co. PCL (10%); Rosebery Mine, also in Tasmania and operated by EZ Industries Ltd. (EZI); Warrego Mine at Tennant Creek, Northern Territory, operated by Peko-Wallsend; and Mount Gunson Mine, South Australia, operated by Mount Gunson Mines Pty. Ltd., a wholly owned subsidiary of CSR Ltd., which recovered and treated remnant ore until ceasing operations at midyear.

Four copper refining-smelting facilities were operating during the year in Australia. MIM smelted copper concentrates onsite at its Mount Isa facility, producing blister copper to be refined at its plant at Townsville, Queensland, operated by Copper Refineries Pty. Ltd., a wholly owned subsidiary. The Electrolytic Refining & Smelting Co. of Australia Ltd. (ER&S) smelted and refined copper from the Cobar and Woodlawn Mines, as well as providing custom smelting facilities for other producers, at its Port Kembla, New South Wales, operations. A 4,000-ton-per-year electrolytic refinery was operated by BHAS at its base metal refinery-smelter complex at Port Pirie, South Australia.

Mine production of copper decreased 8% in 1986, although there was higher output recorded at the mines at Cobar and Woodlawn and a continued high-production level was recorded at the large Mount Isa and Mount Lyell Mines. However, production from these did not offset the lower output from the Warrego Mine or the decrease caused by the cessation of operations at the Mount Gunson Mine at midyear.

Blister copper production increased slightly owing to increased output at the Port Kembla and Mount Isa smelters, but primary refined copper decreased because of lower production at the Townsville refinery.

Construction began in March on the huge Olympic Dam copper-gold-silver-uranium project at Roxby Downs Station, South Australia, and was proceeding on schedule

with the commitment announced at year-end 1985 by the joint venturers WMCH (51%) and BP Australia Ltd. (49%). Scheduled startup was to be in 1987 with the mining of a small, high-grade gold section of the ore body; mining of the copper-uranium ore was expected to start in 1988, also on a high-grade section of ore. Initial copper mining was expected to yield 55,000 tons of copper concentrate per year.

CRA announced that it would proceed with the development of an underground mine, which would supersede the open pit operations, at its Woodlawn Mine. Although the ore grade would be similar, planned production would be less, at 500,000 to 600,000 tons of ore per year compared with the 930,000 tons of ore per year from the open pit, thus enabling the life of the mine to be extended by about 4 years.

Peko-Wallsend announced planning based upon its feasibility study, which foresees development of its Goonumbla porphyry copper project near Parkes, New South Wales, in two stages. The first was based on open pit mining and the second on both open pit and underground mining. Annual output could be 35,000 tons to 50,000 tons of copper contained in concentrate, with a significant precious metal content. Further evaluation was planned to be done in 1987.

Gold.—The production of gold in Australia, which increased for the sixth successive year, was 2.48 million troy ounces in 1986, exceeding the 1985 output by 32%. The increase was due mainly to the expansion of capacity at operating mines, but also partly to the commissioning of new operations and to the trend of re-treating mine tailings dumps using modern recovery techniques for the gold left from previous treatment. Output although at its highest since 1913, was still well below Australia's peak production of 3.8 million troy ounces established in 1903. Gold was Australia's fifth largest mineral export in terms of value in 1986.

Kidston Gold Mines Ltd.'s large open pit gold-silver Kidston Mine, 250 kilometers northwest of Townsville, remained Queensland's largest gold producer. The Telfer Mine, situated in the Great Sandy Desert 400 kilometers southeast of Port Hedland and operated by Newmont Holdings Pty. Ltd. (70%) and BHP Minerals Ltd. (30%), was the largest single producer of gold in Western Australia. The Stawell Mine, a joint venture of WMCH (75%) and Central Norseman Gold Corp. Ltd. (25%), remained Victoria's major producer. The Enterprise Mine at Pine Creek, operated by RGC (60%), in joint venture with Enterprise Gold Mines NL (40%), replaced Peko-Wallsend's Warrego Mine as the Northern Territory's leading producer. South Australia continued to produce only a minor quantity of gold in 1986, although that State's production was expected to expand considerably as the huge Olympic Dam copper-gold-silver-uranium deposit at Roxby Downs Station begins production, possibly in 1987. The production of gold, mainly as a byproduct of base metal mining, in New South Wales and Tasmania continued to be minor in 1986.

Although not an exhaustive listing, the following gold mines and treatment plants were commissioned during the year: Cork Tree Well Mine, Western Australia (Austwhim Resources NL); Emu Mine, Western Australia (WMCH); Golden Crown Mine, Western Australia (Australian Consolidated Minerals Ltd. (ACM)); Granites Mine, Northern Territory (North Flinders Mines Ltd.); Lady Bountiful Mine, Western Australia (WMCH, 50%, and Consolidated Exploration Ltd., 50%); Lawlers Mine treatment plant, Western Australia (Forsayth Oil NL); Mount Leyshon Mine, Queensland (Pan Australian Mining Ltd., 50%, and Noranda Australia Ltd., 50%); Red Dome heap leach operation, Queensland (Elders Resources Ltd.); TC8 Mine, Northern Territory (Norseman Gold Mines NL); and Westonia Mine, Western Australia (ACM).

The Perth Mint, owned by Western Australian Development Corp., in Western Australia, remained the largest source of refined gold in Australia, refining bullion produced in Western Australia and the Northern Territory, as well as imported bullion and scrap. There were only two other recognized gold refiners in Australia, Johnson Matthey Pty. Ltd. of Sydney, New South Wales, and Englehard Industries Pty. Ltd. of Melbourne, Victoria, although ER&S at Port Kembla, New South Wales, refined gold from tankhouse sludge produced during the electrolytic refining of copper, and BHAS refined gold from lead concentrates at its Port Pirie, South Australia, refinery.

The government of Western Australia began the sale of proof Australian gold coins, known as the "Australian Nugget" series, in November, the first gold coins to be produced by the Perth Mint in more than 50 years. The coins, of 99.99% purity and minted beginning in August in 1-ounce (the "Welcome Stranger"), 1/2-ounce (the "Hand

of Faith"), 1/4-ounce (the "Golden Eagle"), and 1/10-ounce (the "Little Hero") denominations, were legal tender under the Australian Currency Act. The obverse featured Queen Elizabeth II and the reverse featured a famous gold nugget, differing with each denomination, discovered in Australia. A gold bullion Nugget series coin was to be introduced for sale in February 1987.

The Government, after specially commissioning a review of the taxation status of gold production early in the year, decided near yearend to leave the gold industry's tax position unchanged. Consequently, the profits earned from gold mining remained tax free.

Iron and Steel.—Australian iron ore production continued to be heavily concentrated in the Hamersley Range of the Pilbara District, Western Australia, accounting for more than 90% of the country's total. Four companies, with an annual production capacity of about 105 million tons, mined iron ore in the Pilbara region during the year from six mines: Robe River Iron Associates, a joint venture comprised of Peko-Wallsend (54.5%), Mitsui Iron Ore Development Pty. Ltd. (31.5%), Nippon Steel Corp. (10.5%), and Sumitomo Metal Australia Ltd. (3.5%), operated the Pannawonica Mine about 300 kilometers southwest of Port Hedland, with Peko-Wallsend managing the project; Robe River purchased the nearby East Deepdale deposits from The Broken Hill Pty. Co. Ltd. (BHP), enabling continuation of the current operation for at least 20 more years.

Goldsworthy Mining Ltd. operated mines at Shay Gap and Sunrise Hill to the east of Port Hedland; Mount Newman Mining Co. Pty. Ltd., a wholly owned subsidiary of BHP, operated two mines at Newman, Mount Whaleback Mine and Orebody 29 Mine, in a joint venture with Japan's Mitsui-C. Itoh Iron Pty. Ltd. (10%) and Australia's Seltrust Iron Ore Ltd. (5%); and Hamersley Iron Pty. Ltd., Australia's biggest iron ore miner and a wholly owned subsidiary of CRA, operated mines at Mount Tom Price and Paraburdoo.

The companies transported their ore to loading facilities by privately owned railways: Ore from the Pannawonica (East Deepdale) Mines was railed about 170 kilometers to Port Walcott at Cape Lambert; ore from the Shay Gap and Sunrise Hill Mines was railed about 180 kilometers to the company's port at Finucane Island, Port Hedland; Mount Newman's Mount Whaleback and Orebody 29 ore was railed about 425 kilometers to Nelson Point at Port Hedland; and Mount Tom Price and Paraburdoo ore was railed about 295 and 395 kilometers, respectively, to the port at Dampier.

BHP Minerals, a wholly owned subsidiary of BHP, produced iron ore by opencut methods on Koolan Island and shipped this ore and stockpiled ore from the depleted mine on Cockatoo Island. Both islands are in Yampi Sound, Western Australia.

Outside Western Australia there were two other centers for iron ore mining in Australia: BHP produced iron ore from the Iron Baron group of mines in the Middleback Ranges, South Australia, to supply its domestic steelworks in nearby Whyalla; and Savage River Mines Ltd., equally owned by Northwest Iron Co. Ltd. and Dahlia Mining Co. Ltd., produced from its Savage River Mine, northwest Tasmania. Concentrate from Savage River was pumped 85 kilometers as slurry by pipeline for pelletizing at Port Latta and subsequent shipment to Japan and to BHP's steelworks at Port Kembla.

Small quantities of iron oxide minerals were also produced by several companies for use domestically in cement manufacture, coal washing, and water purification, and ironstone was mined periodically for domestic use and export for nonironmaking uses.

All iron ore mined in Australia was hematite, or hematite-goethite, except that produced at the Robe River and Savage River Mines, which was limonite and magnetite, respectively. All was high-grade ore, ranging from 62% to 69% iron, except for Robe River's limonite ore, which was 57% iron, and Savage River's magnetite, which ranged from 36% to 39% iron.

Iron ore production decreased slightly in 1986, owing primarily to an ease in export demand but also to diminished output at some mines, partly due to effects of industrial disputes and partly to production bottlenecks. Iron ore exports decreased 9% in 1986, owing mainly to reduced shipments to Japan and Western Europe that were not fully compensated for by increased shipments to other countries of the Far East. Decreased iron ore contract prices, down 4% to 6%, negotiated early in the year were offset to some extent by the depreciation of the Australian dollar relative to the U.S. dollar, in which most contracts were expressed.

BHP announced in July plans to develop its Yandicoogina pisolitic limonite deposit 100 kilometers northwest of its existing operations at Newman, Western Australia. Estimated resources were 1.8 billion tons of ore. CRA also announced plans to develop its lease at the Yandicoogina deposit adjacent to BHP's holdings, depending on obtaining sales contracts and results of a feasibility study. Estimated resources were 3 billion tons of pisolitic limonite ore.

BHP, Australia's largest public company and the only big steel producer, produced steel at three major centers operated by its steel division: Whyalla Steelworks, South Australia; Port Kembla Steelworks, Wollongong, New South Wales; and Newcastle Steelworks, New South Wales.

Production of pig iron increased 5% in accordance with higher steel output. BHP announced in December the reconstruction and enlargement of one of its two operating blast furnaces at the Port Kembla plant over a 2-year period. With this reconditioning, ironmaking capacity of the furnace will increase to 4,500 tons per day from 2,800 tons, and total plant capacity will increase from 3.8 million ingot tons of steel to 4.1 million tons per year, lifting total BHP Steel Group capacity to 7.1 million tons of crude steel per year.

Steel production rose slightly in 1986, primarily to meet an increase in domestic requirements early in the year. BHP announced in September that it was investigating the construction of a steel-rolling mill in Sydney, New South Wales, similar to the one it began constructing in March 1985 at Acacia Ridge in the Brisbane, Queensland, area. The envisioned rolling mill would produce up to 250,000 tons of merchant and reinforcing bar products per year using semifinished billets from BHP's Newcastle works.

Lead and Zinc.—All lead and zinc ore mined in Australia continued to come from operations that produced both, since the two metals occur in associated minerals in the same ore bodies. The predominant lead- and zinc-producing mines in Australia remained the renowned Mount Isa Mine in northwestern Queensland and the equally famous mines at Broken Hill in the far west of New South Wales. The Mount Isa Mine, owned and operated by MIM, a wholly owned subsidiary of MIM Holdings, was one of the largest producers of lead and zinc in the world. There were four operating mines at Broken Hill during the year. New Broken Hill Consolidated Ltd. (NBHC) and Zinc Corp. Ltd. (ZC), both subsidiaries of AM&S, operated mines of the same names at the southern end of the Broken Hill workings—late in 1986, these two mines were amalgamated under the name ZC Mine; the Blackwood opencut, an extension of the old South Mine, was operated by Minerals Mining and Metallurgy Ltd.; and North Broken Hill Ltd. operated the North Mine, the most northerly mine operating on the Broken Hill lode.

Other major lead-zinc mines operating during the year were the large CRA Mine at Cobar and the smaller Woodlawn Mine to the northeast of Canberra, both in New South Wales; the Elura Mine in New South Wales situated north of Cobar, operated by EZI; the Rosebery Mine on the northwestern coast of Tasmania, also operated by EZI; the Que River Mine, northwestern Tasmania, owned by Aberfoyle (90%) and Paringa (10%); and the small, high-grade Woodcutters Mine in the Northern Territory near Darwin, owned by a consortium led by Nicron Resources Ltd.

There were seven lead and zinc refining and smelting operations in Australia in 1986. Lead concentrate was treated at MIM's on-site Mount Isa smelter, producing lead bullion that was shipped to MIM's Northfleet refinery in the United Kingdom for subsequent treatment; Sulphide Corp. Pty. Ltd., a wholly owned subsidiary of AM&S, operated the Cockle Creek, New South Wales, smelter and refinery, producing high-grade and special high-grade zinc, and lead bullion from lead and zinc concentrates from the Woodlawn and Broken Hill Mines; BHAS, owned by AM&S (70%) and North Broken Hill (30%), operated Australia's sole primary lead refinery and a lead smelter-zinc refinery at Port Pirie, South Australia, mainly treating lead concentrate from Broken Hill and supplemented by concentrates from other mines and imports; EZI operated Australia's largest zinc refinery at Risdon, Tasmania, treating concentrates from its own mine at Rosebery, the nearby Que River Mine, the Elura Mine, mines at Broken Hill, and the Mount Isa Mine. ER&S, a wholly owned subsidiary of AM&S, operated a secondary lead refinery at Port Kembla, New South Wales; Simsmetal Pty. Ltd. operated a secondary lead refinery at Sydney, also in New South Wales, and a secondary lead refinery at Melbourne, Victoria, via its Australian Refined Alloys Ltd. subsidiary, a 50-50 joint

venture with BHAS.

Estimated mine production for both lead and zinc decreased 13% owing mainly to the closure of the major mines at Broken Hill in midyear as a result of industrial conflict related to work practices. However, Australia continued to remain the world's leading producer of mined lead and the third leading producer of mined zinc after Canada and the U.S.S.R. Lead mine production also decreased slightly at Mount Isa and both lead and zinc production declined at Woodlawn. Mine production of lead and zinc increased at the Cobar Mine and zinc production increased at both the Woodcutters and Blackwood Mines. A slight increase in zinc production led to a new record-high level at the Mount Isa Mine. Combined production of zinc from the mines on the northwestern coast of Tasmania and at Elura increased slightly in 1986, whereas the level of lead production from these mines remained about the same as that of 1985.

Production of lead bullion increased slightly, primarily owing to the availability of a higher grade of concentrate to the Mount Isa smelter resulting from the production of a low-grade middling concentrate for sale. Production of primary refined lead decreased 24% because of the loss of lead concentrate feedstock from the major mines at Broken Hill during the May 26 to July 22 disruption to production. Refined lead from secondary sources increased slightly in 1986.

Primary refined zinc increased at all three plants in 1986, increasing slightly at both the largest and smallest refineries, Risdon and Port Pirie, respectively, and 24% at Cockle Creek, for an overall 6% rise in production. Estimated production from secondary sources remained the same as that of 1985.

Although actual mine closure resulting from industrial action taken at the major mines at Broken Hill lasted only about 2 months at midyear, a settlement over the dispute in work practices and safety issues was not reached by yearend and the independent review being conducted by the New South Wales State Industrial Commission was still studying the relevant issues. An interim agreement between management and the unions was in effect, enabling mining to continue while negotiations were being conducted.

At yearend, CRA announced that the open pit operation at the Woodlawn Mine would be superseded by the development of an underground mine early in 1987. Planned production would be at a reduced level, 500,000 to 600,000 tons of ore per year compared with the 930,000 tons of ore per year from the open pit, although the grade of the ore mined would remain similar. This would result in extending the life of the mine about 4 years.

AM&S, the operator of NBHC and ZC Mines at Broken Hill, announced during the latter part of 1986 plans to refurbish the NBHC shaft in 1987. During the renovation, all ore will be hoisted through the ZC shaft, but upon completion, ore from the two mines will be hoisted solely through the NBHC shaft.

Pancontinental Mining Ltd. (51%) entered into a joint venture with Outokumpu Oy of Finland (49%) to develop the Lady Loretta lead-silver-zinc deposit in Queensland, north of Mount Isa. The exploratory phase for development of the deposit began in May and will extend through 1987. Work will include the sinking of a 470-meter exploration shaft along with associated underground development, underground diamond drilling, and the mining and testing of bulk metallurgical samples. Reserves were 9 million tons of ore averaging 14.8% zinc, 6.5% lead, and 95 grams of silver per ton.

Development work continued throughout 1986 at MIM's Hilton lead-silver-zinc deposit 20 kilometers north of the Mount Isa operations. A trial mechanized cut-and-fill operation was scheduled to begin early in 1987, continuing until about 1990 when mine production was scheduled to commence using sublevel open stoping methods. A production rate of 2.5 million tons of ore per year, about 1996 or 1997, was being planned to compensate for a corresponding decline in the production at Mount Isa proper, thus resulting in little change in MIM's overall production from the vicinity.

A 1,300-meter adit was driven to the ore body at Aberfoyle's wholly owned Hellyer lead-gold-silver-zinc deposit 3 kilometers north of their Que River Mine in Tasmania in May. The joint venture was conducting a feasibility study to examine the economic viability of both a modest-scale operation, using Aberfoyle's nearby Mount Cleveland tin milling facility, and a larger scale operation using a new mill situated at the Hellyer minesite. A 6-month trial milling program was conducted in the second half of the year, using the Cleveland tin concen-

trating facility, which had been converted to process the ore.

Manganese.—Virtually all production of manganese ore in Australia continued to be produced at Groote Eylandt in the Gulf of Carpentaria, Northern Territory, by Groote Eylandt Mining Co. Pty. Ltd. (GEMC), a wholly owned subsidiary of BHP, at one of the world's largest high-grade manganese mines.

Production decreased 18%, in accordance with lower sales due to a rise in consumer stocks resulting from the reduced output of world steel. Exports of manganese ore also decreased by 18%, with shipments to all major markets declining. Upgrading of the capacity of the concentration plant began in order to produce oxides for batteries and sinter material for direct feed to steel furnaces.

Ferromanganese and silicomanganese was produced by Tasmanian Electro Metallurgical Co. Pty. Ltd., also a wholly owned subsidiary of BHP, from Groote Eylandt ore at Bell Bay, Tasmania. Production of ferromanganese and silicomanganese decreased 16% and 15%, respectively, from that of 1985. The $37 million expansion of production capacity for manganese alloys, begun in 1985, was expected to be completed in 1987.

Mineral Sands.—Mineral sands, high concentrations of the heavy minerals rutile, ilmenite (including leucoxene), zircon, and monazite, were mined at several places on the east and west coasts of Australia from modern and/or relic shoreline sands. Deposits along the northern coast of New South Wales and the southern coast of Queensland long dominated Australian production of mineral sands. However, production from deposits along Australia's western coast in the vicinity of Perth, Western Australia, overtook that from the eastern coast in the early 1980's, owing to the latter's generally declining ore grades and increasing environmental restrictions. About 75% of mineral sands production was derived from operations in Western Australia in 1986.

Seven major companies conducted mineral sands mining operations in Australia during 1986. In Western Australia, Associated Minerals Consolidated Ltd. (AMC), the world's largest producer of mineral sands and a wholly owned subsidiary of RGC, had mining operations at Capel and Eneabba. Allied Eneabba Ltd., 100% owned by RGC, also had mining operations at Eneabba. Westralian Sands Ltd. operated mineral sands mines at North Capel and Yoganup Extended, and Cable Sands Pty. Ltd., a wholly owned subsidiary of Kathleen Investments (Australia) Ltd., produced mineral sands from its operations at Bunbury. Consolidated Rutile Ltd., eastern Australia's largest producer, conducted all mineral sands mining on Queensland's North Stradbroke Island, acquiring the operations of AMC in early 1985 to augment that from its Bayside workings. Currumbin Minerals Pty. Ltd. operated dredges at Kirra, Queensland, and Kingscliff, New South Wales, and Rutile and Zircon Mines (Newcastle) Ltd., a company jointly held by Peko-Wallsend and Kathleen Investments, operated dredges at Tomago, near Newcastle, New South Wales.

Although the majority of Australian producers of mineral sands operated at full mining capacity throughout the year, estimated production of concentrates decreased about 8%, reflecting generally declining ore grades. However, Australia remained by far the world's leading miner of mineral sands in 1986, producing an estimated 70% of world production. Australia also remained the world's leading exporter of mineral sands. However, with the exception of rutile, exports of all mineral sands declined, although export earnings increased 10% owing to higher prices.

ICI Australia Ltd., in association with the Federal Government's Commonwealth Scientific and Industrial Research Organization, developed a process to produce zirconia, used in the manufacture of advanced ceramics for engineering and electronics applications, from zircon. As a result, ICI announced that it would construct a zirconia plant at Rockingham, Western Australia, for the production of high-purity zirconia powders and zirconium chemicals commencing in May 1987, with the plant expected to be in operation by late 1988.

Two major synthetic rutile (upgraded or beneficiated ilmenite) plants were nearing completion at yearend 1986, AMC's at Geraldton and Westralian Sands' at Capel, both in Western Australia. The plants will quadruple Australian synthetic rutile capacity, to 272,000 tons per year, when commissioned about mid-1987.

France's Rhône-Poulenc S.A. announced that it would build a rare-earth minerals extraction plant at Pinjarra, Western Australia, near Perth. The plant, scheduled to be operational in 1989, will process about

15,000 tons of monazite per year.

Nickel.—All of Australia's mined nickel production was in Western Australia, except for that produced at the Greenvale Mine in Queensland. Cobalt was a byproduct of nickel mining in both States. The Greenvale Mine, managed by Queensland Nickel Pty. Ltd. and owned by Metals Exploration Queensland Pty. Ltd. (50%) and Freeport Queensland Nickel Inc. (50%), mined lateritic nickel ore by opencut methods.

Western Mining Corp. (WMC), one of the world's most important integrated nickel producers and Australia's largest, operated 11 underground mines in the Kambalda-St. Ives areas of the Kalgoorlie District of southern Western Australia at the beginning of the year. Owing to a substantial fall in the price of nickel and a number of industrial disputes, including a strike lasting from April 3 to May 19, WMC suspended operations at five of its higher cost Kambalda mines—Hunt, Jan, McMahon, Mount Edwards, and Wannaway. However, the resulting loss in production from these mines was compensated in part by increased production from the other mines—Carnilya Hill (44% owned by BHP), Fisher, Foster, Long, Otter-Juan, and Silver Lake—as well as the startup of the Lanfranchi Mine early in the year. WMC also mined nickel at its Windarra nickel project in Western Australia, consisting of the Mount Windarra underground mine and the South Windarra open pit. Treatment of the ore at South Windarra began early in the year, whereas mining operations without treating the ore had resumed in June 1985. However, ore treatment was suspended in April and mine production ceased a few months later owing to depressed nickel prices.

Metals Exploration Ltd.'s Nepean Mine in Western Australia operated throughout the year after resuming production from its care-and-maintenance status in August 1985. However, the mine was expected to close about the end of 1987 because of ore depletion.

Production at the Agnew Mine in Western Australia, managed by Agnew Mining Co. Pty. Ltd. and owned by Seltrust Holdings Ltd. (60%), a wholly owned subsidiary of BP Australia, and MIM (40%), was suspended in August owing to sustaining losses from continued low nickel prices. The mine and infrastructure were being placed on care and maintenance.

Estimated mine production in Australia decreased 9% in 1986, mainly attributed to a 24% decline in production at the Agnew Mine and a 13% decrease from the Kambalda Field mines. The Greenvale Mine operated at full capacity during the year.

There were two nickel refineries and one nickel smelter in Australia. WMC operated a refinery at Kwinana, near Perth, and a smelter 15 kilometers south of Kalgoorlie, both in Western Australia. Queensland Nickel operated a refinery at Yabulu, north of Townsville in northern Queensland. Nickel matte produced at Kalgoorlie was estimated to have decreased 5% from the 1985 level; less concentrate was available because of industrial conflict and the closing of several mines that fed the smelter. Refined nickel produced at Kwinana was estimated to have decreased 6% from that of 1985. The Yabulu refinery operated at near capacity throughout the year, increasing its output of nickel in products by 11%.

Queensland Nickel, in anticipation of exhausting its ore at the Greenvale Mine within 3 to 5 years, began testing ores from New Caledonia at the Yabulu refinery. Consideration was also under study to construct a pier at the refinery's port near Townsville to accommodate importation of foreign ores.

Silver.—Australia ranked as the fifth largest mine producer of silver in the world in 1986, although it was primarily produced as a byproduct of the mining of copper, lead, and zinc, as well as gold. However, only about one-third of the silver mined in Australia was recovered as refined silver in Australia; most of the remainder was contained in lead bullion exported by MIM to its Northfleet refinery in the United Kingdom, with the rest contained in blister copper and lead and zinc concentrates exported to a number of countries.

The principal mines producing silver in Australia were the same as those that produced lead-zinc and/or copper, with the mine at Mount Isa, Queensland, being the most eminent, as well as the largest silver producer in the world.

Australia's most important producer of refined silver, accounting for about 70% of output, was the primary lead refinery-smelter at Port Pirie, South Australia, producing refined silver predominantly from lead concentrates from the mines at Broken Hill in conjunction with lead smelting and refining. Refined silver was also produced at the copper refinery at Port Kembla, New South Wales, recovering silver from copper

concentrates produced at Australia's copper mines, jewelry scrap, and silver-rich waste residue from the copper refinery at Townsville. Additionally, small amounts of refined silver were produced at the Perth Mint from silver coins withdrawn from circulation, from gold bullion, and scrap.

Estimated mine production of silver decreased 7% and refined silver production declined 10% from the 1985 figures.

Tin.—As a result of the termination of the International Tin Council (ITC) buffer stock operations in October 1985, and the resulting collapse in international tin prices due to the suspension of trading by the London Metal Exchange, Australia's tin mining industry was disrupted, the effects of which continued through 1986. A number of mines were closed, especially smaller operations. The lifting of export quotas (imposed on member countries of the ITC in 1982) from the end of March 1986 enabled producers to increase production and exports of tin concentrates, if it were economically viable for them to do so.

Australian mine production of tin increased 36% in 1986, mainly owing to the lifting of export quotas. However, tin smelter output declined 51% owing to decreases in the supply of suitable concentrate resulting from mine closures, either because of ore depletion or economics.

Australia's largest tin producer, RGC's Renison Bell Mine in Tasmania, the world's largest hard-rock underground tin mine as well as a low-cost producer with large high-grade reserves, returned to its 850,000-ton-per-year commissioning capacity, mainly because of the lifting of the export quotas, but also because the mine was very competitive even at the depressed price of tin.

Greenbushes Ltd. continued to mine tin southeast of Bunbury, Western Australia, but at both a reduced level and a reduced work force. Production was shifted to mine higher grade ore zones, and as a result, although throughput to its on-site smelter fell 48%, smelter production of tin increased 48%.

Both of the tin mines operated by Aberfoyle, previously Australia's second largest tin producer, were closed during the year because of the depletion of ore reserves. The Mount Cleveland underground mine in northwestern Tasmania ceased production in July, and the tin concentrator was converted to a pilot plant for testing ore from the company's nearby lead-gold-silver-zinc Hellyer deposit. The Ardlethan Mine, both an opencut and underground operation in southern New South Wales, was closed in September. Most of the mine plant and equipment was sold.

The alluvial tin operation at Gibsonvale, New South Wales, was placed on care and maintenance by Metals Exploration at the end of July after completing shallow-lead mining.

Besides the Greenbushes tin smelter in Western Australia, which produced antimonial tin and tantalite-rich slag from its own mining operations, Australia's domestic producer of primary refined tin was the large plant at Alexandria in Sydney. The smelter was sold in midyear by Associated Tin Smelters Ltd. to Lyncord Investments Ltd., which became on reorganization the Refining Div. of Tolltreck Metal Products Ltd.

Tungsten.—Australia continued to be one of the world's leading producers of tungsten, although weak demand and depressed prices for the past several years have resulted in a substantial lowering of production since the 1980 peak.

King Island Scheelite Pty. Ltd., a wholly owned subsidiary of Peko-Wallsend, was Australia's largest producer in 1986, mining scheelite from its Dolphin Mine on King Island, Tasmania. King Island produced 54% of the contained tungsten in concentrates in Australia. About 40% of total contained tungsten was produced by Queensland Wolfram Pty. Ltd., owned by Poseidon Ltd. (66.6%), and by R. B. Mining Pty. Ltd. (33.3%), at the Mount Carbine wolframite mine near Cairns, northern Queensland. The remainder was produced by Tasmania Mines at its Kara Mine in northern Tasmania.

King Island Scheelite operated at about 50% of rated capacity at its Dolphin Mine, with the company's Bold Head Mine on the island remaining on care and maintenance. Mining operations at the Mount Carbine opencut were reduced over 40% in June, and the mine was placed on care and maintenance indefinitely in November. Tasmania Mines increased production by about 25% compared with that of 1985, but did not reach its production goal because of commissioning problems at its new mill, completed in June; an increase in the overburden-to-ore ratio; and low scheelite prices.

Virtually all production was exported, mainly to the Federal Republic of Germany, the United States, and the U.S.S.R. Seco-

Titan Pty. Ltd. was the only consumer of domestic supplies, using minor output for the production of ammonium paratungstate and tungsten carbides.

INDUSTRIAL MINERALS

Diamond.—Argyle Diamond Mines Pty. Ltd.'s AK-1 kimberlite pipe diamond mine in the Kimberley District of northwestern Western Australia became the world's largest diamond mine in 1986, the first full year of production. In fact, Australia's production from the Argyle diamond mine exceeded the annual production from any other country in the world, accounting for about one-third of the 1986 output of natural diamond. However, the diamond production from the AK-1 pipe comprised only about 5% gem, 40% near-gem, and 55% industrial-grade material, the lowest proportion of gem-quality diamond from any leading producer country in the world.

Argyle Diamond Mines was a joint venture comprised of CRA (56.8%), Ashton Mining Ltd. (38.2%), and the Western Australian government-owned West Australian Diamond Trust (5%), formerly Northern Mining Corp. NL. Argyle Diamond Sales Ltd. (ADS), a company jointly owned by Ashton and CRA, marketed about 95% of the joint venture's production—that of Ashton's and CRA's shares. All of the gem production, except for a small quantity of high-quality diamonds that was retained for cutting and polishing in Perth, and 75% of the near-gem and industrial-grade rough diamonds was marketed to DeBeers Central Selling Organization in London, England. ADS sold the balance of near-gem and industrial-grade diamonds internationally through its Antwerp, Belgium, outlet. ADS marketed the Australian cut and polished gem diamonds through selected authorized retailing jewelers, and the West Australian Diamond Trust marketed its 5% share of production separately.

Exploration for diamond continued in the Kimberley region of Western Australia, the Coanjula area of the Northern Territory, and in an adjacent area, Barkly, across the Queensland border. At the Bow River Joint Venture in Western Australia, Freeport Bow River Properties Inc. (80%), and Gem Exploration and Minerals Ltd. (20%), have extensively explored their alluvial deposits in the Limestone Creek and Bow River areas 20 kilometers east of Argyle Diamond Mines' leases and were assessing their viability for commercial production. These deposits were reported to have more higher quality stone, about 22%, than that of Argyle Diamond, but at a lower grade.

Gem Stones.—Gem stone mining in Australia, apart from diamond, consisted typically of opal and sapphire, although minor quantities of amethyst, chrysophase, emerald, garnet, nephrite jade, rhodonite, topaz, and zircon were also produced.

Australia remained the largest producer of opal in the world, accounting for about 80% of the world market. Most was mined in the three South Australian fields at Andamooka, Coober Pedy, and Mintabie, with Mintabie the largest producing area. The Lightening Ridge District of central-northern New South Wales accounted for a small percentage of production, but was virtually the world's sole source of black opal. A small quantity, mostly the boulder opal variety but including other types, was produced in Queensland where it occurs in a broad zone between Opalton in the north and Yowah near the New South Wales border.

Again, Australia remained the world's leading producer of uncut sapphire, accounting for over 70% of the world's trade. Sapphire was mined in the Anakie District of central Queensland and in the Inverell-Glen Innes District of New South Wales.

Reliable production and trade statistics for opal and sapphire were not available because most sales were carried out by transactions between, usually, small-scale miners and buyers, usually foreign, in the production fields privately.

MINERAL FUELS

Coal.—Production, consumption, and exports of black coal again, for the fourth consecutive year, attained record-high levels in 1986, despite the continuance of world oversupply and depressed international prices. Australia was the seventh largest producer of coal (all grades), in the world ranking behind China, the United States, the U.S.S.R., the German Democratic Republic, Poland, and the Federal Republic of Germany, and was the world's largest exporter, overtaking the United States in 1985. Significant increases in raw coal production in both Queensland and New South Wales were substantially responsible for the record-high output, increasing 8% to 84.3 million tons and 7% to 80.1 million tons, respectively, over that of 1985. The coal industry was the country's single largest employer and accounted for more than

30% of the mineral industry's employment.

Queensland was Australia's largest coal-producing State for the second successive year, followed by New South Wales, Western Australia, South Australia, and Tasmania. New South Wales and Queensland together accounted for more than 96% of Australia's coal production and 100% of the country's coal exports. Victoria only produced lignite and the Northern Territory had no coal production.

The principal areas of coal production were from the Bowen Basin, Queensland; Hunter Valley, Western Coalfield, and South Coast Coalfield, New South Wales; Leigh Creek, South Australia; Fingal, Tasmania; Latrobe Valley Coalfield, Victoria; and near Bunbury, Western Australia.

Victoria was the only State in Australia producing lignite in 1986, almost all of which was derived from surface mines operated by the State Electricity Commission of Victoria to fuel its power stations in the Latrobe Valley. An estimated 40 million tons of lignite was produced in 1986 in Victoria, about 95% coming from four large State Electricity Commission mines.

Domestic coal consumption increased 3% to an estimated 43 million tons, 90% of which was used for electricity generation and in the iron and steel industry, primarily steaming and coking coal, respectively.

Although exports again recorded record-high tonnages in 1986, the growth rate was severely curtailed, increasing just 5% over that of 1985, compared with increases of 25% and 15% in 1983 and 1984, respectively. The reduced growth was attributed to reduced shipments of coking coal, particularly to Japan, which was barely offset by increased shipments of steaming coal. Queensland's coal exports increased 9% over that of 1985, accounting for 56% and 51 million tons of the total, and exports from New South Wales declined 1% to 40 million tons. Coal remained Australia's largest single export earner, accounting for over one-third of export revenues from the minerals sector, and about 15% of the country's export earnings.

Queensland's first fully mechanized longwall mining unit began operating in the Bowen Basin, at the German Creek Central Colliery managed by Capricorn Coal Management Pty. Ltd., in June. The unit was to mine 5.25 million tons of coal, over a 4-year period, from four blocks in the German Creek Seam. Each longwall face was to be 200 meters wide and 2.5 meters high.

The Moura No. 4 underground mine, operated by Thiess Dampier Mitsui Coal Pty. Ltd. in Queensland's Bowen Basin, temporarily ceased mining following an explosion and roof-fall that killed 12 miners in July. The No. 2 underground mine and opencast operations restarted limited production in early August. Following the accident, the Commonwealth Government announced it would allocate $3 million over a 3-year period for safety research in underground mining under the National Energy Research, Development, and Demonstration Program.

A 33,000-ton trial shipment of high-quality anthracite was exported to Europe from Allied Queensland Coalfields Ltd.'s proposed Barabala Mine at Dawson Valley, eastern Queensland, in October. Contingent upon the trial and subsequent long-term contract negotiations being successful, the company was to initially develop a 300,000-ton-per-year opencut followed by an underground mine, raising total capacity to 1.3 million tons per year.

The Commonwealth Government relaxed its export control requirements for black coal in September, removing the requirement for exporting companies to obtain prior approval for their proposed negotiating parameters, thus allowing them to conduct negotiations in accordance with their own commercial judgments. However, export approval was still required to be obtained upon completion of the negotiations to ensure the protection of the national interest.

Petroleum and Natural Gas.—Until the late 1960's, all of Australia's crude petroleum requirements were imported. Since then, the country has developed into the position of being able to provide 80% to 85% of its needs through domestic production. However, unless significant new oilfields are discovered, Australian production can be expected to decline significantly by about 1990.

Despite its relative self-sufficiency in oil and gas production, Australia remained a minor producer compared to world standards in 1986. Output of crude oil and condensate decreased to 187 million barrels, down 11% from 1985's record-high production level, owing primarily to the depressed as well as unstable oil prices. Production of natural gas liquids also declined from the record-high level produced in 1985, falling 5% to 25 million barrels. Natural gas pro-

duction, however, increased 9% to 519 billion cubic feet, establishing a new record high. Increasing output as the huge North West Shelf project progressed to full realization was the predominant reason for the continued rise in natural gas production.

More than 90% of the crude oil production continued to be from the Gippsland Shelf fields in the Bass Strait between the mainland State of Victoria and the island State of Tasmania. The majority of the remaining production was from the Barrow Island Field off the coast of Western Australia and from the Cooper and Eromanga Basins in South Australia and Queensland.

With the fall in world oil prices in 1986, hydrocarbons exploration and development drilling continued to decline during the year. Exploration companies completed 140 exploration wells, of which 112 were onshore and 28 offshore, a 48% decrease from that of 1985. In addition, only 35 development wells were completed, 15 onshore and 20 offshore. Seismic activity included 48,000 line kilometers being shot, of which 27,192 kilometers was offshore.

In 1986, 12 petroleum product refineries operated in Australia, 4 in New South Wales, 3 each in Queensland and Victoria, and 1 in both South Australia and Western Australia, for a combined capacity of about 730,000 barrels per day.

Uranium.—Australia was the fourth largest producer of uranium in the world behind the United States, Canada, and the Republic of South Africa in 1986. As adopted at the Australian Labor Party's National Convention in July 1984, only the two existing mines, Ranger and Nabarlek, and the committed Olympic Dam copper-gold-uranium mine in South Australia will be permitted to export uranium. As a result, Energy Resources of Australia Ltd.'s (ERA) Ranger opencut mine in the Alligator River's region in the Northern Territory and QML's Nabarlek operation, also in the Alligator River's region, were the only uranium producers in Australia during 1986. All uranium production was done for export since Australia had no nuclear powerplants.

Production of uranium oxide (U_3O_8) in Australia increased 30% over that of 1985 owing to a substantial increase in production at the Ranger Mine and a sizable, but more modest, increase at the Nabarlek operation. ERA produced 3,497 tons of U_3O_8 during 1986, an increase of 39% over that of 1985, and Nabarlek produced 1,402 tons of U_3O_8, a 7% increase, from ore stockpiled during an intense period of opencut mining in 1979.

ERA's planning to increase the capacity of its mill from about 3,800 to 4,500 tons of U_3O_8 per year progressed during the year, and at the same time, engineering design options for a major expansion to 6,000 tons of U_3O_8 per year were being studied and evaluated. ERA was anticipating that new sales contracts would compel an expansion to 4,500 tons per year by 1989, with a further increase to 6,000 tons by 1991-92. ERA negotiated four new long-term contracts for supplying uranium concentrate with utilities in the United States during the fiscal year ending June 30, adding to the five previously signed U.S. contracts, plus additional ones to supply concentrates to Asia and Europe.

The Commonwealth Government lifted its embargo on uranium exports for end use in France in August, imposed in 1983 until such time as France discontinued testing nuclear weapons in the South Pacific. To protect the profit and cash flow position of QML, which held a long-term contract for shipping uranium to the French utility Électricité de France, the Government had been purchasing each scheduled shipment for the original delivery price. QML also held contracts for exporting uranium to Finland and Japan.

Roxby Mining Corp. Pty. Ltd., a wholly owned subsidiary of WMCH (51%) and BP Australia (49%), announced at yearend 1985 its decision to proceed with the initial development of the enormous Olympic Dam copper-gold-silver-uranium project at Roxby Downs Station, South Australia, and detailed plans were provided for approval to the South Australian government for development of the mine, mill, hydrometallurgical plant, smelter-refinery, and township. Construction of the project was initiated with production expected to commence in mid-1988. Initial output will be about 2,000 tons of U_3O_8 per year. During 1986, long-term contracts for the sale of uranium concentrate were concluded with the Swedish State Power Board and the Central Electricity Generating Board of the United Kingdom.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Australian dollars (A$) to U.S. dollars at the rate of A$1.00=US$0.65.

The Mineral Industry of Austria

By George A. Rabchevsky[1]

Austria is rich in mineral deposits, many of which, however, are too small, too far apart, or too difficult and costly to mine. Many older deposits were being depleted, and the metals processing industry depended on imports for raw materials in 1986. Exploration for new deposits continued, however, with state aid, and the Government encouraged companies to enter into private or joint ventures, trade and barter agreements, and export of consulting services. Long-range plans were also being prepared to reemploy miners in other professions, or to redirect the mining industries of entire communities into alternative economies.

The mining and mineral processing industries of Austria continued to contribute their moderate share to the gross national product (GNP). The Austrian economy, in general, had entered the fourth year of a moderate but steady growth, which was also reflected in the mineral industry. Although the GNP did not grow as much as in 1985, it nevertheless grew by 1.8%, while inflation decreased to 1.7%, from 3.2% in 1985. Unemployment, at 6%, was lower than in most Western European countries. The trade deficit also declined slightly to about $5.28 billion.[2] In foreign business, however, the landlocked country still lagged by almost every measure.

Austria lacked many aspects of a mature industrialized nation. This could be explained, in part, by the fact that since the end of the occupation in 1955, Austria has focused on such basic industries as steel and paper, and a considerable share of the industry was still concentrated in these undiversified, stagnant sectors in 1986. Moreover, much of the industry was nationalized, and since 1955, not a single privately owned large multinational company has emerged. Instead, Austria has developed a thriving tourist industry. Almost 200 companies made up the nationalized sector. Only a few companies ventured abroad or attempted to diversify. One such attempt by Voest-Alpine AG (VA), a steel giant and the biggest state-owned industrial conglomerate, failed in 1985 when it attempted to move into the oil investment business. Under a $2.6 billion restructuring of the state-owned sector, VA and other firms have been laying off workers, closing down plants, denationalizing subsidiaries, and seeking foreign partners.

Österreichische Industrieverwaltungs AG (OIAG), the holding company for nationalized industries, employed about one-fifth of the country's industrial labor force and was responsible for about 20% of all exports in 1986. It included VA, the troubled steel and engineering group Vereinigte Edelstahlwerke AG (VEW) and Chemie-Linz AG. OIAG also owned Austria's only oil refinery. Through rationalization, the OIAG's 102,000 workers in 1985 were cut to 93,000 in 1986.

PRODUCTION

Production of mineral commodities in Austria had remained more or less steady for over a decade. In 1986, however, mining and metals production declined slightly, except for antimony and germanium; output of important industrial minerals also declined, on the average, as did all categories of mineral fuels. Overall industrial production, however, continued an upward trend, but was limited to 1.5% because of a decline in exports. Growth was concentrated in investment and consumer goods production.

The Supreme Mining Authority of Austria, a section of the Ministry of Trade, Commerce and Industry, published a 255-page book on the Austrian mining industry.[3] The publication presents a historical and updated account of Austrian mining production but not the metals processing industry.

Table 1.—Austria: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[p]
METALS					
Aluminum metal:					
Primary	93,908	94,200	95,833	94,106	92,453
Secondary	39,066	56,785	56,579	58,592	56,354
Total	132,974	150,985	152,412	152,698	148,807
Antimony, mine output, Sb content of concentrate	667	659	523	477	514
Cadmium metal	48	46	49	52	52
Copper:					
Smelter, secondary	30,000	30,000	30,000	30,000	36,000
Refined:					
Primary	8,802	8,769	9,592	8,207	7,067
Secondary	32,757	33,131	34,293	34,966	32,579
Total	41,559	41,900	43,885	43,173	39,646
Germanium: Ge content of concentrate kilograms	4,000	6,000	4,800	5,500	6,300
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	3,330	3,540	3,600	3,270	3,120
Fe content do	1,045	1,107	1,138	1,019	976
Metal:					
Pig iron do	3,115	3,320	3,745	3,704	3,349
Ferroalloys, electric-furnace do	14	14	13	12	e14
Steel, crude do	4,258	4,411	4,870	4,660	4,292
Semimanufactures do	3,381	3,555	3,842	3,760	3,462
Lead:					
Mine output, Pb content of concentrate	4,086	4,290	4,151	7,500	5,865
Metal:					
Smelter:					
Primary	3,410	4,210	1,707	1,930	e1,500
Secondary	14,512	12,860	16,476	15,601	e15,000
Total	17,922	17,070	18,183	17,531	e16,500
Refined:					
Primary	10,400	12,000	10,000	10,000	e6,500
Secondary	11,100	11,500	16,200	15,500	e13,500
Total	21,500	23,500	26,200	25,500	e20,000
Manganese: Mn content of domestic iron ore	61,549	65,284	67,101	60,074	e55,000
Tungsten, mine output, W content of concentrate	1,465	1,408	1,632	1,481	1,387
Zinc:					
Mine output, Zn content of concentrate	19,065	19,432	20,879	24,259	28,628
Metal, refined	23,000	23,000	24,000	25,000	24,000
INDUSTRIAL MINERALS					
Cement, hydraulic thousand tons	5,012	4,907	4,899	4,560	4,569

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[p]
INDUSTRIAL MINERALS —Continued					
Clays:					
Illite	441,497	381,598	285,553	212,678	268,451
Kaolin:					
Crude	351,392	402,511	455,695	500,844	444,852
Marketable	77,288	83,558	99,541	100,151	46,291
Other	15,598	32,946	18,058	49,161	33,037
Feldspar, crude	2,960	1,063	2,554	16,528	2,850
Graphite, crude	24,451	40,418	43,789	30,764	36,167
Gypsum and anhydrite, crude	727,520	750,921	740,117	693,993	701,749
Lime thousand tons	1,027	1,140	1,262	1,301	1,275
Magnesite:					
Crude do	1,031	1,006	1,183	1,255	1,084
Sintered or dead-burned do	370	320	377	389	315
Caustic calcined do	98	89	93	75	73
Nitrogen: N content of ammonia do	485	495	e500	e500	e450
Pigments, mineral: Micaceous iron oxide	9,570	11,734	e11,500	11,583	11,730
Pumice (trass)	10,551	2,458	9,666	6,981	5,808
Salt:					
Rock thousand tons	1	1	1	1	2
In brine:					
Evaporated do	434	359	419	438	486
Other do	214	141	239	230	250
Total do	649	501	659	669	738
Sand and gravel:					
Quartz sand do	864	816	782	735	798
Other do	15,192	15,318	15,387	14,593	8,861
Total do	16,056	16,134	16,169	15,328	9,659
Sodium compounds, n.e.s.:[e]					
Carbonate, synthetic do	170	170	150	150	150
Sulfate, synthetic do	55	55	50	50	55
Stone:[2]					
Dolomite do	1,029	938	981	1,291	1,308
Quartz and quartzite do	177	171	223	176	196
Other including limestone and marble do	12,559	r11,977	11,903	11,667	9,250
Total do	13,765	r13,086	13,107	13,134	10,754
Sulfur:					
Byproduct:					
Of metallurgy	9,504	9,429	10,113	11,204	10,986
Of petroleum and natural gas	38,243	32,000	28,342	24,250	29,348
From gypsum and anhydrite	27,102	26,122	26,449	26,547	23,837
Total	74,849	67,551	64,904	62,001	64,171
Talc and soapstone	117,092	122,128	134,011	131,454	133,319
MINERAL FUELS AND RELATED MATERIALS					
Coal, brown and lignite thousand tons	3,297	3,041	2,901	3,081	2,969
Coke do	1,622	1,725	1,854	1,751	1,744
Gas, natural:					
Gross million cubic feet	46,758	42,850	44,931	41,102	39,269
Marketed do	38,088	34,205	37,084	34,325	e32,000
Oil shale	1,010	1,060	970	620	e550
Petroleum:					
Crude thousand 42-gallon barrels	8,994	8,847	8,404	7,999	7,783
Refinery products:					
Gasoline do	15,378	16,407	17,499	18,184	e18,100
Kerosene and jet fuel do	1,059	1,079	1,461	1,452	e1,400
Distillate fuel oil do	15,484	15,267	15,538	16,482	e16,300
Residual fuel oil do	17,740	11,646	13,064	16,040	e16,100
Lubricants do	538	603	557	604	e600
Liquefied petroleum gas do	3,876	4,966	5,509	5,479	e5,300
Bitumen do	1,605	1,218	1,658	1,363	e1,300
Unspecified do	270	676	235	182	e200
Refinery fuel and losses do	3,072	3,064	3,090	3,292	e3,200
Total do	59,022	54,926	58,611	63,078	e62,500

eEstimated. pPreliminary. rRevised.

[1]Table includes data available through July 1987.

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

TRADE

A limited domestic market, decreasing trade with the Council for Mutual Economic Assistance (CMEA)[4] countries at 11% of exports, and a static European Economic Community (EEC) market, prompted Austria to look beyond its borders for economic viability. Austria wanted to participate especially in community research and technology programs, and a framework agreement for cooperation with the EEC, of which it was not a member, was concluded, to be firmed up at a later date. The Federal Republic of Germany was Austria's largest EEC trading partner, accounting for 32% of Austria's exports. Overall, the EEC absorbed about 54% of Austria's exports. Austrian exports to the Organization of Petroleum Exporting Countries amounted only to 6% of the total.[5] VA received an order from China for the construction of a continuous casting plant at the Taiyuan steelworks. VA also built China's first basic oxygen steel plant at the same location in the mid-1960's. Conversely, Bulgaria was attempting to buy the bankrupt Styrian iron and steel company Denzel Stahl-Industrieprodukte GmbH. Bulgaria, in 1985, had already purchased another ailing Austrian firm.[6]

Austrian exports more than doubled in 5 years, to about $27.4 billion in 1986, accounting for over 30% of the GNP. The number of concerns with overseas subsidiaries also doubled over a 3-year period, to 650 in 1986. Metallwerk Plansee GmbH, for example, has grown into Western Europe's biggest metallurgical concern.[7]

Imports declined slightly, mainly because of a reduced value of imports of petroleum and raw materials, while demand for semifinished products, machinery, and other metal and mineral products remained strong. The value of imports from the United States declined slightly. Principal mineral-related U.S. imports from Austria in 1985 were equipment for metallurgical applications, steel, and imitation gem stones.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	1	1	--	NA.
Alkaline-earth metals	(2)	1	--	NA.
Aluminum:				
Ore and concentrate	--	(2)	--	All to West Germany.
Metal including alloys:				
Scrap	29,843	33,248	--	Italy 19,030; West Germany 12,782; Finland 507.
Unwrought	28,817	31,072	--	West Germany 13,996; Italy 7,908; France 4,232.
Semimanufactures	92,353	98,145	1,876	West Germany 24,277; Italy 7,118; Switzerland 6,919.
Antimony:				
Ore and concentrate	4	5	--	All to Yugoslavia.
Oxides	19	42	--	Hungary 32; West Germany 10.
Metal including alloys, all forms	5	1	--	Mainly to Switzerland.
Arsenic: Oxides and acids	(2)	2	NA	NA.
Beryllium: Oxides and hydroxides	(2)	(2)	--	NA.
Cadmium: Metal including alloys, all forms	43	45	--	All to United Kingdom.
Chromium:				
Ore and concentrate	349	953	--	Venezuela 700; West Germany 201.
Oxides and hydroxides	9	6	NA	NA.
Cobalt: Oxides and hydroxides	54	31	15	Netherlands 8; Norway 8.
Columbium and tantalum: Metal including alloys, all forms, tantalum	12	17	NA	NA.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Copper:				
Ore and concentrate	1	--		
Matte and speiss including cement copper	24	24	--	All to West Germany.
Oxides and hydroxides	6	2	--	NA.
Sulfate	157	123	NA	West Germany 47; Italy 37; Switzerland 27.
Metal including alloys:				
Scrap	15,451	19,525	--	West Germany 9,609; Belgium-Luxembourg 7,998; United Kingdom 961.
Unwrought	21,588	26,758	--	Italy 14,291; West Germany 8,872; Hungary 1,699.
Semimanufactures	18,254	16,483	142	West Germany 6,487; Italy 3,690; France 2,487.
Gold:				
Waste and sweepings value, thousands	$9	--		
Metal including alloys, unwrought and partly wrought _ troy ounces	13,986	16,397	36	West Germany 12,378; Italy 2,604; Switzerland 932.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	932	50	--	All to West Germany.
Metal:				
Scrap	20,910	32,191	--	Italy 15,332; West Germany 8,867; Switzerland 3,263.
Pig iron, cast iron, related materials	7,290	8,827	120	France 2,878; West Germany 1,512; Italy 1,372.
Ferroalloys	12,668	12,264	612	Italy 2,392; West Germany 1,583; Bulgaria 1,124.
Steel, primary forms	472,623	417,172	4,273	West Germany 187,306; East Germany 83,047; Italy 73,755.
Semimanufactures:				
Bars, rods, angles, shapes, sections _ thousand tons	433	395	11	West Germany 142; Italy 89; Switzerland 32.
Universals, plates, sheets do	1,472	1,513	13	U.S.S.R. 500; West Germany 395; Italy 158.
Hoop and strip do	134	184	(2)	West Germany 57; Switzerland 22; East Germany 20.
Rails and accessories do	131	123	(2)	Algeria 34; Switzerland 26; Iraq 18.
Wire do	68	61	3	West Germany 26; Italy 6; Switzerland 6.
Tubes, pipes, fittings do	492	508	52	U.S.S.R. 199; West Germany 67; Italy 23.
Castings and forgings, rough do	14	17	1	West Germany 7; Italy 2; Netherlands 1.
Lead:				
Ore and concentrate	--	1,022	--	All to Yugoslavia.
Metal including alloys:				
Scrap	93	49	--	All to West Germany.
Unwrought	467	988	--	Yugoslavia 620; West Germany 342; Netherlands 23.
Semimanufactures	64	23	--	West Germany 7; Denmark 5; Italy 4.
Magnesium: Metal including alloys:				
Scrap	172	110	--	West Germany 96; Italy 10.
Unwrought	717	553	--	West Germany 548; Switzerland 5.
Semimanufactures	845	1,159	NA	NA.
Manganese: Oxides	107	131	--	Syria 56; Yugoslavia 55.
Mercury 76-pound flasks	180	84	--	West Germany 61.
Molybdenum:				
Oxides and hydroxides	(2)	--		
Metal including alloys, all forms	1,284	1,439	NA	NA.
Nickel:				
Matte and speiss	1	3	--	All to Yugoslavia.
Metal including alloys:				
Scrap	773	395	--	West Germany 226; Switzerland 45; United Kingdom 18.
Unwrought	45	66	--	West Germany 58; Yugoslavia 7.
Semimanufactures	856	1,641	24	West Germany 1,075; Bulgaria 227; Switzerland 64.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	427,444	13,278	--	West Germany 11,092; Sweden 514; Greece 482.
Rare-earth metals including alloys, all forms	675	712	NA	NA.
Silver:				
Waste and sweepings[3] value, thousands	$260	$57	NA	France $51.
Metal including alloys, unwrought and partly wrought thousand troy ounces	1,612	1,722	--	West Germany 634; Yugoslavia 509; Switzerland 304.
Tin:				
Oxides	18	21	--	Bulgaria 10; Portugal 4; Romania 3.
Metal including alloys:				
Scrap	6	10	--	All to West Germany.
Unwrought	56	17	--	Netherlands 10; West Germany 7.
Semimanufactures	3	4	--	North Korea 3; Angola 1.
Titanium: Oxides	208	523	--	West Germany 429; Iraq 30; Hungary 26.
Tungsten:				
Ore and concentrate	25	(2)	--	NA.
Oxides and hydroxides	(2)	--	--	
Metal including alloys, all forms	1,050	1,485	NA	NA.
Uranium and thorium: Oxides and other compounds	2,661	2,106	NA	NA.
Zinc:				
Oxides	2,649	2,263	NA	Yugoslavia 1,374; Hungary 500; West Germany 261.
Blue powder	27	58	9	Switzerland 25; Iraq 21.
Metal including alloys:				
Scrap	832	1,123	--	West Germany 1,035; Taiwan 88.
Unwrought	4,520	4,371	--	Yugoslavia 3,481; Hungary 430; West Germany 234.
Semimanufactures	236	227	3	West Germany 104; Yugoslavia 79; Italy 17.
Other:				
Ores and concentrates	86	65	7	West Germany 31; Yugoslavia 5.
Ashes and residues	129,093	101,089	--	Italy 79,185; West Germany 17,451; Spain 2,862.
Base metals including alloys, all forms	2,888	2,120	181	Italy 1,494; United Kingdom 234.
Waste and sweepings of unspecified precious metals value, thousands	$5,833	$3,992	$3	West Germany $3,722; United Kingdom $174.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	97	37	--	West Germany 24; Iran 11.
Artificial: Silicon carbide	4	92	NA	Albania 56; Iran 12.
Dust and powder of precious and semi-precious stones including diamond	4	13	--	West Germany 10; Poland 1.
Grinding and polishing wheels and stones	13,624	14,030	92	West Germany 2,652; Italy 1,526; Sweden 1,082.
Asbestos, crude	3	1	--	All to Australia.
Barite and witherite	6	7	--	All to West Germany.
Boron materials:				
Crude natural borates	2	20	--	All to France.
Oxides and acids	15	10	NA	Yugoslavia 7.
Cement	16,904	14,374	--	West Germany 10,146; Hungary 1,916; Italy 1,669.
Chalk	1,752	1,927	--	Hungary 315; Czechoslovakia 288; Italy 145.
Clays, crude:				
Bentonite	6	1	--	NA.
Chamotte earth	22	10	--	West Germany 9.
Kaolin	49,853	45,194	--	Hungary 29,423; West Germany 9,709; Italy 4,688.
Unspecified	20,618	15,403	--	West Germany 15,004; Hungary 93; Yugoslavia 55.
Cryolite and chiolite	15	(2)	--	NA.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Diamond:				
Gem, not set or strung value, thousands	$187	$134	$31	Belgium-Luxembourg $56; West Germany $25; Israel $17.
Industrial stones do	$129	$80	--	Hungary $60; Yugoslavia $20.
Diatomite and other infusorial earth	2,425	2,471	--	Bulgaria 1,120; Yugoslavia 676; Hungary 194.
Feldspar, fluorspar, related materials:				
Fluorspar	6	20	--	All to Yugoslavia.
Unspecified	2	--		
Fertilizer materials:				
Crude, n.e.s	335	382	--	West Germany 136; Switzerland 134; Italy 73.
Manufactured:				
Phosphatic	39,486	24,434	--	Hungary 15,021; Czechoslovakia 9,368.
Potassic	75	5,005	--	Yugoslavia 4,995.
Unspecified and mixed	919,923	764,796	106	West Germany 403,541; Italy 135,744; East Germany 65,000.
Graphite, natural	11,552	11,826	31	West Germany 4,070; Poland 3,498; Italy 1,233.
Gypsum and plaster	191,804	141,461	--	West Germany 139,022; Saudi Arabia 106.
Lime	1,497	1,229	--	West Germany 1,133; Hungary 39; Switzerland 32.
Magnesium compounds:				
Magnesite, crude	697	573	NA	NA.
Oxides and hydroxides	167,334	154,233	2,717	West Germany 34,167; Venezuela 29,498; France 18,536.
Mica:				
Crude including splittings and waste	829	316	--	Italy 136; West Germany 94; Greece 52.
Worked including agglomerated splittings	246	274	--	West Germany 70; Yugoslavia 34; India 30.
Pigments, mineral:				
Natural, crude	7,374	7,611	53	West Germany 2,201; United Kingdom 2,107; Netherlands 873.
Iron oxides and hydroxides, processed	2,124	2,702	--	West Germany 1,109; United Kingdom 745; Taiwan 621.
Precious and semiprecious stones other than diamond:				
Natural kilograms	2,480	1,720	9	West Germany 152; Yugoslavia 22; Italy 11.
Synthetic do	3,347	4,129	92	India 1,961; Switzerland 806; Italy 663.
Pyrite, unroasted	81	47	--	All to Bulgaria.
Salt and brine	924	1,506	--	West Germany 617; Hungary 541; Italy 298.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	15	20	--	NA.
Sulfate, manufactured	80,515	80,826	NA	NA.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	115,789	130,979	--	West Germany 96,385; Switzerland 33,153; France 1,044.
Worked	34,917	60,152	292	West Germany 52,025; Switzerland 7,421.
Dolomite, chiefly refractory-grade	23,124	24,943	--	West Germany 18,057; Venezuela 4,500; Saudi Arabia 1,000.
Gravel and crushed rock	691,655	544,124	--	Switzerland 354,228; West Germany 173,766; Hungary 5,817.
Limestone other than dimension	964	1,054	--	West Germany 977; Hungary 73.
Quartz and quartzite	53	60	--	West Germany 56.
Sand other than metal-bearing	181,396	145,332	--	Switzerland 83,097; West Germany 58,873; Italy 2,441.
Sulfur:				
Elemental: Crude including native and byproduct	4,667	139	--	Yugoslavia 111; West Germany 26.
Sulfuric acid	11,501	7,525	NA	Italy 5,623; Yugoslavia 1,504; West Germany 211.
Talc, steatite, soapstone, pyrophyllite	114,084	110,150	--	West Germany 55,623; Italy 14,236; Switzerland 9,048.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Other:				
Crude	27,648	3,914	3	West Germany 3,002; Italy 258; Switzerland 175.
Slag and dross, not metal-bearing	109,499	90,389	--	West Germany 82,331; Italy 7,185; Netherlands 432.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	89	14	--	Hungary 12; Yugoslavia 2.
Carbon black	21	18	NA	West Germany 16.
Coal:				
Anthracite	13	3	--	All to Switzerland.
Bituminous	14	1	--	NA.
Briquets of anthracite and bituminous coal	97	122	--	Switzerland 93; Bulgaria 27.
Lignite including briquets	8,275	8,657	--	West Germany 8,522; Switzerland 84; Finland 40.
Coke and semicoke	2,618	4,526	--	West Germany 4,431; Switzerland 69; Sweden 25.
Peat including briquets and litter	11,652	11,779	--	Italy 9,465; Switzerland 216; Greece 129.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	301	371	(2)	Italy 160; West Germany 107; Yugoslavia 93.
Gasoline, motor do	1,370	2,156	--	West Germany 2,024; Hungary 121; Switzerland 11.
Mineral jelly and wax do	121	99	--	West Germany 41; Netherlands 36; Switzerland 10.
Kerosene and jet fuel do	179	161	(2)	Yugoslavia 99; Poland 40; West Germany 17.
Distillate fuel oil do	418	264	--	West Germany 254; Yugoslavia 7; Romania 2.
Lubricants do	411	554	(2)	Czechoslovakia 137; Hungary 123; Finland 66.
Residual fuel oil do	279	2,529	--	Hungary 2,276; Yugoslavia 131; Poland 53.
Bitumen and other residues do	161	68	--	Italy 17; Malta 16; West Germany 15.
Bituminous mixtures do	39	27	--	Pakistan 12; Algeria 9; West Germany 3.
Petroleum coke do	2	--		

NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.
[3]May include other precious metals.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	17	1	--	NA.
Alkaline-earth metals	14	7	--	West Germany 4; France 2.
Aluminum:				
Ore and concentrate	39,174	46,342	NA	NA.
Oxides and hydroxides	250,607	303,515	NA	Hungary 166,897; West Germany 128,809.
Metal including alloys:				
Scrap	47,516	53,109	NA	NA.
Unwrought	74,676	78,148	2	West Germany 40,083; Norway 16,924; Yugoslavia 4,582.
Semimanufactures	51,923	54,591	18	West Germany 20,725; Switzerland 8,585; Italy 5,762.
Antimony:				
Ore and concentrate	36	182	--	Turkey 80; China 72; Canada 30.
Oxides	140	173	--	U.S.S.R. 100; Belgium-Luxembourg 61; West Germany 10.
Metal including alloys, all forms	31	80	NA	China 31; Taiwan 25; Belgium-Luxembourg 23.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Arsenic: Oxides and acids	17	8	--	All from West Germany.
Beryllium: Metal including alloys, all forms	(2)	(2)	--	NA.
Cadmium: Metal including alloys, all forms	5	1	--	Mainly from West Germany.
Chromium:				
Ore and concentrate	56,814	46,607	NA	Republic of South Africa 34,746; Greece 3,703; Cuba 2,976.
Oxides and hydroxides	701	621	NA	West Germany 324; U.S.S.R. 125; Yugoslavia 89.
Cobalt: Oxides and hydroxides	8	6	--	West Germany 5; Belgium-Luxembourg 1.
Columbium and tantalum: Metal including alloys, all forms, tantalum	29	40	16	West Germany 21; Netherlands 1.
Copper:				
Ore and concentrate	22	--		
Matte and speiss including cement copper	(2)	--		
Oxides and hydroxides	58	47	--	All from Belgium-Luxembourg.
Sulfate	1,182	1,059	NA	Italy 551; Hungary 291; Poland 100.
Metal including alloys:				
Scrap	30,616	44,156	NA	U.S.S.R. 22,950; West Germany 11,531; Hungary 3,395.
Unwrought	15,027	13,314	5	Republic of South Africa 9,170; West Germany 1,784.
Semimanufactures	72,756	74,207	53	West Germany 38,561; Italy 9,177; Belgium-Luxembourg 7,833.
Gold:				
Waste and sweepings value, thousands	$3	--		
Metal including alloys, unwrought and partly wrought troy ounces	[3]105,294	107,545	547	Republic of South Africa 39,481; Switzerland 34,562; West Germany 21,509.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	3,890	3,684	--	U.S.S.R. 1,273; Sweden 858; Canada 635.
Pyrite, roasted do	10	20	--	Yugoslavia 16; West Germany 2.
Metal:				
Scrap	363,084	239,048	177	West Germany 79,890; U.S.S.R. 61,375; Bulgaria 39,857.
Pig iron, cast iron, related materials	50,788	55,413	10	Canada 17,327; U.S.S.R. 16,887; West Germany 8,136.
Ferroalloys:				
Ferrochromium	25,904	20,677	NA	Yugoslavia 7,964; U.S.S.R. 4,057; Zimbabwe 2,481.
Ferromanganese	25,430	22,779	NA	Norway 12,486; West Germany 8,226; Republic of South Africa 1,143.
Ferromolybdenum	62	109	NA	United Kingdom 52; Belgium-Luxembourg 21; France 10.
Ferronickel	4,580	3,305	33	Greece 1,105; France 567; Dominican Republic 421.
Ferrosilicon	14,726	16,215	20	Yugoslavia 8,419; U.S.S.R. 3,143; West Germany 1,820.
Unspecified	9,466	11,441	59	Czechoslovakia 4,150; Norway 2,463; West Germany 1,542.
Steel, primary forms	142,334	147,356	2	West Germany 72,263; Hungary 38,129; Italy 13,223.
Semimanufactures:				
Bars, rods, angles, shapes, sections	262,562	306,473	46	West Germany 117,616; Italy 88,053; France 31,993.
Universals, plates, sheets	264,811	252,974	101	West Germany 117,936; Belgium-Luxembourg 32,908; France 21,220.
Hoop and strip	92,038	95,191	9	West Germany 64,573; Italy 12,196; Switzerland 5,906.
Rails and accessories	2,663	3,147	--	West Germany 2,559; Switzerland 347; Belgium-Luxembourg 135.
Wire	39,574	38,320	6	West Germany 13,829; Belgium-Luxembourg 11,177; France 6,334.
Tubes, pipes, fittings	181,364	189,871	47	West Germany 100,932; Italy 21,857; Hungary 11,443.
Castings and forgings, rough	14,295	14,784	(2)	West Germany 11,607; Italy 833; Yugoslavia 369.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Lead:				
Ore and concentrate	7,730	3,987	--	Italy 3,836; West Germany 100; Canada 49.
Oxides	998	633	--	West Germany 401; Netherlands 227.
Metal including alloys:				
Scrap	4,332	6,745	NA	U.S.S.R. 3,889; Switzerland 1,001; Hungary 854.
Unwrought	39,271	37,501	50	West Germany 19,062; United Kingdom 6,298; France 3,961.
Semimanufactures	1,192	1,056	(2)	West Germany 944; United Kingdom 71; Belgium-Luxembourg 28.
Magnesium: Metal including alloys:				
Scrap	29	85	NA	Norway 41; Italy 29; France 9.
Unwrought	2,185	2,105	NA	NA.
Semimanufactures	138	211	21	West Germany 88; Italy 60; France 22.
Manganese:				
Ore and concentrate, metallurgical-grade	441	666	--	Netherlands 425; Republic of South Africa 202.
Oxides	121	60	--	West Germany 36; Japan 8.
Mercury 76-pound flasks	331	189	NA	West Germany 78; China 49.
Molybdenum:				
Oxides and hydroxides	2,062	2,241	NA	NA.
Metal including alloys:				
Scrap	63	10	NA	West Germany 6.
Unwrought	4	26	17	West Germany 8.
Semimanufactures	106	61	37	France 19; West Germany 4.
Nickel:				
Ore and concentrate	--	22	--	Switzerland 21.
Matte and speiss	1,122	1,207	--	Netherlands 578; U.S.S.R. 146; Republic of South Africa 140.
Metal including alloys:				
Scrap	607	572	NA	France 151; West Germany 145; Yugoslavia 108.
Unwrought	3,105	2,663	258	Republic of South Africa 639; Canada 446.
Semimanufactures	774	1,690	58	West Germany 1,370; Sweden 87; United Kingdom 65.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	14,564	40,575	21,284	West Germany 16,751; U.S.S.R. 932.
Rare-earth metals including alloys, all forms	59	147	NA	U.S.S.R. 101; Italy 23; Brazil 18.
Silver:				
Waste and sweepings[4] value, thousands	$8	$3	$3	
Metal including alloys, unwrought and partly wrought thousand troy ounces	5,329	5,946	7	West Germany 3,279; Switzerland 1,170; Republic of South Africa 1,141.
Tin:				
Oxides	8	9	--	West Germany 7; United Kingdom 2.
Metal including alloys:				
Scrap	40	18	--	Hungary 16.
Unwrought	509	501	NA	West Germany 201; Bolivia 145; Brazil 57.
Semimanufactures	135	144	(2)	West Germany 130; Belgium-Luxembourg 6; Netherlands 6.
Titanium: Oxides	10,004	11,377	138	West Germany 7,479; United Kingdom 1,068; Finland 904.
Tungsten:				
Ore and concentrate	3,920	3,810	NA	NA.
Oxides and hydroxides	197	263	NA	NA.
Metal including alloys:				
Scrap	495	908	235	West Germany 362; United Kingdom 55.
Unwrought	132	218	26	West Germany 144; United Kingdom 30.
Semimanufactures	13	14	1	West Germany 11; France 2.
Uranium and thorium: Oxides and other compounds	2,409	3,007	NA	NA.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Ore and concentrate	11,804	10,793	--	Italy 10,657; Yugoslavia 126; West Germany 10.
Oxides	2,098	1,695	--	West Germany 1,437; Netherlands 101; France 91.
Blue powder	1,027	1,428	--	Belgium-Luxembourg 1,055; West Germany 253; Norway 90.
Metal including alloys:				
Scrap	321	198	--	All from Yugoslavia.
Unwrought	9,626	8,686	--	West Germany 6,220; Belgium-Luxembourg 1,895; Yugoslavia 168.
Semimanufactures	2,476	2,256	1	West Germany 1,651; France 370; Belgium-Luxembourg 96.
Other:				
Ores and concentrates	11,117	10,519	1,821	Netherlands 2,508; West Germany 2,015.
Ashes and residues	196,304	150,036	1,595	U.S.S.R. 76,028; Hungary 22,215; Republic of South Africa 18,541.
Base metals including alloys, all forms	3,080	2,574	88	U.S.S.R. 1,347; West Germany 262; France 209.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	308	294	5	Italy 120; India 51; Spain 46.
Artificial:				
Corundum	12,393	13,443	1,005	West Germany 4,201; Hungary 3,668; France 2,598.
Silicon carbide	2,854	2,988	NA	West Germany 1,652; Norway 452; Yugoslavia 201.
Dust and powder of precious and semi-precious stones including diamond kilograms	862	511	412	Switzerland 61; Algeria 19.
Grinding and polishing wheels and stones	1,607	1,716	3	West Germany 775; Spain 323; Italy 276.
Asbestos, crude	22,654	21,595	15	Canada 11,666; U.S.S.R. 3,476; Italy 2,929.
Barite and witherite	11,325	5,034	--	West Germany 3,031; Czechoslovakia 2,003.
Boron materials:				
Crude natural borates	17,200	18,339	2,646	Turkey 15,623; Netherlands 58.
Oxides and acids	605	561	NA	France 430; United Kingdom 53; Italy 44.
Cement	39,336	56,927	(2)	Yugoslavia 29,783; Italy 13,437; West Germany 5,654.
Chalk	3,832	9,580	--	Italy 7,180; West Germany 1,287; France 806.
Clays, crude:				
Bentonite	1,391	2,432	--	West Germany 1,169; Brazil 1,141.
Chamotte earth	15,067	12,479	--	Czechoslovakia 10,362; West Germany 1,167; France 919.
Kaolin	102,598	95,401	3,225	Czechoslovakia 35,513; United Kingdom 22,732; Brazil 19,800.
Unspecified	75,486	85,557	86	West Germany 57,852; Czechoslovakia 16,351; France 4,647.
Cryolite and chiolite	180	206	--	All from United Kingdom.
Diamond:				
Gem, not set or strung value, thousands	$4,391	$2,854	$25	Israel $950; Belgium-Luxembourg $766; West Germany $375.
Industrial stones do	$615	493	$7	Republic of South Africa $124; Hungary $96; West Germany $89.
Diatomite and other infusorial earth	11,142	12,931	1,015	Czechoslovakia 4,050; Hungary 2,667; Denmark 2,190.
Feldspar, fluorspar, related materials:				
Feldspar	4,485	4,474	--	Sweden 2,538; West Germany 1,316; Italy 456.
Fluorspar	14,416	13,090	--	East Germany 5,816; West Germany 4,098; Italy 2,604.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Fertilizer materials:				
Crude, n.e.s	5,365	5,540	NA	West Germany 3,237; Italy 1,183; Netherlands 557.
Manufactured:				
Ammonia	61,745	79,488	NA	NA.
Nitrogenous	110,283	143,318	NA	France 40,284; West Germany 37,371; Romania 23,081.
Phosphatic	69,551	69,546	NA	France 36,323; West Germany 21,077; Yugoslavia 4,177.
Potassic	255,680	272,476	NA	East Germany 106,098; West Germany 79,255.
Unspecified and mixed	149,609	163,384	3,118	West Germany 62,438; Italy 33,207; Hungary 24,396.
Graphite, natural	7,134	3,280	--	China 2,431; West Germany 363; Madagascar 242.
Gypsum and plaster	11,252	11,826	5	West Germany 8,820; Italy 2,574; East Germany 251.
Lime	2,479	2,676	4	Yugoslavia 1,868; Italy 430; West Germany 345.
Magnesium compounds:				
Magnesite, crude	221	153	--	Turkey 120.
Oxides and hydroxides	116,497	150,117	10	Turkey 41,029; Italy 32,679; Greece 21,291.
Mica:				
Crude including splittings and waste	205	321	1	West Germany 168; France 46; Norway 37.
Worked including agglomerated splittings	195	225	(2)	France 110; Belgium-Luxembourg 42; India 35.
Nitrates, crude	1,345	961	--	All from West Germany.
Phosphates, crude	470,132	424,530	NA	Israel 138,885; Togo 129,201; Algeria 117,081.
Pigments, mineral:				
Natural, crude	1,130	927	--	Spain 843; France 53.
Iron oxides and hydroxides, processed	4,557	5,141	--	West Germany 4,818; United Kingdom 248.
Potassium salts, crude	11,628	12,868	--	All from West Germany.
Precious and semiprecious stones other than diamond:				
Natural kilograms	2,666	4,090	30	West Germany 2,414; Brazil 430; Republic of South Africa 336.
Synthetic do	17,749	15,858	1,279	Switzerland 6,962; U.S.S.R. 3,542; West Germany 2,514.
Pyrite, unroasted	775	854	--	Italy 652; West Germany 179; Netherlands 23.
Salt and brine	153	134	2	France 69; West Germany 50.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	3,389	2,499	--	East Germany 1,038; West Germany 1,009; Poland 270.
Sulfate, manufactured	340	418	--	West Germany 413.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	45,696	40,357	--	Italy 23,791; Republic of South Africa 5,352; France 2,474.
Worked	54,717	56,499	--	Italy 39,978; West Germany 9,694; Yugoslavia 3,039.
Dolomite, chiefly refractory-grade	3,718	5,277	--	West Germany 3,413; Italy 1,431; Yugoslavia 191.
Gravel and crushed rock	259,515	216,420	--	West Germany 196,122; Italy 19,337.
Limestone other than dimension	496	1,349	--	West Germany 763; Yugoslavia 561; France 24.
Quartz and quartzite	33,161	28,829	--	Hungary 16,815; West Germany 10,495; Norway 521.
Sand other than metal-bearing	426,925	407,812	6	West Germany 219,478; Czechoslovakia 161,798; East Germany 17,379.
Sulfur:				
Elemental:				
Crude including native and byproduct	113,304	98,589	--	Poland 36,314; West Germany 35,617; Hungary 16,368.
Colloidal, precipitated, sublimed	53	336	--	Poland 320.
Sulfuric acid	18,253	33,002	NA	West Germany 13,380; Yugoslavia 8,858; Hungary 5,727.
Talc, steatite, soapstone, pyrophyllite	3,609	2,732	1	India 1,000; France 893; Norway 375.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Other:				
Crude	75,682	87,514	1,600	West Germany 42,065; Hungary 18,372; Czechoslovakia 7,388.
Slag and dross, not metal-bearing	45,222	47,967	49	Italy 34,783; West Germany 8,210; Switzerland 2,797.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	3,368	3,319	73	Trinidad and Tobago 3,119; West Germany 105.
Carbon black value, thousands	$16,832	$19,567	$17	West Germany $9,238; Italy $7,664; Canada $1,668.
Coal:				
Anthracite thousand tons	52	55	--	U.S.S.R. 48; West Germany 7.
Bituminous do	3,271	3,522	522	Poland 1,606; Czechoslovakia 652; U.S.S.R. 469.
Briquets of anthracite and bituminous coal do	19	21	--	West Germany 20.
Lignite including briquets do	638	827	--	East Germany 366; Yugoslavia 234; West Germany 215.
Coke and semicoke do	1,083	1,274	--	West Germany 556; Czechoslovakia 355; Poland 192.
Gas, natural: Gaseous million cubic feet	143,968	148,331	--	U.S.S.R. 145,191; West Germany 3,140.
Peat including briquets and litter	59,653	59,448	--	West Germany 42,651; U.S.S.R. 9,357; Poland 3,805.
Petroleum:				
Crude thousand 42-gallon barrels	43,982	38,435	--	Libya 7,838; U.S.S.R. 5,517; Algeria 5,261.
Refinery products:				
Liquefied petroleum gas do	1,418	1,793	(2)	Hungary 782; West Germany 432; U.S.S.R. 363.
Gasoline do	5,122	4,887	--	Italy 1,954; West Germany 1,720; Hungary 756.
Mineral jelly and wax do	116	110	(2)	West Germany 46; Hungary 25; Poland 24.
Kerosene and jet fuel do	733	908	(2)	Hungary 626; Czechoslovakia 227; West Germany 48.
Distillate fuel oil do	4,346	3,758	(2)	Hungary 1,326; West Germany 1,055; Yugoslavia 587.
Lubricants do	3,055	3,436	6	Hungary 1,193; Czechoslovakia 610; Romania 345.
Residual fuel oil do	5,774	5,883	--	West Germany 2,392; Czechoslovakia 2,300; Switzerland 351.
Bitumen and other residues do	1,956	1,827	--	West Germany 847; Yugoslavia 585; Italy 241.
Bituminous mixtures do	29	30	(2)	West Germany 21; Netherlands 5; Italy 3.
Petroleum coke do	524	492	56	West Germany 371; Yugoslavia 46.

NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.
[3]Excludes unreported quantity valued at $7,000.
[4]May include other precious metals.

COMMODITY REVIEW

METALS

Aluminum.—Austria Metall AG (AM), held by OIAG and virtually the only producer of aluminum in Austria, decided to construct a new aluminum smelter, with a capacity of 84,000 tons per year, with start-up planned for 1990.[8] With minor fluctuations, the production of primary and secondary aluminum had remained the same since 1972. The new smelter, at Ranshofen, north of Salzburg, would double Austria's aluminum output.

Antimony.—In 1986, antimony ore was mined at Schlaining in eastern Austria, near the Hungarian border, where mining started in 1770. There was only one mine, operated by Bleiberger Bergwerks-Union AG (BBU), the same state-owned company that operated the lead and zinc mines. About 160 people were employed. The production of stibnite was declining, and plans were made to develop new reserves. In 1985, about 26,000 tons of ore of about 2.86% antimony was mined.

Copper.—AM was also the only producer of copper in Austria. The smelter at Brixlegg had produced copper for over 500 years and had a capacity in 1986 of 30,000 tons of metal per year. The plant at Amstetten had operated since 1904 and had an annual capacity in 1986 of 25,000 tons per year of copper alloys and semifinished products, such as tubes, pipes, rods, sectioning, and wire. The two copper plants and the Ranshofen aluminum plant employed in all about 41,000 workers.

Iron and Steel.—Austria's production of iron ore, pig iron, and steel declined for the second consecutive year. Most of the iron ore was imported from Brazil, Canada, Sweden, and the U.S.S.R. The manganese-rich iron ore mine at Erzberg supplied ore only to the Donawitz steel plant nearby. In 1985, 1,383 people worked at the mine, 240 of whom were in administrative positions.

VA was cutting its work force, and plans were being made to terminate or privatize some operations. VA employed about 38,000 workers and was the 26th largest steel producer in the world. RSR Corp. purchased the minimill Bayou Steel Corp., in Louisiana, from VA for about $5 million. Since February 1986, VA had been seeking a buyer for the mill, which was not profitable. The company was, however, going ahead at its Donawitz works to develop a new steelmaking process jointly with Klöckner AG of the Federal Republic of Germany. The process is to use a charge of up to 100% scrap in making steel. One of the three 50-ton oxygen converters at Donawitz was to be switched entirely to operating with 100% scrap. The work force at the Donawitz plant was reduced to 3,450 during the year.

VA was also developing a new ironmaking technology called Corex. The process uses natural gas and low-grade coal to smelt iron ore. It also produces gas for heating as a byproduct. According to company officials, Austria is 5 years ahead with this technology, which could become a repeat performance of VA's postwar success with the Linz-Donawitz oxygen-steel process, now used worldwide.[9]

VA's subsidiary VEW lost about $110 million, which was more than the estimated $84 million allowed under its restructuring plan "Konzept 2000," by the OIAG holding company. The company's Ternitz steel plant was to be closed during the summer, and shorter workweeks for 950 of the 1,000 employees at the plant in Kindberg were being considered. The Soviet Union was Kindberg's only major buyer of its tube products. VEW's steelmaking plant at Kapfenberg was also planning a shorter work schedule for 380 of its 5,000 employees.

Lead and Zinc.—The production of lead and zinc concentrates by BBU was beginning to be unprofitable owing to the generally low prices of these metals worldwide and because of high production and labor costs. In addition, the mining conditions were complex, and the ore grades were low by world standards, about 1.3% for lead and 3.8% for zinc. BBU, the only producer of these metals in Austria, was owned by the Government.

Tungsten.—The scheelite mine at Mittersill was opened in 1976, by Wolfram Bergbau-und Hüttengesellschaft mbH, from a discovery by Rudolf Holl in 1967. The concentrator at Bergla, about 300 kilometers east of Mittersill, near the Yugoslav border, began operating in 1977. The underground mine at Westfeld was fully operational after the termination of open pit mining at Ostfeld in the fall of 1986. A total of about 2.6 million tons of ore had been extracted from the pit, at 0.6% WO_3, since

1967; the pit operated only during the summer months.

About 25 people worked at Mittersill in 1986 in 1 shift per day on a contractual basis. Prior to that, 38 people worked in 2 shifts per day in surface and underground mines; the underground mine operated 1 shift, 5 days per week, and employed 55 miners. About 1.5 million tons of ore at 0.4% WO_3 was mined underground. The remaining reserves were estimated to be 10 million tons. The ore was crushed underground, presorted, and sent to the concentrator at Bergla in Styria. The ore was concentrated to about 20% to 25% WO_3. Almost 80% of the concentrate was exported, 80% of which was shipped to EEC countries, and 20%, to the Soviet Union.

INDUSTRIAL MINERALS

Cement.—Austria had ample supplies of calcite, dolomite, and limestone to support a viable cement industry. The production rate of cement had been more or less stable for the past 20 years, with minor fluctuations. There were 13 operating companies and at least 16 major cement-producing plants, with many other smaller quarries and plants distributed throughout the country. The Perlmooser Zementwerke AG (PZ) was the largest company with three plants; PZ's largest plant, at Mannesdorf near Vienna, had a 1-million-ton-per-year capacity. Total capacity was about 7.5 million tons of cement annually, of which PZ accounted for almost 45%.

According to one survey, the Austrian cement industry's major costs consisted of maintenance, bagging, general management, and subcontracting. These totaled 31% of the 1984 costs but fell slightly to 29% in 1985. Of all European producers, the Austrian cement industry had the highest costs. Wages in 1985 made up the second largest operating cost category, 23%. Coal accounted for 14% of total operating costs; electricity, 8%; raw materials, 14%; and capital costs, 8%.[10]

Fertilizer Materials.—The Austrian fertilizer industry, owned by the OIAG and Chemie-Linz, incurred heavy financial losses because of competition from Norsk Hydro A/S of Norway, an inadequate production plant, and the high cost of natural gas.

Lithium.—Mineral-Exploration GmbH continued exploration work in the Koralpe area, drilling perpendicular to strike through the spodumene-rich pegmatite veins. The spodumene was about 25% by weight of the pegmatite material, giving an average grade higher than 1.6% Li_2O. Three 2- to 5-meter thick veins were intersected, with indications that four additional veins may be present as drilling proceeded south into the mountain. Several drifts were started from the main entry ramp, along the strike of the deposit. About 10 people were working on the site, including 2 geologists and 1 mining engineer.

Magnesite.—There were two privately held magnesite-producing companies in Austria in 1986: Radex-Austria AG, formerly Österreichisch-Amerikanische Magnesit AG, at Radenthein, and Veitscher Magnesitwerke AG, at Breitenau and Trieben. Tyroler Magnesit AG and Steirische Magnesit-Industrie AG (Magindag) were both state owned. Magindag closed its mining operations and produced only chemical products, and there were indications that the company was being sold.

Radex-Austria operated an underground mine near the processing plant at Radenthein, close to overland roads and a railroad. About 80,000 tons of ore per day was mined by the block caving process. The mine operated on a year-round basis, with one shift. There were a total of 26 people working at the mine. The coarsely crushed ore was transported in cable cars to the processing plant 7 kilometers away.

Salt.—Salt was produced in Austria mostly by underground leaching. Most of the Permian-Triassic salt-bearing strata are a mixture of clays and marls, with only a few layers of pure rock salt. The salt-producing region of Austria was in the Salzkammergut area of north-central Austria. Over 90% of the rock salt was produced at Steinkogel and the rest at Hallein. Salt from brines was produced at Altensee, Hallstaat, Bad Ischl, and Hallein, in descending order of magnitude. The production of both the rock salt and brines had been steadily increasing since 1950, with insignificant yearly fluctuations.

Talc.—There were six talc-producing operations, with an estimated production capacity of 160,000 tons per year. About 265 people were employed by the industry, of which 210 were in the mine labor force. Over 92% of the output was produced by the Talkumwerke Naintsch GmbH (TN), with headquarters situated north of Graz. Talcs de Luzenac S.A. of France owned 80% of the company. TN operated five underground mines and plants, all in Styria in southeastern Austria. There was one surface mine at

Rabenwald, where about 100,000 tons of ore was mined and sent to the plant at Oberfeistritz for processing. White grades of talc were imported from Australia and India. About 85% of production was exported to Western Europe, some CMEA countries, and the Near East.[11]

MINERAL FUELS

Austria mined a small amount of brown and lignite coal and produced natural gas and some crude oil. Much of those resources went into the generation of electricity. Austria's energy situation was characterized by a tendency toward declining domestic production of fossil fuels and growing dependence on imported energy. Hydropower was the main indigenous energy source covering over 25% of tons of oil equivalent and about 71% of Austrian electricity generation. The use of fuel oil for electricity generation in public utilities decreased by 34% between 1983 and 1985, while natural gas use increased by 33%; the use of brown coal decreased slightly in 1985 after reaching a peak in 1984. Combustion of imported hard coal, even though still minor, increased during 1986, after commissioning of the Durnrohr, Mellach, and Riedersbach plants.

Because of the opposition by environmentalists, the Zwentendorf nuclear powerplant, the only one in Austria, which had been built in 1978 but never commissioned, was abandoned and is to be dismantled (broken up). In 1986, the Government decided instead to continue harnessing the Danube River for electric power. Plans were being considered for the disposal of unirradiated nuclear fuel, which had been purchased from the United States for use in the Zwentendorf plant.

Coal.—Coal was a minor factor in Austria's economy. It had been mined in Austria since the 1600's, but the relatively small amount produced had been used mostly domestically, so that little of it was exported. In 1986, only brown coal and lignite were mined, and anthracite was imported from the Federal Republic of Germany, Poland, and the Soviet Union. The number of coal mines in Austria decreased from a total of 51 lignite and 10 anthracite mines in 1946, to 7 lignite mines in 1986. About 33% of the coal was mined from open pits, and almost 60% of it was mined in Styria by Graz-Köflacher Eisenbahn-und Bergbau GmbH, a Government-owned company operated by VA. Two other companies were privately held and produced about 20% each of the total output. In 1985, 3,167 persons were employed by the coal industry, of which 2,745 were classified as miners or workers.

Natural Gas.—The share of natural gas in tons of oil equivalent was about 17%. Austria supplemented its oil consumption by imports from the Soviet Union and the Federal Republic of Germany. Since 1968, an increasingly greater portion of Austria's natural gas consumption has been imported from the Soviet Union. In 1986, approximately 80% of imports came from that country. To diversify import sources, Austria signed a contract with Norway for up to 35 billion cubic feet of gas per year starting in 1993. The gas from the Troll Field is to be delivered via an offshore pipeline to the West German coast near the town of Emden, and from there to Austria via an overland pipeline. Talks with Algeria and the Netherlands, on the other hand, have led to no results. Austria was also an important transit link for Soviet gas deliveries to Western Europe, Italy, and Yugoslavia. A 313-kilometer loop was being built to increase by 247 billion cubic feet per year the capacity of the line transporting Soviet gas to Italy.

Gas drilling by Österreichische Mineralölverwaltungs AG continued with promising results in Höflein near Klosterneuburg in the Vienna Woods. The deposit was discovered in 1982, and 14 exploratory wells were sunk to a depth of about 3,000 meters.

Petroleum.—The share of oil accounted for about 35% of tons of oil equivalent and continued to decline slightly. The decrease of indigenous production of oil also continued, owing in part to the need to use enhanced oil recovery methods.

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[1]Physical scientist, Division of International Minerals.
[2]Values have been converted from Austrian schillings (S) to U.S. dollars at the rate of S15.5=US$1.00, the average in 1986.
[3]Bundesministerium fuer Handel, Gewerbe und Industrie, Section VI (Oberste Bergbehorde-Roh und Grundstoffe). Der Österreichische Bergbau. Vienna, 1986, 255 pp.
[4]An organization of 10 centrally planned economy countries involved in economic cooperation and coordination, comprising the following countries: Bulgaria, Cuba, Czechoslovakia, the German Democratic Republic, Hungary, Mongolia, Poland, Romania, the U.S.S.R., and Vietnam. Yugoslavia has permanent observer status.
[5]Österreichische Landerbank AG. Landerbank Report. Vienna, No. 2, 1987, p. 4.
[6]Die Presse (Vienna). Feb. 7, 1986, p. 7.
[7]The Wall Street Journal (New York). May 20, 1987, p. 30.
[8]Erzmetall (Weinheim). V. 40, No. 2, 1987, p. 58.
[9]Financial Times (London). Sec. 6, Mar. 16, 1987.
[10]Roehlkepartain, J. L. European Cement Operating Costs. Rock Prod., Oct. 1986, p. 33.
[11]Schober, W. Talc in Europe. Ind. Miner. (London), June 1987, p. 41.

The Mineral Industry of Belgium-Luxembourg

By John R. Craynon[1]

BELGIUM

Belgium remained an important processor of minerals and metals despite being totally dependent on foreign sources of raw materials. The country was the world's leading producer of special cobaltiferous materials, germanium, and selenium. The smelter production of cadmium, copper, indium, lead, silver, steel, tellurium, and zinc was among the highest in the world.

The economic situation in Belgium continued to be dominated by the Government's budgetary austerity program. The Organization for Economic Cooperation and Development (OECD) estimated the economic growth at 1.5%, far below the projected European Economic Community (EEC) average of 2.6%. The prime area of concern was the budget deficit, which climbed slightly in 1986 from the approximately 12% of gross national product (GNP) level recorded in 1985. Unemployment also began to increase from its midyear level of 12.2% as yearend approached.

However, there were some bright spots in the economic picture. Inflation remained fairly low, and interest rates continued to fall. The balance of payments position improved and finished the year positive. The upturn in Belgium's credit rating enhanced the country's ability to fund its budget deficit. The economic situation improved the competitiveness of Belgian metals on the world market.

PRODUCTION

Production of most nonferrous metals was carried out by Union Minière S.A. and Union Minière subsidiaries, Métallurgie Hoboken-Overpelt S.A. (MHO) and Vieille-Montagne SA. Cockerill-Sambre SA (CS), Sidmar SA, Usines Gustave Boël SA, and Forges de Clabecq SA were steel producers. Overall metal production levels increased slightly from those of 1985.

Table 1.—Belgium: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum	4,188	5,784	5,712	3,908	5,000
Arsenic, white[e]	3,000	3,000	3,000	3,000	3,000
Cadmium, smelter	996	1,260	1,476	1,252	1,300
Copper:					
Blister:[e]					
Primary	2,500	2,800	500	r900	2,000
Secondary	r79,400	r70,500	r75,500	r114,200	106,000
Total	r81,900	r73,300	r76,000	r115,100	108,000
Refined, primary and secondary, including alloys	501,636	431,268	427,704	455,459	450,000
Iron and steel:					
Pig iron thousand tons	7,836	8,028	8,964	8,719	38,040
Ferroalloys: Electric-furnace ferromanganese[e] do	r85	r87	95	90	87
Steel:					
Crude do	9,916	10,157	11,303	10,683	39,744
Semimanufactures do	7,368	7,056	8,136	8,072	9,000
Lead:					
Smelter:[e]					
Primary[4]	52,950	54,400	71,500	r67,000	70,000
Secondary[5]	28,020	30,000	30,000	r8,300	10,000
Total	80,970	84,400	101,500	r75,300	80,000
Refined:					
Primary	66,000	96,300	89,600	84,293	65,000
Secondary	33,720	37,848	38,116	30,000	26,000
Total[6]	99,720	134,148	127,716	114,293	91,000
Selenium[e]	60	60	65	65	70
Tin: Secondary	2,208	2,220	2,408	2,298	2,900
Zinc:					
Slab:					
Primary	228,300	262,600	270,700	271,400	269,000
Secondary (remelted zinc)	12,552	13,244	14,624	18,162	21,000
Total	240,852	275,844	285,324	289,562	290,000
Powder	23,532	25,104	29,652	32,568	31,500
Other, nonferrous: Precious metals, unworked, n.e.s.[7] thousand troy ounces	33,237	37,152	40,815	41,123	41,500
INDUSTRIAL MINERALS					
Barite[e]	39,900	39,900	39,000	40,000	40,000
Cement, hydraulic thousand tons	6,320	5,719	5,715	5,537	6,800
Clays: Kaolin do	53	60	69	37	40
Lime and dead-burned dolomite:					
Quicklime do	1,368	1,596	1,980	1,812	1,800
Dead-burned dolomite do	159	174	190	--	--
Nitrogen: N content of ammonia do	509	449	452	387	350
Phosphates: Thomas slag, gross weight do	393	250	254	143	250
Sodium compounds:					
Carbonate	327,648	259,764	409,344	446,484	460,000
Sulfate[e]	250,000	250,000	250,000	260,000	265,000
Stone, sand and gravel:					
Calcareous:					
Dolomite thousand tons	2,581	2,713	2,982	3,210	3,900
Limestone do	24,660	22,044	20,520	20,502	21,200
Marble:					
In blocks cubic meters	7,848	1,332	3,624	684	1,250
Crushed and other	108	108	108	84	90
Petit granite (Belgian bluestone):					
Quarried thousand cubic meters	626	507	677	563	475
Sawed do	56	48	49	41	50
Worked do	8	9	15	e8	10
Crushed and other do	610	545	768	588	445
Porphyry, all types thousand tons	5,033	4,166	3,315	3,413	3,250
Quartz and quartzite	216,643	469,720	349,720	266,839	275,000
Sandstone:					
Rough stone including crushed thousand tons	2,036	1,962	2,436	1,864	1,920
Paving	11,112	12,444	7,596	10,224	9,590

See footnotes at end of table.

Table 1.—Belgium: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
INDUSTRIAL MINERALS —Continued					
Stone, sand and gravel —Continued					
Sand and gravel:					
Construction sand ____ thousand tons	6,348	6,768	6,636	6,576	6,480
Foundry sand ____ do.	624	540	612	624	560
Dredged sand ____ do.	1,244	1,368	1,127	1,235	1,000
Glass sand ____ do.	1,716	1,668	1,680	1,392	1,450
Other sand ____ do.	1,572	1,644	1,452	1,836	2,060
Gravel, dredged ____ do.	3,984	4,788	5,340	5,820	5,060
Sulfur, byproduct:[e]					
Elemental ____ do.	110	105	105	[r]100	110
Other forms ____ do.	160	145	135	[r]150	150
Total ____ do.	270	250	240	[r]250	260
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[e] ____	2,000	2,000	1,750	1,700	1,800
Coal:					
Anthracite ____ thousand tons	263	187	340	--	--
Bituminous ____ do.	6,277	5,909	5,960	6,211	[3]5,591
Total ____ do.	6,540	6,096	6,300	6,211	[3]5,591
Coke, all types ____ do.	5,220	5,112	5,928	5,964	5,350
Fuel briquets, all kinds ____ do.	50	46	24	28	--
Gas:					
Manufactured ____ million cubic feet	20,987	21,989	25,337	25,272	23,900
Natural ____ do.	[r]1,271	[r]817	1,648	1,847	1,500
Petroleum refinery products:					
Gasoline ____ thousand 42-gallon barrels	31,243	33,514	31,527	32,749	40,900
Jet fuel ____ do.	13,492	11,333	9,782	9,879	10,750
Kerosene ____ do.	295	[r]279	54	171	500
Distillate fuel oil ____ do.	59,277	56,271	59,889	54,727	72,300
Residual fuel oil ____ do.	47,271	30,616	35,208	24,230	47,400
Lubricants ____ do.	300	252	260	([8])	([8])
Other ____ do.	26,210	15,479	14,560	12,315	13,700
Refinery fuel and losses ____ do.	10,680	10,690	7,580	8,992	9,750
Total ____ do.	188,768	[r]158,434	158,860	143,063	195,300

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

[1]Table includes data available through May 26, 1987.

[2]In addition to the commodities listed, Belgium produced a number of other metals for which only aggregate output figures were available.

[3]Reported figure.

[4]Data not reported; derived by taking reported primary lead output, plus exports of lead bullion, minus imports of lead bullion.

[5]Data represent secondary refined lead output minus remelted lead; as such, the figures are probably high because they include some lead that was sufficiently pure as scrap that it did not require resmelting, but data are not adequate to permit differentiation.

[6]Includes remelted lead as follows, in metric tons: 1982—6,000; 1983—7,900; 1984—8,100; 1985—8,800; and 1986—9,000 (estimated).

[7]Known to include gold, platinum-group metals, and silver.

[8]Included with "Petroleum refinery products: Other."

TRADE

Belgium was among the world's most export-intensive countries. Imports were often reexported, usually with value added. This was especially true for mineral commodities. U.S. products were about 40% less expensive for Belgian consumers compared with 1985 prices, owing to the lower value of the dollar. Principal U.S. exports to Belgium included coal. Cut diamonds and precious metals were the most important Belgian exports to the United States, which was Belgium's most important non-EEC trading partner.

Belgium relied on Zaire for much of its nonferrous metals ore. Chile, Peru, Poland, the Republic of South Africa, Sweden, and Zambia were other major suppliers. The Federal Republic of Germany, France, and the Netherlands were the country's most important trading partners.

Table 2.—Belgium-Luxembourg: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	25	33	--	Italy 25; France 7.
Alkaline-earth metals	52	150	--	West Germany 148; France 1.
Aluminum:				
Ore and concentrate	1,702	1,992	--	France 1,862; West Germany 125; Netherlands 5.
Oxides and hydroxides	732	1,353	(2)	United Kingdom 770; France 191; Netherlands 134.
Ash and residue containing aluminum	7,111	8,032	--	Netherlands 3,485; West Germany 3,113; Spain 1,225.
Metal including alloys:				
Scrap	51,395	46,950	--	France 15,132; West Germany 13,545; Netherlands 11,018.
Unwrought	10,277	23,036	--	West Germany 12,391; France 5,880; Netherlands 1,771.
Semimanufactures	280,145	283,087	32,380	France 57,164; West Germany 48,250; United Kingdom 33,686.
Antimony: Metal including alloys, all forms	1	2	--	France 1; Italy 1.
Beryllium: Metal including alloys, all forms	1	10	--	West Germany 5; Netherlands 5.
Cadmium: Metal including alloys, all forms	727	804	16	France 410; West Germany 213; United Kingdom 48.
Chromium:				
Ore and concentrate	51	36	--	France 24; Netherlands 10; Switzerland 2.
Oxides and hydroxides	21	43	15	France 6; West Germany 6.
Metal including alloys, all forms	112	300	16	West Germany 216; Netherlands 46.
Cobalt: Metal including alloys, all forms	80	68	5	France 24; Sweden 15; West Germany 11.
Columbium and tantalum:				
Ash and residue containing columbium and/or tantalum	237	518	--	All to West Germany.
Metal including alloys, all forms:				
Columbium (niobium)	(2)	50	--	All to United Kingdom.
Tantalum	12	(2)	(2)	
Copper:				
Ore and concentrate	742	532	--	Netherlands 290; West Germany 108; Spain 74.
Matte and speiss including cement copper	162	664	--	Spain 662; Netherlands 2.
Oxides and hydroxides	1,644	1,614	8	West Germany 807; France 111; Italy 104.
Sulfate	8,141	6,723	241	Netherlands 2,435; West Germany 2,075; Denmark 1,210.
Ash and residue containing copper	1,840	1,271	--	France 558; Spain 407; Netherlands 218.
Metal including alloys:				
Scrap	32,176	30,411	--	Netherlands 10,715; West Germany 10,535; France 4,132.
Unwrought	219,059	217,208	5,888	France 61,794; West Germany 48,030; United Kingdom 29,414.
Semimanufactures	270,232	282,317	1,484	West Germany 104,436; France 54,067; Netherlands 35,266.
Gold:				
Waste and sweepings value, thousands	$8,861	$3,890	--	Netherlands $2,875; United Kingdom $683.
Metal including alloys, unwrought and partly wrought troy ounces	738,412	900,357	127,402	United Kingdom 280,807; Japan 158,113.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	302	15,263	--	France 14,022; West Germany 1,210.
Pyrite, roasted	54,834	153,750	--	Spain 113,842; France 17,631; West Germany 16,240.
Metal:				
Scrap	773,616	736,458	3	West Germany 227,614; France 203,231; Netherlands 120,099.
Pig iron, cast iron, related materials	10,581	9,631	54	Netherlands 3,968; France 3,058; Italy 970.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Ferroalloys:				
Ferrochromium	2,914	1,338	--	West Germany 618; France 616.
Ferromanganese	23,741	20,557	--	France 8,388; West Germany 8,003; Hungary 2,100.
Ferromolybdenum	17,740	17,282	NA	NA.
Ferronickel	7	324	--	West Germany 312; Switzerland 10.
Ferrosilicochromium	64	97	--	Italy 72; West Germany 25.
Ferrosilicon	877	368	34	West Germany 226; Spain 48; France 45.
Silicon metal	65	62	1	Iraq 43; Japan 18.
Unspecified	2,696	2,541	--	West Germany 1,172; United Kingdom 315; Sweden 211.
Steel, primary forms thousand tons	3,384	3,151	122	France 1,343; West Germany 600; Italy 598.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	3,115	3,141	318	West Germany 800; France 558; Netherlands 380.
Universals, plates, sheets do	4,727	4,919	278	France 1,013; West Germany 988; Netherlands 458.
Hoop and strip do	501	508	3	West Germany 239; France 91; Netherlands 50.
Rails and accessories do	93	105	14	France 25; Italy 14; Mexico 14.
Wire do	315	294	41	West Germany 61; France 40.
Tubes, pipes, fittings do	584	616	54	U.S.S.R. 225; West Germany 73; France 59.
Castings and forgings, rough do	12	15	1	Netherlands 6; France 4.
Lead:				
Oxides	4,844	5,511	--	West Germany 4,051; Netherlands 580; France 340.
Ash and residue containing lead	6,363	4,517	--	France 3,083; Netherlands 138.
Metal including alloys:				
Scrap	7,427	8,555	--	France 4,179; Netherlands 2,209; East Germany 1,613.
Unwrought	84,701	70,573	2	West Germany 18,601; Netherlands 13,055; France 11,866.
Semimanufactures	21,058	20,295	43	Netherlands 7,622; United Kingdom 4,055; France 3,393.
Lithium:				
Oxides and hydroxides	--	54	--	Netherlands 49; France 4.
Metal including alloys, all forms	1	(2)	(2)	
Magnesium: Metal including alloys:				
Scrap	2,034	3,201	--	West Germany 1,606; United Kingdom 1,009; Italy 248.
Unwrought	134	48	--	West Germany 38; Netherlands 10.
Semimanufactures	317	65	1	Republic of South Africa 36; Italy 16; West Germany 8.
Manganese:				
Ore and concentrate, metallurgical-grade	2,757	492	403	West Germany 46; France 31.
Metal including alloys, all forms	1,489	1,327	(2)	West Germany 658; Norway 420; United Kingdom 80.
Mercury 76-pound flasks	777	287	--	Netherlands 145; United Kingdom 70; West Germany 38.
Molybdenum:				
Ore and concentrate	10,847	11,412	358	United Kingdom 4,398; West Germany 1,928; France 1,741.
Oxides and hydroxides	39	42	--	United Kingdom 41; Italy 1.
Metal including alloys:				
Scrap	3	4	3	France 1.
Unwrought	24	22	--	Sweden 20.
Semimanufactures	63	87	--	Netherlands 50; United Kingdom 23; France 7.
Nickel:				
Ore and concentrate	10	--		
Oxides and hydroxides	1	2	--	All to Yugoslavia.
Ash and residue containing nickel	4,441	3,578	--	Canada 2,017; Finland 1,016; West Germany 330.
Metal including alloys:				
Scrap	843	1,139	99	West Germany 775; Netherlands 134; France 107.
Unwrought	254	218	--	West Germany 83; Czechoslovakia 42; United Kingdom 42.
Semimanufactures	271	1,103	3	West Germany 933; Netherlands 54; France 34.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals:				
Waste and sweepings value, thousands	$5,043	$3,524	--	West Germany $1,879; Switzerland $780; Netherlands $351.
Metals including alloys, unwrought and partly wrought troy ounces	289,214	293,796	159,115	United Kingdom 43,011; Netherlands 17,926.
Rare-earth metals including alloys, all forms	39	--		
Silicon, high-purity	1	44	--	Iraq 43.
Silver:				
Waste and sweepings value, thousands	$1,938	$1,775	--	West Germany $927; Netherlands $318; United Kingdom $253.
Metal including alloys, unwrought and partly wrought thousand troy ounces	26,383	37,713	13,349	United Kingdom 15,086; France 1,954.
Tellurium and arsenic, elemental	93	53	1	France 20; United Kingdom 16; West Germany 13.
Tin:				
Ore and concentrate	--	36	--	Netherlands 32; Spain 3; West Germany 1.
Ash and residue containing tin	2,315	3,072	--	United Kingdom 1,959.
Metal including alloys:				
Scrap	50	68	--	West Germany 41; Netherlands 21; Venezuela 3.
Unwrought	1,648	2,528	88	France 966; West Germany 470; Netherlands 443.
Semimanufactures	75	618	15	France 270; West Germany 162; United Kingdom 151.
Titanium:				
Oxides	35,053	44,089	14,599	West Germany 9,031; Algeria 3,104.
Metal including alloys:				
Scrap	43	22	--	France 11; West Germany 9; United Kingdom 2.
Unwrought	1	41	41	
Semimanufactures	140	109	1	Italy 24; West Germany 23; France 18.
Tungsten:				
Ash and residue containing tungsten	22	4	--	West Germany 3.
Metal including alloys:				
Scrap	28	112	1	West Germany 54; France 28; United Kingdom 4.
Unwrought	17	16	1	Switzerland 5; Iran 4; Philippines 3.
Semimanufactures	94	125	(2)	Netherlands 62; United Kingdom 34; France 15.
Uranium and/or thorium:				
Ore and concentrate	2	203	202	Yugoslavia 1.
Oxides and other compounds value, thousands	$99	$75	--	France $48; West Germany $27.
Metal including alloys, all forms, thorium	r29	--		
Vanadium:				
Oxides and hydroxides	598	451	--	France 298; Japan 72; West Germany 52.
Ash and residue containing vanadium	4,477	4,685	--	West Germany 2,128; Sweden 1,201; Netherlands 1,025.
Metal including alloys, all forms	139	337	--	France 162; West Germany 138; Italy 36.
Zinc:				
Ore and concentrate	23,282	17,433	--	France 14,736; West Germany 2,477; Netherlands 197.
Oxides	4,980	7,563	2	France 4,131; West Germany 2,147; Italy 496.
Blue powder	18,765	18,063	18	West Germany 9,058; France 1,897; Switzerland 1,547.
Matte	4,280	5,057	--	France 2,322; West Germany 1,339; Netherlands 721.
Ash and residue containing zinc	49,302	35,928	--	Netherlands 16,356; France 10,227; West Germany 7,356.
Metal including alloys:				
Scrap	14,585	12,302	--	Netherlands 3,894; France 3,578; West Germany 3,022.
Unwrought	197,107	189,509	11,450	West Germany 61,169; France 25,598; Italy 15,209.
Semimanufactures	7,540	9,525	75	West Germany 5,401; France 1,681; Netherlands 1,219.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Zirconium:				
Ore and concentrate	163	102	--	France 100; West Germany 2.
Metal including alloys:				
Unwrought	11	4	--	West Germany 2; Ireland 1.
Semimanufactures	7	2	1	Mainly to Ireland.
Other:				
Ores and concentrates	194	48	--	Spain 27; Netherlands 20.
Oxides and hydroxides	2,028	5	1	France 2; West Germany 1.
Ashes and residues	42,665	5,123	474	West Germany 1,501; Netherlands 140.
Base metals including alloys, all forms	323	366	5	West Germany 126; Austria 76; France 69.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	12,095	5,465	--	Netherlands 5,124; France 186; West Germany 127.
Artificial:				
Corundum	569	1,192	3	West Germany 639; Netherlands 290; France 222.
Silicon carbide	2,430	3,046	(2)	France 1,800; Italy 784; West Germany 327.
Dust and powder of precious and semi-precious stones including diamond kilograms	1,548	1,671	507	Ireland 292; Netherlands 154.
Grinding and polishing wheels and stones	3,051	2,946	31	France 1,677; United Kingdom 288; West Germany 279.
Asbestos, crude	350	254	--	Netherlands 101; United Kingdom 83; West Germany 36.
Barite and witherite	33,912	86,620	--	Netherlands 35,474; West Germany 16,178; Norway 11,988.
Boron materials:				
Crude natural borates	19,534	24,903	--	Netherlands 10,894; West Germany 10,311; Australia 1,038.
Oxides and acids	109	146	--	Colombia 36; Netherlands 21; Mexico 15.
Cement thousand tons	2,723	2,591	12	Netherlands 1,352; West Germany 455; France 362.
Chalk	85,087	74,600	--	West Germany 19,006; Saudi Arabia 14,368; Netherlands 13,626.
Clays, crude:				
Bentonite	1,488	2,041	--	Netherlands 1,146; West Germany 829; France 39.
Chamotte earth	639	213	--	West Germany 161; Netherlands 39; France 10.
Fuller's earth	659	482	--	Netherlands 439; West Germany 25; United Kingdom 10.
Kaolin	31,728	38,642	43	Netherlands 18,632; West Germany 9,901; France 3,793.
Unspecified	7,252	3,384	--	Netherlands 2,466; West Germany 301.
Cryolite and chiolite	2	80	--	Netherlands 78; Argentina 1; Mexico 1.
Diamond:				
Gem, not set or strung thousand carats	40,313	48,494	1,729	India 29,540; United Kingdom 9,379; Israel 4,139.
Industrial stones do	11,794	9,761	1,511	United Kingdom 4,170; West Germany 661.
Diatomite and other infusorial earth	162,749	107,661	--	Netherlands 106,435; Zaire 609; Cameroon 233.
Feldspar, fluorspar, related materials:				
Feldspar	70	3	--	Mexico 2; Netherlands 1.
Fluorspar	1,902	237	--	West Germany 127; France 54; Netherlands 30.
Unspecified	35	1	--	Mainly to France.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Fertilizer materials:				
Crude, n.e.s	43,108	45,329	--	Netherlands 23,226; France 18,428; West Germany 3,519.
Manufactured:				
Ammonia	46,936	40,286	--	France 32,789; West Germany 3,775; Netherlands 2,993.
Nitrogenous -- thousand tons	2,216	2,245	79	France 972; West Germany 381; Thailand 84.
Phosphatic -- do	635	733	(2)	West Germany 346; France 268; Netherlands 51.
Potassic -- do	27	20	--	West Germany 7; Netherlands 7; France 3.
Unspecified and mixed -- do	1,858	1,875	7	France 883; West Germany 160; Netherlands 90.
Graphite, natural	3,254	74	13	France 27; Mexico 14.
Gypsum and plaster	110,011	116,913	--	Netherlands 86,703; West Germany 26,408; France 3,155.
Iodine	123	66	6	Spain 15; France 13; United Kingdom 7.
Lime	906,974	719,387	--	Netherlands 559,852; West Germany 107,706; France 20,300.
Magnesium compounds:				
Magnesite	404	282	--	Netherlands 131; France 125.
Oxides and hydroxides	2,610	4,231	2	France 2,958; West Germany 571; Algeria 546.
Other	3,768	4,555	--	France 1,780; Netherlands 914; Papua New Guinea 610.
Mica:				
Crude including splittings and waste	26	225	--	West Germany 190; France 19; United Kingdom 10.
Worked including agglomerated splittings	4	8	--	Netherlands 6; Congo 1.
Nitrates, crude	11,805	13,596	--	Netherlands 5,770; West Germany 3,448; France 3,322.
Phosphates, crude	19,886	26,761	--	West Germany 12,923; France 9,116; Netherlands 3,489.
Phosphorus, elemental	15	(2)	--	All to United Kingdom.
Pigments, mineral:				
Natural, crude	228	68	--	Ecuador 30; Syria 15; West Germany 11.
Iron oxides and hydroxides, processed	9,166	11,006	376	West Germany 2,582; France 2,195; United Kingdom 1,741.
Potassium salts, crude	--	382	--	Netherlands 245; West Germany 137.
Precious and semiprecious stones other than diamond:				
Natural -- kilograms	498	523	28	West Germany 346; Sweden 15.
Synthetic -- do	16,242	8,158	1,402	Republic of Korea 2,095; Poland 1,669; Taiwan 1,595.
Pyrite, unroasted	73	46	--	France 24; Netherlands 22.
Salt and brine	227,719	205,256	31	Netherlands 113,653; France 88,719; West Germany 1,154.
Sodium compounds, n.e.s.: Carbonate, manufactured	9,400	30,080	51	France 11,234; Netherlands 7,857; United Kingdom 5,300.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	495	647	(2)	Netherlands 621; France 21; West Germany 5.
Worked -- do	29	33	(2)	West Germany 18; Netherlands 9; France 4.
Dolomite, chiefly refractory-grade do	1,390	1,238	--	Netherlands 740; France 237; West Germany 224.
Gravel and crushed rock -- do	8,814	8,861	--	Netherlands 5,517; France 2,943; West Germany 400.
Limestone other than dimension do	604	809	--	Netherlands 439; France 215; West Germany 154.
Quartz and quartzite -- do	139	172	--	France 162; West Germany 6; Netherlands 3.
Sand other than metal-bearing do	3,403	3,801	(2)	Netherlands 1,692; France 1,101; West Germany 190.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Sulfur:				
Elemental:				
Crude including native and byproduct	8,787	7,511	--	West Germany 3,680; Nigeria 601; France 588.
Colloidal, precipitated, sublimed	79	213	3	Mexico 84; Venezuela 54; Sudan 18.
Sulfuric acid	160,456	159,551	--	Netherlands 102,984; France 26,168; West Germany 20,601.
Talc, steatite, soapstone, pyrophyllite	38,566	41,241	27	United Kingdom 11,280; West Germany 7,100; Sweden 6,343.
Vermiculite, perlite, chlorite	18,820	17,213	18	France 8,407; United Kingdom 7,488.
Other:				
Crude	308,153	919,126	18	Netherlands 805,374; West Germany 88,913; France 20,733.
Slag and dross, not metal-bearing thousand tons	2,225	2,109	--	West Germany 713; France 664; Netherlands 537.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	105,181	94,446	--	France 65,223; Netherlands 29,219.
Carbon black	5,545	1,516	364	France 431; West Germany 173.
Coal:				
Anthracite thousand tons	120	70	--	United Kingdom 32; France 19.
Bituminous do.	1,099	1,394	--	West Germany 519; France 301; Netherlands 249.
Briquets of anthracite and bituminous coal do.	83	39	--	Netherlands 29; France 5; United Kingdom 3.
Lignite including briquets do.	5	26	--	Netherlands 14; France 8; United Kingdom 3.
Coke and semicoke do.	804	759	--	France 331; West Germany 230; Romania 83.
Gas, natural: Gaseous million cubic feet	3	NA		
Peat including briquets and litter	8,531	18,123	5	France 16,418; Netherlands 1,522; Oman 65.
Petroleum:				
Crude thousand 42-gallon barrels	570	84	--	West Germany 48; Netherlands 24; United Kingdom 12.
Refinery products:				
Liquefied petroleum gas do.	2,547	3,295	331	Netherlands 1,603; West Germany 596.
Gasoline do.	29,520	28,701	4,098	Netherlands 7,491; Switzerland 6,672; West Germany 4,894.
Mineral jelly and wax do.	10	20	(2)	Nigeria 5; Tanzania 3; Netherlands 2.
Kerosene and jet fuel do.	8,001	8,499	75	West Germany 1,911; Netherlands 1,245; bunkers 3,307.
Distillate fuel oil do.	29,042	20,417	--	West Germany 7,383; Netherlands 4,068; France 3,572.
Lubricants do.	2,757	2,557	9	Netherlands 656; West Germany 234; France 182.
Residual fuel oil do.	44,377	32,116	742	United Kingdom 8,011; Netherlands 5,395; bunkers 8,072.
Bitumen and other residues do.	1,399	1,777	--	United Kingdom 724; Netherlands 407; West Germany 357.
Bituminous mixtures do.	89	101	(2)	Netherlands 69; France 11; West Germany 5.
Petroleum coke do.	161	537	(2)	France 278; West Germany 235; Netherlands 20.

[r]Revised. NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.

Table 3.—Belgium-Luxembourg: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	503	895	15	West Germany 839; France 24; Canada 15.
Alkaline-earth metals	96	233	--	France 104; West Germany 52; Netherlands 52.
Aluminum:				
Ore and concentrate	40,536	36,650	--	West Germany 17,609; Guyana 8,825; China 5,712.
Oxides and hydroxides	28,189	27,899	1,882	West Germany 21,418; Netherlands 2,402.
Ash and residue containing aluminum	7,916	16,575	--	France 13,235; West Germany 2,103; United Kingdom 133.
Metal including alloys:				
Scrap	57,981	62,708	3,498	France 18,506; Netherlands 14,694; West Germany 12,445.
Unwrought	311,597	307,868	173	Netherlands 192,780; West Germany 22,747; United Kingdom 19,711.
Semimanufactures	94,007	96,017	398	West Germany 40,814; France 21,696; Netherlands 15,965.
Antimony:				
Ore and concentrate	6,097	5,851	203	Bolivia 1,700; Turkey 1,450; Chile 952.
Oxides	646	811	14	France 591; United Kingdom 127; U.S.S.R. 29.
Metal including alloys, all forms	201	215	--	Netherlands 107; China 77; France 3.
Arsenic: Oxides and acids	34	22	7	France 13; Iraq 1.
Beryllium: Oxides and hydroxides	17	25	--	West Germany 21; United Kingdom 4.
Bismuth: Metal including alloys, all forms	--	23	--	Yugoslavia 22.
Cadmium: Metal including alloys, all forms	1,190	1,174	--	Netherlands 417; Italy 263; France 134.
Cesium and rubidium: Metal including alloys, all forms	2	3	--	All from France.
Chromium:				
Ore and concentrate	4,223	5,231	--	Netherlands 4,853; Republic of South Africa 168; France 138.
Oxides and hydroxides	865	1,026	(2)	West Germany 536; Italy 125; France 102.
Metal including alloys, all forms	232	456	--	West Germany 164; Netherlands 116; United Kingdom 65.
Cobalt:				
Ore and concentrate	1	8	--	All from United Kingdom.
Oxides and hydroxides	30	35	(2)	United Kingdom 18; Finland 11; France 3.
Metal including alloys, all forms	85	81	11	France 30; Sweden 15; West Germany 11.
Columbium and tantalum:				
Ore and concentrate	1,378	1,949	60	Canada 1,838; Australia 30.
Ash and residue containing columbium and/or tantalum	1,108	--		
Metal including alloys, all forms:				
Columbium (niobium)	1	13	--	All from West Germany.
Tantalum	43	21	16	West Germany 4.
Copper:				
Ore and concentrate	2,047	3,315	445	Peru 2,021; Australia 763.
Oxides and hydroxides	135	34	--	Norway 15; West Germany 10.
Sulfate	1,611	1,396	--	Netherlands 1,020; Hungary 154.
Ash and residue containing copper	45,577	70,838	21,165	France 11,151; Brazil 9,232.
Metal including alloys:				
Scrap	115,166	152,480	11,058	France 34,355; United Kingdom 28,023; Netherlands 23,574.
Unwrought	396,725	421,483	4,755	Zaire 212,553; Republic of South Africa 36,993; Sweden 29,477.
Semimanufactures	47,599	46,668	172	West Germany 26,057; France 7,075; Netherlands 5,681.
Gold:				
Waste and sweepings value, thousands	$2,263	$2,467	--	France $1,423; Netherlands $740.
Metal including alloys, unwrought and partly wrought thousand troy ounces	1,987	2,101	NA	Switzerland 1,608; United Kingdom 298.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	19,701	18,997	--	Brazil 4,848; Sweden 3,111; France 3,082.
Pyrite, roasted do	55	1,576	--	France 1,533; West Germany 40.
Metal:				
Scrap do	1,672	1,490	18	West Germany 576; France 522; Netherlands 303.
Pig iron, cast iron, related materials	103,796	124,197	61	France 77,008; West Germany 26,256; Canada 7,923.
Ferroalloys:				
Ferrochromium	44,974	49,686	50	Yugoslavia 12,196; West Germany 8,312; Zimbabwe 5,432.
Ferromanganese	52,460	56,037	1	France 26,393; Norway 18,830; West Germany 6,534.
Ferromolybdenum	298	591	--	Netherlands 212; United Kingdom 184; Austria 115.
Ferronickel	6,322	7,239	514	Brazil 1,756; Colombia 1,478; Dominican Republic 1,230.
Ferrosilicochromium	3,189	3,157	16	West Germany 1,942; Zimbabwe 609; Republic of South Africa 396.
Ferrosilicomanganese	35,439	30,594	15	Norway 20,523; France 4,667.
Ferrosilicon	29,170	30,947	--	West Germany 14,071; Norway 9,216; France 5,171.
Silicon metal	594	559	42	France 433; United Kingdom 43.
Unspecified	4,395	4,030	30	France 2,437; West Germany 822; United Kingdom 269.
Steel, primary forms thousand tons	1,141	1,161	(2)	France 378; West Germany 338; Netherlands 238.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	1,009	916	(2)	France 283; West Germany 233; Netherlands 124.
Universals, plates, sheets do	850	892	(2)	Netherlands 335; West Germany 207; France 162.
Hoop and strip do	132	123	(2)	West Germany 60; France 41; Netherlands 11.
Rails and accessories do	6	7	(2)	France 4; West Germany 2.
Wire do	82	83	(2)	West Germany 46; Netherlands 14; France 11.
Tubes, pipes, fittings do	299	323	1	West Germany 96; Netherlands 60; France 55.
Castings and forgings, rough do	66	58	4	West Germany 22; France 20; Netherlands 7.
Lead:				
Ore and concentrate	67,774	114,697	--	Peru 60,231; Australia 13,921; Greece 12,423.
Oxides	2,056	5,387	(2)	France 3,100; West Germany 2,158; Netherlands 106.
Ash and residue containing lead	69,913	54,903	7,818	United Kingdom 8,873; Italy 2,953.
Metal including alloys:				
Scrap	15,053	11,626	50	Netherlands 5,221; France 2,621; Ireland 1,801.
Unwrought	57,950	49,391	419	United Kingdom 18,251; France 13,830; Mexico 4,863.
Semimanufactures	3,897	3,573	1	United Kingdom 1,526; West Germany 822; France 711.
Lithium: Oxides and hydroxides	156	175	--	West Germany 130; Netherlands 36.
Magnesium: Metal including alloys:				
Scrap	194	438	12	Netherlands 133; Italy 108; United Kingdom 78.
Unwrought	3,304	2,946	337	Italy 1,170; Yugoslavia 471; France 425.
Semimanufactures	646	1,222	126	Italy 436; West Germany 397.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Manganese:				
Ore and concentrate, metallurgical-grade	221,558	230,710	--	Republic of South Africa 81,989; Australia 49,006; Zaire 25,498.
Oxides	637	1,090	47	Japan 324; Netherlands 322; France 126.
Metal including alloys, all forms	2,333	2,096	789	France 934; Netherlands 17.
Mercury 76-pound flasks	9,541	7,534	29	Spain 4,176; Finland 1,740; France 551.
Molybdenum:				
Ore and concentrate	21,952	22,150	4,040	Netherlands 8,347; Canada 3,553.
Oxides and hydroxides	282	39	--	Netherlands 26; West Germany 13.
Metal including alloys:				
Scrap	54	24	--	Austria 12; West Germany 6.
Unwrought	20	11	--	West Germany 10.
Semimanufactures	100	188	3	Netherlands 143; United Kingdom 31; France 4.
Nickel:				
Matte and speiss	2,402	1,669	--	Netherlands 820; West Germany 787.
Oxides and hydroxides	384	142	--	Canada 50; West Germany 42; Netherlands 28.
Ash and residue containing nickel	1,985	2,838	453	West Germany 1,160; Netherlands 329.
Metal including alloys:				
Scrap	601	527	24	Netherlands 286; West Germany 80; Spain 35.
Unwrought	3,050	2,596	226	Netherlands 1,581; West Germany 359.
Semimanufactures	820	1,923	62	West Germany 1,458; Netherlands 156; United Kingdom 138.
Platinum-group metals:				
Waste and sweepings value, thousands	$7,176	$9,886	--	Netherlands $5,831; Algeria $3,172.
Metals including alloys, unwrought and partly wrought troy ounces	67,099	59,989	3,631	United Kingdom 27,332; West Germany 11,335.
Rare-earth metals including alloys, all forms	18	65	--	Austria 30; France 30.
Selenium, elemental	71	168	--	Netherlands 144; United Kingdom 22.
Silicon, high-purity	5	(2)	--	Mainly from Switzerland.
Silver:				
Ore and concentrate[3] value, thousands	$9,040	$29,329	$5,389	Peru $21,799; Canada $2,140.
Waste and sweepings do.	$2,126	$1,275	$113	West Germany $500; France $254; Switzerland $234.
Metal including alloys, unwrought and partly wrought thousand troy ounces	61,756	47,226	22,084	Netherlands 16,726; Greece 3,365.
Tellurium and arsenic, elemental	123	83	--	Sweden 79; France 2; West Germany 2.
Tin:				
Ore and concentrate	2,944	556	--	Argentina 534; Hong Kong 20.
Oxides	11	11	--	Netherlands 8; United Kingdom 3.
Ash and residue containing tin	127	517	1	Netherlands 300; West Germany 109; Peru 40.
Metal including alloys:				
Scrap	172	404	5	France 171; Ireland 165; Netherlands 50.
Unwrought	2,310	3,853	1,155	Denmark 776; Netherlands 775.
Semimanufactures	331	288	1	Netherlands 145; West Germany 64; France 33.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Titanium:				
Ore and concentrate	91,502	122,299	--	Canada 112,341; Norway 9,290.
Oxides	7,080	7,208	107	West Germany 5,457; France 737; Netherlands 375.
Metal including alloys:				
Scrap	197	1,101	649	United Kingdom 209; Canada 201.
Unwrought	80	65	60	France 1.
Semimanufactures	186	147	8	West Germany 33; Italy 25; France 22.
Tungsten:				
Ore and concentrate	(2)	278	--	China 228; Netherlands 49.
Oxides and hydroxides	32	5	--	All from China.
Metal including alloys:				
Scrap	60	102	--	United Kingdom 47; Netherlands 22; France 17.
Unwrought	14	48	--	United Kingdom 33; France 4; West Germany 4.
Semimanufactures	102	113	--	Netherlands 107; West Germany 2.
Uranium and/or thorium:				
Ore and concentrate value, thousands	--	$4	--	China $2; Sweden $2.
Oxides and other compounds do	$413	$647	$282	West Germany $140; France $105.
Metal including alloys, all forms:				
Uranium do	$639	$18	--	All from France.
Thorium do	$16	$1	--	All from Czechoslovakia.
Vanadium:				
Oxides and hydroxides	4,796	4,049	302	China 1,817; Netherlands 859; Republic of South Africa 599.
Ash and residue containing vanadium	13,579	18,091	17	Republic of South Africa 14,678; West Germany 3,372.
Metal including alloys, unwrought	206	350	350	
Zinc:				
Ore and concentrate	577,076	568,469	--	Canada 153,836; France 83,222; Mexico 59,300.
Oxides	12,489	10,553	178	France 3,927; Netherlands 3,463; West Germany 1,220.
Blue powder	393	691	--	Netherlands 281; West Germany 184; France 155.
Matte	4,079	771	--	West Germany 422; France 172; Netherlands 158.
Ash and residue containing zinc	47,066	61,132	7,050	West Germany 25,400; Netherlands 6,808.
Metal including alloys:				
Scrap	9,159	10,081	51	West Germany 4,350; Netherlands 3,365; France 1,617.
Unwrought	49,352	51,547	73	Netherlands 26,809; France 12,450; West Germany 7,176.
Semimanufactures	16,459	18,826	8	France 15,231; West Germany 2,586; Netherlands 882.
Zirconium:				
Ore and concentrate	4,476	5,954	--	Netherlands 4,861; United Kingdom 167.
Metal including alloys:				
Scrap	41	43	--	All from France.
Unwrought	2	3	--	All from West Germany.
Semimanufactures	108	128	--	France 110.
Other:				
Ores and concentrates	121,917	116,555	--	Norway 116,015; West Germany 510.
Oxides and hydroxides	269	849	20	France 591; United Kingdom 131; West Germany 36.
Ashes and residues	19,682	15,468	7,640	Netherlands 432; Spain 327.
Base metals including alloys, all forms	(2)	7	(2)	West Germany 5; United Kingdom 1.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	8,509	7,604	57	West Germany 4,790; Netherlands 1,834; Italy 490.
Artificial:				
Corundum	7,885	8,200	19	France 2,141; West Germany 2,089; Brazil 1,450.
Silicon carbide	4,911	5,532	--	West Germany 3,297; Italy 1,205; Spain 851.
Dust and powder of precious and semiprecious stones including diamond kilograms	3,033	4,524	1,068	Ireland 1,700.
Grinding and polishing wheels and stones	3,629	3,759	97	West Germany 1,037; Italy 595; Netherlands 575.
Asbestos, crude	34,882	25,138	211	Canada 13,347; Italy 2,844; Republic of South Africa 2,511.
Barite and witherite	8,165	8,193	--	West Germany 7,107; France 703; Netherlands 233.
Boron materials:				
Crude natural borates	78,611	40,284	--	Turkey 37,334; Italy 1,814; West Germany 736.
Oxides and acids	2,731	2,649	--	France 1,610; Italy 637; Turkey 254.
Bromine	1,653	1,281	--	Netherlands 823; Israel 319.
Cement	277,653	351,908	33	Netherlands 200,396; West Germany 132,218; France 9,004.
Chalk	170,804	165,853	36	France 142,597; Netherlands 22,158; West Germany 966.
Clays, crude:				
Bentonite	19,873	20,166	12	West Germany 13,753; United Kingdom 2,879.
Chamotte earth	90,695	58,917	2,133	West Germany 36,068; France 15,918.
Fuller's earth	9,470	1,520	50	West Germany 1,205; Netherlands 91.
Kaolin	275,863	297,481	2,974	United Kingdom 128,558; Netherlands 98,657; France 27,693.
Unspecified	135,864	215,362	269	West Germany 176,938; France 13,639; Spain 8,090.
Cryolite and chiolite	72	48	4	Denmark 44.
Diamond:				
Gem, not set or strung thousand carats	40,445	45,517	190	United Kingdom 27,047; Zaire 6,432; Israel 1,325.
Industrial stones do	16,534	18,751	3,346	Ireland 4,294; Zaire 3,972; India 3,348.
Diatomite and other infusorial earth	8,008	8,463	1,720	France 3,885; Netherlands 1,298.
Feldspar, fluorspar, related materials:				
Feldspar	24,778	17,806	--	France 14,345; West Germany 1,814.
Fluorspar	8,310	7,773	--	France 4,687; East Germany 1,019; West Germany 913.
Unspecified	34,879	29,482	--	Norway 26,139.
Fertilizer materials:				
Crude, n.e.s	85,373	111,219	--	Netherlands 101,738; France 4,412; West Germany 2,931.
Manufactured:				
Ammonia	2,846	3,567	4	Netherlands 2,723; West Germany 835.
Nitrogenous thousand tons	545	607	--	West Germany 200; Netherlands 191; France 74.
Phosphatic do	130	207	107	Kuwait 41; Tunisia 15.
Potassic do	1,102	1,137	3	West Germany 602; U.S.S.R. 241; France 94.
Unspecified and mixed do	544	497	136	West Germany 195; France 77.
Graphite, natural	991	827	13	West Germany 737; Japan 40; United Kingdom 18.
Gypsum and plaster	420,528	401,794	255	France 307,674; West Germany 54,790; Netherlands 38,984.
Iodine	194	180	5	Japan 123; France 16; Mexico 16.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Kyanite and related materials	1,655	2,494	91	West Germany 959; Netherlands 840; Republic of South Africa 203.
Lime	107,017	117,065	17	France 82,078; West Germany 27,461; Netherlands 7,458.
Magnesium compounds:				
Magnesite	524	318	--	Netherlands 185; France 56; Austria 13.
Oxides and hydroxides	20,905	19,617	176	United Kingdom 3,700; Netherlands 3,613; Czechoslovakia 3,476.
Other	23,587	21,227	--	West Germany 16,176; East Germany 4,911.
Mica:				
Crude including splittings and waste	4,004	4,561	9	India 2,665; France 931; Madagascar 375.
Worked including agglomerated splittings	24	17	(2)	Switzerland 7; France 5; West Germany 2.
Nitrates, crude	23,709	39,327	--	Chile 39,002; Netherlands 325.
Phosphates, crude thousand tons	2,472	2,482	482	Morocco 1,473; Togo 221.
Phosphorus, elemental	222	244	--	France 131; United Kingdom 101.
Pigments, mineral:				
Natural, crude	183	290	--	Republic of South Africa 116; Spain 72; Cyprus 54.
Iron oxides and hydroxides, processed	8,522	8,031	459	West Germany 6,590; Spain 339.
Potassium salts, crude	32,653	40,155	--	West Germany 24,065; France 9,185; East Germany 6,799.
Precious and semiprecious stones other than diamond:				
Natural kilograms	3,962	15,260	197	West Germany 8,356; Israel 442.
Synthetic do	819	730	281	Ireland 363; Republic of Korea 22.
Pyrite, unroasted	286,067	276,967	--	Spain 195,410; Norway 51,560; Netherlands 24,129.
Salt and brine thousand tons	1,134	1,344	(2)	Netherlands 725; West Germany 501; United Kingdom 34.
Sodium compounds, n.e.s.: Carbonate, manufactured	109,610	106,342	23	West Germany 57,084; France 29,888; Netherlands 18,525.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	264	161	--	West Germany 80; France 39; Portugal 7.
Worked do	103	109	--	France 30; Netherlands 26; Italy 20.
Dolomite, chiefly refractory-grade do	38	52	--	West Germany 27; Netherlands 13; France 12.
Gravel and crushed rock do	5,750	4,667	--	Netherlands 2,524; United Kingdom 964; West Germany 527.
Limestone other than dimension do	226	236	--	United Kingdom 190; France 42; West Germany 3.
Quartz and quartzite do	88	81	(2)	West Germany 66; France 7; Sweden 6.
Sand other than metal-bearing do	8,491	9,756	(2)	Netherlands 8,349; West Germany 890; France 330.
Sulfur:				
Elemental:				
Crude including native and byproduct	535,236	492,263	238,617	Poland 61,371; Netherlands 54,417.
Colloidal, precipitated, sublimed	982	1,352	2	West Germany 693; France 657.
Dioxide	6,322	5,366	--	West Germany 4,568; Netherlands 462; France 335.
Sulfuric acid	557,989	654,344	7,730	West Germany 205,540; France 168,478; Netherlands 118,141.
Talc, steatite, soapstone, pyrophyllite	35,610	58,735	5,213	Australia 17,829; Netherlands 8,909; Spain 8,835.
Vermiculite, perlite, chlorite	79,042	78,340	--	U.S.S.R. 51,311; Greece 11,204; Spain 5,894.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Other:				
Crude thousand tons	1,106	1,231	9	France 651; Spain 233; West Germany 165.
Slag and dross, not metal-bearing	846,375	553,714	--	France 244,879; Netherlands 212,795; West Germany 94,796.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	70,853	77,545	241	France 75,284; West Germany 1,132; Netherlands 740.
Carbon black	44,860	44,078	523	Netherlands 18,193; France 13,131; West Germany 10,912.
Coal:				
Anthracite thousand tons	1,289	1,419	--	West Germany 843; Republic of South Africa 208; Netherlands 129.
Bituminous do	8,074	7,962	3,676	West Germany 1,044; Poland 541.
Briquets of anthracite and bituminous coal do	101	135	--	West Germany 117; France 13; Netherlands 4.
Lignite including briquets do	304	425	--	West Germany 353; East Germany 66; Netherlands 5.
Coke and semicoke do	2,621	2,510	73	West Germany 1,849; Netherlands 350; United Kingdom 104.
Gas, natural, gaseous million cubic feet	325,964	330,241	--	Netherlands 175,785; France 90,362.
Peat including briquets and litter	132,902	140,327	--	Netherlands 90,885; West Germany 34,168; U.S.S.R. 14,188.
Petroleum:				
Crude thousand 42-gallon barrels	131,196	113,067	(2)	United Kingdom 27,796; Nigeria 21,879; Saudi Arabia 10,369.
Refinery products:				
Liquefied petroleum gas do	6,299	7,441	12	Netherlands 3,890; United Kingdom 1,643; West Germany 507.
Gasoline do	23,625	22,390	12	Spain 2,084; Turkey 1,368; unspecified 2,110.
Mineral jelly and wax do	153	134	1	West Germany 71; France 32; Netherlands 20.
Kerosene and jet fuel do	1,455	1,993	3	Netherlands 1,458; United Kingdom 415; France 21.
Distillate fuel oil do	35,096	33,958	--	Netherlands 21,279; U.S.S.R. 8,705; United Kingdom 837.
Lubricants do	3,960	4,054	142	France 1,239; Netherlands 1,065; West Germany 695.
Residual fuel oil do	60,984	50,719	--	Netherlands 17,418; U.S.S.R. 13,381; United Kingdom 2,764.
Bitumen and other residues do	635	803	(2)	Netherlands 271; West Germany 247; France 152.
Bituminous mixtures do	57	72	1	France 37; Netherlands 20; West Germany 9.
Petroleum coke do	1,373	1,923	1,638	Netherlands 126; United Kingdom 77.

NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.
[3]May include other precious metals.

COMMODITY REVIEW

Metals.—*Iron and Steel.*—Belgium remained the world's 17th largest steel producer, although production decreased by almost 9%. Total world output was nearly unchanged from the 1985 level.

CS continued programs aimed at improving competitiveness and reducing losses. The permanent closure of the Charleroi Est steel plant at the Couillet-Montignies complex was completed during the year. The shutdown reduced CS' sintering capacity by 2.75 million tons per year annually, blast furnace capacity by 1.56 million tons per year, LD mill capacity by 1.7 million tons per year, and continuous casting capacity by 1.7 million tons per year.

The company planned to avoid other facility closures by laying off 2,000 to 2,500 employees at its Charleroi and Liège plants in early 1987. It was subsequently announced, however, that the cold-rolling mill at Jemeppe was planned to be phased out before the end of 1988. The Liège cold-rolling facility will be modernized to make up for the capacity lost as a result of the Jemeppe shutdown. A new pickling line and a renovation of the electrical system were planned to enable continuous operation at Liège. The capacity of the Liège plant and the Tilleur cold-rolling mill will be 1.7 million tons annually after the modernization, an equivalent level to the 1986 capacity of all three operations combined. At yearend, CS was reportedly operating at 100% capacity, producing at a rate of 4.5 million tons per year. This represented less than one-half of the 10 million tons produced by CS in 1974.

Forges de Clabecq, Belgium's fourth largest steel producer, unexpectedly closed its Vilvorde coke oven plant in July. Forges de Clabecq reached a 10-year agreement with CS to purchase coke from CS' Carcoke Div. as a means of replacing the coke formerly supplied by the Vilvorde plant.

Laminoirs de Saint Eloi SA (Saint Eloi) expressed interest in buying the billet plant of seamless tubemaker Tubemeuse SA. Tubemeuse had been producing 320,000 to 400,000 tons of billets annually at the plant. Tubemeuse began debt proceedings in October owing to its inability to repay its obligations. Production at all of Tubemeuse's plants was cut by one-third to one-half pending settlement of the situation.

Saint Eloi rerolled about 70,000 tons of imported billets in 1986. The purchase of the billet plant was intended to serve as a source for the company's rebar and merchant bar mill at Thy-le-Chateau. Delays in resolving Tubemeuse's status prevented the sale from being finalized by yearend.

Nonferrous Metals.—MHO continued to implement the $238 million[2] investment plan aimed at the expansion and improvement of facilities and at the implementation of new technologies. Another focus of the program was to reduce the company's dependence on foreign raw materials. To help achieve that goal, MHO invested in a new recycling process to treat large amounts of low-metal-content materials and industrial waste containing rare and precious metals.

At MHO's Olen copper refinery, a new blister anode furnace came into production in June. The continuous-process furnace features highly automated feeding and anode removal. In March, a 1,000-ton-per-year cobalt recovery unit came on-stream at Olen. The plant was designed to process complex materials, such as residues, slag, machined alloys, scrap, and used catalysts containing less than 10% combined nickel and cobalt. Prior to the installation of the unit, the Olen cobalt products division had an annual capacity of 8,400 tons of metallic powders, oxides, and salts.

MHO commissioned two electric slag smelting furnaces during the year at its Hoboken facilities. The Hoboken smelters previously produced about 160,000 tons of slag annually, which was sold in the form of blocks to be used as ballast in construction projects. The new furnaces recovered copper, lead, silver, tin, and zinc from these slags. Reconstruction of the Nos. 3 and 4 blast furnaces was also completed.

Work neared completion on equipment to recover mercury and selenium from roaster stack gases, sulfuric acid production slimes, and metal powder production slimes at the company's Overpelt plant. Development work continued on a new system to allow diversification of the raw material feed for the plant.

At its Balen complex, Vieille-Montagne put into service a zinc-roasting facility to handle 850 tons of concentrate per day; this was the world's largest roasting plant. Construction on the fluidized-bed furnace began in early 1985 and cost a total of $170 million. The facility included the proprietary-design furnace, a heat recovery boiler that produces twice the electricity consumed by the plant, dry and wet gas purification systems, and a sulfuric acid plant.

Industrial Minerals.—*Cement.*—SA des Cimenteries CBR, the largest cement company in Belgium, started production in its new 2,600-ton-per-day dry-process clinker unit at the Antoing plant early in 1986. Tournasis calcareous rock from the Antoing quarry was the primary feed for the clinker plant. The dry process utilizes a heat exchanger to preheat the raw materials prior to calcining. However, the older wet process remained the most common in use in Belgium.

Slate.—Belgium and Luxembourg imported a total of almost 25,000 tons of slate in 1985, with over one-half coming from France. The Federal Republic of Germany, Norway, Portugal, Spain, and the United Kingdom were other major suppliers. Belgian slate production takes place in two regions in the Ardennes, one near Neufchateau and the other between Stroumont and Vielsalm in Liège. Two underground mines and two opencast quarries operated near Neufchateau, and two underground mines and five open pits were in operation in the Stroumont-Vielsalm area.

Mineral Fuels.—Belgium continued to be highly dependent on imported energy, but substantial improvements were made in 1986. The share of petroleum in the total primary energy requirement was reduced to about 37% compared with 60% in 1973 and 41% in 1985. Nuclear power increased its share to over 62% compared with 0.2% in 1973. The Government of Belgium remained an active participant in the energy sector, controlling 70% of the only operating coal company, NV Kempense Steenkolenmijnen (KS); 50% of the gas producing utility, Distrigaz S.A.; and veto power over the electrical utility's production plans.

Coal.—Belgian coal resources are substantial but very expensive to extract. The output of the Campine mines of KS in Limburg Province, the sole producers in 1986, was about one-fourth of the country's peak production of 23 million tons recorded during the 1950's. Long-term contracts with the steel and electrical power industries provided for the purchase of this production. Belgium's consumption was approximately 15.5 million tons with 48% going to the steel industry, 32% to the electrical utilities, 10% to other industrial users, and the remainder to the domestic heating sector. The Government heavily subsidized the domestic production ($962 million in 1985) to meet three major objectives: to enhance the security of the supply, to keep industrial production costs at an acceptable level, and to prevent social disruptions caused by mine closures.

Natural Gas.—Belgium joined France, the Federal Republic of Germany, and the Netherlands in signing a $65 billion agreement to buy natural gas from Den Norske Stats Oljeselskap A/S (Statoil), Norway's state-owned oil company. The deal covered natural gas from the Troll and Sleipner Fields in the northern sector of the North Sea. Deliveries to Zeebrugge were scheduled to begin via an undersea pipeline to be built by Norway in 1993. The agreement called for 700 billion cubic feet of gas to be delivered annually between the years 2000 and 2020. Belgium will not receive any gas for its own use until 2000. Distrigaz agreed to provide the infrastructure necessary to accept the gas and to deliver it to France.

In 1986, construction continued on the liquefied natural gas terminal at Zeebrugge to accommodate deliveries of Algerian gas. Completion was scheduled for 1987. Negotiations with Algeria led to an agreement in principle to reduce the cost and quantity of gas purchased by Distrigaz.

Nuclear Power.—The Doel 41,000-megawatt powerplant was commissioned in April. An identical unit, Tihange 3, was inaugurated in June. The seven operational nuclear powerplants have a combined capacity of 5,454 megawatts. Plans for an eighth station were delayed as a result of public concern following the Chernobyl powerplant accident in the U.S.S.R. All seven Belgian reactors are pressurized water reactors with double containment structures.

Petroleum.—Petrofina SA and the Phillips Petroleum Co. NV, reached an agreement enabling Petrofina to take over Phillips' share in a refinery and petrochemicals plant operated by the joint subsidiary Petrochim SA of Antwerp. After the transaction, Petrofina owned 99.6% of the complex, one of the most important in Europe.

Belgium's refining industry continued to be greatly affected by the drop in Western European demand. Refinery capacity declined 25 million tons in the 10 years from 1977 to 1986. Refinery utilization dropped to about 65% during the year.

LUXEMBOURG

The economy of Luxembourg continued to thrive. Inflation was nearly zero, unemployment dropped to about 1.25%, and GNP growth was estimated at 2.4% in terms of 1980 prices. The overall economic situation was the best among the OECD and EEC countries. Steel production remained Luxembourg's only smokestack industry and accounted for just over 11% of the GNP. The country ranked 30th in world steel production despite its small size.

Minerals and metals were an important part of Luxembourg's foreign trade. In terms of value, metals accounted for about 16% of imports; oil products, about 8%; coke and coal, about 5%; and unrefined minerals, about 3% of total imports. Metals also accounted for 48% of exports. EEC and European Free Trade Association countries provided 94% of imports and received 81% of exports.

Luxembourg was almost entirely dependent on foreign sources of mineral and energy raw materials. France and the Federal Republic of Germany were the most important sources of these commodities. The long-term prospects for coal and iron ore supplies from these countries were extremely bleak because of dwindling reserves.

Arbed SA, Luxembourg's only steel producer, was totally dependent on foreign raw materials. Output was reduced by 6% in 1986. Arbed's production level was somewhat controlled by quotas imposed by the EEC. An overcapacity of 20 million tons in the EEC and the weak market conditions for steel made expansion in this sector highly unlikely. However, continued improvements in efficiency as a result of facility modernization resulted in continuing profitability.

Except for indigenous hydropower, which accounted for less than 1% of total primary energy requirements, Luxembourg was entirely dependent on energy imports. Total energy requirements rose marginally. The steel industry accounted for over 80% of total industrial energy demands and 90% of coal consumption.

[1]Physical scientist, Division of International Minerals.
[2]Where necessary, values have been converted from Belgian francs (BF) to U.S. dollars at the rate of BF44.68 = US$1.00.

Table 4.—Luxembourg: Production of mineral commodities[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
Cement, hydraulic	344	353	340	295	300
Gypsum and anhydrite, crude tons	443	[e]400	450	[e]400	420
Iron and steel: Metal:					
Pig iron (including blast furnace ferroalloys)	2,587	2,316	2,768	[e]2,755	[3]2,652
Steel:					
Crude	3,510	3,294	3,987	3,945	[3]3,705
Semimanufactures	2,945	2,828	3,550	3,878	[3]3,770
Phosphates: Thomas slag, gross weight	572	586	728	701	650
Sand and gravel:					
Foundry sand tons	3,100	--	2,000	1,500	2,000
Other sand except glass sand thousand cubic meters	783	703	140	570	500
Gravel do	203	129	135	80	100
Stone:					
Construction:					
Crushed do	[r]533	[r]785	96	461	450
Dimension:					
Rough cut do	4	12	8	--	5
Facing square meters	974	598	560	245	250
Finished cubic meters	584	623	729	800	750
Flagstone:					
Polished square meters	1,225	1,775	1,260	1,694	1,500
Rough tons	255	299	209	1,830	1,000
Slate slabs thousand pieces	1,199	834	646	683	700
Industrial:					
Dolomite	331	330	350	--	100
Quartzite	24	20	25	7	10

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through May 26, 1987.
[2]In addition to the commodities listed, refractory clays and manufactured phosphatic fertilizers other than Thomas slag are produced, but data are not published, and information is inadequate to make reliable estimates of output levels.
[3]Reported figure.

The Mineral Industry of Bolivia

By Pablo Velasco[1]

In 1986, Bolivia completed its sixth consecutive year of economic recession and experienced the most severe decline in its mining industry. Internally, all export-oriented industries, of which hydrocarbons and mining are the most important, were strongly affected by the difference between the official and the free market peso-U.S. dollar exchange rate. Production and exports of almost all minerals and natural gas were below the level of 1985. Tin output declined 35% and export increased 3.7%, respectively, compared with those of 1985. Externally the collapse of tin prices in October 1985, followed by the sharp decline in petroleum prices in 1986, had devastating effects on the country's mining industry. These events prevented the anticipated recovery of the industry after new economic measures were implemented by the Government in August 1985. Foreign exchange income generated by minerals and hydrocarbons fell once again. Depressed metal prices have made the majority of Bolivia's antimony, tin, and tungsten mines uneconomic, and debased real wages have not compensated for lowered prices in the cost structure of mining. Many mines had closed or were on the verge of closing, and it seemed unlikely that they would reopen in the near future.

To combat the severe economic recession, the Government of Bolivia hoped to receive substantial international support for the economic adjustment program it had been pursuing since July 1985. In June 1986, Bolivia received an addition to its Special Drawing Rights (SDR) of a $57 million standby loan from the International Monetary Fund, which also approved two other loans: A structural adjustment facility for another SDR $42.6 million loan was made available in December 1986, and a compensatory financing facility for $64.1 million was expected to be made available early in January 1987. In addition, the International Development Bank (IDB) approved a $100 million agricultural and agro-industrial credit program that was to be channeled through local banks.

The country's gross domestic product (GDP) declined for the fifth consecutive year. The 2.9% decline from that of 1985 resulted mainly from the collapse in production and exports of the mining sector, owing to the effect of depressed world mineral prices, which resulted in massive layoffs and mine closings. The GDP for agriculture, the single largest sector of the Bolivian economy, dropped 1.9% from that of 1985 after several years of positive growth. The hydrocarbons sector declined 3.9% below that of 1985 as natural gas exports to Argentina were reduced. Sectors registering positive growth included commerce, finance, and transportation. The minerals and hydrocarbons sectors represented over 89% of the total 1986 exports but accounted for only 10.5% of Bolivia's GDP.

Government Policies and Programs.—On August 29, 1985, the Government of Bolivia implemented Supreme Decree No. 21060, a drastic anti-inflationary measure designed to reduce the spiraling inflation that had reached a rate of over 20,000% in 1985. This policy established a floating exchange rate based on daily exchange auctions managed by the Central Bank. The official rate of exchange, which had been grossly over valued, was initially devalued by 93% to 1.05 million pesos to the dollar. The peso reached a low of 2.7 million pesos per dollar in January 1986, but quickly recovered and stabilized at about 1.9 million pesos to the dollar where it remained the

rest of the year.

The Government was planning to introduce a new currency, the Boliviano, on January 1, 1987, to eliminate six zeros from the prevailing exchange rate. In addition to legalizing the parallel exchange market and eliminating all exchange restrictions, the Government program (1) froze public sector wages, (2) raised public enterprises revenues through establishing dollar-denominated prices for their services and putting them on a self-financing basis, (3) required state enterprises to submit a budget and detailed accounts, (4) prepared a public sector budget for the first time in several years, (5) authorized the decentralization of state enterprises, (6) eliminated controls on bank interest rates, (7) authorized banks to offer foreign currency accounts and make foreign currency loans, (8) initiated a comprehensive tax reform, eliminating all price controls, (9) established a uniform 20% tariff on all imports and eliminated tariff exemptions, (10) eliminated all import restrictions (except those related to health or state security), (11) eliminated all export controls except those on dangerous substances, endangered species, and cultural treasures, (12) adjusted mineral royalties to correspond more closely with costs, (13) modified labor laws to permit more flexibility in hiring and firing, and (14) reduced the number of public holidays to 10. A key element of the economic stabilization was a plan to reduce excessive staffing of several major public sector institutions, notably the Corporación Minera de Bolivia (COMIBOL) and the Banco Central de Bolivia (Central Bank).

During the year, COMIBOL, which earlier had employed 40% of the nation's miners, dismissed nearly 20,000 workers and closed numerous mines. The planned restructuring of the Central Bank in early 1987 was expected to reduce the bank's staff by approximately 70%. The Government also dissolved the Corporación Boliviana de Fomento (CBF) and transferred its assets to regional development entities. Custom and tax reforms, including a new value-added tax to be implemented in April 1987, would significantly expand the Government's revenue base from the extremely low levels of 1983-85.

The policy of the present Government is to create an environment in which private individuals and private companies are free to search for ore deposits, to invest in them, and to benefit from the effort and capital expended under tax laws that are equitable for the country, investor, and labor.

PRODUCTION

Tin remained Bolivia's most important mineral commodity although production has declined steadily since 1981. The October 1985 collapse of the world tin market profoundly affected the industry as 1986 production dropped by 35% from that of 1985. COMIBOL produced 4,249 tons of tin or 41% of Bolivia's total, the lowest output in the history of the corporation. Metallic tin production also declined 40% from that of 1985. Bolivia remained the world's largest market economy country producer of antimony with a 14.8% increase in production from that of 1985. The country remained a leading tungsten producer despite a production decline of 27.1% below the 1985 level. Other important minerals produced in Bolivia were gold, lead, silver, and zinc. Silver output declined almost 15% compared with that of 1985. Private and Government sources indicated that gold was produced on an increasing scale; however, the official amount purchased by Banco Minero de Bolivia in 1986 was only 24,531 troy ounces compared with 40,827 troy ounces in 1984. Exports of gold also increased 14.2% over that of 1985 as several new enterprises began gold mining operations. Production of natural gas and liquids (crude oil plus lease condensate) declined 2% and 11.4%, respectively, compared with 1985 output. Domestic consumption of hydrocarbons products remained unchanged during the year as did prices for finished products.

Table 1.—Bolivia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[p]
METALS[3]					
Antimony:					
Mine output, Sb content	13,978	9,951	9,281	8,925	10,243
Metal	1,820	2,001	NA	532	106
Arsenic, mine output, arsenic trioxide, arsenic sulfide	261	107	144	361	32
Bismuth:					
Mine output, Bi content	5	6	3	159	43
Metal	18	--	--	--	--
Cadmium, mine output, Cb content[4]	134	143	124	104	36
Copper, mine output, Cu content	2,270	1,982	1,610	1,665	338
Gold, mine output, Au content[5] troy ounces	40,146	49,217	40,827	[e]30,000	24,531
Iron ore:[6]					
Gross weight[e]	7,832	10,939	256	--	17
Fe content	4,891	7,001	4	--	11
Lead:					
Mine output, Pb content	12,433	11,838	7,448	6,242	3,121
Metal including alloys	236	301	185	231	182
Manganese ore:[6]					
Gross weight[e]	120	61	--	--	61
Mn content	55	28	--	--	28
Silver, mine output, Ag content thousand troy ounces	5,472	6,025	4,560	3,580	3,058
Tin:					
Mine output, Sn content	26,773	25,278	19,911	16,136	10,479
Metal, smelter	19,032	14,164	15,842	12,859	7,673
Tungsten, mine output, W content	2,534	2,449	1,893	1,643	1,198
Zinc, mine output, Zn content	45,667	47,132	37,770	37,110	33,472
INDUSTRIAL MINERALS					
Barite	607	516	984	1,282	129
Calcite	267	165	[e]150	23	300
Cement, hydraulic	[r]324,814	327,300	285,600	379,500	295,200
Feldspar-related minerals: Sodalite	1	--	--	--	--
Gypsum, crude[e]	[7]756	750	700	700	3,000
Salt[e]	10,000	10,000	10,000	10,000	10,000
Sulfur	5,914	3,010	1,878	2,741	4,730
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural:					
Gross million cubic feet	[r]188,198	178,059	173,206	164,118	160,858
Marketable do.	81,115	78,652	78,047	78,255	78,161
Natural gas liquids:					
Natural gasoline thousand 42-gallon barrels	710	728	601	593	540
Liquefied petroleum gas do.	234	509	1,136	1,460	1,406
Petroleum:					
Crude do.	[r]8,918	8,100	7,621	7,245	6,419
Refinery products:					
Gasoline do.	3,562	2,917	2,728	2,784	2,988
Jet fuel do.	531	569	548	573	587
Kerosene do.	699	647	653	578	358
Distillate fuel oil do.	1,701	1,544	1,496	1,489	1,958
Residual fuel oil do.	850	928	727	535	474
Lubricants do.	171	115	74	67	107
Liquefied petroleum gas do.	615	475	1,712	1,788	542
Unspecified do.	1,099	550	20	12	66
Refinery losses[8] do.	77	66	87	8	5
Total do.	9,305	7,811	8,045	7,834	7,085

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

[1]Table includes data available through June 1987.

[2]In addition to the commodities listed, a variety of crude construction materials (clays, crushed and broken stone, dimension stone, and sand and gravel) are produced, but available information is inadequate to make reliable estimates of output levels.

[3]Unless otherwise specified, data represent actual production by Corporación Minera de Bolivia (COMIBOL) and small- and medium-scale mines.

[4]Cadmium contained in zinc concentrates produced by COMIBOL. (Cadmium is not recovered in elemental form in Bolivia.)

[5]Small- and medium-scale mines output sales to Banco Minero de Bolivia (BAMIN) and COMIBOL exports (small- and medium-scale mines cannot legally export gold).

[6]Data represent exports and are regarded as being virtually equal to production.

[7]Reported figure.

[8]Refinery fuel not reported separately, if at all, in recorded data.

TRADE

Bolivia's trade balance deteriorated from a $160.6 million surplus in 1985 to a $58.2 million deficit in 1986. The decline resulted primarily from reduced exports of both minerals and hydrocarbons. Natural gas sales to Argentina dropped 8.2% to $342.2 million compared with those of 1985.

Mineral exports totaled $196.8 million, a decrease of 25.4% compared with those of 1985. These two categories of products represented approximately 89% of total legal exports from the country. Prompted by the establishment of a free market economy in August 1985, officially registered imports increased by 30% over that of 1985 to a total of $601.6 million f.o.b. or $717.5 million c.i.f. The current account deficit widened to $312.7 million. Bolivia continued to import large quantities of contraband, primarily consumer goods such as foodstuffs and electronic equipment. The current account also excludes illegal narcotics exports. Although undetermined, income from these exports could have equaled the total of all other legal exports.

Tin, in concentrate, metal, and alloys, and other exports dropped 44.2% to $104.1 million compared with 1985 exports. Antimony exports of concentrate, trioxide, regulus, and alloys fell 9% from 1985 levels to $14.5 million. Silver exports increased from $10.2 million in 1985 to $27.3 million in 1986. Gold exports increased by 30% over the 1985 level to $7.2 million, tungsten declined 35.4% below that of 1985, and zinc fell 5% below that of 1985 to $28.0 million. Natural gas exports to Argentina decreased slightly in volume and dropped 8.2% in value from 1985 levels to $342.2 million. Only 40% of this amount was paid in cash with the remainder paid in trade credits. A total of 270,000 barrels of condensate valued at $3.8 million were exported by Occidental Boliviana Inc. and Tesoro Bolivian Petroleum Co.

Bolivia has increasingly become more dependent on foreign exchange earnings derived from the sale of hydrocarbons. Tin, the traditional foreign exchange commodity earner, is declining in importance and the future of the hydrocarbons sector will depend heavily upon exports to foreign countries and domestic consumption of natural gas.

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

(Metric tons unless otherwise specified)

Commodity	1985	1986
Antimony:		
Ore and concentrate	6,987	7,308
Trioxides	385	652
Regulus (impure metal)	263	50
Alloys, all forms	114	469
Arsenic: Trioxides and other compounds	361	241
Barite and witherite	1,282	129
Bismuth: Ore and concentrate	--	45
Copper:		
Ore and concentrate	1,245	568
Metal including alloys	(2)	--
Gold: Metal including alloys, unwrought and partly wrought troy ounces	17,164	19,607
Lead:		
Ore and concentrate	1,369	12,886
Metal including alloys	(2)	--
Manganese: Ore and concentrate	--	28
Silver:		
Ore and concentrate thousand troy ounces	1,660	5,055
Metal including alloys	(2)	--
Sulfur, all forms	2,741	4,730
Tin:		
Ore and concentrate	4,434	8,618
Ash and residue containing tin	282	(3)
Metal including alloys, all forms	11,891	8,609
Tungsten: Concentrate (WO_3)	1,644	1,504
Zinc:		
Ore and concentrate	33,941	35,572
Metal including alloys	(2)	--

[1]Table prepared by Harold D. Willis. Table includes partial provisional export data; information on export destinations and on imports was not available at the time of publication.
[2]Revised to zero.
[3]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Antimony.—Bolivia's production of antimony increased 14.8% over that of 1985 to 10,243 tons. Its share of world production recovered slightly but not enough to recover its former leadership over China, which maintained first place in the world ranking of production of antimony. China had increased its output steadily for the last 5 years, and with a currency devaluation in China in 1986, the incentive in that country to flood the market remained strong. Major traders of antimony had foreseen easy availability of material in all forms either directly from China or through intermediaries in Hong Kong. For this reason, the long-term prospects for Bolivia, once the world's major antimony producer, were uncertain. Bolivia's output had been declining for about the same period that China's output had been increasing. The problem with Bolivia's production is almost totally related to the state of the domestic economy. Although ore grades were believed to be holding up well, there was insufficient hard currency to pay for fuel and inputs at the plants. Even more importantly, discrepancies in earlier years between official and black market exchange rates had discouraged delivery of antimony ore to the country's two major processing plants.

Bolivian antimony production was entirely by the private mining sector of which medium-sized mines produced 70.2%, and small-sized mines produced the remaining 29.8%. Empresa Minera Unificada S.A. (EMUSA), with its Chilcobija and Caracota Mines, was by far the largest producer of antimony concentrate, followed by Empresa Minera San Juan Ltda., Churquini Enterprises Inc., and Empresa Minera Hemanos Bernal S.A.

The Vinto smelter (formerly part of Empresa Nacional de Fundiciones) will undergo both administrative and structural changes, which the Government hopes will make it economically viable. A feasibility study on modifying the smelter was expected to be completed by February 1987. The smelter will remain open as long as it is provided with suitable feed. The rehabilitation of the smelter, based on the results of the feasibility study, was scheduled to begin in February 1987.

Gold.—In January 1984, the Government of Bolivia created the National Gold Commission. A year later, the Commission presented its conclusions and drafted legislation to complement a mining code that would regulate all gold operations in Bolivia. At yearend 1986, no action had been taken to implement a national gold policy. The gold program contemplated exploration of the areas near Araras and the Madre de Dios, Madera, and Iténez-Guaporé Rivers along the Bolivian-Brazilian border. It also proposed a well-planned exploration and exploitation program of the well-known gold-producing areas of Tipuani, Guanay, and Mapiri in the La Paz Department. Instead, COMIBOL exploration work was limited to short field visits, and in the traditional gold-producing areas, concessions were given in an irregular way to a large number of mining cooperatives. Twenty-year operational contracts were included with these concessions, but they did not contain established mining development plans for exploiting them. Government officials expected their new gold program to increase gold production during the next 5 years to approximately 707,300 troy ounces per year.

COMIBOL selected four areas on the river banks of the Araras, Perseverancia, Cachuela Riberon, and Cachuela Esperanza Rivers for future work. This project was also known as the "San Antonio del Rio" gold project and covered 608,000 hectares. Preliminary study in these areas indicated that a production of 335,000 troy ounces of gold per year could be obtained with a capital investment of $10 million. COMIBOL submitted a petition for legal approval of another 1.3 million hectares in the areas of Chorolque, Huayna Potosí, Illampu, Illimani, Madidi, Manupiri, Omasuyos, and San Simon.

The main source of gold production in Bolivia continued to be the 78 gold mining cooperatives operating in the areas of Guanay, Huayti, Mapiri, Teoponte, and Tipuani (120 kilometers north of La Paz). These cooperatives had 21,000 hectares of concessions and had requested 53,000 additional hectares. The 78 cooperatives had over 2,500 members and 10,000 temporary workers known as "barranquilleros." The gold output from this group in 1986 was about 61% of the country's total, and the remainder was produced by medium-sized mines.

The Regional Federation of gold mining

cooperatives established an educational center to give technical assistance and training to gold miners in the promotion, development, and exploitation of gold resources.

In the medium-sized mining sector, Inti Raymi S.A., a 50-50 joint venture operation between the U.S. company Westworld of Texas and EMUSA, had become the largest private gold producer in Bolivia. Full mining operation began in 1983 at its open pit mine, La Joya, near the city of Oruro. The operation used cyanide heap leaching to extract the gold and silver from the ore. The leached solution was then transported by pipeline to a Merrill-Crow zinc precipitation concentrator 3.5 kilometers from the mine. Currently, Inti Raymi has a $3 million guaranteed loan from the U.S. Overseas Private Investment Corp. and also is seeking partners to exploit other parts of its goldfield concession.

Compañía Minera del Sur S.A. (COMSUR) was another important private concern from the medium-sized sector that operated dredging equipment at Teoponte with an average monthly gold production of 193 troy ounces. In November 1985, COMSUR signed a contract with Corporación de Las Fuerzas Armadas para el Desarrollo Nacional to start dredging in the Mapiri River across from the town of Guanay. The dredge was moved to its new location in June 1986.

Lead, Silver, and Zinc.—Production of lead, silver, and zinc continued the downward trend that began in 1983, and output for 1986 was down 50%, 14.6%, and 9.9%, respectively, compared with those of 1985.

COMIBOL continued to be the largest lead producer in the country with 60% of the total output. The medium-sized mines produced 6%, and the small mines produced 34%. The production of silver, mainly as a byproduct of tin and lead, fell 14.6% compared with that of 1985. COMIBOL accounted for 43% of the total production; the medium-sized mines, 37%; and the small mines, 20%.

One of the several controversial projects of the new administration in the Bolivian mining industry was the tender for the Bolivar polymetallic project. Bids were originally called for in 1984 and then offered to the Argentine-Finnish consortium Indemi Trading Interandina S.A. The contract was awarded by the former Bolivian Government in September 1985 but was then canceled by the new administration. The Government based its actions on the introduction of special regulations that replaced an earlier public tender and on a purchasing decree. Mining officials indicated that the original project offer, based on feasibility studies, was $54.4 million. Later, this cost was inflated to $86.7 million. To reduce overall costs on the project, it was decided that COMIBOL could build the Poopo-Bolivar road link, and construct the tailings dam and the transporting system for zinc-silver concentrates from the mine to the Poopo railhead.

However, the Government was reluctant to put up the necessary capital to fund the rest of the project. The opposition argued that the project was a first priority for the country as a whole and should be undertaken at any cost. The project aims to produce lead, silver, tin, and zinc ores with a plant capacity of 750 tons per day. The annual production of lead-silver concentrates would be 9,000 tons grading 28.4% lead, 75,000 tons of zinc-silver concentrates grading 50% zinc, and 41,000 tons of tin preconcentrates grading 4%. The Ministry of Mines and Metallurgy had had to face fierce arguments from opposition members in the Chamber of Deputies over the cancellation of the project.

COMIBOL and the Japanese International Cooperation Agency (JICA) signed an agreement to continue exploration drilling and underground development in San Antonio de Lipez in order to increase proven reserves in the complex lead-silver-zinc deposit of Mesaverde, the Quechisla area of the Potosí Department in southern Bolivia. The exploration program, known as Proyecto Los Lipez, was designed with the purpose of increasing the availability of lead for the Karachipampa smelter. The new drilling program was planned for August to November 1987 and was to consist of diamond drilling up to 900 meters and the opening of 200 meters of drifts. JICA was to invest $2 million in the project and COMIBOL was to provide the technical staff and drilling equipment and do the underground prospecting. The Karachipampa smelter, which had yet to begin operation, was originally scheduled to start production in July 1984. A large part of the delay was caused by workers' strikes (8 months since 1982), delays in construction (5 months), and other problems. The 1983 water shortage in Potosí also caused further delays.

Later postponements were due to a shortage of ore feed and a lack of operational capital. The biggest problem still remaining

is the future lead ore feed supply. Assuming an average lead production of 10,000 tons of lead concentrate per year based on the years 1981-86, 10,000 tons of concentrate would be needed whenever the plant began operation. To provide this feed, COMIBOL, the new owner since August 1985, had been stockpiling some lead concentrates. It was estimated by mining officials that by year-end 1986, the Karachipampa smelter would have 9,000 tons of lead-silver concentrates in stock.

The current Minister of Mines announced that some of the 400 Karachipampa employees that were laid off in 1985 would be recalled in June 1987 when operations were scheduled to be fully on-stream. The Minister indicated that one of the integral elements in the Government's strategy of rehabilitating COMIBOL involved making Karachipampa fully operational with the aid of $25 million in startup capital from various international organizations. The shortfall in lead concentrate feed would have to be imported from two Argentine mines: the Aguilar Mine in Argentina, which produces high lead and low silver content concentrates, and the Pirquitas Mine, which produces tin with a high silver content. These concentrates were to be mixed together to improve the quality of products.

Tin.—Among the world's leading tin-producing countries, Bolivia was the hardest hit by the collapse of the world tin market in late 1985. However, even before the crisis, the Bolivian tin industry was in serious financial trouble because the state-controlled COMIBOL organization, in charge of most of the Nation's tin output, was losing over $200 million per year. Bolivia's tin crisis was not only attributable to political instability, low levels of industrial efficiency, and a traditionally militant mining industry work force, but an equally important factor was that Bolivia's tin mines consisted of both old and underground low-grade ore deposits, resulting in extremely high unit mining costs. Long before the crisis, when tin prices were at historic record-high levels and most of the world's tin industry was making a profit, the Bolivian miners were asking for higher prices. But when Bolivia was unable to sway other members of the International Tin Producers Association to their view, they refused to join the Sixth International Tin Agreement. National tin output fell 35.1% from that of 1985 to 10,479 tons, and COMIBOL, which contributed 40.6% of the total output, incurred losses of $246 million. The contributions of the small- and medium-sized mines were 28% and 31% of the total, respectively, compared with 15% and 23% in 1985.

Prior to the tin crisis, the Government of Bolivia had drawn up a plan to decentralize COMIBOL. The plan involved dividing the state corporation into four holding companies covering mining operations in northern, southern, eastern, and western Bolivia, plus an administrative office in La Paz. This reorganization project was delayed as mining officials attempted to implement short-term emergency measures to cope with the collapse in the price of tin, which accounted for 70% of total mineral production. COMIBOL's rehabilitation plan ended the 1986 fiscal year with an employment reduction of mine workers from 27,500 to about 12,500 employees. The reduction objective, according to Government officials, was to bring the number of employees in the nationalized mines down to less than 6,000, because at this level of employment COMIBOL might have a hope of breaking even. However, COMIBOL's major remaining problem was the large administrative staff in the headquarters offices of La Paz and Oruro.

The Government's second official objective was to create an organization that could be managed by cost center accounting and that would actually be able to show profits, an event that might be possible when COMIBOL's restructuring takes place. In 1986, COMIBOL received financial support both from the Bolivian Treasury and international organizations in order to implement the rehabilitation plan.

COMIBOL was considering and assessing the financial recommendations and suggestions made by a West German consultant, Stolberg Ingenieurberatung GmbH, whose report was optimistic in its assessment of the viability of future projects for COMIBOL mines and that indicated that the unprofitable state mines could be made productive again.

The Bolivian Mine Workers Federation was skeptical about such plans and was more concerned with obtaining better wages for those miners remaining in the nationalized mines. The relocation of the remaining mine workers had already cost the Government more than $67 million in social welfare payments and extra legal costs, and it expected to spend a further $9 million in monthly redundancy payments.

According to the Mining Minister, 11,500 miners and families had already been relocated to tropical areas of the Departments of Beni and La Paz to colonize agro-industrial zones. Relocation was not welcomed by many miners who were reluctant to leave the areas, employment, and climate familiar to them for a new life in another part of Bolivia. Some refused to be moved and asked the Government to grant them leases to the mineral-rich areas near their homes in the Department of Potosí. The United Nations also intended to cooperate in Bolivian plans to reactivate the Catavi and Siglo XX Mines, planning to adapt the existing facilities into workshops for agricultural tools and machinery. Meanwhile, the Government made its final offer on severance pay for workers who were made redundant in COMIBOL's mines after August 1986. The package included a special bonus of 1 to 3 billion Bolivian pesos ($500 to $1,500), a 1-year unemployment compensation of $40 per month in addition to 3 months severance pay, and access to free medical facilities for a year.

COMIBOL planned a modification of its Vinto tin smelting complex as a last effort to bring the unit to profitability. The program, part of a $120 million rescue plan for the state-owned mining and smelting company, was to be carried out by the Federal Republic of Germany consultants, Klöckner Humboldt-Deutz AG, who sent a team of engineers to Bolivia in November 1986.

The Vinto complex, operating at only 25% capacity in 1986, consisted of a 20,000-ton-per-year high-grade smelter and a 10,000-ton-per-year low-grade tin smelter. With international tin prices still at historically record-low levels, the low-grade tin unit was effectively out of action as mines were attempting to produce higher grade ores and concentrates. The aim of the modification was to convert Vinto into a small smelter that would be an integral part of the plan to help Bolivia's tin mines survive the present crisis. In addition to the modification, it was hoped that a cost savings would be made by converting the plant's power base from fuel oil to natural gas.

Tungsten.—Tin was not the only mineral commodity to have suffered from unusually low international prices that forced closures and a complete restructuring of the Bolivian mining sector. National tungsten output fell 27.1% from that of 1985 to 1,198 tons of metal content. COMIBOL's output dropped 86.5% from that of 1985. The production of medium-sized mines decreased 30.9% from that of 1985, and the output of small-sized mines increased 27.5% over that of 1985. Extremely low international prices forced the closing of 7 out of the country's 10 mines. COMIBOL, which officially ceased production of tungsten in December 1985, registered a negligible output of about 61 tons of tungsten in 1986.

International Mining Co. (IMCO), the country's largest private sector tungsten producer in 1986, recorded an output of 413,000 tons of tungsten and 415,000 tons of tin concentrate. IMCO's Chojlla Mine, part of the Estalsa Group, was closed for 2 weeks in November, but pressure from the 400 mine workers laid off as a result led IMCO officials to reopen the mine even though operational costs were about $72 per ton, considerably higher than the current market price of about $45 per ton. IMCO officials had to close the Chambillaya, Enramada, and Lilia Mines for similar reasons in 1985.

Empresa Minera San José de Berque remained the third largest tungsten producer with its Esmoraca, Española, La Argentina, and Pueblo Viejo mining groups in Sud Chichas, Potosí Department.

Chicote Grande of Churquini Enterprises Inc. (owned by the U.S. firm Anschutz Mining Corp.) did not continue mine development or expand its 150-ton-per-day concentrator pilot plant as originally announced in 1984. However, limited exploitation of the mine was expected to cotinue until market conditions improved.

The General Services Administration auctions from the U.S. Government tungsten stockpile continued to be of great concern to the Bolivian Tungsten Producers Association in 1986, and available surplus material for future disposals added to the concern about the possibilities of future market disruptions.

INDUSTRIAL MINERALS

Cement.—Production of cement in Bolivia decreased 22.3% compared with that of 1985. The 60,000-ton-per-year El Puente cement plant in the Mendez Province of the Tarija Department was completed at the end of 1985, but operation did not begin for lack of a fuel source. Yacimientos Petrolíferos Fiscales Bolivianos (YPFB), the state-owned oil company, completed the installation of a natural gas pipeline in mid-1986. The plant was owned by the Regional Development Corp. of Tarija and was built

by a U.S.-French consortium, GATX-Fuller S.A., and CGEE Alsthon S.A. for $19 million. Besides the new El Puente cement plant, Bolivia had three other cement plants operating at less than their production capacity because of the severe economic recession: Compañía Boliviana de Cementos S.A.M., in Cochabamba, had a production capacity of 100,000 tons of cement per year, and contributed 36.5% of the total national output. Fabrica Nacional de Cementos S.A. cement plant in Sucre Department provided 41.1%, and Sociedad Boliviana de Cemento S.A. cement facility in La Paz Department, produced the remaining 22.4%. Domestic consumption of cement reached 269,000 tons, which was almost the entire national production.

The 200,000-ton-per-year Sevarayo cement plant project, in the south of the Oruro Department was to have been built jointly by the Regional Development Corps. of Oruro and Potosí and at a revised cost of $56 million but was postponed owing to current financial difficulties. The 345,000-ton-per-year Yacuses cement plant project in Santa Cruz Department was being planned by the Regional Development Corp. of Santa Cruz. Construction was scheduled to start in 1987.

Lithium and Potassium.—Other nontraditional mining resources that might prove more attractive for development in a more favorable Bolivian economic climate are the lithium-rich brines of the Salar de Uyuni. These brines contain, according to U.S. evaluators, 110 million tons of potassium grading 25 grams per liter, 3.2 million tons of boron grading over 3,000 milligrams per liter, and 5.5 million tons of lithium grading over 4,000 milligrams per liter.

The Salar de Uyuni contains 40% of the lithium in brines in the world; the Bolivian brines are richer than those currently being worked in California, although less attractive than those of the Salar de Atacama in neighboring Chile, whose development was the subject of negotiations. Two U.S. companies interested in exploiting the Salar de Uyuni—Lithium Corp. of America of Houston, Texas, and Foote Mineral Co. of Exton, Pennsylvania—were still awaiting the Government's international bid call to start full negotiations. A third consortium—formed by S. J. Groves of the United States, COMINCO Ltd. of Canada, and the Bolivian mining company Compañía Minera del Sur S.A.—also expressed its interest in the project.

Industria Minera Tierra Ltda. from Bolivia put forward plans to install a pilot plant for exploitation, on an experimental basis, of the lithium deposit in the Salar de Uyuni in Potosí. Initial investment would be about $1 million, and the company asked the Government agency Complejo Industrial de los Recursos Evaporíticos del Salar de Uyuni (CIRESU) for the concession to install the experimental plant and to market the production of lithium carbonate. CIRESU was preparing a bid package for a call for international tender to exploit the estimated 5.5 million tons of lithium resources in the Salar de Uyuni. Foreign investment was being sought for the project.

MINERAL FUELS

Natural Gas.—Production of natural gas declined slightly from that of 1985 and 14.6% compared with 1982 levels. The declining trend in natural gas production started in 1983 and was due to the natural decline in gas reserves from some gasfields of Occidental, Tesoro, and YPFB. Argentina continued to be Bolivia's sole foreign customer for natural gas.

Exports to Argentina decreased slightly to 78.2 billion cubic feet of natural gas compared with those of 1985. Revenues from natural gas exported to Argentina decreased slightly to $342.2 million compared with those of 1985. The reduction in revenues was due to the price reduction agreement made between Bolivia and Argentina in April 1986. Argentina wanted to reduce imports of natural gas from Bolivia by 30% owing to new discoveries of natural gas in northern Argentina. Therefore, Argentina wanted to negotiate a new gas price by mid-1987.

Of the total natural gas produced in Bolivia, 48.6% was exported to Argentina, 5.2% was consumed internally, 36.5% was reinjected into the gasfields, 3.4% was vented or flared, 3.6% was consumed as fuel by YPFB, and the remainder was consumed in miscellaneous uses. Domestic consumption of natural gas continued to be minimal at 8.2 million cubic feet, 16.7% over that of 1985. The major consumers of natural gas in 1986 were the City of Santa Cruz, the National Electrical Power Co., and the cement plants. Future increases in domestic consumption were expected on completion of the new gas pipeline to the altiplano in late 1988. Protexa S.A. of Mexico was awarded the contract for the construction of the 457-kilometer, 10 3/4-inch pipeline.

When completed, the pipeline will transport 52 million cubic feet per day of natural gas. The cost of the construction was estimated at $98.6 million. This project has IDB financial support up to $69 million with the balance to be covered by YPFB.

A proposal for a gas pipeline from Santa Cruz, Bolivia, through Corumba to São Paulo, Brazil, was studied up to the basic engineering stage, but no further work was done in 1986. Eventual decisions to proceed with the project will depend on the results of current Bolivian-Brazilian negotiations, which have been slow. Subsidiaries of two large U.S. oil firms, Occidental and Tesoro, have operations in Bolivia. Both of these firms were negotiating new operational contracts for their current exploitation areas and possible new exploration tracts.

Petroleum.—Production of crude oil and condensate declined by 11.5% to 6.4 million barrels compared with 1984 output. The total average daily production continued the downward trend begun in 1977 to 17,587 barrels compared with 19,849 barrels in 1985. The decrease in production was due to reduction in output from both YPFB and some of the contractor's oilfields because of natural depletion of some of the traditional oilfields, such as Camiri and Monteagudo, where secondary recovery methods were being used to increase their output.

In May 1986, Bolivia exported 270,000 barrels of petroleum to the Port of Arica for subsequent sale to a petroleum broker at $12.40 per barrel. This was the first petroleum exported since May 1984. The petroleum was produced by the Occidental and Tesoro petroleum companies. The export was made possible by a drop in domestic demand rather than additional production in the fields. However, Bolivia expected to begin exporting about 3,000 barrels of crude oil per day in August 1987. Exports by Occidental and Tesoro were credited to the company's own account and were not included in Bolivian trade statistics. The future export possibilities were the result of a modest new crude oil discovery made 10 kilometers north of Villamontes in an exploration tract previously held by Tesoro. Tesoro voluntarily returned the concession to YPFB early in 1986. The new oilfield was discovered by an X-1 wildcat hole spudded in mid-November 1986 at a depth between 2,590 and 2,614 meters. Reserves were estimated at 30 million barrels of over 50% API gravity crude oil. Expected production for early May 1987 was 1,200 barrels per day, and after the drilling of eight more wells, production was expected to peak at 3,000 to 4,000 barrels per day.

YPFB's 1986 liquid production—crude oil plus condensates—was about 17,000 barrels per day, and Bolivia's total liquids production was about 20,500 barrels per day, including production by Occidental and Tesoro. Bolivia's domestic consumption in 1986 was 19,000 to 20,000 barrels per day of which 60% was covered by condensates and only 40% by crude oil production.

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The Mineral Industry of Botswana

By Thomas O. Glover[1]

The value of minerals produced in Botswana in 1986 exceeded the 1985 value by 20.8% in terms of the pula, the local currency; however, in terms of the U.S. dollar, the value rose 14.5%. Average rates of exchange for the pula fell from 1.76 pula to 1.86 pula per dollar from 1985 to 1986.

Botswana's economy was one of the fastest growing economies in Africa. Its gross domestic product (GDP) per capita in 1986 was approximately $950.[2] Real GDP growth rates in Botswana were among the fastest in the developing world, averaging about 13% in real terms since independence. The expansion of mining, especially of diamonds, was the major stimulus to Botswana's rapid growth. The increase in revenues from diamond exports led to a substantial improvement in the country's balance-of-payment position. The increase in diamond export receipts more than offset the impact of continuing drought on the cattle industry.

Constraints of significance facing the economy were heavy reliance on mineral exports, an oversupply of unskilled workers, and a shortage of skilled workers. Attempts were made by the Government to overcome its overdependence on minerals. Industrial complexes were built and investment incentives were offered to external corporations. Botswana's current economic strength was heavily dependent on diamond revenues.

Botswana's currency reserves, estimated at $1.1 billion in late 1986, covered approximately 24 months of foreign trade. These large reserves were essential, owing to volatility of the diamond market, which had sales approaching $600 million in 1986. The new development plan for the years 1986-91 showed a shift of emphasis in overall development strategy. The focus was switched from large-scale projects, where no new mineral developments were scheduled, to investment in transport, industry, and the agricultural rural areas.

U.S. investments in Botswana were few in 1986; however, two U.S. mining firms were insured by U.S. Overseas Private Investment Corp. One of these was Botswana BRST Ltd., part owner of a copper-nickel mine, and the other was Phelps Dodge International Corp. of Africa, which was to develop a gold mine in the country.

Botswana's budget was approximately $644 million. The country's resources came from diamond (54.7% of budget) and mining taxes (9.2% of budget). Infrastructure, particularly railroads and power, was to receive a major part of the budget. A $4 million contract was awarded to a consortium consisting of BBC Brown Boverie Zimbabwe (Private) Ltd., Brown Boverie Canada Inc., and Powerline Central Africa of Zimbabwe for the interconnection of electric power between southern Zambia and northern Botswana. The project was one of many power interconnection programs estimated to cost more than $64 million over the next 5 years. Botswana had been slated to take over the operation of the National Railway of Zimbabwe line passing through Botswana in 1987; however, late in 1986, the project was indefinitely shelved.

PRODUCTION AND TRADE

The value of mineral production in Botswana increased by approximately $85 million in 1986 compared with that of 1985. The major production increases were in coal, diamond, gold, sand and gravel, and stone. Coal production increased by 14.3% with the value increasing 11.1% from $8.02 per ton in 1985 to $8.91 per ton in 1986. The production of diamond increased by 3.7% compared with that of 1985. The value of diamond increased by 17.8%. The $90.3 million raise in diamond values was attributed to more diamonds being classified in the gem category. Diamonds that in previous years were sold as industrial diamond were processed by developing countries in 1986 as gem diamond. Gold and silver production, even though small by world standards, doubled. Construction materials—sand and gravel and stone—were mined at a considerably increased rate. The production of copper-nickel matte remained approximately the same as that of 1985.

Botswana encouraged U.S. trade and in 1985 sent its first trade mission to the United States. As a member of the Southern African Customs Union, Botswana served over 36 million people duty free. Similarly, as a signatory to the Lome III Convention, Botswana had duty-free access to the European Economic Community for many of its products. The United States also permitted many of Botswana's products to enter duty free.

Table 1.—Botswana: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[p]
Coal, not further described	414,778	395,127	392,851	437,053	499,400
Cobalt, Co content of nickel-copper (smelter product)[2 3]	254	223	259	222	162
Copper:					
Mine output, Cu content[4]	21,161	24,411	25,868	26,134	22,858
Cu content of nickel-copper (smelter product)[3]	18,375	20,261	21,471	21,692	21,337
Diamond:					
Gem[e] thousand carats	1,165	4,829	5,778	[r]6,318	9,600
Industrial stones[e] do.	6,604	5,902	7,104	6,317	3,500
Total do.	7,769	10,731	12,882	12,635	13,100
Gem stones, semiprecious, rough, not further described kilograms	[r]1	NA	37	14	5
Gold do.	13	11	[e]15	[e]11	[e]2
Nickel:					
Mine output, Ni content[4]	20,669	21,431	21,887	23,018	25,102
Ni content of nickel-copper (smelter product)[3]	17,756	18,216	18,604	19,565	18,972
Nickel-copper matte, gross weight	45,685	48,083	51,845	51,507	51,507
Sand and gravel cubic meters	NA	NA	188,498	102,524	129,181
Silver kilograms	3	2	[e]3	[e]2	[e]4
Stone, crushed, not further described cubic meters	NA	NA	436,604	132,966	177,792

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

[1]Table includes data available through May 13, 1987.

[2]Figures approximate recoverable mine output and have been used in world production tables appearing in volume I of the "Minerals Yearbook."

[3]Smelter product was a combination of matte and pellets in 1982 and 1983, and all pellets in 1984, 1985, and 1986.

[4]Analytic content of ore milled.

COMMODITY REVIEW

METALS

Cobalt-Copper-Nickel.—In eastern Botswana near Francistown, copper-nickel matte was produced from the sulfide ore mined at the Selebi and Phikwe Mines. The sulfide ore was put through the smelter near the mines where the matte was produced in pellet form for export to Norway and Zimbabwe. Matte production was the same in 1986 as that of 1985; however, the value was 10.5% less owing to low metal prices. Approximately 45% of the matte pellets was assigned to the Falconbridge Nikkelverk A/S refinery at Kristiansand, Norway, and 55% of the pellets was assigned to Rio Tinto (Zimbabwe) Ltd.'s Eiffel Flats refinery in Zimbabwe.

Operations at the Selebi and Phikwe Mines and the smelter were satisfactory in 1986; however, the unit costs rose by 4% during the year. Cobalt production decreased by 27%, falling to 162 tons from 222 tons in 1985. AMAX Inc. was paid $11.1 million for releasing Bamangwato Concessions Ltd. (BCL) from a pellet contract cancellation that occurred in 1985. AMAX, however, retained 29.8% of Botswana Roan Selection Trust Ltd., the parent company of BCL. With no improvement in metal prices, the company's financial position further declined in 1986. In the light of the company's huge accumulated losses, BCL deemed it unlikely that dividends on company securities would be paid.

Platinum.—Gold Fields of South Africa Ltd. (GFSA) and Southern Prospecting International Ltd. (SPIL) conducted extensive exploration activities for platinum in Botswana during 1986. The area under study by GFSA and SPIL encompassed approximately 2.2 million acres and was located 87 miles southwest of Gaborone, the capital. The duration of exploratory drilling was uncertain, and any mine development was several years off.

INDUSTRIAL MINERALS

Diamond.—Even though gains in production were posted for the year, Botswana moved from second place to third place among world diamond producers in 1986. Australia and Zaire were in first and second place, while the former third-place country, the U.S.S.R., dropped to fourth. The country also fell from first place to second place as a gem diamond producer behind Australia. Botswana produced 13.1 million carats, of which 9.6 million was gem and 3.5 million was industrial. Gem diamond rose by 52% over the production in 1985 owing to the sales of near-gem diamond as gem and not as industrial diamond. Developing countries were making gems out of near gems that were previously sold as industrial.

DeBeers Co.'s marketing arm, the Central Selling Organization (CSO), raised the price of uncut diamonds for the gem market by an average of 17.4%. The increase was the first in 3 years. Industrial diamonds were not affected by the price rise.

The Government of Botswana was reportedly seeking to sell some uncut gem diamonds outside the CSO, since its sales agreement with the CSO had expired in 1985. The sales agreement had not been signed by the latter part of 1986. Botswana's estimated $500 million stockpile had stopped growing.

A new diamond-cutting operation was started. The operation, operated by Belgian diamond cutters, employed local workers on a per-piece basis. Botswana produced approximately $595.5 million of gem-quality diamond that accounted for approximately 89% of the total value of all minerals produced.

Soda Ash.—British Petroleum Co. PLC (BP) planned a $200 million, 300,000-ton-per-year soda ash operation at Lake Makgadikgadi (Sua Pan) in Botswana. BP was seeking investors for the project that was scheduled to produce soda ash, potash, and table salt. The project required the construction of a soda ash refinery at Sua Pan, a packaging factory at Francistown, 25 miles of primary roads, buildings for a hospital and staff, and training for 200 to 300 midlevel managers. BP also applied for an extension of its exploration rights on the project.

MINERAL FUELS

Coal.—Botswana's only operating coal mine was the Morupule open pit mine. Situated near Palapye, operations commenced in 1973. Even though the mine was originally intended to supply steam coal to BCL's nickel-copper smelter at Selebi-Phikwe, the Morupule powerplant consumed 65% of the 499,400 tons produced in 1986. Production of coal increased by 14.3% when compared with 1985 production with

values increasing by 11%. The value of coal at the mine was $8.91 per ton.

A new 90-megawatt powerplant was scheduled to be completed in 1986; however, at yearend, it was still under construction. The plant, near the Morupule Mine, was scheduled to consume over 425,000 tons of coal per year when fully operational.

Petroleum.—A unit of the state-owned Petro-Canada International Assistance Corp. agreed to conduct an onshore exploration project in Botswana. A $9.6 million seismic survey was planned by Petro-Canada of Ottawa, Canada. Petro-Canada's 1-year project in Botswana called for acquisition, processing, and interpretation of as many as 559 line miles of conventional reflection and refraction seismic data. The survey was scheduled to take place in three deep sedimentary basins in the western and northwestern sections of Botswana. Botswana had no crude oil production in 1986.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Botswana pula (P) to U.S. dollars at the rate of P1=US$0.5388.

The Mineral Industry of Brazil

By H. Robert Ensminger[1]

In 1986, the mining sector had a rate of growth of 3.6% compared with 11.5% in 1985 and 30.5% in 1984. The Government imposed a domestic price freeze, and the lower export prices affected company performance. Many of the state-operated companies bore the brunt of Government controls on expenditures and investments, which were influenced by high interest rates. The gross domestic product (GDP) for 1986 was $269 billion.[2] This represented real growth of 8% of the GDP over that of 1985. As a result of the Cruzado Plan, the inflation rate declined by 158% to approximately 75%.

A cooperative agreement between the Cia. Siderúrgica Belgo-Mineira steel company of Brazil, the Paraguayan steel company, Aceros del Paraguay S.A. (Acepar), and Paul Wurth do Brasil was signed in January. The agreement was to supply the equipment and to assist in setting up a charcoal blast furnace. Production is to begin in 1987. Acepar's initial production was originally scheduled for yearend 1984.

Early in the year, two commissions from China visited Cia. Vale do Rio Doce (CVRD) to discuss the possibility of forming a Brazil-China enterprise for the production of iron ore, and the establishment of a private company with CVRD for the production of approximately 300,000 tons per year of cast iron.

West German companies operating in Brazil disclosed plans to invest $5 billion, more than their total investments to date, by 1990. In 1986, there were 1,700 companies of West German origin operating in Brazil. The $5 billion will be invested primarily by the top 15 West German capital companies, which include several mineral companies.

Some major U.S. mineral companies planned total or partial disinvestment in the Brazilian minerals industry in 1986. The M. A. Hanna Co. was negotiating to sell its 34.2% share of the Minerações Brasileiras Reunidas S.A. (MBR) iron ore mining operation to Cia. Auxiliar de Empresas de Mineração (CAEMI). The U.S. companies' retreat from iron ore mining in Brazil was begun in 1976 by United States Steel Corp. (USX Corp.), which discovered the Carajás iron ore deposits in 1967.

At yearend 1986, the Government of Brazil gave full backing to the new north-south railway project designed to link the Carajás iron ore export Ports of Itaqui and Ponta de Madeira in Maranhão State with the Tubarao steel export port at Vitoria, Espirito Santo State. The new public-private joint company managing the project was Ferrovia Norte S.A. Participants in the scheme are CVRD and the national railway company Rede Ferroviario Federal S.A.. The project was being financed by the International Bank for Reconstruction and Development and the Banco Nacional de Desenvolvimento Económico e Social, the national economic development bank.

Government Policies and Programs.—Faced with the threat of power shortages, the Government began drawing up plans for nationwide electricity rationing. The plan would go into effect if the means of production, transformation, and distribution of energy fail to meet the country's needs.

The Brazilian state mineral exploration entity, Cia. de Pesquisa de Recursos Minerais (CPRM), continued to conduct coal exploration activities in the Department of Moatize, Mozambique. CPRM and the Mozambican Economy Ministry were negotiat-

ing a $9.5 million line of credit to finance the exploration project, which is to define reserves and establish the country's coal export potential.

Mining companies holding concessions in Brazil were warned by the Ministry of Mines and Energy to work them or lose them. The Ministry stated that groups holding a large number of concessions would find them canceled automatically unless they carried out prospecting and development work within the 2-year period (plus extension) currently allowed by law. The warning was addressed principally to foreign companies that comprised four of the six groups holding the largest number of concessions.

The Government of Brazil was considering measures to restrict the participation of foreign companies in mining ventures that involved minerals deemed to be of strategic importance to the country. The minerals that were considered were those that occur abundantly in Brazil, but not in other countries, and those upon which Brazil is import dependent.

The Planning Ministry set a deadline of mid-1987 for the privatization of the pig iron producer Cimetal Siderúrgia S.A. and the steel producers Acos Finos Piratini, Cia. Ferro e Aco Vitoria, Cia. Siderúrgica de Mogi das Cruzes, Usina Siderúrgica da Bahía S.A., and Usinas Siderúrgicas de Minas Gerais S.A.

PRODUCTION

In 1986, the most important mineral commodities produced in Brazil, from the domestic consumption and export aspects, were aluminum, bauxite, cement, ferroalloys, gold, iron ore, manganese, petroleum and natural gas, pig iron, phosphate rock, steel, and tin. Other important mineral commodities were coal (steam), columbium, gem stones, nickel, potash, and titanium.

Iron ore products for export and domestic consumption achieved record-high levels in 1986. As in 1985, Brazil again was the largest iron ore producer and exporter of the market economy countries. With the recent exploitation of the huge Carajás mineral deposits, Brazil was the world's fastest growing manganese ore producer. Gold output was estimated to have been 2.2 million troy ounces. Official figures were lower than this, as it was difficult to obtain accurate records of the garimpeiros (prospectors) production from the many alluvial sources, and the large Serra Pelada open pit mine.

Hoping to increase production to 780,000 barrels per day by 1989, the Ministry of Mines and Energy announced a further expansion of the Petróleo Brasileiro S.A. (PETROBRÁS) exploration and production budget from $2.31 billion in 1986 to $2.86 billion in 1987.

In 1986, the Metalur Ltda. group inaugurated an effort to make Brazil a leading producer of magnesium metal. Approval was obtained by its Cia. Brasileira do Magnesio (BRASMAG) subsidiary to increase its production to 35,000 tons annually by 1988. This would make BRASMAG the largest magnesium producer in the world using the silico-thermic process, and the third largest producing company in the world. Brazil's magnesium production in 1986 was 4,500 tons.

Table 1.—Brazil: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum:					
Bauxite, dry basis, gross weight	4,186,500	5,238,700	6,433,100	6,251,000	[3]6,544,000
Alumina	606,177	786,648	891,300	1,100,000	[3]1,196,800
Metal:					
Primary	299,054	400,744	454,999	549,830	[3]757,584
Secondary	46,280	43,016	48,946	44,828	[3]47,971
Beryllium: Beryl concentrate, gross weight	1,135	943	1,407	877	[3]907
Cadmium: Metal, primary	73	189	225	124	[3]136
Chromium:					
Crude ore	668,000	468,737	709,000	780,000	780,000
Concentrate	158,500	110,978	128,910	130,696	[3]135,000
Marketable product[4]	275,500	155,022	255,914	[e]275,000	285,000

See footnotes at end of table.

Table 1.—Brazil: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS —Continued					
Columbium-tantalum ores and concentrates, gross weight:					
Columbite and tantalite	201	264	170	180	180
Djalmaite concentrate	4	7	10	10	10
Pyrochlore concentrate	19,593	19,663	16,247	[e]32,000	[3]17,267
Copper:					
Mine output, Cu content	24,482	[r]32,077	35,212	41,000	[3]40,000
Metal, secondary	57,000	39,920	36,000	49,000	[3]50,000
Gold:[e 5]					
Mine output troy ounces	260,421	NA	NA	[r]700,000	300,000
Garimpeiros (prospectors) do	1,186,361	NA	NA	[r]1,300,000	1,900,000
Total do	1,446,782	1,750,000	[3]1,768,305	2,000,000	2,200,000
Iron and steel:					
Ore and concentrate, (marketable product):[4]					
Gross weight thousand tons	93,159	88,716	112,133	128,251	[3]128,800
Fe content do	61,035	57,980	72,900	[r e]87,200	87,600
Metal:					
Pig iron[6] do	10,827	12,945	17,200	18,970	[3]20,350
Ferroalloys, electric-furnace:					
Chromium metal	6	7	123	124	[3]138
Ferroboron	--	--	11	29	[3]35
Ferrocalcium silicon	9,657	7,400	17,755	22,179	[3]23,715
Ferrochromium	96,646	77,326	125,125	127,288	[3]109,392
Ferrochromium-silicon	2,598	5,526	7,628	8,875	[3]9,512
Ferrocolumbium	11,506	9,665	16,522	17,676	[3]17,391
Ferromanganese	120,743	103,271	106,459	134,835	[3]164,093
Ferromolybdenum	337	126	437	509	[3]511
Ferronickel	10,597	25,991	30,000	9,399	[3]9,600
Ferrophosphorus	22	1,211	926	1,281	[3]1,461
Ferrosilicon	115,314	156,683	157,873	187,246	[3]220,711
Ferrosilicon magnesium	11,275	10,698	15,429	14,876	[3]13,053
Ferrosilicon zirconium	503	85	244	421	[3]852
Ferrotitanium	430	166	551	1,372	[3]755
Ferrotungsten	74	228	239	218	[3]173
Ferrovanadium	238	102	456	905	[3]439
Inoculant	1,393	1,400	1,992	1,748	[3]3,244
Silicomanganese	172,358	167,333	185,631	180,271	[3]177,568
Silicon metal	17,921	20,602	26,783	29,477	[3]37,077
Total	571,618	587,820	694,184	738,729	[3]789,720
Steel, crude, excluding castings thousand tons	11,642	12,486	16,680	18,557	[3]20,014
Semimanufactures, flat and nonflat do	12,999	14,660	18,385	20,457	[3]21,234
Lead:					
Mine output, Pb content	19,360	18,821	16,692	20,712	[3]17,384
Metal:					
Primary	21,943	20,581	25,965	29,811	[3]32,718
Secondary	26,322	28,939	45,656	51,764	[3]52,728
Manganese ore and concentrate, marketable, gross weight[4]	2,340,979	2,091,631	2,457,063	2,320,109	[3]2,400,000
Nickel:					
Mine output, Ni content	14,451	15,561	23,532	20,300	[3]13,465
Ferronickel, Ni content	3,471	8,314	9,187	9,407	13,000
Rare-earth metals: Monazite concentrate, gross weight	1,814	5,256	3,622	1,895	1,947
Silver[7] thousand troy ounces	[r]1,808	[r]1,772	2,275	3,018	3,500
Tin:					
Mine output, Sn content	8,218	13,275	19,957	26,514	[3]27,400
Metal, smelter, primary	9,298	12,950	18,877	24,701	[3]24,427
Titanium concentrates, gross weight:					
Ilmenite	11,322	30,452	40,945	76,354	[3]75,472
Rutile	234	463	412	713	[3]495
Tungsten, mine output, W content	1,524	1,026	1,037	1,090	[3]875
Zinc:					
Concentrate and salable ore	596,971	662,126	573,260	673,166	650,000
Mine output, Zn content	[r]110,600	[r]118,600	113,691	123,811	[3]123,942
Metal, smelter:					
Primary	95,528	99,913	106,927	116,136	[3]129,659
Secondary	14,400	11,045	7,522	4,601	[3]5,936
Zirconium: Zircon concentrate, gross weight[8]	4,966	[r]7,431	6,375	21,039	[3]13,351

See footnotes at end of table.

Table 1.—Brazil: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
INDUSTRIAL MINERALS					
Asbestos:					
Crude ore	2,092,087	2,090,472	1,889,326	2,254,922	1,800,000
Fiber	145,998	158,855	134,788	165,446	[3]204,460
Barite:					
Crude	98,931	69,341	101,301	83,817	[3]102,708
Beneficiated	122,219	100,106	104,920	125,957	[3]108,328
Marketable product[4]	140,243	127,039	143,173	142,575	150,000
Calcite	72,507	48,993	48,915	56,798	50,000
Cement, hydraulic thousand tons	25,644	20,870	19,741	20,612	[3]25,297
Clays:					
Bentonite	164,060	128,691	201,025	236,021	[3]206,021
Kaolin:					
Crude	1,243,520	1,241,252	1,569,063	2,156,787	[3]2,196,256
Beneficiated	493,186	420,120	486,359	524,182	[3]533,800
Marketable product[4]	600,632	501,706	596,688	655,205	650,000
Other:					
Crude thousand tons	22,160	21,784	22,477	[e]23,000	25,000
Beneficiated do	1,442	1,034	984	[e]1,000	1,000
Diamond:[e]					
Gem thousand carats	80	80	200	[3]233	[3]310
Industrial do	450	450	550	[3]217	[3]315
Total[9] do	530	530	750	[3]450	[3]625
Diatomite:					
Crude	106,581	22,431	9,069	24,387	35,000
Beneficiated	13,131	[r]14,310	16,029	17,463	[3]19,601
Marketable product[4]	13,146	8,678	7,721	12,731	15,000
Feldspar and related materials:					
Feldspar, marketable product[4]	131,853	111,837	105,491	110,150	120,000
Leucite, marketable product[4]	209	3,588	3,680	2,567	3,000
Sodalite, crude, marketable product	644	845	1,214	1,077	1,200
Total	132,706	116,270	110,385	113,794	124,200
Fluorspar:					
Crude	201,971	239,522	368,130	276,623	300,000
Concentrates, marketable product:					
Acid-grade	32,000	[r]43,943	44,341	42,681	[3]53,560
Metallurgical-grade	19,000	[r]26,685	31,369	29,714	[3]31,720
Total	51,000	[r]70,628	75,710	72,395	[3]85,280
Graphite:					
Crude	359,991	442,810	290,007	191,823	200,000
Marketable product:					
Direct-shipping crude ore	6,131	11,138	2,633	16,425	16,000
Concentrate	15,413	16,498	30,047	27,239	31,000
Total	21,544	27,636	32,680	43,664	47,000
Gypsum and anhydrite, crude	680,800	555,907	493,732	560,007	[3]705,140
Kyanite:					
Crude	1,076	735	1,587	2,800	3,000
Marketable product[4]	423	526	1,290	2,350	2,500
Lime, hydrated and quicklime[e] thousand tons	5,000	5,000	[r]4,584	[r]4,767	[3]4,909
Lithium mineral concentrates:					
Amblygonite	66	113	49	118	150
Lepidolite	74	1	--	--	--
Petalite	2,293	1,892	477	1,323	850
Spodumene	341	116	288	107	500
Total	2,774	2,122	814	1,548	1,500
Magnesite:					
Crude	505,385	486,374	724,280	623,330	650,000
Beneficiated	225,533	231,000	321,643	260,754	250,000
Mica, all grades[10]	878	3,595	4,007	2,881	[3]2,200
Nitrogen: N content of ammonia	503,200	738,100	873,800	944,900	1,000,000

See footnotes at end of table.

Table 1.—Brazil: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
INDUSTRIAL MINERALS —Continued					
Phosphate rock including apatite:					
Crude:					
Mine product thousand tons	25,070	19,898	22,704	23,698	27,000
Of which, sold directly do	7,395	32	29	23	35
Concentrate:					
Gross weight do	2,767	3,208	3,798	4,148	[3]4,509
P_2O_5 content do	476	575	666	684	694
Pigments, mineral: Other, crude	5,272	3,820	4,254	[e]4,500	4,500
Precious and semiprecious stones except diamond, crude and worked:[10]					
Agate kilograms	1,038,287	966,095	1,671,287	2,067,267	2,000,000
Amethyst do	195,502	244,269	336,341	472,652	475,000
Aquamarine do	24,479	4,727	10,238	17,012	17,000
Cat's-eye do	NA	2	220	([11])	--
Citrine do	29,760	30,572	30,244	63,077	65,000
Emerald do	7,646	9,640	6,259	5,133	5,000
Garnet do	16	241	313	([11])	--
Opal do	46	48	679	334	650
Ruby value	NA	$17,868	$17,455	$29,440	NA
Sapphire do	NA	$9,814	$14,613	$31,767	NA
Topaz kilograms	3,631	3,822	440	6,567	6,500
Tourmaline do	2,669	12,498	5,577	12,659	12,000
Turquoise value	--	$1,051	([11])	([11])	--
Other kilograms	188,674	620,796	544,593	633,639	650,000
Quartz crystal, all grades	7,421	9,681	4,727	7,612	[3]3,936
Salt:					
Marine thousand tons	2,888	3,259	3,578	1,734	[3]1,600
Rock do	836	928	950	955	[3]600
Silica (silex)	7,978	2,200	1,479	2,024	2,500
Sodium compounds:					
Caustic soda	760,000	875,000	950,000	[e]950,000	975,000
Soda ash, manufactured (barilla)	199,000	210,000	215,000	179,000	225,000
Stone, sand and gravel:					
Dimension stone:					
Marble, rough-cut cubic meters	122,114	141,280	174,531	232,797	235,000
Slate	4,411	98,009	60,801	45,779	60,000
Crushed and broken stone:					
Basalt cubic meters	329,564	153,733	484,302	491,000	500,000
Calcareous shells	1,328,960	1,214,171	994,545	883,282	1,000,000
Dolomite thousand tons	1,954	1,714	1,917	2,208	2,400
Gneiss cubic meters	249,798	190,563	376,001	363,421	375,000
Granite thousand cubic meters	43,720	35,261	38,815	38,817	40,000
Limestone thousand tons	49,027	44,918	34,831	36,329	[3]42,652
Quartz[12]	67,527	83,590	109,964	113,282	115,000
Quartzite:					
Crude	636,797	250,352	235,314	268,560	275,000
Processed	102,826	93,246	100,825	169,120	170,000
Sand thousand cubic meters	40,088	24,450	24,957	[e]30,000	30,000
Sulfur:					
Frasch thousand tons	--	1	1	2	2
Pyrites do	54	55	55	60	65
Byproduct:					
Metallurgy do	30	150	150	165	160
Petroleum do	100	110	110	120	135
Total do	184	316	316	347	362
Talc and related materials:					
Talc, marketable product[4]	328,644	326,145	348,915	343,647	[3]370,700
Pyrophyllite, marketable product[4]	76,624	70,318	64,432	43,401	50,000
Other: Agalmatolite, marketable product	63,068	42,967	86,268	102,461	105,000
Vermiculite:					
Crude	43,316	42,337	49,890	41,455	50,000
Marketable product[4]	14,059	9,877	9,157	9,291	[3]13,138
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous, marketable[4] thousand tons	5,835	6,935	7,752	7,934	[3]7,554
Coke, metallurgical, all types do	960	1,247	1,315	1,396	[3]1,416
Gas, natural: Marketed million cubic feet	989	141,700	173,119	193,008	[3]199,841
Natural gas liquids thousand 42-gallon barrels	2,950	4,015	5,475	[e]6,500	[3]4,586
Petroleum:					
Crude do	94,738	120,378	168,788	205,500	[3]217,175
Refinery products:					
Gasoline do	74,539	64,300	69,999	[e]75,000	79,500
Jet fuel do	19,975	17,600	18,000	[e]20,000	21,200
Kerosene do	4,024	4,500	5,000	[e]5,500	5,800

See footnotes at end of table.

Table 1.—Brazil: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum —Continued					
Refinery products —Continued					
Distillate fuel oil thousand 42-gallon barrels	122,105	113,900	126,784	[e]140,000	148,400
Residual fuel oil ---do---	89,397	80,300	90,000	[e]100,000	106,000
Lubricants ---do---	4,801	4,800	5,500	[e]6,000	6,400
Other ---do---	NA	NA	NA	[e]70,000	74,200
Refinery fuel and losses ---do---	NA	NA	NA	[e]12,000	12,700
Total ---do---	NA	NA	NA	[e]428,500	454,200

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

[1]Table includes data available through Oct. 1987.

[2]In addition to the commodities listed, bismuth, molybdenite, and uranium oxide are produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Direct sales and beneficiated.

[5]Officially reported figures are as follows, in troy ounces: major mines: 1982—148,408; 1983—199,206; 1984—213,963; 1985—267,623; and 1986—not available. Small mines (garimpos): 1982—671,982; 1983—1,526,775; 1984—982,623; 1985—698,475; and 1986—not available.

[6]Includes sponge iron as follows, in thousand metric tons: 1982—226 (estimated); 1983—255 (estimated); 1984—246 (estimated); 1985—285; and 1986—295.

[7]Partially revised officially reported output; of total production, the following quantities are identified as placer silver (the balance being silver content of other ores and concentrates), in thousand troy ounces: 1982—748; 1983—486; 1984—829; 1985—1,572; and 1986—not available.

[8]Includes baddeleyite-caldasite.

[9]Figures represent officially reported output plus official Brazilian estimates of output by nonreporting miners.

[10]Exports.

[11]Revised to zero.

[12]Apparently includes crude quartz used to produce quartz crystal (listed separately in this table) as well as additional quantities of common quartz.

TRADE

The drafting of the new Brazilian constitution, which began in 1986, will have an important impact on the environment for foreign investment and trade. Among the various economic areas affected are mining and oil exploration and development.

A 1986 arrangement with Saudi Arabia to trade 100,000 Volkswagen automobiles for petroleum remained incomplete by yearend because of Brazil's inability to deliver the automobiles owing to the shortage of spare parts. At yearend, Brazil and Argentina signed a number of bilateral trade agreements. Mining was one of the sectors that was to benefit from this new era of cooperation and collaboration. The two countries are to promote the formation of joint mining ventures integrated by a minimum of 30% capital from both Brazil and Argentina with the aim of encouraging mining investment projects. Other projects include a joint technical and advisory service, which would exploit any idle mineral exploration capacity and purchase new high-technology equipment that could not be justified as a unilateral expense. Under the new agreement, Brazil would supply, among other products, drilling equipment and parts and gold processing plants in return for Argentine explosives, reagents, and general spare parts.

At yearend, Brazil and China signed an agreement in which Brazil agreed to import 3 million tons of petroleum and 300,000 tons of coking coal in exchange for sales of aluminum, iron ore, and steel products. An accord was proposed by Australia to increase its exports of coal to Brazil from 10% of total production at present to 35%.

Metalmin S.A., Brazil's largest producer and trader of mining equipment, signed an agreement with U.S. and West German equipment producers to acquire technology to supply Brazil's booming minerals industry and to boost exports. In other discussions, Metalmin was negotiating technology trades with Atlas Bower Corp., the largest manufacturer of mining explosives in the United States, and Eickhoff Maschinenfabrik, one of the largest producers of coal mining equipment in the Federal Republic of Germany.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate thousand tons	4,247	3,317	640	Canada 1,450; Venezuela 1,083.
Oxides and hydroxides	43,213	94,214	73,529	Norway 14,000; Argentina 5,493.
Metal including alloys:				
Unwrought	147,923	179,130	42,271	China 48,961; Netherlands 29,992.
Semimanufactures	47,378	30,063	5,466	Saudi Arabia 4,816; India 4,790.
Antimony: Metal including alloys, all forms	5	--		
Beryllium: Ore and concentrate	1,021	878	878	
Cadmium: Metal including alloys, all forms	33	--		
Chromium:				
Ore and concentrate	2	6	--	All to Uruguay.
Oxides and hydroxides	101	30	--	Chile 20; Ecuador 5; Uruguay 5.
Metal including alloys, all forms	--	22	--	All to Netherlands.
Cobalt:				
Oxides and hydroxides	--	1	--	Mainly to Ecuador.
Metal including alloys, all forms	97	35	--	Netherlands 31; United Kingdom 4.
Columbium and tantalum: Ore and concentrate	255	270	100	Japan 133; Netherlands 23.
Copper:				
Ore and concentrate	20,124	--		
Matte and speiss including cement copper	981	433	--	All to Italy.
Metal including alloys:				
Unwrought	342	199	54	Netherlands 126; Canada 18.
Semimanufactures	34,552	19,626	13,573	Canada 1,309; Hong Kong 1,107.
Iron and steel:				
Iron ore and concentrate including roasted pyrite thousand tons	r90,294	94,218	2,546	Japan 28,851; West Germany 15,780; Italy 5,626.
Metal:				
Scrap	500	1	--	All to Angola.
Pig iron, cast iron, related materials	3,069,126	2,481,375	115,041	China 1,518,890; Japan 156,825.
Ferroalloys:				
Ferroaluminum	90	80	80	
Ferrochromium	53,880	60,285	16,700	Japan 31,870; Netherlands 11,000.
Ferrocolumbium	13,771	14,324	3,448	Netherlands 3,334; Japan 2,705.
Ferromanganese	21,302	33,594	12,467	Venezuela 15,300; Colombia 3,030.
Ferromolybdenum kilograms	100	--		
Ferronickel	11,175	9,871	--	West Germany 6,468; Netherlands 1,911; Finland 1,471.
Ferrosilicomanganese	100,388	65,327	14,946	Japan 42,513; Venezuela 2,000.
Ferrosilicon	89,874	127,371	34,068	Japan 71,897; West Germany 7,514.
Ferrotungsten	61	--		
Silicon	17,268	22,541	11,636	Japan 9,207; Venezuela 304.
Unspecified	13,401	11,612	8,180	Australia 913; West Germany 791.
Steel, primary forms	1,445,316	NA		
Semimanufactures:				
Bars, rods, angles, shapes, sections	2,137,603	NA		
Universals, plates, sheets	2,720,856	NA		
Hoop and strip	115,200	NA		
Rails and accessories	236	NA		
Wire	54,364	NA		
Tubes, pipes, fittings	676,776	NA		
Castings and forgings, rough	8,855	NA		
Lead:				
Ore and concentrate	--	21	21	
Metal including alloys:				
Unwrought	(2)	1,174	--	Poland 600; Turkey 501; Republic of South Africa 53.
Semimanufactures	7	5	--	Mainly to Angola.
Lithium: Ore and concentrate	--	18	--	All to Japan.
Magnesium: Metal including alloys, semimanufactures kilograms	4	149	--	Mainly to Ecuador.
Manganese:				
Ore and concentrate, metallurgical-grade	878,976	901,201	63,375	United Kingdom 225,726; West Germany 112,246; Belgium-Luxembourg 95,957.
Oxides	3,991	2,415	506	Argentina 619; Colombia 566.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Molybdenum: Metal including alloys, semimanufactures ____ kilograms__	59	70	50	Uruguay 20.
Nickel:				
Oxides and hydroxides ____	1	3	__	All to Ecuador.
Metal including alloys:				
Unwrought ____	381	42	__	Argentina 40; Uruguay 2.
Semimanufactures ____	51	15	(2)	Argentina 9; Mexico 4; Peru 1.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, platinum ____ troy ounces__	161	1	__	All to Chile.
Silver: Metal including alloys, unwrought and partly wrought ____ do____	122,108	4,051	__	West Germany 1,608; Costa Rica 804; Chile 772.
Tin:				
Oxides ____	(2)	7	__	Spain 4; Italy 2; Japan 1.
Metal including alloys:				
Unwrought ____	14,602	20,041	10,837	Netherlands 7,337; Argentina 489.
Semimanufactures ____	3	11	__	United Kingdom 10; Uruguay 1.
Titanium:				
Ore and concentrate ____	2,002	2,832	2,832	
Oxides ____ kilograms__	450	1,590	__	Argentina 1,500; Chile 90.
Metal including alloys, all forms ___	3	(2)	(2)	
Tungsten:				
Ore and concentrate ____	970	513	196	Netherlands 160; Sweden 98.
Metal including alloys, unwrought __	__	3	__	Mainly to Mexico.
Zinc:				
Oxides ____	37	12	__	Chile 10; Nigeria 2.
Blue powder ____	3	__		
Metal including alloys:				
Unwrought ____	20	__		
Semimanufactures ____	14	16	__	Mainly to West Germany.
Other:				
Ores and concentrates ____	r1,277	__		
Oxides and hydroxides ____	701	784	339	U.S.S.R. 200; West Germany 122.
Ashes and residues ____	26,257	28,097	105	Spain 16,808; Belgium-Luxembourg 8,774; Netherlands 1,364.
Base metals including alloys, all forms	11	7	1	Japan 3; Netherlands 3.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc ____	15	5	__	Paraguay 2; Singapore 2; Bolivia 1.
Artificial:				
Corundum ____	29,362	32,402	6,463	Japan 6,385; Argentina 3,535.
Silicon carbide ____	5,854	8,378	600	Japan 6,536; Colombia 209.
Grinding and polishing wheels and stones ____	1,094	1,286	480	Chile 208; Singapore 70.
Asbestos, crude ____	19,716	23,248	__	India 8,940; Mexico 4,720; Argentina 2,581.
Barite and witherite ____	12,717	7,303	__	Venezuela 6,050; Paraguay 1,253.
Boron materials:				
Crude natural borates ____	(2)	5	__	All to Italy.
Oxides and acids ____	(2)	15	15	
Cement ____	102,365	160,644	1,182	Paraguay 134,335; India 12,000; Bolivia 9,121.
Chalk ____	235	133	__	Uruguay 132; Congo 1.
Clays, crude:				
Bentonite ____	99	12	__	Uruguay 10; Venezuela 2.
Chamotte earth ____	79	35	__	All to Argentina.
Fuller's earth ____	__	35	__	All to Paraguay.
Kaolin ____	195,830	196,402	__	Belgium-Luxembourg 78,148; Japan 68,052; Italy 41,000.
Unspecified ____	988	1,483	__	Uruguay 1,320; Argentina 81; Paraguay 73.
Diamond:				
Gem, not set or strung ____ carats__	21,200	1,625	385	Switzerland 560; Belgium-Luxembourg 455.
Industrial stones ____ do____	35	__		
Dust and powder ____ do____	1,955	__		
Diatomite and other infusorial earth ___	18	23	__	Nigeria 12; Uruguay 11.
Feldspar ____	2	5	__	Mainly to West Germany.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Fertilizer materials:				
Crude, n.e.s	135	1	--	All to Bolivia.
Manufactured:				
Ammonia	42,525	33,861	--	Lesotho 18,832; Spain 14,786; Bolivia 62.
Nitrogenous	16,393	7,392	--	Uruguay 4,931; Argentina 1,820; Paraguay 526.
Phosphatic	9,153	1,175	--	Paraguay 985; Peru 90; Argentina 60.
Potassic	865	2,522	--	Argentina 1,030; Uruguay 990; Paraguay 500.
Unspecified and mixed	27,835	24,319	--	Paraguay 21,959; Uruguay 1,198; Bolivia 1,162.
Fluorspar	1,012	--		
Graphite, natural	5,082	8,725	5,423	Italy 1,545; Republic of South Africa 788.
Gypsum and plaster	30	122	--	Paraguay 112; Angola 10.
Kyanite and related materials	18	344	--	Italy 315; Finland 18; Argentina 11.
Lime	2,149	2,767	--	Paraguay 2,526; Republic of South Africa 192; Bolivia 49.
Magnesium compounds:				
Magnesite, crude	--	12	--	Argentina 7; Colombia 5.
Oxides and hydroxides	97,215	84,127	2,868	Poland 37,200; Venezuela 15,010; Argentina 14,849.
Other	r66	47	--	Argentina 33; Uruguay 13; Peru 1.
Mica:				
Crude including splittings and waste	3,265	931	1	United Kingdom 900; West Germany 20; Uruguay 10.
Worked including agglomerated splittings, kilograms	500	598	--	Uruguay 500; Switzerland 98.
Phosphates, crude	--	42	--	All to Bolivia.
Pigments, mineral: Iron oxides and hydroxides, processed	500	1,139	392	Japan 439; Paraguay 81.
Precious and semiprecious stones other than diamond:				
Natural, crude, value, thousands	$57,065	$22,074	$7,965	Japan $4,777; West Germany $2,780.
Synthetic, do.	$373	$13	--	All to Japan.
Salt and brine	384,114	144,581	34,400	Nigeria 86,810; Uruguay 17,102.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	192	294	78	Canada 110; Argentina 44.
Sulfate, manufactured	(2)	4	--	Uruguay 3; Paraguay 1.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	144,990	179,538	1,200	Italy 132,047; Japan 17,944; West Germany 3,905.
Worked	10,854	13,075	8,010	Japan 2,666; Paraguay 495.
Dolomite, chiefly refractory-grade	586	434	--	Argentina 264; Uruguay 155; Colombia 15.
Gravel and crushed rock	6,901	29	--	All to Bolivia.
Limestone other than dimension	3,000	1,608	--	Paraguay 1,583; Uruguay 25.
Quartz and quartzite	5,691	9,080	60	West Germany 2,883; Japan 2,793; Italy 1,172.
Sand other than metal-bearing	4,177	1,913	--	Argentina 1,433; Colombia 451; Paraguay 16.
Sulfur:				
Elemental, all forms	319	25	--	Uruguay 19; Paraguay 6.
Sulfuric acid	151	140	--	Bolivia 131; Iraq 5; Paraguay 4.
Talc, steatite, soapstone, pyrophyllite	3,142	4,135	113	Venezuela 1,957; Nigeria 1,700.
Vermiculite	1,136	137	--	Australia 108; Denmark 19; Chile 10.
Other:				
Crude	108	286	70	Paraguay 124; Bolivia 37.
Slag and dross, not metal-bearing	r402	548	--	Argentina 500; United Kingdom 38; Netherlands 10.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,047	--		
Carbon black	1,503	448	--	Uruguay 359; Argentina 70; Chile 18.
Coal:				
Anthracite	600	153	--	Argentina 100; Paraguay 53.
All grades	--	42,195	--	All to Denmark.
Coke and semicoke	54	89	--	Uruguay 84; Paraguay 5.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	482	465	(2)	Argentina 210; Suriname 145; Paraguay 110.
Gasoline do	r26,320	29,961	13,575	Nigeria 13,599; Zaire 723.
Mineral jelly and wax do	366	163	90	Mexico 31; Nigeria 16.
Kerosene and jet fuel do	r8,968	5,834	302	Nigeria 3,029; Zaire 1,153; Senegal 430.
Distillate fuel oil do	r7,987	6,250	1,265	Zaire 2,684; Senegal 645.
Lubricants do	1,195	1,177	78	Nigeria 708; Zaire 171; Mexico 129.
Nonlubricating oils do	r(2)	(2)	--	Mainly to Paraguay.
Residual fuel oil do	13,064	9,298	8,636	Netherlands Antilles 332; Italy 329.
Bitumen and other residues do	50	10	--	Paraguay 9.
Bituminous mixtures do	14	25	--	Congo 18; Paraguay 6.
Unspecified do	145	183	5	Netherlands 54; Taiwan 40; Italy 37.

rRevised. NA Not available.
[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and rare-earth metals: Unspecified	127	82	45	West Germany 18; United Kingdom 17.
Aluminum:				
Ore and concentrate	11,159	8,801	1,000	Guyana 7,236; Poland 500.
Oxides and hydroxides	183,724	136,637	232	Netherlands 102,766; West Germany 963; Canada 828.
Metal including alloys:				
Scrap	210	684	684	
Unwrought	4,584	2,618	160	Argentina 1,491; United Kingdom 766.
Semimanufactures	2,465	2,132	747	France 850; Japan 116.
Antimony:				
Ore and concentrate	34	397	--	Thailand 357; Australia 20; Austria 20.
Oxides	37	49	--	West Germany 24; Belgium-Luxembourg 19; United Kingdom 5.
Metal including alloys, all forms	260	483	--	China 382; Bolivia 51; Mexico 40.
Arsenic: Metal including alloys, all forms	3	2	--	Netherlands 1; Sweden 1.
Beryllium: Metal including alloys, all forms value, thousands	$3	$4	$2	West Germany $2.
Bismuth:				
Oxides and hydroxides	3	4	1	West Germany 2; Mexico 1.
Metal including alloys, all forms	101	31	(2)	Mexico 21; Peru 9; Netherlands 1.
Cadmium:				
Oxides and hydroxides	39	76	--	Peru 42; Mexico 29; West Germany 5.
Metal including alloys, all forms	11	1	(2)	Mainly from Peru.
Chromium:				
Ore and concentrate	20,674	14,685	--	Philippines 9,875; Republic of South Africa 4,810.
Oxides and hydroxides	62	97	(2)	West Germany 60; United Kingdom 36.
Metal including alloys, all forms	22	47	3	Netherlands 29; West Germany 7; United Kingdom 7.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Cobalt:				
Ore and concentrate	7	10	--	West Germany 8; Canada 2.
Oxides and hydroxides	4	10	3	Belgium-Luxembourg 5; West Germany 2.
Metal including alloys, all forms	282	388	12	Belgium-Luxembourg 126; Netherlands 79; United Kingdom 64.
Columbium and tantalum: Metal including alloys, all forms, tantalum value, thousands	$22	$54	$52	Australia $1; Switzerland $1.
Copper:				
Ore and concentrate	87,553	164,015	--	Chile 140,353; Peru 9,223; Switzerland 8,804.
Oxides and hydroxides	212	222	(2)	West Germany 130; Chile 60; Peru 27.
Metal including alloys:				
Scrap	854	3,227	2,245	Chile 906; Canada 40.
Unwrought	107,136	77,480	1,403	Chile 67,592; Peru 4,936; Netherlands 1,400.
Semimanufactures	1,320	1,473	60	West Germany 483; United Kingdom 455; Japan 140.
Gold: Metal including alloys, unwrought and partly wrought thousand troy ounces	71	538	1	West Germany 496; Sweden 41.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	16	15	14	Switzerland 1.
Metal:				
Scrap	30,506	103,997	65,567	Netherlands 24,369; United Kingdom 11,922.
Pig iron, cast iron, related materials	r4,253	29,371	2,376	Trinidad and Tobago 25,639; Argentina 600.
Ferroalloys:				
Ferroaluminum	1	(2)	(2)	
Ferrochromium	197	196	3	Italy 121; Sweden 58; West Germany 13.
Ferromanganese	--	1,284	--	Republic of South Africa 1,227; France 57.
Ferronickel	1	(2)	(2)	
Ferrosilicomanganese	--	1,610	--	All from Republic of South Africa.
Ferrosilicon	61	148	59	Italy 87.
Unspecified	65	69	11	United Kingdom 58.
Steel, primary forms	111	NA		
Semimanufactures:				
Bars, rods, angles, shapes, sections	25,604	NA		
Universals, plates, sheets	29,926	NA		
Hoop and strip	5,132	NA		
Rails and accessories	30,125	NA		
Wire	2,780	NA		
Tubes, pipes, fittings	7,595	NA		
Castings and forgings, rough	58	NA		
Lead:				
Ore and concentrate	10,724	27,447	--	Ireland 14,063; Peru 10,251; Canada 3,133.
Oxides	240	334	(2)	Mexico 302; West Germany 31.
Metal including alloys:				
Scrap	6,543	12,888	8,695	Canada 4,193.
Unwrought	r652	2,141	--	Mexico 1,996; Trinidad and Tobago 135.
Semimanufactures	1	4	(2)	Belgium-Luxembourg 3; West Germany 1.
Lithium: Oxides and hydroxides	271	426	422	West Germany 4.
Magnesium: Metal including alloys:				
Scrap	13	39	--	All from Italy.
Unwrought	4,363	3,091	119	Norway 2,972.
Semimanufactures	2	2	2	
Manganese:				
Ore and concentrate, metallurgical-grade	1,006	3,753	--	All from Netherlands Antilles.
Oxides	r24	66	34	West Germany 25; Denmark 6.
Metal including alloys, all forms	1,158	1,221	187	Republic of South Africa 928; Nether lands Antilles 60.
Mercury 76-pound flasks	5,134	5,408	174	Netherlands 2,421; Mexico 2,052; West Germany 662.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Molybdenum:				
Ore and concentrate	2,590	2,893	102	Chile 2,778; United Kingdom 12.
Oxides and hydroxides	519	542	--	Chile 535; Austria 5; United Kingdom 2.
Metal including alloys:				
Scrap	--	2	2	
Unwrought	6	5	--	West Germany 4; Switzerland 1.
Semimanufactures	43	43	17	West Germany 13; Netherlands 9.
Nickel:				
Matte and speiss	5	112	112	
Metal including alloys:				
Unwrought	r341	1,133	173	Netherlands 780; Canada 154.
Semimanufactures	151	146	47	West Germany 79; France 5.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	18,969	25,592	8,713	West Germany 16,140; Belgium-Luxembourg 611.
Selenium, elemental	19	30	(2)	Chile 16; Belgium-Luxembourg 8; Peru 5.
Silicon	4	15	(2)	West Germany 9; Italy 6.
Silver:				
Ore and concentrate	--	5	--	All from Peru.
Metal including alloys, unwrought and partly wrought thousand troy ounces	3,434	4,329	1,219	Peru 2,273; West Germany 541.
Tellurium, elemental	1	4	--	Mainly from Peru.
Tin: Metal including alloys, semimanufactures	5	10	(2)	West Germany 6; Taiwan 4.
Titanium:				
Oxides	1,010	1,282	21	West Germany 563; France 519; Belgium-Luxembourg 83.
Metal including alloys:				
Scrap	75	120	120	
Unwrought	13	20	18	United Kingdom 2.
Semimanufactures	24	31	20	Italy 8; Japan 2.
Tungsten:				
Ore and concentrate	r25	--		
Metal including alloys:				
Unwrought	15	19	6	West Germany 8; United Kingdom 4.
Semimanufactures	32	39	12	West Germany 13; Netherlands 6.
Zinc:				
Ore and concentrate	60,098	75,316	--	Peru 58,239; Mexico 7,101; Argentina 5,863.
Oxides	110	84	7	West Germany 51; Uruguay 26.
Blue powder	21	131	128	West Germany 3.
Metal including alloys:				
Unwrought	3,769	23,086	199	Peru 7,146; Mexico 6,269; Australia 4,309.
Semimanufactures	r1,645	5,548	--	Canada 5,498; West Germany 48; Sweden 2.
Zirconium:				
Ore and concentrate	8,301	12,134	3,011	Republic of South Africa 4,662; Australia 4,206.
Metal including alloys:				
Scrap	(2)	--		
Semimanufactures	(2)	1	(2)	Mainly from West Germany.
Other:				
Ores and concentrates	r35,635	17,994	--	Sri Lanka 15,000; Republic of South Africa 2,079; Australia 915.
Oxides and hydroxides	r25	17	10	West Germany 6; France 1.
Ashes and residues	17,951	20,780	13,579	Suriname 6,000; Canada 1,201.
Base metals including alloys, all forms	r2	3	1	West Germany 1; Japan 1.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	987	941	108	Italy 821; West Germany 12.
Artificial:				
Corundum	318	317	42	Japan 140; France 122.
Silicon carbide	1,266	1,191	(2)	Argentina 495; Norway 431; West Germany 181.
Dust and powder of precious and semiprecious stones including diamond	(3)	--		
Grinding and polishing wheels and stones	190	221	56	Italy 86; West Germany 52.
Asbestos, crude	3,791	2,591	83	Canada 1,627; Republic of South Africa 723; Italy 155.
Barite and witherite	133	22	--	West Germany 20; Switzerland 2.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Boron materials:				
Crude natural borates	15,088	21,699	--	Peru 10,789; Argentina 6,881; Turkey 4,000.
Oxides and acids	4,180	5,338	1	Argentina 4,169; France 543; West Germany 543.
Bromine	20	14	(2)	Mainly from Israel.
Cement	1,948	2,077	1,354	Spain 368; France 326.
Chalk	--	40	--	All from Switzerland.
Clays, crude	17,151	14,734	7,891	Argentina 6,230; France 507.
Cryolite and chiolite kilograms	141	550	--	Switzerland 500; West Germany 50.
Diamond:				
Gem, not set or strung value, thousands	$70	$155	--	All from Switzerland.
Industrial stones thousand carats	40	85	60	Ireland 15; West Germany 10.
Dust and powder	2,970	3,290	1,810	Ireland 710; West Germany 675.
Diatomite and other infusorial earth	1,303	1,401	107	Mexico 1,124; West Germany 150.
Feldspar, fluorspar, related materials	2	1	--	All from Switzerland.
Fertilizer materials:				
Crude, n.e.s	10,451	12,510	672	Chile 11,670; West Germany 150.
Manufactured:				
Ammonia	34,429	17,081	17,022	France 59.
Nitrogenous	r602,633	534,454	288,661	Netherlands 110,980; West Germany 94,168.
Phosphatic	60,665	30,789	27,004	Uruguay 3,750; Netherlands 35.
Potassic	1,793,981	1,799,959	296,347	East Germany 573,481; Canada 404,629.
Unspecified and mixed	160,576	105,598	43,627	Chile 61,951; West Germany 10.
Graphite, natural	41	8	1	West Germany 6; Denmark 1.
Gypsum and plaster	1	1	(2)	Mainly from Italy.
Iodine	223	261	(2)	Mainly from Chile.
Lime	20	40	--	All from Belgium-Luxembourg.
Magnesium compounds:				
Magnesite, crude	3	3	3	
Oxides and hydroxides	1,265	533	237	West Germany 295; United Kingdom 1.
Mica:				
Crude including splittings and waste	--	1	1	
Worked including agglomerated splittings	48	63	16	France 31; Switzerland 10.
Nitrates, crude	9,707	11,670	--	All from Chile.
Phosphates, crude	9,449	31,678	26,678	Israel 5,000.
Phosphorus, elemental	3,376	6,163	5,975	West Germany 133; United Kingdom 41.
Pigments, mineral: Iron oxides and hydroxides, processed	776	1,048	120	West Germany 772; Belgium-Luxembourg 111.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$410	$29	$29	
Synthetic kilograms	19	11	6	Switzerland 5.
Pyrite, unroasted	60	65	(2)	Mainly from West Germany.
Salt and brine	37	222,568	--	France 47,838; Spain 44,020; Netherlands Antilles 38,000.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	1,093	110,858	65,634	France 37,000; West Germany 8,224.
Sulfate, manufactured	r28,624	35,725	(2)	Chile 21,250; Mexico 13,275; Argentina 1,200.
Stone, sand and gravel:				
Dimension stone, crude and partly worked	15	(2)	--	All from Italy.
Dolomite, chiefly refractory-grade	470	351	--	Austria 310; Italy 40; Japan 1.
Gravel and crushed rock	100	60	--	All from West Germany.
Limestone other than dimension	--	19	--	Do.
Quartz and quartzite	1	56	15	Switzerland 40; West Germany 1.
Sand other than metal-bearing	7	9	9	
Sulfur:				
Elemental:				
Crude including native and by-product	1,174,132	1,084,955	174,771	Canada 574,170; Poland 327,843.
Colloidal, precipitated, sublimed	499	633	584	France 27; United Kingdom 18.
Sulfuric acid	192,029	41,735	28,292	Spain 8,316; Uruguay 5,126.
Talc, steatite, soapstone, pyrophyllite	18	87	79	France 5; Sweden 1.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Other:				
Crude	5,321	7,581	36	Argentina 7,336; France 100; Mexico 96.
Slag and dross, not metal-bearing	8,423	12,852	--	Republic of South Africa 11,822; West Germany 1,000.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	139	188	148	Argentina 40.
Carbon black	2,550	2,779	1,173	West Germany 1,079; East Germany 200.
Coal: All grades excluding briquets thousand tons	8,104	8,260	4,630	Poland 1,668; Canada 957.
Coke and semicoke	55,061	94,610	41,816	West Germany 42,803; Japan 9,991.
Petroleum:				
Crude thousand 42-gallon barrels	236,601	197,556	--	Iraq 65,001; Nigeria 46,508; Saudi Arabia 33,285.
Refinery products:				
Liquefied petroleum gas do	2,939	4,826	173	Angola 1,632; Saudi Arabia 1,521; Mexico 694.
Gasoline do	758	1,221	27	Argentina 840; Algeria 236; Netherlands Antilles 53.
Mineral jelly and wax 42-gallon barrels	504	541	19	Republic of South Africa 382; Belgium-Luxembourg 79.
Kerosene and jet fuel do	--	10	--	All from Venezuela.
Distillate fuel oil thousand 42-gallon barrels	(2)	2,481	(2)	Venezuela 1,928; Argentina 519.
Lubricants do	147	841	197	Netherlands 162; Romania 157.
Nonlubricating oils do	97	59	8	Romania 51.
Residual fuel oil do	1,008	1,530	--	Venezuela 704; Argentina 396; Mexico 315.
Bitumen and other residues do	--	(2)	(2)	
Petroleum coke do	601	556	516	United Kingdom 30; Argentina 10.

[r]Revised. NA Not available.
[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.
[3]Revised to zero.

COMMODITY REVIEW

METALS

Alumina, Aluminum, and Bauxite.—Brazil's aluminum production of 757,600 tons was an increase of 38% over that of 1985. Most of the production went into exports, which increased 48%. Capacity at yearend was 874,000 tons annually. Alumina and bauxite production in 1986 increased slightly over that of 1985.

Because of problems with the hydroelectric supply, the subsidized power policy toward smelters came under review by the Government of Brazil. This was brought about by the power shortage directly related to the lack of rain in the southern part of Brazil, where almost one-half of the smelting capacity is situated. Later in the year, a policy group recommended that Brazil's aluminum production and export plans should be scaled down to take some of the pressure off the power supply system and reduce the time period of preferential power tariffs from 20 years to 8 years.

In March, the second potline at the Alumínio do Maranhão S.A. smelter came onstream. This raised the plant's smelting capacity 110,000 tons per year to 245,000 tons per year. The second potline at the Aluminío Brasileiro Ltda. smelter at Belém, Pará State, came into production late in 1986. By yearend, it had reached its design capacity of 160,000 tons per year. There were plans to double the plant's capacity to 320,000 tons annually by 1991 with the work scheduled to begin early in 1987.

The much-delayed Alumínio do Norte do Brasil S.A. refinery project had its problems in 1986. In July, as a result of growing uncertainty about the viability of the proj-

ect among its 33 shareholders, the Nippon Amazon Aluminium Co. (NAAC) decided to exercise its special right to halt its participation. Given until yearend to review its position, NAAC decided in November that it wished to withdraw from the project with the $78.5 million already committed to remain in the project as nonvoting capital. With another $400 million still needed to complete the 800,000-ton-per-year refinery, construction was delayed still further while CVRD looked for another partner.

Columbium.—Cia. Brasileira de Metalúrgia e Mineração (CBMM), the largest columbium producer in the world, produced approximately 88% of Brazil's total of 17,391 tons of ferrocolumbium in 1986. CBMM is jointly owned by the Moreira Salles group of Brazil (55%) and the Union Oil Co. of the United States (45%).

The Industrial Development Council announced the approval of CBMM's plan to construct a $6.2 million electron-beam refining plant to produce high-purity columbium metal (99.7% pure). When on-stream in 1988, the 40-ton-per-year plant will be able to supply 20% of the world demand. Paranapanema S.A. Mineração Indústria e Construção announced plans to recover columbium pentoxide from columbite-tantalite production from the Pitinga tin mine in the State of Amazonas. The pilot plant operations originally scheduled to commence in late 1987 slipped to late 1988 because of equipment supply difficulties.

Brazil, which at yearend 1985 possessed approximately 85% of the world's columbium reserves, announced the discovery of additional reserves that doubled the 1985 figure of approximately 4.5 million tons. The new reserves are in the far northwest part of the Brazilian Amazon near the border with Colombia and Venezuela. The columbium ore in the new reserves is not pyrochlore. It is intermixed with iron ores, manganese, and titanium, making extraction difficult. CBMM stated that a new extraction technology would have to be developed to make the columbium ore marketable.

Copper.—Cia. Paraibuna de Metais (CPM) announced that construction would begin in 1987 on a 100,000-ton-per-year electrolytic copper unit. The plant would be near the Igarapé do Salobo copper deposit in the Carajás area of the State of Maranhão. The plant would be operated by Cia. Metalquímica do Maranhão S.A., a newly formed subsidiary of CPM. Caraíba Metais S.A. Indústria e Cómercio began work to increase the capacity of its Camacari electrolytic refinery from 150,000 tons per year to 200,000 tons per year. The company planned to expand capacity to 400,000 tons per year over the succeeding 6 years.

Gold.—Brazilian gold production in 1986 was estimated to be 2.2 million troy ounces. However, official figures were lower as a result of the difficulty in obtaining accurate records of the garimpeiros production from the many alluvial sources and the large Serra Pelada open pit mine in the Carajás area.

At the beginning of the year, Rio Tinto Zinc Corp. Ltd. do Brasil (RTZ) and Autram Mineração e Particiações S.A. concluded a joint venture agreement to develop the Morro do Ouro gold project, located 3 kilometers from the town of Paracatu in the State of Minas Gerais. RTZ will be manager of the venture through a new company, Rio Paracatu Mineração Ltda., which is 51% owned by RTZ. Initial production was scheduled for yearend 1987, with output expected to be approximately 10,000 troy ounces.

A British Petroleum Co. Ltd. (BP) subsidiary, BP Mineração, entered into a joint venture with Monteiro Arranha and the Global Group. The joint venture, in which BP holds 49% ownership, established an operating company, Santa Martha S.A., to develop the Cabacal copper-gold mine. The mine, situated near the town of Araputanga in Mato Grosso State, has reported reserves of 1 million tons assaying 0.5 troy ounce of gold per ton.

In early 1986, Osborne and Chappel Goldfields Ltd. (Canada) entered into a joint venture with a new Brazilian company, Cia. Nacional de Mineração (CNM). CNM had recently acquired dredging rights to 2,510 square kilometers on the Teles Pires River in the State of Mato Grosso. The reserves contain 127 million cubic feet of material estimated to contain 30,000 troy ounces of gold. Production was scheduled to begin at yearend.

The Brazilian Mining Institute announced a projection of an estimated $1.5 billion to be invested up to 1990 in gold production in Brazil. Foreign companies' share of the estimated investments would be 46%.

Iron Ore.—Brazil's exports and domestic consumption of iron ore products rose to record-high levels in 1986. As in 1985, Brazil was the world leader in iron ore exports with a total of 92.0 million tons. CVRD and

its partners exported 60 million tons of the total iron ore exports. CVRD produced 17 million tons of iron ore pellets, of which 15.5 million tons was exported in 1986. Exports from CVRD's Carajás project in the State of Pará totaled 11.5 million tons for the year. All the Carajás ore was exported through the newly constructed Port of Ponta de Madeira, which was officially inaugurated on January 2.

MBR announced plans to invest approximately $50 million to expand iron ore output from its Minas Gerais mines by 5 million tons per year. MBR began work on the Ferrovia do Aco railway, which is to shorten the transportation distance between its mines and the Sepetiba Bay terminal in the State of Rio de Janeiro. MBR was considering additional investments to bring other iron ore deposits in Minas Gerais State into production. Ownership of MBR was altered during 1986 when M. A. Hanna (United States) sold its indirect 34.2% holding in MBR. CAEMI, in acquiring M. A. Hanna's share, increased its majority ownership to 70%, with Mitsui & Co. Ltd. (Japan) owning 14%, Bethlehem Steel Corp. (United States) holding 5%, and other Japanese interests holding the remainder.

Samarco Mineração S.A. produced 7.7 million tons of iron ore in 1986 and exported 7.4 million tons primarily in the form of pellets. Ferteco Mineração S.A. produced 10 million tons and exported 7.4 million tons during the year. S.A. Mineração da Trindade had an output of 9.8 million tons of iron ore in 1986 with exports of 2.7 million tons.

Itaminas Cómercio de Minerios S.A. signed an agreement with the China National Metals & Minerals Import and Export Corp. to develop a pig iron venture. Two furnaces capable of producing up to 200,000 tons of pig iron annually were to be constructed in the State of Minas Gerais. Itaminas also acquired W. M. H. Muller S.A. Minerios Cómercio e Navegacaos, and announced plans to double output, with increased exports.

Iron and Steel.—*Ferroalloys.*—In 1986, three alloy groups accounted for approximately 93% of the total production of ferroalloys. The three were manganese alloys with 43%, silicon alloys with 32%, and chromium alloys with 18%. The remainder was divided among nickel alloys, 2%, and special alloys, 5%. Sibra Electrometalúrgica Brasileira S.A. was the leading producer of manganese and silicon ferroalloys, which are widely used in the steel industry.

Steel.—Steel production in Brazil increased slightly from 18.6 million tons in 1985 to 20.0 million tons in 1986. Discussions were held within the Government concerning the assumption of Siderúrgia Brasileira S.A.'s (SIDERBRÁS) debt burden of between $12 billion and $17 billion by the Federal Government treasury.

U.S. and Japanese companies began discussions with the Government on the possibility of participating in Brazil's steel plan to double capacity by the year 2000. One of the important areas negotiated was future investment in Brazilian slab production joint ventures, involving the participation of both private and state-run steel companies. Cia. Siderúrgica de Tubarao announced plans in midyear to double raw steel production from 3 million tons to 6 million tons annually. Expansion plans over the longer term to 12 million tons annually were also discussed. Cia. Siderúrgica Paulista, one of Brazil's top three integrated steel companies, inaugurated a new mill addition that boosted production from 2.7 million tons to 3.9 million tons annually at a cost of $170 million.

The President of Brazil announced that the third stage of Acos Minas Gerais S.A., comprised of medium- and heavy-sections mills and a rail mill, will proceed, with installation work expected to begin in 1987 and to be completed within 2 years.

Manganese.—Indústria e Cómercio de Minerios S.A., the major producer of manganese metal in Brazil, saw its mine production decline by 22% from that of 1985 to 789,000 tons. However, the reserves in Amapá Territory of northern Brazil are becoming depleted, and production from the source will eventually be phased out.

Utah International Inc.'s (Australia) subsidiary, Mineração Colorado S.A., sold the only privately owned manganese deposit in Brazil, situated in the Carajás region, to Prometal Produtos Metalúrgicos S.A. The Buritirama deposit was assayed at 45% to 48% manganese. The Igarapé Azul manganese mine in the Carajás region went into full-scale production in 1986 at a production level of 1 million tons annually. The reserves were estimated at 65 million tons, of which 11 million tons is natural manganese oxide, the basic material for the manufacture of batteries. The Igarapé Azul battery-grade ore assayed at 76% to 78% pure.

Cia. Paulista de Ferro-Ligas announced the postponement of plans for a 36,000-ton-per-year ferromanganese facility in the Carajás region. The move came as the result of the linkup between CVRD and the U.S.S.R. for the construction of a 150,000-ton-per-year ferromanganese facility in the Carajás region. The facility is to come on-stream in 1990, with the Soviet Union financing one-half the $100 million project cost in return for one-half of the annual production over a 12-year period.

Tin.—Tin mine production (Sn content) increased slightly to 27,400 tons. This made Brazil the second largest tin producer in the world after Malaysia. At yearend, Brazil's reserves were estimated at 250,000 tons, which constituted almost 8% of the world's reserves and 66% of South American reserves. Brazil's tin reserves are the fourth largest in the world after Malaysia, Indonesia, and Thailand. Departamento Nacional da Produção Mineral's study of the country's tin reserves also stated that the tin reserves should be increased considerably by exploration work carried out by the country's largest producer, Paranapanema S.A. Mineração Indústria e Construção, at its Pitinga Mine in the State of Amazonas. In addition, new reserves were also delineated at several new prospects in the State of Pará by the Rhodia group.

Empresas Brumadinhos S.A., third largest tin producer in Brazil, announced plans to set a 5-year investment plan in motion in early 1987. The plan included exploration and experimental production of gold, an increase in the production capacity of nonferrous metals, and investment in tin and other minerals at a projected cost of $43 million.

Titanium.—Nuclebrás de Monazita e Associdos Ltda., a subsidiary of the Federal nuclear agency Empresas Nucleares Brasileiras S.A., announced plans to export ilmenite. The company was negotiating the sale of 20,000 tons of ilmenite with Japanese trading companies and another 20,000 tons with other consumers.

Metais de Goias S.A. began work with International Minerals & Chemical Corp. (United States) to develop anatase deposits at Catalao, Goias. The plans include the construction of a 300,000-ton-per-year plant to produce anatase concentrate by the end of the decade.

INDUSTRIAL MINERALS

Cement.—In 1986, Brazil produced 25.3 million tons of cement, an increase of approximately 23% over that of 1985. This was a very significant growth rate, which was among the highest in the world. Installed capacity was increased by 800,000 tons to 44.8 million tons. Plans were made to increase installed capacity to 47.7 million tons by 1988.

One new plant came on-line in 1986, a 693,000-ton-per-year, dry-process plant owned by Cia. Industrial de Monte Alegre. In 1987, two new plants were scheduled to come on-stream: one at Bage, Rio Grande do Sul owned by Cimento e Mineração Bage S.A.; and the other at Nobres, Mato Grosso under the ownership of Cimento Portland Mato Grosso S.A. Also in 1987, several other companies were to increase their installed capacity.

Phosphate Rock.—A large phosphate deposit was discovered between the Malcuru and Paru Rivers near Monte Alegre in the State of Pará. Testing of the samples identified by Rio Doce Geologia e Mineração S.A. (Docegeo), the geological arm of CVRD, indicated an average grade of 30% phosphate content. The reserve quantity had not been established by yearend. However, it appears that a much more detailed study of the deposit will be required before any commercial mining will be considered. Because of the deposit's remote location, it will be many years before the product becomes available domestically.

Despite investments in domestic capacity, Brazil was expected to have a phosphorus pentoxide deficit for the next few years; therefore, substantial quantities for all uses will have to be imported.

Potash.—The first potash mine in Brazil, situated in the State of Sergipe and opened in 1985 with a 500,000-ton-per-year capacity, had an extremely low output of 23,000 tons in 1986. The mine was owned and operated by Petrobrás Mineração S.A. (PETROMISA), the mining subsidiary of PETROBRÁS. A feasibility study was begun at yearend by PETROMISA on the Fazendinha potash deposit in Amazonas State. The reserves at Fazendinha, wholly comprised of the mineral sylvanite, were determined to be approximately 570 million tons. In addition, another 600-million-ton reserve was identified near Arari, 40 kilometers from the Fazendinha deposit. If the completed study is approved by the Government, 8 to 10 years would be required to develop the project.

Metalmin, in a joint venture with J. S. Redpath Co. of Canada, formed a new company, Metalmin Industrial S.A., to pioneer a new mining technique for sylvanite in water-saturated deposits. The new company

will operate in the Taquari-Vassouras complex in the State of Sergipe.

MINERAL FUELS

Coal.—During the year, a total of 70,000 tons of steam coal was exported to Italy. In addition, three Brazilian coal companies signed contracts with three Italian companies for shipments of 30 million tons of coal from Brazil over a 10-year period. PETROBRÁS announced plans to start experimental production of briquets made from coal fines and asphalt in an attempt to produce a more efficient, useful product. The fines would be supplied by Cia. de Pesquisas e Lavras Minerais (COPELMI) and the asphalt by PETROBRÁS.

At midyear, CVRD and COPELMI signed letters of intent for the creation of a joint venture coal mining company, Mineradora Passo da Areia S.A. The company planned, within 3 years, to produce 1 million tons annually from the Terezinha deposit in the State of Piaui and 2.1 million tons per year from the Guaiba Coalfield near Porto Alegre, Rio Grande do Sul. The Terezinha deposit contains metallurgical-grade coal while the Guaiba deposit is thermal grade.

In early 1986, SIDERBRÁS, in an effort to secure improved metallurgical coal supplies, sent a mission to the U.S.S.R. to sign a contract for a trial shipment of 50,000 tons of metallurgical coal to Brazil. In midyear, it was announced that the National Association of Coal Producers and CPRM, the national mineral resources research company, will form an association with Colombian business interests to explore Colombian metallurgical coal reserves. A major consideration of any agreement would be a countertrade of Brazilian manufactured goods for Colombian coal.

Natural Gas.—In August, the Minister of Mines and Energy issued a decree covering, among a number of areas, the priorities for the consumption of natural gas. The emphasis on consumption is an effort to reduce the consumption of petroleum products, much of which is imported. The priorities for natural gas consumption were as follows: (1) reinjection for the production of petroleum and liquefied petroleum gas (LPG); (2) substitution of LPG; (3) use in petrochemical and fertilizer production; (4) substitution for diesel fuel in common carrier vehicles; (5) substitution for petroleum derivatives in industry; and (6) other uses.

In midyear, PETROBRÁS announced the discovery of a giant natural gas field in the Campos Basin. If confirmed and proven commercial, it would increase known natural gas reserves in Brazil from 3.3 trillion cubic feet to approximately 8.5 trillion cubic feet.

Petroleum.—Average production for 1986 was 595,000 barrels per day, which was an increase of approximately 5.7% over that of 1985. This amount of increase contrasts sharply with the 22% increase registered in 1985 over that of 1984.

In 1986, PETROBRÁS set an international record by putting its Rio de Janeiro Submarino 294 well in water 413 meters deep into production. The well is in the Marimba Field of the Campos Basin. It was producing at the rate of 5,000 barrels of crude petroleum per day and 1.7 million cubic feet of natural gas per day.

Petrobrás Internacional S.A., the overseas operating subsidiary of PETROBRÁS, signed an agreement with the Forsund group of Norway to form a new company, Brasnor Neptum A/S. The company will focus its activities on underwater engineering services and nonstationary production systems, and will be international in scope.

At yearend, the oil pipeline network in Brazil had reached 5,100 kilometers, of which 4,300 kilometers was onshore and 800 kilometers was offshore. The proven petroleum reserves at yearend totaled 2.35 billion barrels, an increase of 14% over that of 1985.

Nuclear Power.—The Government announced it was resuming its program of nuclear powerplant construction. Approximately $1.5 billion was to be spent on a third reactor at the Angra complex, at Angra dos Reis in the State of Rio de Janeiro, upon the completion of the second reactor there. A decision on a fourth Angra reactor was postponed until 1989.

NONMINERAL ENERGY SOURCES

Alcohol.—The Government announced it was freezing its alcohol automotive fuel program (Proalcool) owing to high costs and other considerations. The program had been criticized for distorting economic development and for expense as subsidies were costing almost one-half as much as the investment. The freeze on investments is expected to last at least until 1989-90.

Hydroelectric.—Top Government officials were considering the ramifications of approving the construction of the 18-gigawatt Altamira hydroelectric complex, potentially the largest in the world. It would be on the Xingu River in the Amazon

Basin in the State of Pará. The project would involve the building of 100 kilometers of dams and dikes at a cost of approximately $10 billion. Construction would begin by late 1990, and take 10 to 12 years for completion.

The rationing of electricity was threatened in the three southern States of Parana, Rio Grande do Sul, and Santa Catarina owing to a continuing drought that began in 1985. Much of the problem was due to the sharp curtailment of investment in the country's energy industries since 1979. In addition, consumption of electric power has risen at a rate of 10% per year since 1984.

[1]Physical scientist, Division of International Minerals.
[2]Where necessary, values have been converted from Brazilian cruzados (Cz$) to U.S. dollars at the rate of Cz$13.7 = US$1.00 as an average for 1986.

The Mineral Industry of Bulgaria

By Walter G. Steblez[1]

In 1986, Bulgaria remained largely self-sufficient in the production of copper, lead, and zinc. However, to meet domestic needs, the country had to import substantial amounts of bituminous coal, iron and manganese ores, natural gas, and petroleum products.

In 1986, Bulgaria's centrally planned economy met its overall objectives with a 4.3% increase in industrial production, compared with that of 1985. However, there were shortfalls in the output of pig iron, some ferroalloys, and crude steel. Several mineral projects scheduled to come on-stream were delayed, including a 120,000-ton-per-year copper concentrator, and a plant for the production of ammonia, ammonium nitrate, and nitric acid. Major projects under development included new continuous casting facilities at the Lenin iron and steel works, and a new natural gas pipeline in cooperation with the Soviet Union. Work also continued on the development of the Asarel copper mine. Negotiations conducted with Greece regarding Bulgaria's participation in the Greek-Soviet alumina project had largely negative results.

Government Policies and Programs.—In a departure from usual practice, the Government of Bulgaria did not publish an approved annual central economic plan for 1987. The law on the ninth 5-year plan (1986-90) did not include provisions for the approval of annual plans for this period. The few details that were provided on 1987 targets indicated a planned 5.2% increase in national income compared with that of 1986. The ninth 5-year plan called for a 30% increase in national income and a 27% increase in industrial production compared with those of 1985.[2] By 1990, the consumption of raw materials and fuels would be reduced by 17% to 20%, and the machine-tool industry would increase output by 55% to 60% compared with that of 1985; the production of rolled stainless steel strip would be increased by 80%. Also, the number of unfinished industrial projects, including those in the mineral industry would be reduced by 90%.

PRODUCTION

In 1986, production was reportedly negatively affected by delays in machinery installation at construction sites and the inability of several enterprises in the mineral industry to reach full operational capacity on schedule. Reportedly, on average, new facilities were operating at about 70% of capacity and some below 50%. Adverse winter conditions and a severe earthquake were cited as other factors negatively influencing production in the country's mineral industry.

Table 1.—Bulgaria: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Cadmium metal, smelter[e]	200	200	200	200	200
Copper:[e]					
Mine output, Cu content	70,000	80,000	80,000	80,000	80,000
Metal, primary and secondary:					
Smelter	62,000	60,000	60,000	90,000	90,000
Refined	65,000	62,000	62,000	93,000	95,000
Iron and steel:					
Iron ore:					
Gross weight thousand tons	1,552	1,803	2,063	1,985	2,000
Fe content do	474	554	622	607	607
Iron concentrates do	732	824	913	917	910
Metal:					
Pig iron do	1,558	1,623	1,578	1,702	[3]1,597
Ferroalloys, electric-furnace, all types[e] do	57	57	49	41	48
Steel, crude do	2,584	2,831	2,878	2,944	[3]2,898
Semimanufactures, rolled do	3,253	3,235	3,354	3,325	[3]3,347
Lead:					
Mine output, Pb content	95,000	95,000	95,000	95,000	95,000
Metal, smelter, primary and secondary	118,000	116,000	116,000	116,000	115,000
Manganese ore:					
Gross weight	45,000	45,000	45,000	38,000	40,000
Mn content	13,207	13,100	13,000	11,300	12,000
Molybdenum, mine output, Mo content[e]	170	190	190	190	190
Silver, mine output, Ag content[e] thousand troy ounces	930	930	930	930	910
Zinc:					
Mine output, Zn content	66,000	68,000	68,000	68,000	70,000
Metal, smelter, primary and secondary	90,000	91,000	91,000	91,000	90,000
INDUSTRIAL MINERALS					
Asbestos	600	700	600	[e]600	600
Cement, hydraulic thousand tons	5,614	5,644	5,717	5,296	[3]5,631
Clays: Kaolin	237,000	242,000	256,000	257,000	260,000
Gypsum and anhydrite:					
Crude thousand tons	376	386	393	388	390
Calcined	104	116	115	113	[3]115
Lime: Quicklime thousand tons	1,634	1,634	1,526	1,331	1,400
Nitrogen: N content of ammonia	1,033	1,124	1,138	1,138	1,140
Pyrites, gross weight[e]	[r]189,000	[r]189,000	[r]177,000	[r]153,000	187,000
Salt, all types[e]	87,000	87,000	89,000	89,000	90,000
Sodium carbonate, calcined thousand tons	1,459	1,271	1,212	1,037	1,200
Sulfur:[e]					
S content of pyrites	[r]80,000	[r]80,000	[r]75,000	[r]65,000	80,000
Byproduct, all sources	[r]59,000	[r]56,000	[r]62,000	[r]53,000	62,000
Total	[r]139,000	[r]136,000	[r]137,000	[r]118,000	142,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, marketable:					
Anthracite thousand tons	80	83	84	83	85
Bituminous do	161	160	139	140	145
Brown do	5,537	5,342	5,519	5,385	5,500
Lignite do	26,437	26,805	26,617	25,272	26,000
Total do	32,215	32,390	32,359	30,880	31,730
Coke do	1,274	1,270	1,186	1,087	1,200
Gas, natural, marketed[e] million cubic feet	4,840	4,800	[3]4,800	4,600	4,600
Petroleum, crude: As reported[e] thousand tons	1,314	1,314	1,314	1,300	1,080

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

[1]Table includes data available through Aug. 1, 1986.

[2]In addition to the commodities listed, barite, bismuth, chromite, fluorspar, gold, magnesite, palladium, platinum, tellurium, uranium, and a variety of crude construction materials (common clays, sand and gravel, crushed stone, and dimension stone) are produced, but available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

TRADE

The total value of Bulgaria's foreign trade in 1986 declined slightly compared with that of 1985. The U.S.S.R. remained Bulgaria's major trading partner, accounting for 61% of the country's exports and 57% of its imports. Bulgaria continued to rely heavily on the Soviet Union for its import needs of iron ore, manganese, mineral fuels, and pig iron. The share of Bulgaria's total trade with centrally planned economy countries increased from 77% in 1985 to 81% in 1986. The value of trade with developed market economy countries declined by 23% during the year. Bulgaria's exports of fuels, minerals, and metals declined by 35% and exports of chemicals and fertilizers, by 19%. These declines were partly offset by increased exports of producer durables and consumer products. The total value of imports remained at about the same level as those of 1985. Imports from centrally planned economy countries rose slightly, while those from market economy countries declined by 5%, with the exception of that from the Federal Republic of Germany and Japan, which rose by 26% and 22%, respectively.

Major U.S. mineral exports to Bulgaria included bituminous and coking coal, heavy fuel oils, and rotary drill bits, valued at about $19 million. U.S. imports from Bulgaria included kerosene and liquid petroleum derivatives valued at about $22 million.

Table 2.—Bulgaria: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ash and residue containing aluminum	3,372	1,137	--	Italy 917; West Germany 220.
Metal including alloys:				
Scrap	2,760	3,059	--	West Germany 2,217; Italy 819; Greece 23.
Unwrought	4,997	3,923	--	Japan 3,271; Italy 652.
Semimanufactures	62	25	6	Austria 18; Netherlands 1.
Bismuth: Metal including alloys, all forms	8	15	--	All to West Germany.
Cadmium: Metal including alloys, all forms	54	42	--	All to Czechoslovakia.
Copper:				
Sulfate	496	NA		
Metal including alloys:				
Scrap	290	418	--	Switzerland 287; Yugoslavia 131.
Unwrought	1,210	599	--	Yugoslavia 253; Italy 238; Belgium-Luxembourg 100.
Semimanufactures	829	1,142	--	Yugoslavia 1,000; Morocco 96; Switzerland 38.
Gold:				
Waste and sweepings value, thousands	$470	$665	--	All to West Germany.
Metal including alloys, unwrought and partly wrought, troy ounces	1,768	418	--	West Germany 257; Switzerland 161.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	--	5,484	--	All to Hungary.
Metal:				
Scrap	48,000	38,000	--	NA.
Pig iron, cast iron, related materials[2]	263,000	78,900	--	Yugoslavia 25,803; unspecified 53,093.
Ferroalloys:				
Ferrochromium	1,368	927	--	Belgium-Luxembourg 427; West Germany 350; Italy 150.
Ferromanganese	1,000	1,000	--	NA.
Ferrosilicomanganese	165	NA		
Ferrosilicon	1,423	370	--	All to West Germany.
Unspecified	12,342	9,703	--	Belgium-Luxembourg 1,330; Austria 413; unspecified 7,452.
Steel, primary forms	309,000	327,000	--	Italy 65,512; Yugoslavia 51,554; Belgium-Luxembourg 40,977.

See footnotes at end of table.

Table 2.—Bulgaria: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	88	72	(3)	NA.
Universals, plates, sheets do	522	402	(3)	Cuba 53; Egypt 38; unspecified 169.
Hoop and strip do	14	11	(3)	NA.
Rails and accessories do	11	6	--	All to Pakistan.
Wire do	54	61	--	NA.
Tubes, pipes, fittings do	42	44	1	Poland 11; Cuba 10; West Germany 4.
Castings and forgings, rough do	1	1	--	NA.
Lead:				
Oxides	--	1,158	--	Yugoslavia 1,053; Egypt 105.
Metal including alloys, unwrought	1,617	1,224	--	All to Yugoslavia.
Lithium: Oxides and hydroxides	573	NA		
Manganese: Ore and concentrate, metallurgical-grade	[2]24,600	[2]7,300	--	All to Czechoslovakia.
Mercury 76-pound flasks	406	NA		
Molybdenum: Ore and concentrate	48	90	--	All to West Germany.
Nickel:				
Ash and residue containing nickel	--	26	--	All to Netherlands.
Metal including alloys:				
Scrap	1	4	--	All to Switzerland.
Unwrought	125	508	--	Yugoslavia 389; Netherlands 119.
Semimanufactures	20	63	--	All to Morocco.
Platinum-group metals:				
Waste and sweepings value, thousands	--	$182	--	All to West Germany.
Metals including alloys, unwrought and partly wrought do	$115	$26	--	Do.
Silver:				
Ore and concentrate do	--	$53	--	Do.
Waste and sweepings[4] do	$85	$107	--	All to Belgium-Luxembourg.
Metal including alloys, unwrought and partly wrought do	$700	$40	--	All to West Germany.
Zinc: Metal including alloys:				
Unwrought	23,912	20,244	--	Czechoslovakia 10,000; Yugoslavia; 9,499; Hungary 670.
Semimanufactures	19	341	--	All to Yugoslavia.
Other:				
Ores and concentrates	4,758	NA		
Ashes and residues	144	28	--	All to Italy.
Base metals including alloys, all forms	24	30	--	United Kingdom 22; Belgium-Luxembourg 5; Sweden 2.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Artificial: Corundum	--	18	--	All to Italy.
Dust and powder of precious and semiprecious stones including diamond value, thousands	--	$56	$56	
Barite and witherite	20	NA		
Boron materials:				
Crude natural borates	341	29	--	All to Sweden.
Oxides and acids	--	165	--	All to West Germany.
Cement[5]	342,600	52,300	--	Switzerland 19,200; Yugoslavia 16,400.
Clays, crude:				
Chamotte earth	150	NA		
Kaolin	6,173	16,748	--	Poland 6,873; Hungary 5,907; Greece 2,968.
Unspecified	19,375	4,126	--	Yugoslavia 4,125; West Germany 1.
Diamond:				
Gem, not set or strung value, thousands	--	$6	$6	
Industrial stones do	$466	$876	--	Belgium-Luxembourg $874; Netherlands $2.
Fertilizer materials: Manufactured:				
Nitrogenous[5] thousand tons	1,022	942	--	India 182; Morocco 31; Vietnam 27.
Potassic do	2	NA		
Lime	--	731	--	All to Yugoslavia.
Nitrates, crude[5]	4,736	2,139	--	Czechoslovakia 550; Yugoslavia 549.
Pigments, mineral: Iron oxides and hydroxides, processed	96	101	--	All to Yugoslavia.

See footnotes at end of table.

Table 2.—Bulgaria: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Precious and semiprecious stones other than diamond:				
Natural ____ value, thousands	$4	$20	$5	West Germany $10; Italy $5.
Synthetic ____ do ____	$387	$393	--	West Germany $359; Italy $24; Netherlands $10.
Sodium compounds, n.e.s.: Carbonate, manufactured[4] ____ thousand tons	945	838	--	U.S.S.R. 490; Hungary 126; Czechoslovakia 40.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked ____	8,412	8,143	--	Hungary 5,536; Poland 1,141; Italy 696.
Worked ____	3,475	3,166	129	West Germany 2,264; Belgium-Luxembourg 650.
Gravel and crushed rock ____	500	NA		
Sand other than metal-bearing ____	14,636	16,231	--	All to Greece.
Sulfur: Sulfuric acid[5] ____	5,500	--		
Talc, steatite, soapstone, pyrophyllite --	25	10	--	All to West Germany.
Other: Crude ____	14,166	60	--	Do.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural ____	--	1	--	All to United Kingdom.
Carbon black ____	5	58	--	All to Italy.
Coal: Anthracite and bituminous ____	[2]287,000	[2]529,000	--	United Kingdom 78,289; Italy 73,494; Sweden 21,561.
Coke and semicoke ____	42	234	--	All to Greece.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	701	667	--	Yugoslavia 460; Italy 169; Austria 31.
Gasoline ____ do ____	823	856	--	Netherlands 642; Italy 172; Belgium-Luxembourg 24.
Mineral jelly and wax ____ do ____	22	15	--	Italy 13; Belgium-Luxembourg 1; Netherlands 1.
Kerosene and jet fuel ____ do ____	113	46	--	Hungary 25; West Germany 17; Belgium-Luxembourg 4.
Distillate fuel oil ____ do ____	2,717	1,303	--	West Germany 834; Greece 228; Austria 137.
Lubricants ____ do ____	362	64	5	Yugoslavia 34; Belgium-Luxembourg 14; Austria 11.
Residual fuel oil ____ do ____	742	2	--	All to Greece.
Petroleum coke ____ do ____	--	24	--	All to Italy.
Unspecified ____ do ____	213	29	--	All to Poland.

[p]Preliminary. NA Not available.

[1]Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Bulgaria, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the trading partner countries.

[2]Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

[3]Less than 1/2 unit.

[4]May include other precious metals.

[5]Official Trade Statistics of Bulgaria.

Table 3.—Bulgaria: Apparent imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides ____	105	87	--	West Germany 70; Japan 14; United Kingdom 3.
Metal including alloys:				
Scrap ____	2	6	--	All from Netherlands.
Unwrought ____	17,933	18,551	--	Yugoslavia 13,305; Hungary 4,996; Austria 250.
Semimanufactures ____	6,112	6,757	--	Hungary 2,348; West Germany 1,923; Austria 657.
Antimony:				
Oxides ____	10	16	--	All from West Germany.
Metal including alloys, all forms ___	--	20	--	All from Netherlands.

See footnotes at end of table.

Table 3.—Bulgaria: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Beryllium: Oxides and hydroxides	--	20	--	All from Italy.
Chromium:				
Ore and concentrate	--	5,060	--	All from Pakistan.
Oxides and hydroxides	452	377	--	All from U.S.S.R.
Metal including alloys, all forms	--	6	--	All from United Kingdom.
Cobalt: Metal including alloys, all forms	--	4	--	Netherlands 3; West Germany 1.
Copper:				
Matte and speiss including cement copper	672	933	--	All from Yugoslavia.
Sulfate[2]	7,727	7,967	--	All from U.S.S.R.
Metal including alloys:				
Unwrought	1,300	67	--	Poland 40; Italy 26; West Germany 1.
Semimanufactures	2,024	1,552	--	West Germany 1,251; Belgium-Luxembourg 98; Austria 75.
Gold: Metal including alloys, unwrought and partly wrought ---troy ounces	38,734	1,947	--	All from West Germany.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite[2] -- thousand tons	2,286	2,215	--	U.S.S.R. 2,115.
Metal:				
Pig iron, cast iron, related materials[2]	664,573	404,296	--	U.S.S.R. 362,508; Pakistan 10,500; Sweden 1,598.
Ferroalloys:				
Ferromanganese	3,000	3,000	--	West Germany 1,239; Belgium-Luxembourg 250; Yugoslavia 100.
Silicon metal	--	1,748	--	All from Yugoslavia.
Unspecified	23,000	25,000	--	NA.
Steel, primary forms	571,000	451,000	--	NA.
Semimanufactures:				
Bars, rods, angles, shapes, sections--- thousand tons	376	374	--	Hungary 97; West Germany 18; unspecified 224.
Universals, plates, sheets[2] do	161	139	--	U.S.S.R. 74; Poland 21; West Germany 19.
Hoop and strip[2] ---do	7	3	--	Mainly from U.S.S.R.
Rails and accessories do	75	66	--	NA.
Wire ---do	17	14	--	Austria 4; Italy 1; unspecified 6.
Tubes, pipes, fittings do	68	73	--	West Germany 8; Yugoslavia 8; unspecified 47.
Castings and forgings, rough do	8	9	--	NA.
Lead:				
Ore and concentrate	4,524	82,694	--	All from Greece.
Metal including alloys, unwrought	166	200	--	All from Yugoslavia.
Magnesium: Metal including alloys:				
Unwrought	--	30	--	Do.
Semimanufactures	--	38	--	Do.
Manganese: Ore and concentrate, metallurgical-grade	[3]94,400	[3]92,600	--	U.S.S.R. 78,000.
Mercury ---- 76-pound flasks	189	--		
Molybdenum: Metal including alloys, all forms	--	3	([4])	Netherlands 2; Japan 1.
Nickel: Metal including alloys:				
Scrap	18	NA		
Semimanufactures	192	413	--	Austria 227; West Germany 141; Sweden 40.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$3,177	$1,294	--	West Germany $1,240; Switzerland $48; United Kingdom $6.
Silver: Metal including alloys, unwrought and partly wrought ---do	$165	$908	--	West Germany $636; United Kingdom $209; Austria $51.
Tin:				
Ore and concentrate	14,446	NA		
Oxides	--	10	--	All from Austria.
Metal including alloys, unwrought	820	100	--	All from Singapore.
Titanium:				
Ore and concentrate	3,108	2,319	--	West Germany 1,789; Netherlands 530.
Oxides	971	1,013	--	All from West Germany.
Metal including alloys, all forms	5	NA		

See footnotes at end of table.

Table 3.—Bulgaria: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Tungsten: Metal including alloys, all forms	12	8	1	Japan 3; Netherlands 3; West Germany 1.
Zinc:				
Ore and concentrate	25,788	14,050	--	Poland 13,921; Greece 129.
Metal including alloys, semimanufactures	5	4	--	All from Belgium-Luxembourg.
Zirconium: Ore and concentrate	1,108	1,673	--	West Germany 1,183; Netherlands 490.
Other:				
Ores and concentrates	20	1	--	All from West Germany.
Oxides and hydroxides	--	91	--	Austria 75; Switzerland 16.
Ashes and residues	--	2	2	
Base metals including alloys, all forms	185	144	--	Hong Kong 70; Sweden 63; Austria 5.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Artificial:				
Corundum	2,683	2,684	--	Italy 1,321; Yugoslavia 1,017; Hungary 337.
Silicon carbide	1,163	660	--	All from Italy.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$196	$269	--	Japan $103; Belgium-Luxembourg $85; United Kingdom $81.
Grinding and polishing wheels and stones	1,270	1,436	--	Yugoslavia 713; Austria 375; Italy 255.
Asbestos, crude	3,549	3,132	--	Greece 2,720; Canada 412.
Boron materials: Oxides and acids	7	NA		
Cement[2]	64,533	71,006	--	U.S.S.R. 53,765; Czechoslovakia 16,138; France 290.
Chalk	501	1	--	All from United Kingdom.
Clays, crude:				
Fire clay	--	21	--	All from Yugoslavia.
Kaolin	--	3,497	--	All from United Kingdom.
Unspecified	149	56	--	All from West Germany.
Diamond: Industrial stones value, thousands	$4,053	$6,250	--	Belgium-Luxembourg $5,251; United Kingdom $630; West Germany $367.
Diatomite and other infusorial earth	674	1,356	--	Austria 1,120; Iceland 236.
Feldspar, fluorspar, related materials:				
Fluorspar	758	850	--	West Germany 830; Italy 20.
Unspecified	64	312	--	All from Yugoslavia.
Fertilizer materials: Manufactured:				
Ammonia	3	NA		
Nitrogenous	11,000	20	--	All from Netherlands.
Phosphatic thousand tons	[3]780	[3]1,344	--	U.S.S.R. 211; Morocco 24; unspecified 1,095.
Potassic do	[3]209	[3]214	--	U.S.S.R. 163; unspecified 51.
Unspecified and mixed	654	1,725	--	United Kingdom 1,500; West Germany 225.
Graphite, natural	1,968	2,045	--	West Germany 1,178; Austria 867.
Gypsum and plaster	443	103	--	Austria 98; West Germany 5.
Lime	49	45	--	All from West Germany.
Magnesium compounds	24,398	25,330	--	Czechoslovakia 25,000; Austria 160; Yugoslavia 109.
Mica:				
Crude including splittings and waste	20	NA		
Worked including agglomerated splittings	40	36	--	Austria 28; West Germany 4; Switzerland 4.
Phosphates, crude[2] thousand tons	1,688	1,566	--	U.S.S.R. 800; Morocco 161; Tunisia 60.
Pigments, mineral: Iron oxides and hydroxides, processed	912	866	40	West Germany 476; Japan 350.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$20	$19	--	All from West Germany.
Synthetic do	--	$44	--	West Germany $34; Switzerland $9; Belgium-Luxembourg $1.
Pyrite, unroasted	249,000	238,047	--	U.S.S.R. 238,000; Austria 47.
Salt and brine	35,760	10	--	All from West Germany.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	1	2,275	--	All from Poland.
Sulfate, manufactured	3,642	NA		

See footnotes at end of table.

Table 3.—Bulgaria: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	3,257	154	--	Yugoslavia 85; Greece 54; Italy 15.
Worked	564	48	--	All from Italy.
Gravel and crushed rock	1,114	1,090	--	All from Yugoslavia.
Quartz and quartzite	796	1,827	--	Sweden 1,722; West Germany 105.
Sand other than metal-bearing	241	1,431	--	Hungary 1,170; West Germany 107; Yugoslavia 60.
Sulfur:				
Elemental:				
Crude including native and by-product	68,000	50,010	--	Poland 49,000; Greece 1,000; West Germany 10.
Colloidal, precipitated, sublimed	10	NA		
Sulfuric acid	11,531	8,694	--	United Kingdom 7,092; Yugoslavia 1,602.
Talc, steatite, soapstone, pyrophyllite	178	120	--	All from Italy.
Other: Crude	722	2,018	--	Pakistan 1,050; Greece 748; West Germany 220.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	12	NA		
Carbon black[2]	26,794	37,931	--	U.S.S.R. 29,196; Italy 2,535; West Germany 1,739.
Coal:				
Anthracite and bituminous[2] thousand tons	5,338	5,528	250	U.S.S.R. 5,226.
Briquets of anthracite and bituminous coal do	--	(4)	--	All from Austria.
Coke and semicoke[2] do	544	664	21	U.S.S.R. 143; Poland 35; Czechoslovakia 20.
Peat including briquets and litter	18	NA		
Petroleum:				
Crude thousand 42-gallon barrels	1,241	NA		
Refinery products:				
Gasoline 42-gallon barrels	286,415	281,699	--	Yugoslavia 281,631; West Germany 68.
Mineral jelly and wax do	276	322	--	West Germany 220; Austria 55; Italy 47.
Kerosene and jet fuel do	395	387	--	United Kingdom 217; Yugoslavia 116; West Germany 54.
Distillate fuel oil do	790	343	--	West Germany 328; Netherlands 15.
Lubricants do	35,181	41,755	77	Austria 15,540; West Germany 11,886; United Kingdom 7,742.
Residual fuel oil do	229,616	480,153	480,153	
Bitumen and other residues do	18,774	32,227	--	Hungary 30,579; West Germany 1,648.
Bituminous mixtures do	12	42	--	All from West Germany.
Petroleum coke do	3,932	2,382	--	Do.

[p]Preliminary. NA Not available.

[1]Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Bulgaria, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the trading partner countries.

[2]Official Trade Statistics of Bulgaria.

[3]Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

[4]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Alumina.—Bulgaria and Greece reached an agreement on Bulgaria's participation in the Greek-Soviet alumina project, near Delphi. At midyear, Bulgaria agreed to purchase 200,000 tons of alumina per year over a 10-year period and to provide $20 million for the plant's construction over a 4-year period, in the form of technical services and equipment. Bulgaria also agreed to pay an additional 13% of the market price for the first 3 years of the alumina plant's operation and 12.6% for the subsequent 7 years.

One-half of the payment was to have been in hard currency, and the remainder in exports of Bulgarian goods to Greece. However, at yearend, Bulgaria gradually withdrew from the agreement because of shortages of hard currency and marketing difficulties for its prospective alumina purchases.

Copper.—Commercial copper mining in Bulgaria began in 1901 in Burgas, near the Black Sea. In 1986, the Burgas and Panagiurk copper mining and beneficiation complexes accounted for about 10% of Bulgaria's ore output at several 400- to 800-meter-deep underground workings. The balance of the country's copper ore was mined in open pits at deposits operated by the Asarel, Elatsite, and Medet mining and beneficiation complexes. The Asarel complex was still under development. Copper was smelted largely at the Georgi Damyanov copper smelting complex at Pirdop in the Sredniegorie District. A new 120,000-ton-per-year concentrator at the Damyanov complex was to have gone on-stream during the year, but owing to delays in equipment deliveries and construction problems, the project was unfinished by yearend. At midyear, the D. Ganev nonferrous metals semimanufactures plant announced plans to install four to six new production lines to increase output of copper and zinc products as part of the plant's $200 million expansion plan. Facility expansion was scheduled to last 3 years and would double the plant's capacity of 40,000 tons of copper and 30,000 tons of zinc products per year. The Friedrich Krupp Hüttenwerke AG of the Federal Republic of Germany was contacted to prepare engineering studies and plans involving the production of thinner copper sheet, and expanded copper tubing capacity. Several Japanese firms were approached by Technoimport of Bulgaria for equipment supply contracts.

Iron and Steel.—Bulgaria announced plans to increase its continuous steel casting capacity at the Lenin iron and steel works at Pernik. Four new electric arc furnaces were to be added to existing capacities in 1985 and 1986 in order to increase continuous casting as much as fourfold. Bulgaria's 5-year development program for the steel industry included plans to meet 85% of the country's rolled steel requirement by 1990 through domestic production.

Lead and Zinc.—The Garubso mining and beneficiation complex was Bulgaria's chief producer of lead and zinc ores and concentrates. The complex, situated in Madan, consisted of 18 underground workings and 4 beneficiation plants. Concentrates were smelted at the D. Blagoev nonferrous metals complex. The Blagoev complex obtained 70% of its lead and 60% of its zinc feed requirements from Gorubso and the balance from imported concentrates. Reportedly, specialists at the Blagoev lead and zinc complex planned to conduct joint research with Soviet experts on upgrading metallurgical processes at the plant to improve the extraction of cadmium and silver, and to renovate and reorganize the plant's water supply.

INDUSTRIAL MINERALS

Bulgaria continued to produce between 3.6 and 4 million tons of industrial minerals per year, which satisfied almost all of the country's domestic needs. In 1986, the output of industrial minerals included barite, bentonite, dolomite, fluorite, gypsum, kaolin, marble, and perlite.

MINERAL FUELS

Coal.—Plans were announced to increase output from open pit operations at the East Maritsa, Elhova, Lom, and Sofia lignite basins. Bituminous coal deposits at Dobrudja, estimated at 1.2 billion tons, were studied by the Dravo Corp. of the United States; however, development had been delayed owing to shortages of capital.

Natural Gas and Petroleum.—Bulgaria disclosed the signing of an agreement for the construction of a trans-Bulgaria pipeline to transport Soviet natural gas to Greece and Turkey. The new pipeline would parallel an existing line; construction began in 1986. The U.S.S.R. was to provide technical assistance, machinery, and equipment; Bulgaria would be responsible for the actual construction. Although the new pipeline was to be fully operational by 1990, the first deliveries of natural gas to Turkey were scheduled for 1987.

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[1]Foreign mineral specialist, Division of International Minerals.
[2]Rabotnichesko Delo. Dec. 23, 1986, pp. 1-4.

The Mineral Industry of Burma

By Gordon L. Kinney[1]

Burma's mineral output was small by world standards but important to its domestic economy. Its most important mineral or mineral-related production was cement, copper, natural gas, nitrogen fertilizer, gem stones, lead, crude oil, silver, tin, and tungsten. By far the most valuable was oil and gas, its dollar value being several times the combined value of the other minerals. Burma was one of the few South or East Asian nations that has been self-sufficient in crude oil. That enviable position, however, was in danger of changing as energy needs have increased while crude oil production has at best shown no real gain in the last few years. As such, Burma has had an increasingly severe shortage of petroleum that has affected all segments of the economy. A firm policy of not importing oil, mainly because of a severe shortage of foreign exchange, was exacerbating the problem. The Government has set the highest priority on finding additional onshore crude oil reserves.

Burma was a major producer of lead and silver before World War II and in 1986 was still considered to have good potential for developing or expanding the production of antimony, copper, lead, tin, tungsten, and zinc among the metals and barite, fluorite, and several other industrial minerals.

About 74,000 persons were employed in state-owned mining activities and another 13,000 by the cooperative and private sectors. In all, 0.6% of the labor force was employed in the mining sector.

After several years of economic growth, Burma, like many other developing countries dependent on exports of primary products, found itself in increasing difficulty. World prices for rice and minerals, two of Burma's major export earners, have fallen precipitously. Burma has increased its volume of exports but had not been able to prevent a decline in overall export earnings. At the same time, economic growth has slowed with the growth of Burma's debt burden and the expiration of grace periods on many of its bilateral and multilateral loans. In 1986, Burma was dependent on exports of primary goods for more than 90% of its foreign exchange earnings. In one case, the foreign exchange shortage forced the Government to export portland cement despite a chronic shortage on the homefront. Burma's international debt grew to more than $2.6 billion in fiscal year (FY) 1985.[2] Debt service payments were $240 million, resulting in a debt service ratio of more than 70%. While the debt service payments were increasing, world prices for rice, Burma's major export, decreased from nearly $400 per ton in FY 1982 to less than $200 per ton in FY 1985. The decline in export earnings forced the Government to reduce imports in FY 1983 and FY 1984 then allow a slight increase in FY 1985. The resulting shortage of spare parts and raw materials, combined with an energy shortage, began to take its toll in declining production in the manufacturing sector. The same problems also affected the country's ability to maintain exports. Mineral exports were particularly affected in FY 1985. Fuel and spare parts shortages adversely affected exports of lead, silver, and zinc.[3]

PRODUCTION

In FY 1985, net output of the mining sector grew by 22%. Production of lead ore, steel ingot, and concentrates of copper, tin, and tungsten increased significantly. Production decreased for most industrial minerals except fire clay powder, white clay, dolomite, graphite, gypsum, and soapstone. The effects of continuing foreign exchange shortages were becoming more evident. Production of jade, lead, silver, and zinc was down because of shortages of imported machinery and spare parts. The increase in copper production was not as large as planned because of a lack of spare parts at the Monywa facility.[4] Production figures for 1986 showed that only concentrates of zinc among the metals increased whereas concentrates of tin, tungsten and mixed tin-tungsten, and refined lead all declined substantially.

Table 1.—Burma: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985	1986[p]
METALS					
Copper:					
Mine output, Cu content	101	4,200	12,000	16,700	11,368
Matte, gross weight	223	173	173	173	144
Iron and steel: Pig iron	13,328	15,200	7,764	--	--
Lead:					
Mine output, Pb content	e16,050	23,146	21,937	21,935	18,156
Metal:					
Refined	7,829	7,636	6,996	9,585	5,359
Antimonial lead (18% to 20% Sb)	279	313	254	e300	299
Nickel:					
Mine output, N content[e]	20	20	20	20	20
Speiss, gross weight	81	80	80	80	86
Silver, mine output thousand troy ounces	526	558	r455	568	527
Tin, mine output, Sn content:					
Of tin concentrate	804	629	745	622	600
Of tin-tungsten concentrate	877	1,013	1,283	1,129	895
Total	1,681	1,642	2,028	1,751	1,495
Tungsten, mine output, W content:					
Of tungsten concentrate	243	235	216	171	102
Of tin-tungsten concentrate	601	695	880	774	613
Total	844	930	1,096	945	715
Zinc, mine output, Zn content	5,382	4,537	5,320	4,353	4,643
INDUSTRIAL MINERALS					
Barite[3]	16,029	9,989	9,967	8,100	8,149
Cement, hydraulic	344,225	334,685	311,179	477,000	433,811
Clays:[3]					
Ball clay	409	404	r960	110	496
Bentonite	1,463	710	r725	710	851
Fire clay[4]	1,633	e1,780	r1,220	1,370	2,040
Industrial white clay	813	810	r357	610	203
Feldspar[3]	2,540	e2,700	6,220	2,446	2,861
Graphite[3]	279	200	234	234	722
Gypsum[3]	26,079	34,278	r27,580	38,594	38,889
Nitrogen: N content of ammonia	51,000	53,900	56,916	125,795	133,130
Precious and semiprecious stones: Jadeite[3] kilograms	9,682	r45,700	r90,990	43,145	12,804
Salt[5] thousand tons	269	288	280	320	321
Stone:[3]					
Dolomite	3,250	4,400	1,305	2,383	5,253
Limestone, crushed and broken thousand tons	1,221	1,247	1,210	1,541	1,329
Quartz	39	--	--	--	--
Talc and related materials: Soapstone[3]	r165	128	r91	128	56

See footnotes at end of table.

Table 1.—Burma: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985	1986[p]
MINERAL FUELS AND RELATED MATERIALS					
Coal, lignite	38,200	34,500	[r]44,232	43,000	43,848
Gas, natural:					
Gross[e] million cubic feet	19,000	20,000	26,000	34,000	40,000
Marketed[3] do	17,400	18,190	[r]24,417	32,962	38,290
Petroleum:					
Crude (gross wellhead)[3] thousand 42-gallon barrels	9,789	10,168	[r]11,200	10,253	10,103
Refinery products[e] do	7,000	7,000	8,000	8,000	7,500

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

[1]Table includes data available through June 10, 1987.

[2]In addition to the commodities listed, pottery clay, common sand, glass sand, other varieties of crude construction stone, and other varieties of gem stones are produced, but available information is inadequate to make reliable estimates of output levels.

[3]Data are for fiscal years beginning Apr. 1 of that stated.

[4]Includes fire clay powder.

[5]Brine salt production as reported by the Burmese Government was as follows: 1982—73,901; 1983—200,944; 1984—81,166; 1985—44,508; and 1986—40,000 (estimated).

TRADE

After a modest decline during FY 1984, Burma suffered a nearly 50% decline in mineral export earnings in FY 1985.[5] This was caused mainly by generally lower prices for its mineral exports in the world market despite an increase in volume of mineral trade. Energy shortages and a lack of spare parts and raw materials have begun to affect Burma's ability to export. Mineral exports were particularly hit in FY 1985. Diesel oil shortages and machinery breakdowns led to declines in exports of lead, silver, and zinc. Spare parts shortages prevented No. 1 Mining Corp. from bringing copper production over 70% of capacity. No. 2 Mining Corp. stopped exporting tin in October 1985 because of the International Tin Council crises. Since then, both tin and tungsten exports have been severely depressed. Export figures were not available through yearend 1986 but were believed to have remained well below former levels. Sales at the 22d Annual Gem Emporium in February 1985 hit a record-high level of $9.3 million on gem stones mined earlier. Jade production, however, declined severely in FY 1985. Two factors contributed to the decline—a shortage of mine explosives and a large inventory of jade. It was the lowest jade output since FY 1978.

To reduce its vulnerability to cyclical changes in the world commodity market, the Government attempted to diversify its exports. Mineral sector exports included copper concentrates, which Burma began producing for export in FY 1984, and urea and liquefied petroleum gas, which it exported for the first time in FY 1985.

COMMODITY REVIEW

METALS

Steel.—The modernization work on the 28-year-old Ywama steelworks was progressing well and was scheduled for completion by yearend. A Japanese consortium led by Kobe Steel Ltd. and C. Itoh & Co. Ltd. was awarded the $14 million contract in 1984. The work included increasing an electric arc furnace's capacity to 12,000 tons per year; increasing annual rolling capacity from 28,800 to 48,800 tons, a slight increase over the originally planned 43,000 tons; and doubling the wire mill capacity to 16,400 tons per year. A 12,000-ton-per-year continuous billet caster was being installed to improve the plant's operating efficiency, material flow, and quality of products. Funding was provided by the Japanese Overseas Economic Cooperation Fund.

Work on the steel grinding-ball mill continued at the No. 1 Iron and Steel plant at Anisakan. Initial production of 3,000 tons was scheduled to begin in 1987 according to a Government report.[6] Capacity was apparently to be 5,250 tons of grinding balls for the Burmese mining industry. Foreign exchange savings and new employment oppor-

tunities were additional benefits of the project.

Tin and Tungsten.—Production of high-grade tin and tungsten concentrate and tin ingot increased substantially in FY 1985 but exports of concentrate and tin ingot were believed to have declined. Burma's tin export policy was determined by a Government committee from the Ministry of Mines and Nos. 1 and 2 Mining Corp. Tin was sold by tender two or three times each year with the majority going to Penang's smelters. Apparently some recent tenders were terminated in midnegotiation when the committee decided tin prices had fallen to an unsatisfactory level. No. 2 Mining Corp. was storing a considerable amount of tin until the prices become more attractive.

Burma's security forces have been occupied with insurgents activity in the Northeast and have left the tin producing South relatively less protected. As a result, it was believed that illegal gravel pump operators were selling tin and tin-tungsten concentrates across the nearby Thai border to Thai and Malaysian traders.[7] The quantities of concentrates involved were not known but it could have involved a fair proportion of total output.

The Government has been counting on increasing tin and tungsten exports to earn foreign exchange but the low world prices and costly infrastructure for new major tin mines were delaying development. The main casualty has been the Tenasserim project, which would have increased Burmese tin production by 60%. The project would have included a foundry and a central ore concentration plant and maintenance workshop in Mergui to provide service and repair facilities to the five proposed alluvial tin mines. Modern machinery and equipment would have been acquired and foreign technical trainers provided to No. 2. Mining Corp. The mining project was estimated to cost $40 million and would have employed 1,800 workers. In addition to the infrastructure cost, the lack of investment funds and foreign exchange were major problems. Also, the paucity of engineers familiar with modern mining technology contributed to the delay of the project.[8] It was likely that this would be the first new tin project undertaken by the Government when economic conditions improve.

MINERAL FUELS

Despite a study by Petro-Canada International Assistance Corp. concluding that development of the natural gas reserves in the Gulf of Martaban was economically feasible, the Government has reportedly shelved plans for the $1 billion project and indefinitely suspended further offshore petroleum exploration. The main reasons apparently for postponement were a shortage of foreign exchange and the depressed world price of oil.

The energy ministry will apparently concentrate on onshore development of known gas reserves and continued onshore exploration for crude oil. An indication of this was the completion of a 254-millimeter gas pipeline from the Payagon Gasfield in the Irrawaddy Delta to Rangoon where it was supplying a brick factory, steel rolling mill, other light industries, and several electric powerplants. Also being studied was the possibility of laying gas pipelines from Rangoon through Pa-an and Thaton, to Moulmine. Although reportedly justified on economic grounds, the pipeline would run partially through an area of political instability, which could complicate the construction and maintenance of the pipeline.

Officials were considering the installation of a compressed natural gas system for the Rangoon area also using gas from Payagon Gasfield. The compressed gas would be used for the public transportation system and fueling Government-owned trucks.

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[1]Physical scientist, Division of International Minerals.
[2]The Burmese fiscal year begins Apr. 1 of the year stated.
[3]U.S. Embassy, Rangoon, Burma. State Dep. Airgram A-12, July 22, 1986, p. 5.
[4]———. State Dep. Airgram A-007, May 9, 1986.
[5]Page 4 of work cited in footnote 3.
[6]Ministry of Planning and Finance. Report to the Pyithu Hluttaw on the Economic and Social Condition of the Socialist Republic of the Union of Burma for 1986/87. 1986, p. 315.
[7]Tin International. V. 59, No. 10, Oct. 1986, p. 354.
[8]Work cited in footnote 7.

The Mineral Industry of Canada[1]

By Harold R. Newman[2]

The continuing efforts by the Canadian mineral industry to increase efficiency and productivity resulted in a better performance in the metallic mineral sector with a slight increase in value from that of 1985. The mineral industry continued to be impacted by decreased investment and export trade. The weak worldwide demand for minerals, surplus capacity, and marginal to moderate world economic growth were problems the mineral industry faced in 1986. Low interest rates, a relatively strong U.S. dollar, and the bottoming out of prices for oil and other raw materials was expected to lead to moderate growth in the mineral industry.

The precious metals sector continued to grow with new mines and exploration and development programs.

Government Policies and Programs.—The National Transportation Act of 1986 introduced changes that would benefit rail shippers, especially those in the mineral resource industries. Mineral Development Agreements (MDA) between Canada and the Provinces of Manitoba, New Brunswick, Newfoundland, Nova Scotia, and Saskatchewan were continuing in the third year of the 5-year agreement. British Columbia, Ontario, and Quebec MDA's were in their second year in 1986, and work was continuing in all areas designated for geoscientific investigation.

Free trade negotiations between the United States and Canada began with preliminary discussions in April 1986. Actual negotiations were expected to run through 1987.

PRODUCTION

According to the Canadian Department of Energy, Mines and Resources (EMR), the total value of Canada's mineral production, including fuel and nonfuel minerals, was $24.4 billion[3] compared with $32.2 billion (revised) in 1985, a $7.8 billion decrease. The mineral fuel section, not including uranium, accounted for almost all the decrease. Sluggish demand for minerals worldwide, slower export growth, and lower oil prices all contributed to the 24% drop in value of mineral production from that of 1985. However, metallic mineral value of output increased slightly with a total value of almost $5 billion. Value of output of the industrial minerals sector was relatively unchanged. The 10 leading minerals, based on value of output, were petroleum, natural gas, natural gas byproducts, gold, coal, copper, zinc, iron ore, nickel, and uranium.

The Province of Alberta continued to account for the largest share of the total

value of output of $12.6 billion, down from $19.4 billion (revised) in 1985. Most of the decline was because of decreased volume and value of petroleum output. Ontario was second in output value with $3.5 billion. The value of output increased in 5 of 10 Provinces and the Yukon Territory. Employment in metal and industrial minerals mines was estimated at 77,000, down from a peak of 101,000 in 1981. Smelting, refining, and crude steel industry employment was also estimated at 77,000, down from a peak of 95,000 in 1981. Employment in both mining and mineral manufacturing was estimated at 379,000 in 1986, which was 3.3% of total employment in Canada. The mineral and primary metal sector produced about 50 commodities. Production values of the Provinces and Territories were as follows, in billion dollars:

Province or Territory	1985	1986[p]
Alberta	19.5	12.6
Ontario	3.3	3.5
British Columbia	2.6	2.4
Saskatchewan	2.7	1.9
Quebec	1.6	1.6
Northwest Territories	.6	.6
Newfoundland	.6	.5
Manitoba	.6	.5
New Brunswick	.4	.4
Nova Scotia	.2	.3
Yukon Territory	(1)	(1)
Prince Edward Island	(1)	(1)
Total[2]	32.2	24.4

[p]Preliminary.
[1]Less than 1/2 unit.
[2]Data may not add to totals shown because of independent rounding.

Source: Department of Energy, Mines and Resources, Ottawa, Canada, 1986.

Table 1.—Canada: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum:					
Alumina, gross weight thousand tons	1,127	1,116	1,126	1,019	1,100
Metal:					
Primary	1,064,795	1,091,231	1,227,000	1,282,000	1,364,000
Secondary	62,000	63,000	64,000	65,000	68,000
Antimony[e 2]	--	--	554	[r]1,075	3,900
Bismuth[3]	189	202	166	201	260
Cadmium[4]	854	1,456	1,605	1,717	1,421
Cobalt:					
Mine output, Co content[5]	1,404	1,584	2,325	2,067	2,486
Metal[6]	1,041	1,324	2,213	2,023	1,990
Columbium and tantalum:					
Columbium concentrate (pyrochlore):					
Gross weight	4,758	3,039	4,400	4,944	5,216
Cb content	2,145	1,256	1,987	2,223	2,340
Tantalum concentrate:					
Gross weight[e]	258	--	--	--	--
Cb content	8	--	--	--	--
Ta content	77	--	--	--	--
Copper:					
Mine output, recoverable metal content[7]	612,455	653,040	721,826	738,637	768,244
Metal, primary and secondary:					
Blister and anode	366,625	375,000	452,000	489,700	472,700
Refined	337,780	464,333	504,252	499,626	493,400
Gold thousand troy ounces	2,081	2,363	2,683	2,815	3,365
Iron and steel:					
Iron ore:[8]					
Gross weight thousand tons	35,425	33,495	41,065	39,502	36,100
Fe content do	22,530	21,300	26,076	24,847	22,700
Metal:					
Pig iron do	8,000	8,567	9,643	9,665	9,249
Ferroalloys do	218	269	216	227	240
Steel, crude do	11,762	12,828	14,715	14,500	13,900
Semimanufactures[9] do	9,556	NA	NA	NA	NA
Lead:					
Mine output, Pb content	341,212	251,467	264,301	284,600	349,400
Metal, refined:					
Primary	174,310	178,043	173,000	173,220	169,900
Secondary	67,566	63,914	79,000	68,384	95,000
Lithium: Spodumene[10]	--	--	82	[e]301	624
Magnesium metal, primary	7,900	6,000	8,000	[e]7,000	7,000
Molybdenum	13,961	10,194	11,557	7,852	12,914
Nickel:					
Mine output, Ni content[11]	88,581	128,113	173,725	169,971	180,600
Metal, smelter	58,636	87,200	104,000	119,129	123,730
Platinum-group metals troy ounces	228,426	223,925	333,363	338,676	282,250
Selenium, refined[12] kilograms	222,000	266,000	463,000	361,000	334,000
Silver thousand troy ounces	42,246	35,559	42,655	38,484	39,190
Tellurium, refined[12] kilograms	[e]18,000	[e]16,000	21,000	19,000	16,000

See footnotes at end of table.

Table 1.—Canada: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS —Continued					
Tin, mine output, Sn content	135	141	217	120	2,450
Titanium:					
Ilmenite, gross weight thousand tons	1,735	1,700	1,800	2,500	2,400
Sorel slag (80% TiO_2)[13]	669,000	630,000	733,000	850,000	840,000
Tungsten, mine output, W content	2,842	r328	3,715	4,031	1,786
Uranium oxide (U_3O_8)	7,643	8,483	12,113	12,312	12,944
Zinc:					
Mine output, Zn content	1,189,000	1,069,709	1,207,098	1,172,200	1,290,765
Metal, refined, primary	511,870	617,033	683,156	692,418	510,981
INDUSTRIAL MINERALS					
Asbestos thousand tons	834	858	837	750	640
Barite	27,744	45,465	46,884	71,000	37,000
Cement, hydraulic[14] thousand tons	8,426	7,871	8,609	10,192	10,058
Clays and clay products[15] value, thousands	$95,993	$127,400	$100,200	$138,246	$180,353
Diatomite[e]	2,000	2,000	4,000	3,800	4,100
Gypsum and anhydrite thousand tons	5,987	7,507	7,756	8,447	8,542
Lime do.	2,197	2,232	2,266	2,212	2,365
Magnesite, dolomite, brucite value, thousands	$8,216	$7,825	$5,965	$15,200	$14,400
Mica, scrap and flake	9,979	10,433	10,881	11,500	12,000
Nepheline syenite	550,000	528,000	521,000	467,000	485,000
Nitrogen: N content of ammonia	2,062,100	2,887,870	3,493,464	3,620,286	3,540,000
Potash, K_2O equivalent thousand tons	5,309	5,708	7,527	6,661	6,969
Pyrite and pyrrhotite, gross weight[e]	[16]19,268	5,000	5,000	6,000	6,000
Salt thousand tons	7,940	8,602	10,235	10,085	11,088
Sand and gravel do.	207,227	233,408	233,759	256,183	242,548
Silica (quartz)	1,797	2,303	2,624	2,669	2,437
Sodium compounds, n.e.s.:					
Sodium carbonate[e]	475,000	425,000	365,000	350,000	350,000
Sodium sulfate	542,839	454,000	387,000	375,000	371,000
Stone[17] thousand tons	61,929	74,466	81,754	86,632	91,200
Sulfur:					
Elemental byproduct:					
Of smelter gases do.	627	678	875	822	760
Of sour natural gas do.	5,226	5,390	5,260	5,296	5,170
Of refineries[e] do.	160	170	165	150	150
Of tar sands do.	259	330	296	392	435
S content of pyrite and pyrrhotite[e] do.	8	9	10	10	10
Talc, soapstone, pyrophyllite	72,182	97,000	126,000	127,000	125,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[e]	130,000	135,000	176,500	173,022	154,400
Coal:					
Bituminous and subbituminous	35,317,000	37,146,000	47,510,000	60,436,000	57,800,000
Lignite	7,494,000	7,760,000	9,918,000	9,672,000	8,281,312
Coke, high-temperature	4,000,000	4,120,000	4,900,000	4,683,770	4,552,600
Gas, natural:					
Gross million cubic feet	3,076,002	3,372,670	3,173,708	3,250,000	3,150,000
Marketed do.	2,682,747	2,465,100	2,505,818	2,831,200	2,695,680
Natural gas liquids:					
Gross:					
Butane thousand 42-gallon barrels	20,375	19,793	30,492	20,068	18,733
Propane do.	33,547	30,211	37,322	32,656	31,288
Pentanes plus do.	35,366	33,371	34,513	36,654	36,932
Ethane do.	26,698	29,577	35,765	34,664	32,449
Condensate do.	936	880	1,057	1,043	828
Total do.	116,922	113,832	139,149	125,085	120,230
Peat	487,000	544,000	541,000	643,000	587,000
Petroleum:					
Crude[18] thousand 42-gallon barrels	464,122	494,617	526,350	538,200	534,425
Refinery products:					
Gasoline:					
Aviation do.	1,066	1,081	1,297	1,131	1,887
Other do.	212,126	204,685	203,797	203,793	200,068
Jet fuel do.	25,153	26,442	26,434	27,703	29,169
Kerosene do.	16,256	13,809	13,831	13,573	13,962
Distillate fuel oil, diesel and light do.	146,938	137,693	145,497	140,334	140,939
Residual fuel oil, heavy do.	74,472	58,857	54,723	44,240	41,312
Lubricants do.	4,860	4,940	5,808	5,755	5,414
Liquefied petroleum gas, propane and butane do.	16,101	20,453	21,041	20,421	17,908
Petrochemical feedstocks do.	28,900	26,973	27,527	27,595	32,246
Asphalt do.	16,065	16,666	16,108	18,236	16,437

See footnotes at end of table.

Table 1.—Canada: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum —Continued					
Refinery products —Continued					
Petroleum coke thousand 42-gallon barrels	10,623	27,128	30,922	41,244	30,621
Unspecified do	36,186	10,753	12,823	24,872	35,505
Refinery losses do	588,746	549,480	559,808	568,897	565,468
Total do					

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

[1]Table includes data available through May 31, 1987.

[2]Sb content of antimonial lead alloys, flue dust, and doré slag estimated on the basis of reported gross production.

[3]Refined metal and bullion from domestic ores plus recoverable Bi content of exported concentrates.

[4]Refined metal from domestic ores plus recoverable Cd content of exported ores and concentrates.

[5]Actual output not reported. Data represent the Co content of all products derived from ores of Canadian origin, including nickel oxide sinter shipped to the United Kingdom and nickel-copper-cobalt matte shipped to Norway for further processing.

[6]Actual output not reported. Data represent the output within Canada of metallic cobalt from ores of both Canadian and non-Canadian origin.

[7]Blister copper from domestic ores plus recoverable Cu content of exported matte and concentrates.

[8]Series represent gross weight and metal content of usable iron ore (including byproduct ore) actually produced.

[9]Includes shipment of ingots from primary plants for rolling elsewhere.

[10]Based on U.S. imports.

[11]Refined nickel from domestic ores plus Ni content of oxide produced and recoverable Ni content of exported matte.

[12]From all sources, including imports and secondary sources.

[13]Refined sorel slag contained 72% TiO_2 in 1982, 74% TiO_2 in 1983, and 80% TiO_2 in 1984-86.

[14]Cement shipped and/or used by producers.

[15]Includes bentonite products from common clay, stoneware clay, fire clay, and other clays.

[16]Reported figure.

[17]Crushed, building, ornamental, paving, and similar stone.

[18]Including synthetic crude (from oil shale and/or tar sands).

Table 2.—Canada: Mineral production in 1986, by commodity

(Percent)

Commodity	Share of total[p] (value)
Petroleum	28.7
Natural gas	19.9
Natural gas byproducts	5.4
Gold	5.1
Coal	5.1
Copper	4.6
Zinc	3.9
Iron ore	3.7
Nickel	3.2
Uranium	2.7
Sulfur	2.7
Cement	2.3
Potash	1.7
Other	11.0
Total	100.0

[p]Preliminary.

Source: Department of Energy, Mines and Resources, Ottawa, Canada, 1986.

Several new mining operations commenced in 1986. Most notable were Total Erickson Resources Ltd.'s Mount Skukum Mine in the Yukon, Mining Finance Corp.'s Blackdome Mine in British Columbia, Sherrgold Inc.'s MacLellan Mine in Manitoba, and Gordex Minerals Ltd.'s Cape Spencer Mine in New Brunswick. Production at several major mines continued to be suspended until prices for their products rise to the level necessary to begin economic operations. The Canadian mineral industry has made major adjustments, such as cost cutting, improved mining techniques, and the development of new technology, to respond to market conditions over which, in many cases, it has little influence or control. Mining activities were conducted in every region of the country.

The values of principal mineral production were as follows, in million dollars:

Commodity	1985	1986[p]
METALS		
Gold	870	1,234
Copper	1,056	1,129
Zinc	947	939
Iron ore	1,053	903
Nickel	876	774
Uranium (U)	721	665
Silver	240	223
Lead	111	147
Molybdenum	54	82
Total[1]	5,928	6,097
INDUSTRIAL MINERALS		
Sulfur	739	667
Cement	567	569
Potash, K_2O	453	417
Asbestos	215	216
Salt	153	174
Lime	131	149
Clay products	99	129
Gypsum	54	58
Total[1]	2,413	2,374
MINERAL FUELS		
Petroleum	13,260	6,997
Natural gas	5,794	4,855
Coal	1,328	1,235
Total	20,382	13,087

[p]Preliminary.
[1]Data may not add to totals shown because of independent rounding.

Source: Department of Energy, Mines and Resources, Ottawa, Canada, 1986.

TRADE

The Canadian mineral sector's share of the international market improved in 1986. Preliminary data reported show mineral exports increased more than 4% above that of 1985 to $9.4 billion, while imports increased 7% to $6 billion in 1986. Canada continued as the leading exporter of ores, minerals, and nonferrous metals, but a decline in its share and an increase in the share of the United States, the second largest exporter, narrowed the gap. The Federal Republic of Germany remained in third position. Exports of refined metals and fabricated mineral products increased from $7.5 billion to $8.1 billion. Of the total mineral exports, over 65% was destined for the United States. Mineral exports represented 13.5% of total merchandise exports and added nearly $6 billion to the balance of trade surplus reported to be $8 billion.

The free trade negotiations between the United States and Canada were the most important single trade issue for the Government of Canada. Preliminary discussion began in April 1986 with actual negotiations expected to run through the end of 1987. Although there was opposition, both within Canada and the United States, to bilateral freer trade, the Canadian Government remained committed to concluding as broad an agreement as possible. For mineral resource products, the negotiation would seek to achieve the fullest liberalization of trade including processed and semiprocessed forms. There would be attempts to eliminate or reduce tariff and nontariff measures. If negotiations are successful, then the mining industries of both Canada and the United States would benefit in terms of market access.

Canada is a strong supporter of the new General Agreement on Tariffs and Trade (GATT) multilateral trade negotiations called the "Uruguay Round." The negotiations were agreed to in September 1986 and will be concluded in 4 years. The purpose of negotiations is to reverse protectionism, remove distortion to trade, further the objective of GATT, and develop a more open multilateral trading system.

Table 3.—Canada: Exports and reexports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	51,360	52,799	48,861	West Germany 927; Brazil 878.
Metal including alloys:				
Scrap	106,574	114,674	99,038	Japan 12,909; Italy 945.
Unwrought	834,371	1,051,007	683,512	Unspecified 367,495.
Semimanufactures	[2]101,904	55,979	44,824	Pakistan 3,936; Indonesia 2,711.
Cadmium: Metal including alloys, all forms	1,388	--		
Cobalt:				
Oxides and hydroxides	373	268	--	All to United Kingdom.
Metal including alloys, all forms	1,487	--		
Copper:				
Ore and concentrate, Cu content	[3]339,061	296,927	393	Japan 216,889; Norway 25,366; China 16,025.
Ash and residue containing copper	2,754	--		
Metal including alloys:				
Scrap	52,676	62,995	39,841	West Germany 5,329; Belgium-Luxembourg 4,540.
Unwrought	346,017	277,126	135,497	United Kingdom 41,347; Netherlands 25,059.
Semimanufactures	63,577	53,705	40,149	India 3,553; Cuba 1,761.
Gold:				
Ore and concentrate, Au content troy ounces	193,676	NA		
Metal including alloys, unwrought and partly wrought thousand troy ounces	4,000	NA		
Iron and steel:				
Iron ore and concentrate thousand tons	30,737	32,216	9,134	United Kingdom 5,373; Netherlands 4,831.
Metal:				
Scrap	795,060	878,204	546,435	Italy 71,837; Turkey 55,940.
Pig iron, cast iron, related materials	439,608	610,527	196,694	Netherlands 241,718; Japan 76,746.
Ferroalloys:				
Ferromanganese	9,202	43,584	43,583	Brazil 1.
Ferrosilicon	35,299	--		
Unspecified	5,202	43,891	24,582	Japan 12,060; United Kingdom 7,214.
Steel, primary forms	249,086	77,137	63,232	Turkey 11,374; Ethiopia 1,776.
Semimanufactures:				
Bars, rods, angles, shapes, sections	890,758	958,363	941,049	Mexico 4,563; Kenya 2,975.
Universals, plates, sheets	1,291,368	1,483,438	1,310,921	Mexico 30,844; India 27,339.
Rails and accessories	108,343	92,397	35,059	Mexico 39,764; Mozambique 8,298.
Wire	167,359	164,725	162,434	Comoros 545; Saudi Arabia 328.
Tubes, pipes, fittings	421,256	442,543	428,347	Egypt 3,938; Cameroon 3,108.
Castings and forgings, rough	139,494	122,575	122,154	United Kingdom 95; Mexico 86.
Lead:				
Ore and concentrate	[4]72,937	62,606	11,155	West Germany 15,712; Japan 13,556; Belgium-Luxembourg 11,535.
Metal including alloys:				
Scrap	5,960	11,393	2,269	Brazil 3,439; Netherlands 2,384.
Unwrought	124,528	114,007	73,966	United Kingdom 28,303; Belgium-Luxembourg 4,994.
Semimanufactures	18,489	16,021	14,515	Japan 1,110; Belgium-Luxembourg 371.
Magnesium: Metal including alloys, all forms	4,059	4,761	1,175	United Kingdom 1,461; Japan 941.
Molybdenum: Ore and concentrate including scrap, Mo content	8,896	--		
Nickel:				
Ore and concentrate	[3] [4]59,410	77,920	NA	NA.
Oxides and hydroxides, Ni content	20,082	--		
Metal including alloys:				
Scrap	9,606	4,948	2,661	Netherlands 1,322; Republic of Korea 264.
Unwrought	80,508	81,772	NA	NA.
Semimanufactures	10,867	12,412	8,692	Japan 1,125; Republic of South Africa 866.
Platinum-group metals:				
Ore and concentrate, Pt content troy ounces	272,156	--		
Metal including alloys:				
Waste and scrap do.	164,290	--		
Unwrought and partly wrought value, thousands	$29,809	$30,547	$23,002	United Kingdom $5,931; Switzerland $897.

See footnotes at end of table.

Table 3.—Canada: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Selenium, elemental	418	--		
Silver:				
Ore and concentrate value, thousands	$197,804	$130,674	$5,977	Japan $76,008; United Kingdom $38,707.
Waste and sweepings do.	$96,330	$82,731	$34,474	United Kingdom $29,522; West Germany $14,167.
Metal including alloys, unwrought and partly wrought do.	$284,680	$267,224	$266,958	Spain $98; Trinidad and Tobago $68.
Tin: Ore and concentrate including scrap, Sn content	317	393	114	Mexico 139; United Kingdom 123.
Uranium and/or thorium: Ore and concentrate value, thousands	$257,664	$169,793	$71,818	Japan $76,238; United Kingdom $17,167.
Zinc:				
Ore and concentrate, Zn content	539,633	409,744	41,909	Belgium-Luxembourg 202,834; West Germany 44,494.
Blue powder	3,532	--		
Metal including alloys:				
Scrap	19,552	--		
Unwrought	529,728	555,616	371,157	China 44,058; United Kingdom 41,087.
Semimanufactures	1,160	9,359	6,824	China 2,000; Colombia 128.
Other:				
Ores and concentrates	96,329	273,495	33,197	Italy 88,428; West Germany 63,735; Japan 35,679.
Ashes and residues	16,071	41,007	18,282	West Germany 7,765; Japan 2,731.
Precious metals, unspecified:				
Waste and sweepings value, thousands	$53,256	--		
Metal, unwrought and partly wrought do.	$107	--		
Base metals including alloys, all forms	1,657	4,712	3,582	United Kingdom 633; Belgium-Luxembourg 238.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	350	65	64	Singapore 1.
Artificial:				
Corundum	135,903	129,359	116,617	United Kingdom 12,724; France 18.
Silicon carbide value, thousands	$32,625	$46,781	$41,438	Japan $1,483; West Germany $901.
Dust and powder of precious and semiprecious stones do.	$165	$326	$322	Australia $3; New Zealand $1.
Grinding and polishing wheels and stones do.	$6,528	$5,638	$4,917	France $172; New Zealand $111.
Asbestos, milled including crude	795,853	721,560	133,311	Japan 99,978; India 46,176.
Barite and witherite	1,247	1,677	1,677	
Cement value, thousands	$81,797	$135,122	$134,434	Comoros $264; St. Pierre and Miquelon $90.
Clays, crude	942	5,553	1,303	West Germany 3,306; United Kingdom 876.
Diamond:				
Gem, not set or strung value, thousands	$22,947	$27,082	$12,979	Belgium-Luxembourg $6,043; Israel $5,641.
Industrial stones do.	$344	$588	$431	Ireland $150; Australia $6.
Dust and powder carats	271,131	--		
Feldspar, fluorspar, related materials	387,069	351,032	314,090	Netherlands 17,232; United Kingdom 6,133.
Fertilizer materials: Manufactured:				
Ammonia thousand tons	832	963	963	
Nitrogenous do.	1,922	1,575	1,301	China 78; Australia 56.
Phosphatic	--	45,866	45,651	New Zealand 144; United Kingdom 37.
Potassic thousand tons	11,215	9,803	6,450	Japan 626; India 528.
Unspecified and mixed do.	115	249	237	Ghana 3; Jamaica 3.
Gypsum and plaster do.	6,229	5,880	5,845	North Korea 23; Bermuda 11.
Lime	186,748	194,091	193,866	Bermuda 117; Australia 70.
Magnesite, crude value, thousands	$25,280	$26,299	$20,752	Venezuela $1,194; Cuba $1,185.
Pigments, mineral: Iron oxides and hydroxides, natural and processed	17,039	15,740	15,524	Venezuela 189; Ethiopia 19.
Precious and semiprecious stones other than diamond value, thousands	$9,281	$6,859	$4,094	France $849; West Germany $386.

See footnotes at end of table.

Table 3.—Canada: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Salt and brine thousand tons	2,531	2,289	2,284	Guyana 2; Barbados 1.
Sodium compounds, n.e.s.: Sulfate, manufactured	239,003	--		
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	220,691	185,090	183,021	Italy 1,750; Japan 295.
Worked value, thousands	--	$19,289	$17,096	Ireland $1,178; Japan $333.
Dolomite, chiefly refractory-grade	580,071	535,648	535,576	United Kingdom 54; Australia 18.
Limestone other than dimension	1,216,727	1,197,313	1,195,938	New Zealand 1,375.
Quartz and quartzite	116,283	112,762	112,762	
Sand and gravel	109,852	242,268	235,361	Bermuda 4,988; Republic of South Africa 1,854.
Sulfur:				
Elemental, all forms thousand tons	7,327	7,849	1,364	Morocco 827; Brazil 620.
Sulfuric acid	553,781	744,837	703,045	Netherlands 27,863; Switzerland 6,862.
Other: Crude value, thousands	$111,554	$124,162	$29,709	West Germany $34,531; France $27,299.
MINERAL FUELS AND RELATED MATERIALS				
Coal, all grades including briquets thousand tons	24,355	27,572	373	Japan 18,305; Republic of Korea 3,971; Brazil 887.
Coke and semicoke	116,710	169,155	129,397	Netherlands 21,958; West Germany 17,709.
Gas, natural million cubic feet	743,768	[5]903,004	898,498	Japan 4,083; Mexico 423.
Peat, agricultural	460,760	446,826	424,578	Japan 21,033; Republic of South Africa 322.
Petroleum:				
Crude thousand 42-gallon barrels	131,024	173,110	173,110	
Refinery products:				
Liquefied petroleum gas do	45,043	NA		
Gasoline do	9,996	14,940	14,556	Cuba 143; West Germany 110.
Distillate fuel oil do	13,994	18,762	17,242	St. Pierre and Miquelon 293; Republic of Korea 243.
Lubricants do	438	505	459	Ghana 20; Bahamas 7.
Residual fuel oil do	13,939	11,293	10,632	Netherlands 661.
Asphalt do	1,816	2,426	2,392	Comoros 27; United Kingdom 3.
Petroleum coke do	305	255	255	

NA Not available.
[1]Table prepared by H. D. Willis.
[2]May include relatively minor quantities of certain shapes not normally included among semimanufactures.
[3]Includes matte.
[4]Metal content.
[5]May include liquefied petroleum gas.

Table 4.—Canada: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals, unspecified	8,126	6,985	6,949	Brazil 17; China 15.
Aluminum:				
Ore and concentrate thousand tons	2,452	2,074	44	Brazil 1,402; Guyana 398.
Oxides and hydroxides do	1,349	1,561	87	Jamaica 652; Japan 287.
Metal including alloys:				
Scrap	61,782	52,424	52,424	
Unwrought	47,279	59,756	43,618	France 8,659; West Germany 2,014.
Semimanufactures	184,350	171,335	131,060	West Germany 15,416; France 8,961.
Antimony: Oxides	1,144	--		

See footnote at end of table.

Table 4.—Canada: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Chromium:				
Ore and concentrate, Cr content	12,888	12,006	4,591	Republic of South Africa 2,749; Turkey 2,124.
Oxides and hydroxides	2,098	2,006	1,106	West Germany 404; United Kingdom 371.
Cobalt:				
Ore and concentrate, Co content	18	NA		
Oxides and hydroxides	17	192	149	United Kingdom 35; Finland 8.
Copper:				
Ore and concentrate, Cu content	36,173	59,689	76	Chile 47,080; Poland 5,255; Spain 4,176.
Oxides and hydroxides	234	--		
Sulfate	2,644	--		
Metal including alloys:				
Scrap	76,338	85,200	84,023	Philippines 770; Haiti 240.
Unwrought	25,563	19,292	8,436	Zaire 5,171; Chile 2,973.
Semimanufactures	44,107	36,307	22,499	West Germany 3,366; Japan 3,149.
Gold:				
Ore and concentrate, Au content troy ounces	18,969	NA		
Metal including alloys, unwrought and partly wrought thousand troy ounces	2,182	NA		
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite thousand tons	4,947	5,800	5,133	Brazil 667.
Metal:				
Scrap do	1,131	884	884	
Pig iron, cast iron, related materials	13,420	15,847	12,956	Brazil 2,301; France 546.
Ferroalloys:				
Ferrochromium	33,091	--		
Ferromanganese	29,805	27,482	10,069	Republic of South Africa 7,002; West Germany 4,917.
Ferrosilicomanganese	6,830	--		
Ferrosilicon	24,777	--		
Unspecified	12,060	58,411	28,979	Republic of South Africa 19,282; Yugoslavia 2,800.
Steel, primary forms	276,706	146,491	32,111	Brazil 36,856; West Germany 30,365.
Semimanufactures:				
Bars, rods, angles, shapes, sections	641,829	596,570	135,274	Belgium-Luxembourg 94,362; France 84,098.
Universals, plates, sheets	662,332	1,016,868	496,127	United Kingdom 87,676; West Germany 82,192.
Hoop and strip	37,091	51,006	41,134	Japan 2,785; West Germany 1,830.
Rails and accessories	33,832	71,975	7,233	Japan 34,298; Australia 12,090.
Wire	78,234	60,498	16,266	United Kingdom 10,849; Belgium-Luxembourg 7,546.
Tubes, pipes, fittings	343,695	340,948	100,037	Japan 130,686; West Germany 38,932.
Castings and forgings, rough	43,365	27,249	22,673	Italy 1,868; Spain 650.
Lead:				
Ore and concentrate, Pb content	21,565	5,734	2,715	Peru 2,491; Spain 271.
Oxides	1,224	2,068	1,757	Mexico 136; Republic of South Africa 100.
Metal including alloys:				
Scrap	48,137	44,308	44,249	Australia 59.
Unwrought	6,314	5,676	3,013	Mexico 2,660; United Kingdom 3.
Semimanufactures	653	267	240	Belgium-Luxembourg 12; United Kingdom 9.
Magnesium: Metal including alloys, all forms	6,249	3,954	3,917	Norway 37.
Manganese:				
Ore and concentrate, metallurgical-grade, Mn content	77,545	102,649	4,497	Gabon 74,501; Brazil 10,825; Mexico 5,100.
Oxides	5,279	4,204	2,661	Japan 1,120; Greece 378.
Metal including alloys, all forms	3,011	--		
Mercury 76-pound flasks	2,176	1,189	667	Algeria 493; United Kingdom 29.
Molybdenum: Oxides and hydroxides	238	--		
Nickel:				
Ore and concentrate including matte, Ni content	3,430	5,078	19	Australia 5,059.

See footnotes at end of table.

Table 4.—Canada: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Nickel —Continued				
Metal including alloys:				
Scrap	21,305	26,478	15,430	United Kingdom 6,565; Belgium-Luxembourg 2,112.
Unwrought	3,479	2,450	603	Norway 1,786; West Germany 44.
Semimanufactures	2,825	3,324	1,866	West Germany 1,031; Sweden 252.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$6,450	$5,029	$2,629	United Kingdom $2,333; West Germany $67.
Silver:				
Ore and concentrate including waste[2]	$463,885	$274,430	$250,763	Peru $9,406; Spain $2,383.
Metal including alloys, unwrought and partly wrought do	$55,161	$113,963	$105,946	Belgium-Luxembourg $3,356; Mexico $3,087.
Tin:				
Ore and concentrate, Sn content	43	579	579	
Metal including alloys:				
Unwrought	4,106	3,785	1,150	Brazil 1,401; Singapore 460.
Semimanufactures	298	48	48	
Titanium:				
Oxides	16,188	12,702	2,657	West Germany 5,651; France 903.
Metal including alloys, all forms	356	--		
Tungsten: Ore and concentrate, W content	7	12	11	China 1.
Uranium and/or thorium:				
Ore and concentrate value, thousands	$76,952	$55,565	$242	Republic of South Africa $34,079; Australia $21,244.
Metal including alloys, all forms do	$158	$223	$223	
Zinc:				
Ore and concentrate, Zn content	41,087	10,060	6,350	Chile 2,457; Peru 1,220.
Oxides	1,350	1,303	1,221	United Kingdom 47; Mexico 30.
Blue powder	845	--		
Metal including alloys:				
Scrap	780	435	435	
Unwrought	6,757	1,816	207	Spain 699; Peru 582; West Germany 258.
Semimanufactures	1,089	1,390	1,188	Belgium-Luxembourg 87; West Germany 68.
Zirconium: Metal including alloys, all forms	227	--		
Other:				
Ores and concentrates, metal content	75,987	25,678	3,865	Australia 18,282; Republic of South Africa 3,460.
Oxides and hydroxides	25,342	16,586	15,085	United Kingdom 570; Japan 448.
Ashes and residues	25,147	32,729	18,422	India 14,307.
Base metals including alloys, all forms value, thousands	$24,919	$67,964	$49,243	Republic of South Africa $4,680; France $3,446.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	26,748	28,432	22,180	Iceland 5,962; Italy 186.
Artificial: Silicon carbide	10,152	7,288	6,087	China 800; West Germany 266.
Dust and powder of precious and semi-precious stones value, thousands	--	$2,457	$1,881	U.S.S.R. $518; Ireland $37.
Grinding and polishing wheels and stones do	$17,716	$19,569	$12,328	Italy $2,231; West Germany $1,565.
Asbestos, crude	326	374	356	Zimbabwe 18.
Barite and witherite	17,686	27,131	7,034	Morocco 11,020; Ireland 8,011.
Boron materials:				
Crude natural borates value, thousands	$387	$580	$578	Hong Kong $2.
Oxides and acids	6,689	4,803	4,524	Italy 230; Netherlands 39.
Cement	236,233	372,796	267,986	Spain 40,968; Venezuela 31,876.
Chalk value, thousands	$134	$1,131	$1,087	West Germany $41; Belgium-Luxembourg $3.
Clays, crude:				
Bentonite	337,054	--		
Chamotte earth	5,089	--		
Fire clay	43,744	--		
Fuller's earth	4,152	--		
Kaolin	253,080	--		
Unspecified	106,661	828,312	753,246	Greece 64,900; United Kingdom 7,391.

See footnotes at end of table.

Table 4.—Canada: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Cryolite and chiolite	537	518	64	Denmark 236; Netherlands 218.
Diamond:				
Gem, not set or strung value, thousands	$95,994	$117,287	$26,275	Belgium-Luxembourg $52,435; Israel $26,216.
Industrial stones do	$6,455	$6,093	$4,128	Ireland $1,650; Belgium-Luxembourg $118.
Dust and powder thousand carats	2,378	--		
Diatomite and other infusorial earth	23,892	24,226	24,222	Denmark 4.
Feldspar, fluorspar, related materials value, thousands	$17,779	$12,291	$1,758	Mexico $6,633; Morocco $1,962; Spain $1,937.
Fertilizer materials:				
Crude, n.e.s	23,825	24,040	23,363	Japan 249; West Germany 175.
Manufactured:				
Ammonia	19,947	31,793	31,793	
Nitrogenous	308,231	267,479	156,205	Netherlands 47,099; U.S.S.R. 27,160.
Phosphatic	340,177	447,968	432,465	Israel 14,456; Belgium-Luxembourg 1,043.
Potassic	80,095	65,230	62,048	France 3,000; Italy 182.
Unspecified and mixed	33,063	29,883	29,194	West Germany 465; Japan 121.
Fluorspar	166,709	--		
Graphite, natural value, thousands	--	$1,691	$1,536	West Germany $62; Norway $54.
Gypsum and plaster	131,809	146,435	42,727	Mexico 92,768; Spain 10,839.
Iodine	275	--		
Lime	24,848	23,056	21,737	United Kingdom 1,319.
Magnesium compounds:				
Magnesite, crude	9,115	46,947	34,307	Italy 5,301; China 2,500.
Oxides and hydroxides	49,943	--		
Mica:				
Crude including splittings and waste value, thousands	$593	$538	$538	
Worked including agglomerated splittings do	$2,409	$2,413	$1,990	France $198; India $130.
Nitrates, crude	9,190	1,967	1,649	Chile 318.
Phosphates, crude thousand tons	3,170	2,638	2,580	Togo 36; Morocco 22.
Pigments, mineral: Iron oxides and hydroxides, natural and processed	7,762	7,754	5,237	United Kingdom 993; West Germany 632.
Precious and semiprecious stones other than diamond value, thousands	$23,359	$17,628	$6,493	Thailand $1,803; Colombia $1,753.
Pyrite, unroasted do	$133	$94	$85	Italy $9.
Salt and brine thousand tons	1,053	1,257	800	Mexico 309; Chile 60.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	131,882	3,520	3,520	
Sulfate, manufactured	20,584	67,502	16,346	United Kingdom 38,529; Norway 4,346.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	54,418	48,681	22,052	Republic of South Africa 16,626; Italy 3,788.
Worked value, thousands	$17,381	$17,287	$2,720	Italy $11,426; Spain $629.
Dolomite, chiefly refractory-grade	3,196	3,667	3,667	
Gravel and crushed rock	44,413	598,197	597,102	West Germany 846; Sweden 163.
Limestone other than dimension thousand tons	1,944	2,074	2,074	
Quartz and quartzite	494	339	311	France 12; Japan 12.
Sand other than metal-bearing thousand tons	--	1,598	1,596	Philippines 2.
Sand and gravel do	1,267	--		
Silica sand do	1,076	--		
Sulfur:				
Elemental, all forms	3,019	3,242	3,222	West Germany 19; France 1.
Sulfuric acid	28,330	17,307	17,298	Unspecified 9.
Talc, steatite, soapstone, pyrophyllite	38,816	41,307	40,879	China 141; France 91.
Vermiculite	24,188	--		
Other:				
Crude value, thousands	$6,777	$10,756	$9,062	Republic of South Africa $676; Australia $456.
Slag and dross, not metal-bearing	84,159	208,300	202,670	Japan 5,498; United Kingdom 131.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,448	2,296	2,278	Trinidad and Tobago 18.
Carbon black	11,035	7,647	7,320	United Kingdom 78; Singapore 76.

See footnotes at end of table.

Table 4.—Canada: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coal: All grades including briquets thousand tons	19,064	15,006	14,997	Greenland 6; Netherlands 3.
Coke and semicoke	660,257	809,740	768,279	West Germany 41,461.
Gas, natural: Gaseous million cubic feet	32	--		
Petroleum:				
Crude thousand 42-gallon barrels	93,402	97,527	8,246	United Kingdom 30,168; Venezuela 21,086; Mexico 12,729.
Refinery products:				
Liquefied petroleum gas value, thousands	$105,204	$89,660	$89,529	West Germany $60; United Kingdom $50.
Gasoline do	$135,649	$200,814	$37,415	Netherlands $57,628; Italy $29,023.
Mineral jelly and wax thousand 42-gallon barrels	59	72	60	United Kingdom 4; West Germany 3.
Kerosene and jet fuel do	3,663	10,081	3,730	Italy 1,471; Venezuela 1,317.
Distillate fuel oil do	5,463	4,075	2,355	Venezuela 687; Finland 301.
Lubricants do	738	2,076	1,000	United Kingdom 287; India 237.
Naphtha do	443	--		
Nonlubricating oils do	336	--		
Residual fuel oil do	15,091	7,083	2,806	Venezuela 4,277.
Asphalt do	(3)	--		
Bitumen and other residues do	443	534	353	Spain 181.
Petroleum coke do	4,877	4,764	4,262	Unspecified 502.
Unspecified do	556	--		

NA Not available.
[1]Table prepared by H. D. Willis.
[2]May include other precious metals.
[3]Revised to zero.

COMMODITY REVIEW

METALS

Aluminum.—All Canadian smelters were reported operating at capacity except for Aluminium Co. of Canada Ltd.'s (Alcan) Arvida smelter at Jonquière, Quebec. The smelter utilized 88% of its installed capacity. Canadian primary aluminum smelting capacity at the end of 1986 was about 1.6 million tons per year. Aluminiere de Bécancour Inc. (ABI) was nearing completion of its 230,000-ton-per-year smelter at Bécancour, Quebec. ABI initiated startup of the second 115,000-ton-per-year potline. The plant was expected to be fully operational by the first part of 1987. This is the world's newest primary aluminum smelter and is considered state-of-the-art technology. The smelter uses the 180,000-ampere electrolytic cell technology developed by the Pechiney Group of Paris, France. A ton of aluminum can be produced with less than 13,500 kilowatt hours of energy, about 20% lower than the energy consumption average for the U.S. aluminum industry. Pechiney also provided technical assistance to the project. The smelter has 480 pots arranged in two lines of 240 pots each. The four buildings that house the potlines are 810 meters long each. Each pot, supplied with 180,000 amperes of direct current and 4.2 volts, produces about 1,375 kilograms of metal per day. Eighteen semiautomatic pot-tenders feed alumina, tap the molten metal, and replace the anodes.

Metal is transferred from the potline to the casting house where three major end products—T-ingots, slabs, and billets—are produced. The smelter is opposite the city of Trois-Rivières adjacent to a year-round deepwater port on the St. Lawrence River. Pechiney's high-intensity cell technology plus low-cost electricity supplied from Quebec's James Bay hydroelectric complex will make the Bécancour smelter one of the less expensive producers in the world.

Alcan Aluminium Ltd. announced that its subsidiary, Alcan Pacific Ltd., reached a joint venture agreement for an integrated aluminum extension and manufacturing plant in China. The facility will make and sell extrusions for the architectural, trans-

portation, communication, and electronics industries in both domestic and export markets. The joint venture involves Alcan Pacific, Alcan Nikkei China Ltd., and China National Nonferrous Metals Industry Shenzhen Associated Corp.

Alcan was testing a pilot gallium extraction plant at its Jonquière, Quebec, alumina facility and was expecting to bring a 4-ton-per-year extraction unit on-stream in 1987. This plant would produce 99.99% pure (4N) gallium from Bayer liquor and gallium-rich slurries obtained during the electrolysis of alumina. The 4N gallium produced would be shipped to Alcan's plant in Switzerland for refining into 99.9999% pure (6N) and 99.99999% pure (7N) gallium metal.

Reportedly, Swiss Aluminium Ltd. had completed a feasibility study during 1986 for a 230,000-ton-per-year aluminum smelter in Quebec.

Copper.—In the face of low metal prices in 1986, Canadian copper producers continued in their efforts to reduce production costs and increase efficiency. Joint ventures and restructuring occurred during the year to help alleviate financial difficulties. One of the more significant changes was the forming of the Highland Valley Copper partnership in July by Cominco Ltd. and Lornex Mining Corp. Ltd. Cominco's mine, the former Bethlehem Copper operation, and Lornex's mine and mill will continue to operate with mining capacity to be increased to about 181,000 tons per year of copper in concentrates. There are significant quantities of silver and gold contained in the ore. Also, molybdenum is contained in the Cominco ore body, which may be recovered depending on the selling price. Cominco and Lornex have equal control and management of Highland Valley Copper, the entity that will operate the project. Capital requirements and cash generated will be shared 45% by Lornex and 55% by Cominco. A $52 million program was initiated in 1986 and includes two semimobile in-pit crushers amd conveyors to move ore to the Lornex mill. The combination of the assets of these two operations will be one of the world's largest single producers of copper concentrate. The combined effects of increased ore reserves and higher grade ore will ensure a low-cost and highly competitive facility.

In early 1986, the Kidd Creek Mines Ltd.'s operations in Timmins, Ontario, was sold to Falconbridge Ltd. Subsequently, Falconbridge Ltd. sold its interest in Corporation Falconbridge Copper to Kerr Addison Mines Ltd. to reduce corporate debt in part resulting from the Kidd Creek purchase.

Westmin Resources Ltd., a new mine and mill at Myra Falls, Vancouver Island, British Columbia, finished its first full year of operation. The H-W ore body has estimated reserves of 13.5 million tons grading 2.2% copper, 0.33% lead, 5.3% zinc, 2.3 grams of gold per ton, and 34 grams of silver per ton. At capacity operation, the H-W ore body was expected to yield 65,000 tons of zinc, 16,000 tons of copper, 2,250 tons of lead, 1,244 kilograms of gold, and 31,100 kilograms of silver per year.

In 1986, Inco Ltd. announced it would invest $15 million over the next 2 years to modernize the company's copper refinery facilities.

Gold.—Canada continued its position as the second largest gold producer of the market economy countries after the Republic of South Africa. The Hemlo Goldfield near Marathon, Ontario, provided for the largest increase in gold production in the country. The three new mines, operated by Lac Minerals Ltd., Noranda Inc., and Teck-Corona Operating Co., completed their first full year of production.

Litigation between Lac Minerals and International Corona Resources Ltd. over the Page-William Mine at Hemlo, Ontario, was continuing. In March, the Ontario Supreme Court awarded the Page-William Mine to Corona, accepting Corona's claim that Lac Minerals breached a trust to jointly develop the property. The court also ordered Corona to pay Lac Minerals $111.6 million for the buildings and underground development. After appealing the decision, Lac Minerals was allowed to continue operating the mine until the results of the appeal were known. The Ontario Court of Appeals heard the appeal in November, and the decision was still pending at yearend.

Lac Minerals and Cambior Inc., joint venture partners in the Doyon Mine in northwestern Quebec, announced plans to expand the mill from 1,650 tons per day to 3,300 tons per day by late 1987. The expansion will allow all the mine's production to be treated on-site instead of being shipped out for custom treatment. The Doyon Mine is one of the largest gold producers in Canada, with an output of 212,913 troy ounces in 1986. The mine, which started out as an open pit mine in 1980, was developed into an underground operation in 1984.

Hope Brook Gold Inc., a subsidiary of BP

Resources Canada Inc., was proceeding in 1986 with developing the Hope Brook Mine on the southwest coast of Newfoundland. Bechtel Canada Engineers Ltd. was providing engineering, procurement, and construction services for the largest gold mine now being developed in Canada. The mine was scheduled to begin production by late 1988 and was expected to yield 1.2 million ounces of gold over an estimated 11-year mine life. The project was assisted by grants from the Federal and Provincial governments totaling $17 million.

Several ownership changes occurred in the gold mining industry. Cominco sold its interest in the Con Mine and an arsenic trioxide plant at Yellowknife, Northwest Territories, to Nerco Minerals Co. The Con Mine is the oldest producing gold property in the Northwest Territories.

The first gold bar was poured in 1938 and since then, over 124,000 kilograms of gold has been produced by the mine. Production in 1986 was estimated to be 2,730 kilograms. Pamour Inc. purchased Falconbridge's interest in both the Giant Yellowknife Mines Ltd. and Akaitcho Yellowknife Gold Mines Ltd. Pamour then merged with Giant Yellowknife, raising Pamour's share of Giant Yellowknife to 50.1%. Gold production from these amalgamated mining operations in the Timmins and Yellowknife areas, was estimated at 7,500 kilograms.

The Mount Skukum Mine, south of Whitehorse, Yukon Territory, began operations in midyear. The mine was the property of AGIP Canada Ltd. and Total Erickson Resources and was the first major hard-rock gold mine in the Yukon Territory. The mine was expected to produce 1,700 kilograms of gold per year. The companies spent an estimated $7.5 million to bring the mine into production.

Iron Ore.—The Canadian iron ore industry operated at 70% capacity in 1986, compared with 78% capacity in 1985. Value of iron ore shipments was estimated at $0.9 billion, compared with $1 billion in 1985.

A large portion of Canadian production was sold at the world price, which resulted in decreased revenues for the producers. The iron ore industry continued its efforts to increase efficiency and cut costs.

Iron and Steel.—The average utilization rate of production capacity was a reported 66% in 1986. Capital expenditures at iron and steel mills were $480 million, up from $310 million in 1985. Trade issues, including access to U.S. markets, unfair foreign competition, demand for steel-based consumer goods, and the worldwide oversupply of steel, continued to be a major concern for the Canadian steel industry. Canada placed carbon steel products on the Import Control List for a period of 3 years to collect information regarding the importation of these products. Canada continued as a net exporter of steel with the majority of products shipped to the United States. Canadian plant rebuilding and modernization projects, when completed, should improve efficiency and allow the industry to be more competitive.

Lead and Zinc.—Production of lead and zinc in Canada increased marginally in 1986. World overcapacity and overproduction continued to plague the Canadian lead and zinc industry. This has resulted in the restructuring and reorganization of the industry. A significant development in 1986 was the purchase of Kidd Creek Mines, from Canada Development Corp. by Falconbridge. Also, Canadian Pacific Ltd. sold a major interest, 31%, in Cominco to a joint venture consisting of Teck Corp., 50%; MIM (Canada) Inc., 25%; and Metallgesellschaft Canada Ltd., 25%. In late 1986, Cominco initiated the first phase of a $188 million project to modernize its lead smelter at Trail, British Columbia. The old smelter will be replaced with a state-of-the-art oxygen smelting plant. Phase 2 of the project will consist of rebuilding the slag fuming furnaces plus new coal grinding and drying facilities. The new smelter will have a capacity of 160,000 tons per year, the same as the existing one; however, the efficiency and environmental conditions will be increased significantly.

Curragh Resources Corp. reopened the Cyprus Anvil Mine in Faro, Yukon Territory, in mid-1986 and was operating at capacity at yearend. The previous owner, Cyprus Anvil Mining Corp., had closed the mine in 1982.

Cominco announced plans to shut down the Pine Point Mine in the Northwest Territories. Concentrates will be stockpiled for processing at Trail, British Columbia, in future years. Corporation Falconbridge Copper was proceeding with the development of the Winston Lake zinc-copper deposit in northwest Ontario. The mine was expected to begin production in 1988 with an annual capacity of 57,500 tons of zinc in concentrate. Noranda announced it would develop the Isle Dieu ore body near its Mattagami Mine in Quebec. Production was scheduled to start in 1988. The mine will have an annual capacity of 50,000 tons of zinc in

concentrate. Ore reserves were estimated at 2.1 million tons grading 22.4% zinc, 1.23% copper, and 87 grams of silver per ton.

Nickel.—Overcapacity and relatively low prices continued to be a problem for Canadian nickel producers. Inco, Falconbridge Ltd., and Sherritt Gordon Mines Ltd. are the major nickel producers in Canada, and they continued their efforts to cut costs and increase productivity. In September, Inco officially opened its Thompson open pit mine. The ore grades 2.7% nickel and is one of the lowest cost nickel mines in the world. Falconbridge Ltd. continued with its 3-year development program at Sudbury, Ontario. This program includes deepening of the Strathcona No. 1 shaft and developing the Craig and Onaping deposits.

Hudson Bay Mining and Smelting Co. Ltd. was continuing with plans to develop the Namew Lake nickel sulfide deposit near Flin Flon, Manitoba. A shaft was sunk to provide material for bulk metallurgical testing. The deposit contains an estimated 2.3 million tons of ore grading 2.4% nickel, 0.9% copper, and minor amounts of platinum and palladium. Canada remained the second largest nickel-producing country in the world and the largest among market economy countries.

Silver.—Production of silver in Canada increased slightly. Equity Silver Mines, expansion of its mill resulted in an increase in milling capacity from 6,300 tons per day to 10,900 tons per day, and production increased. The new Blackdome Mine, operated by Blackdome Mining Corp., near Clinton, British Columbia, began operating in mid-1986. The mine is expected to produce 1,400 kilograms of gold and 6,200 kilograms of silver annually. The Mount Skukum Mine, near Whitehorse, Yukon Territory, started up in mid-1986 and produced about 6,000 kilograms of silver.

Other Metals.—Durham Resources Inc. resumed production of antimony at its Lake George Mine near Fredericton, New Brunswick, in mid-1985 and had achieved a production rate of 500 tons per day by mid-1986. The mine had been closed since 1981. At Port Colborne, Ontario, Inco operated its cobalt refinery at full capacity of 900 tons per year of electrolytic cobalt rounds.

Timminco Ltd., an Ontario company, was the largest producer of strontium metal in the world and the only one in North America in 1986. Timminco was planning to build a $2.6 million vacuum furnace in Haley, Ontario. The company was also attempting to prove up enough celestite (strontium) reserves at its property in Nova Scotia to justify reopening the mine. The open pit mine, east of Sydney, Nova Scotia, has 450,000 tons of proven reserves grading 54% celestite. Production of tantalum at Tantalum Mining Corp. of Canada Ltd.'s mine at Bernic Lake, Manitoba, remained suspended in 1986. The mine was the world's largest supplier of tantalum concentrates prior to shutdown in 1982 owing to high world inventories and low prices. In late 1986, Rio Algom Ltd. announced its decision to end its financial obligations to the East Kemperville tin mine in Nova Scotia, leaving the future of the mine in the hands of the banking syndicate that financed its development. Rio Algom's decision was based on the prospect that a low price for tin would prevail in the foreseeable future. Mine production in 1986 was estimated at 2,375 tons of tin in concentrate, which was shipped to the Capper Pass tin smelter in the United Kingdom. Lac Minerals continued its program to explore the North Zone tin prospect on Billiton's Mount Pleasant tin-tungsten property in New Brunswick.

Production of tungsten decreased owing to the closure in May of Canada Tungsten Mining Corp. Ltd.'s mine in the Northwest Territories, which was the last producing tungsten mine in Canada.

INDUSTRIAL MINERALS

Asbestos.—Asbestos production continued to decline. The industry continued to feel the effects of uncertainties regarding future environmental regulations, adverse publicity, and economic conditions in developing countries. The industry exports about 95% of production; therefore, world economic conditions impact significantly on production.

A limited partnership, known as LAB Chrysotile Inc., was formed by Lake Asbestos of Quebec Ltd. (LAQ), Asbestos Corp. Ltd., and Bell Asbestos Mines Ltd., which involved reorganization of production and sales. This partnership now controls about 50% of asbestos production in Quebec. The mining and milling operations of Carey Canada Inc. at East Broughton, Quebec, was closed in mid-1986.

Potash.—Installed potash production capacity was 9,825,000 tons in Saskatchewan and 750,000 tons in New Brunswick at yearend 1986. Capacity utilization was 63%, and production was marginally higher in 1986.

Canamax Resources Inc. and the Manitoba Provincial government agreed in mid-

1986 to form Manitoba Potash Corp. with the intent of bringing a potash mine into production in southwestern Manitoba. India's state-owned Minerals and Metals Trading Corp. (MMTC) announced it would take a direct equity stake of about 20% in the $500 million project. The mine was expected to have a mine life of 30 years with output at 2 million tons per year.

The Denison-Potacan Potash Co. expects to achieve full operational capacity of 790,000 tons per year by the end of 1987 at its mine at Sussex, New Brunswick.

Other Industrial Minerals.—There was no production of graphite in 1986 because Asbury Graphite Quebec Inc., the only producer, was closed and undergoing an extensive modernization program. The one mica mine, Lacana Petroleum Ltd.'s Suzorite mica mine near Parent, Quebec, operated throughout 1986. Lacana was proceeding with a major expansion plan to increase capacity of production of delaminated mica.

Princeton Resource Corp. was developing a flake graphite deposit at Bissett Creek, Ontario. Exploration efforts had outlined an estimated 5 million tons of flake graphite at a grade of 3.5% to 7% graphite. The ore body, occurring at the surface, was expected to be mined by open pit methods. Cal Graphite Corp. was developing a flake graphite deposit near Huntsville, Ontario. The grade averages 3% flake graphite with 20-year reserves for a 3,000-ton-per-day open pit mine. In 1986, Canada was the world's leading producer of ground and flake phlogophite mica. Canada was also the largest producer of nepheline syenite in the market economy countries. There were two producers of nepheline syenite, Indusmin Ltd. and IMC Industry Group (Canada) Ltd., and both were in the Blue Mountain District of Ontario. In 1985, Falconbridge Ltd. acquired both of these companies. The combined capacity of both companies was about 750,000 tons of nepheline syenite per year. Rock salt in Canada was produced both from underground mines and as by-product from potash mines. Brine was produced in 11 plants. Bakertalc Inc. in Quebec completed its expansion program, which doubled production capacity for high-grade talc. Also, Steetley Talc Ltd. completed its 4-year multiphase expansion program, which also doubled its capacity to produce high-grade talc.

MINERAL FUELS

Coal.—Reported figures for 1986 indicate that coal production in Canada decreased for the first time in several years. Oversupply of coal in the international market and downward pressure on prices contributed to about a 5% decline in production from that of 1985. The coal industry was responding to the situation by diversifying and expanding its markets both in the United States and abroad. Canadian coking coal was marketed in Portugal for the first time in 1986. Also for the first time, Canadian-produced anthracite coal was exported to the Republic of Korea. Exports to Brazil were expected to rise. Exploration for new markets was taking precedence over exploration for new coal deposits. Canada has an excellent coal-producing infrastructure and could respond quickly to market and demand changes.

Teck's Bull Moose Mine and Denison Mines Ltd.'s Quinette Mine in British Columbia had exclusive contracts to export metallurgical and thermal coals to Japanese customers. Declining prices of coal forced both companies to cut prices to these customers in 1986. On the surface, however, it appears the Canadian coal industry fared well in the 1980's. Reportedly, while world coal trade grew by 43% between 1979 and 1985, Canadian coal exports increased by 100%.

Natural Gas.—Canada's reserves of marketable natural gas were estimated at about 100 trillion cubic feet. Both Federal and Provincial governments began deregulating gas marketing in November 1986. Sales competition was expected to increase and more attention was being focused on the U.S. market. Some Canadian companies were attempting to enter the New England natural gas market. Alberta Natural Gas Co. Ltd. announced a major new contract to supply Alberta gas to the U.S. Northeast. If approved, the project could see about 390 million cubic feet of gas exported beginning in 1988.

Petroleum.—Falling oil prices negatively impacted the Canadian petroleum sector in 1986. Investment, employment, drilling, and land sales were off sharply. The sharp fall in upstream investment could mean that Canada would not be able to renew a declining conventional oil resource base. In 1986, established reserves of crude oil and pentanes plus stood at 1,068 million cubic meters. An overall recovery for the petroleum industry was expected as a result of the deregulation of oil prices in late 1986. Well completions were estimated to be 6,500, a 39% decrease from that of 1985.

Uranium.—Canada continued to maintain its position as the leading producer and exporter of uranium of all the market

economy countries. Canada continued to play a major international role with over 30 new export contracts signed in 1986. About 85% of the country's annual production was destined for export.

The major uranium discovery of the 1980's was undoubtedly the Cigar Lake deposit in northern Saskatchewan. With ore reserves of 130,000 tons of uranium oxide grading an average of 14% uranium oxide, the deposit was considered the largest and richest in Canada. Cigar Lake Mining Corp. was proceeding with the development of the deposit. A $35 million underground exploration program was under way to study feasibility of various mining methods.

In late 1986, Denison Mines started operations at its new plant to recover yttrium oxide as a byproduct of uranium production. The plant has an annual capacity of 136 tons of yttrium oxide.

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[1]For more detailed information on the mineral industry, see the Canadian Mineral Surveys for 1984 and 1985, both of which were prepared by the Mineral Policy Sector and the Energy Sector, Department of Energy, Mines and Resources, Ottawa, Canada. The U.S. Department of the Interior, Bureau of Mines, has arranged to have these Canadian publications placed in libraries in each of the 50 States and Puerto Rico as follows: University of Alabama, Tuscaloosa; E. E. Rasmuson Library, University of Alaska, Fairbanks; University of Arizona, Tucson; University of Arkansas, Fayetteville; California State Library, Sacramento; A. Lakes Library, Colorado School of Mines, Golden; Wilbur Cross Library, University of Connecticut, Storrs; H. M. Morris Library, University of Delaware, Newark; Strozier Library, Florida State Library, Tallahassee; P. Gilbert Memorial Library, Georgia Institute of Technology, Atlanta; University of Hawaii, Hilo; University of Idaho, Moscow; Morris Library, Southern Illinois University, Carbondale; Indiana University, Bloomington; Iowa State University of Science and Technology, Ames; Watson Library, University of Kansas, Lawrence; M. L. King Library, University of Kentucky, Lexington; University of Southwestern Louisiana, Lafayette; R. H. Folger Library, University of Maine, Orono; M. S. Eisenhower Library, Johns Hopkins University, Baltimore, MD; Massachusetts Institute of Technology Library, Cambridge; Michigan Technical Library, Houghton; Wilson Library, University of Minnesota, Minneapolis; University of Southern Mississippi, Hattiesburg; Rolla Library, University of Missouri, Rolla; Montana College of Mineral Science and Technology, Butte; D. L. Love Library, Nebraska Geological Survey at University of Nebraska, Lincoln; University of Nevada, Reno; University of New Hampshire, Durham; J. C. Dana Library, Rutgers University, Newark, NJ; New Mexico Institute of Mining and Technology, Socorro; Columbia University, New York, NY; D. H. Hill Library, North Carolina State University, Raleigh; Fritz Library, University of North Dakota, Grand Forks; Ohio State University, Columbus; University of Oklahoma, Norman; Multnomah County Library, Portland, OR; Pennsylvania State University, University Park; University of Rhode Island, Kingston; Thomas Cooper Libary, University of South Carolina, Columbia; South Dakota School of Mines and Technology, Rapid City; Tennessee State Library and Archives, Nashville; Main Library, University of Texas, Austin; Marriott Library, University of Utah, Salt Lake City; Bailey Library, University of Vermont, Burlington; Virginia Polytechnic Institute, Blacksburg; University of Washington, Seattle; West Virginia University, Morgantown; Memorial Library, University of Wisconsin, Madison; University of Wyoming, Laramie; and University of Puerto Rico, Mayaguez.

[2]Physical scientist, Division of International Minerals.

[3]Where necessary, values have been converted from Canadian dollars (CAN$) to U.S. dollars at the rate of CAN$1.3895=US$1.00.

The Mineral Industry of Chile

By Pablo Velasco[1]

Despite severely depressed mineral prices during the last decade, Chile has been able to increase its role as the dominant world copper mining country. In the 1976-85 period, $2.56 billion was invested in mining development. As a result, Chile has become the world's largest copper producer and exporter as well as the world's 2d largest molybdenum and iodine producer, 5th largest lithium producer, 8th largest silver producer, and 11th largest gold producer. Chile also continued to rank as the world's largest producer and exporter of nitrates and rhenium and holds about 37% of the world's total reserves of rhenium. In addition, Chile was a significant producer and exporter of cement, coal, gold, iron ore, lead, manganese, pig iron, silver, selenium, crude steel, and zinc. Depressed world prices for most mineral products limited the increase in the value of Chile's mining output to only 1.5% of the gross domestic product (GDP) despite increases in copper and gold production. The mineral industry contributed 8.4% of Chile's real GDP, placing this sector behind industry and commerce as a generator of national income. About 80,600 workers were directly employed in mining. Because most of the mineral production was exported, the industry generated large amounts of foreign exchange, which is necessary to service Chile's $19.4 billion[2] foreign debt.

Copper production and export was the most important economic activity in Chile, despite the fact that it employed only 38,000 workers or less than 1% of the country's total labor force.

Preliminary data by the Central Bank of Chile and the National Institute of Statistics indicated that Chile's GDP grew at a strong 5.7% rate in 1986, up from 2.4% in 1985 to just above $16.4 billion in current dollars. For the past 3 years, the Chilean economy has grown steadily, recovering from the severe economic recession of 1981-83. Factors contributing to the 1986 expansion were the beneficial effect of currency devaluations in previous years, lower domestic interest rates, and inexpensive oil prices. All of these combined to improve Chile's economic performance in the first three quarters of the year. Moderate inflation and a sharp decline in unemployment accompanied the growth. Chile complied with the terms of the 1984 International Monetary Fund Stand-By Program, despite lower copper prices.

Government Policies and Programs.—Chile has a well-established investment policy (Decree Law 600, the nation's foreign investment statutes), which has very liberal capital transfer rules. However, only $2.5 billion of actual investment has entered the country since 1974, out of the total $7.6 billion that was authorized. New foreign investment in Chile totaled $250 million in 1986, most of which went to the Chilean mining sector. Among the most significant developments were the initiation of the $300 million methanol plant by Cape Horn Methanol Ltd. near Punta Arenas on the Strait of Magellan. Other large investments were made in the Mantos Blancos, Disputada de las Condes, and El Indio Mines.

There were 13 foreign companies conducting mining exploration projects for investments totaling $168 million. One of the most important projects expected to progress rapidly in 1987 was La Escondida copper deposit. Chevron Resources Co. stated that it will spend $5 million continuing gold mining exploration work at Andacollo. In 1988, Chevron will evaluate the project results. If favorable, the 75,000-troy-ounce-per-year production facilities would cost $30 million. Chevron is also associated with Royal Dutch/Shell Ltd. and Mobil Oil Corp. in the development of Collahuasi, a copper

and silver deposit in northern Chile. Other foreign mining companies such as Minera Anglo American Chile Ltda. Freeport Chile Exploration Co., Minera Tenneco Chile, and Phelps Dodge Chile have active exploration programs in Chile for precious metals and copper. In 1986, several companies were considering promising investment projects. However, continuing weak metal prices delayed several mining projects in Chile. One of these was the Cerro Colorado copper project. Corporación Nacional del Cobre de Chile (CODELCO-Chile) was undertaking a $2 billion investment program to maintain production levels in the face of falling ore grades at its four divisions. Earlier, the state-owned Sociedad Química y Minera de Chile (SOQUIMICH), the nitrate and iodine producer, was privatized in line with the Government's policy of reducing the size of the public sector.

PRODUCTION

Copper dominates Chile's mining sector and in recent years has become the world's largest producer and exporter. Chile also has roughly 20% of the world's total known copper reserves, in addition to important reserves of gold, lithium, manganese, molybdenum, nitrates, rhenium, silver, and zinc. Chile's economy remained highly dependent upon the production and export of copper and its byproducts. The largest copper and molybdenum producer in Chile and in the world is CODELCO-Chile, which comprises four divisions: Chuquicamata, El Teniente, Andina, and El Salvador. The second largest copper producers are five privately owned mines: Empresa Minera de Mantos Blancos S.A. (Anglo American); Los Bronces and El Soldado (Cía. Minera Disputada de las Condes S.A.); and Las Cascadas and Lo Aguirre (Sociedad Minera Pudahuel Ltda. y Cía. C.P.A.). The following projects are potential copper producers: La Escondida, El Abra, Los Pelambres, Quebrada Blanca, Andacollo, Cerro Colorado, Mocha, and Collahuasi.

Table 1.—Chile: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Arsenic trioxide[e]	--	--	3,500	4,000	6,000
Copper:					
Mine output, Cu content[3]	r1,255,101	r1,255,374	1,307,503	1,359,840	1,399,384
Metal:					
Smelter, primary[4]	1,046,800	1,058,900	1,098,300	1,088,500	1,124,100
Refined:[5]					
Fire, primary refined	180,914	164,086	185,697	175,977	183,272
Electrolytic	671,586	670,114	694,003	708,323	759,228
Total	852,500	834,200	879,700	884,300	942,500
Gold, mine output, Au content ---troy ounces	r543,572	r570,964	541,064	554,278	577,012
Iron and steel:					
Iron ore and concentrate:					
Gross weight ---------- thousand tons	r6,356	r5,809	6,685	6,534	7,009
Fe content[e] ---------- do	r3,805	r3,502	r3,992	r3,958	4,311
Metal:					
Pig iron ---------- do	453	540	594	580	591
Ferroalloys:					
Ferromanganese	2,982	5,209	4,890	6,330	6,277
Ferrosilicomanganese	--	--	--	755	1,465
Ferrosilicon	1,413	4,885	6,365	--	--
Ferromolybdenum	1,456	1,712	2,211	448	1,465
Total	5,851	11,806	13,466	7,533	9,207
Steel, crude[6] ---------- thousand tons	492	618	692	654	671
Semimanufactures (hot-rolled) ---do	233	371	473	566	585
Lead, mine output, Pb content	1,552	1,679	4,284	2,473	1,501
Manganese ore and concentrate:					
Gross weight	16,111	26,050	26,172	35,635	31,631
Mn content	5,207	r4,485	8,457	11,785	10,966
Molybdenum, mine output, Mo content	20,048	15,264	16,861	18,389	16,581

See footnotes at end of table.

Table 1.—Chile: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS —Continued					
Rhenium, mine output, Re content ____ pounds	17,921	12,516	14,198	12,266	18,607
Selenium ____ kilograms	23,011	43,869	25,450	50,037	16,267
Silver ____ thousand troy ounces	12,288	15,058	15,766	16,633	16,078
Zinc, mine output, Zn content	5,656	5,993	19,168	22,288	10,504
INDUSTRIAL MINERALS					
Barite	292,402	114,595	21,722	54,494	53,121
Borates, crude, natural (ulexite)	291	1,301	3,985	4,773	6,440
Cement, hydraulic ____ thousand tons	1,132	1,255	1,390	1,425	1,436
Clays:					
Kaolin	21,086	40,812	48,608	48,537	42,170
Other (unspecified)	34,072	31,876	36,543	9,177	14,435
Diatomite	387	741	1,712	2,317	2,684
Feldspar	469	2,356	3,026	2,565	2,275
Gypsum:					
Crude	89,636	66,337	167,477	195,911	192,848
Calcined	41,304	53,425	44,818	57,222	60,452
Iodine, elemental	2,596	2,793	2,900	3,020	3,076
Lapis lazuli ____ kilograms	--	--	9,000	8,500	8,000
Lime, hydraulic[e] ____ thousand tons	645	723	778	800	800
Lithium carbonate	--	--	2,110	4,508	4,458
Nitrogen: Natural crude nitrates:					
Sodium	r429,750	r472,710	595,360	621,330	617,010
Potassium	r147,000	r149,800	132,100	150,000	147,000
Phosphates:					
Guano	50	129	NA	3,150	7,546
Rock	1,377	935	4,606	7,110	6,684
Total	1,427	1,064	4,606	10,260	14,230
Pigments, mineral, natural: Iron oxide	2,445	6,751	16,113	8,224	4,404
Potash, K_2O equivalent	21,800	21,280	18,494	21,000	20,000
Pumice (includes pozzolan)	172,382	173,789	172,150	206,333	222,080
Quartz, common	185,556	221,757	293,465	267,510	293,218
Salt, all types	674,002	714,598	625,760	753,427	1,032,373
Sodium compounds, n.e.s.: Sulfate[7]	r47,610	r51,300	56,770	52,700	68,500
Stone:					
Limestone ____ thousand tons	1,667	2,142	2,326	2,470	2,757
Marble	963	--	1,440	1,300	--
Sulfur:					
Native, other than Frasch:					
Refined	6,615	15,688	13,685	14,755	13,297
Caliche	98,372	83,060	40,279	63,992	43,825
Byproduct (from industrial gases)	31,828	32,364	32,135	30,073	41,142
Total	136,815	131,112	86,099	108,820	98,264
Talc	283	637	422	1,299	2,257
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous and lignite ____ thousand tons	997	1,095	1,323	1,256	1,454
Coke: Coke oven ____ do	242	279	278	291	294
Gas, natural:					
Gross ____ million cubic feet	178,851	169,609	172,961	163,793	153,884
Marketed ____ do	124,661	52,760	53,431	50,535	47,500
Natural gas liquids:					
Natural gasoline thousand 42-gallon barrels	969	937	962	943	956
Liquefied petroleum gas ____ do	2,893	2,855	2,969	2,805	2,887
Total ____ do	3,862	3,792	3,931	3,748	3,843
Petroleum:					
Crude ____ do	15,626	14,365	14,069	13,048	12,204

See footnotes at end of table.

Table 1.—Chile: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum —Continued					
Refinery products:					
Gasoline:					
Aviation thousand 42-gallon barrels	101	94	56	25	38
Motor ---do---	7,146	8,032	8,233	8,246	7,975
Jet fuel ---do---	1,145	1,126	1,138	1,063	1,101
Kerosene ---do---	633	1,164	981	887	465
Distillate fuel oil ---do---	6,122	7,334	8,064	8,749	9,573
Residual fuel oil ---do---	6,321	6,390	5,982	5,566	5,302
Liquefied petroleum gas ---do---	2,051	2,208	5,114	4,831	5,265
Unspecified ---do---	2,866	1,252	1,453	1,553	1,981
Refinery fuel and losses ---do---	1,280	--	(8)	(8)	--
Total ---do---	27,665	27,600	31,021	30,920	31,700

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

[1]Table includes data available through Aug. 1987.

[2]In addition to the commodities listed, pyrite is also produced, but available information is inadequate to make reliable estimates of output levels.

[3]Figures are the nonduplicate Cu content of ore, concentrates, cemented copper, slags and minerals, copper as a byproduct of gold and silver precipitate, and other copper-bearing products measured at the last stage of processing as reported in available sources.

[4]Figures are total blister, fire-refined, electrolytic, and equivalent copper output including that blister subsequently refined in Chile and copper produced by electrowinning. Detailed statistics on electrowinning are not available; although based on current plant capacities, electrowon copper production is estimated to be approximately 55 metric tons per year.

[5]Figures are total refined copper distributed into two classes according to method of refining, fire-refined and electrolytic, which includes electrowon copper refined in Chile.

[6]Excludes castings.

[7]Includes natural sodium sulfate and anhydrous sodium sulfate, coproducts of the nitrate industry.

[8]Revised to zero.

TRADE

Chile's economy remained highly dependent upon the production and export of copper, which generated 42% of the total export earnings. However, the Chilean economy has diversified significantly over the past few years. Exports of precious metals and industrial minerals increased in importance.

The copper market weakened slightly in 1986, down from the 1985 average price of 64.3 cents per pound to 62.4 cents per pound in 1986. However, Chilean copper production increased slightly to about 1.4 million tons in 1986. The total value of mineral exports was $2.33 billion, representing about 55% of Chile's total exports. Copper exports alone accounted for $1.77 billion or about 42% of export earnings.

The predominance of minerals in Chile's exports is demonstrated by the relative importance of mining companies in the economy. Seven of the top ten largest exporters in Chile are mineral producers, and their combined output represented 56% of Chile's total exports in 1986. CODELCO-Chile alone accounted for 39% of total exports and contributed over 1.1 million tons of copper to the world market, which represents approximately 15% of the market economy countries' consumption. Proven reserves amount to 113 million tons of copper, based on an average copper content grade of 0.9%, which is 21% of the total world reserves. Export shipments of copper by CODELCO-Chile amounted to 1.14 million tons and were distributed as follows: Western Europe, 47.6%; Asia, 19.9%; South America, 18.2%; North America, 12.2%; and Eastern Europe, 1.5%. It is of special note that there were large sales increases in the Asian market. Copper sales totaled $1.46 billion, exceeding the 1985 figure by $27.3 million. Minerals accounted for about one-half of Chile's exports to the United States. Copper was Chile's main export product to the United States, representing about 31% of the total. Chilean copper exports to the United States declined 19% to 161,846 tons of copper, worth about $283.2 million. Chile was the second largest supplier of copper to the United States, with a 32% market share. Copper imports from Chile represented 9% of the total U.S. apparent consumption, or about 1 month's supply.

Chile also supplied about 32% of U.S. imports of molybdenum, 30% of U.S. imports of iodine, and 60% of U.S. imports of lithium carbonate. The United States was Chile's largest trading partner, purchasing 22% of its exports and providing 20% of its imports. Chile was an important customer

of U.S. mining equipment and chemicals for its mining industry. Chile imported about $50 million worth of mining equipment from the United States. About $56 million (12%) of Chile's exports to the United States were duty free under the Generalized System of Preference (GSP) program. Eligible products for GSP treatment include ammonium perrhenate, molybdenum, and silver. However, unwrought copper (concentrate, blister, and refined) imports from Chile were ineligible for GSP treatment because of competitive need limits. On July 1, Chile's lithium carbonate exports lost GSP treatment owing to denial of the De Minimus Waiver on the competitive need limit.

Table 2.—Chile: Exports of copper and molybdenum ore, by destination[1]

Destination	Copper (thousand metric tons)			Molybdenum (metric tons)
	Ore and concentrate, Cu content[2]	Blister	Refined	Ore and concentrate, Mo content
1985:				
Argentina	--	--	28.9	--
Belgium-Luxembourg	0.1	16.9	6.6	--
Brazil	48.6	19.2	51.7	1
Canada	30.2	--	2.0	2,802
China	15.9	13.8	53.9	--
France	(3)	1.1	97.8	--
German Democratic Republic	--	3.5	6.2	40
Germany, Federal Republic of	25.5	17.4	113.9	351
Greece	--	1.0	15.5	--
India	.1	--	7.0	--
Italy	(3)	9.4	102.1	--
Japan	102.7	1.0	55.1	--
Korea, Republic of	29.2	--	27.8	--
Mexico	--	6.9	14.2	--
Netherlands	.1	--	19.8	1,780
Portugal	--	1.6	5.5	--
Romania	--	6.0	--	--
Saudi Arabia	--	--	8.0	--
Spain	.3	13.9	14.7	--
Sweden	--	--	13.7	404
Taiwan	1.6	--	9.8	--
Turkey	10.8	21.1	--	--
United Kingdom	--	21.4	46.1	--
United States	(3)	22.6	178.3	146
Yugoslavia	--	9.9	3.4	--
Other	.4	3.3	9.9	--
Total	265.5	190.0	891.9	[4]5,523
1986:				
Argentina	--	--	48.2	--
Belgium-Luxembourg	1.5	9.7	8.5	--
Brazil	50.7	18.0	87.0	--
Canada	26.6	--	--	1,294
China	3.8	15.4	31.2	--
France	--	.8	90.2	--
German Democratic Republic	--	--	4.5	--
Germany, Federal Republic of	31.1	25.3	132.3	881
Greece	--	1.5	18.0	--
India	.1	--	6.0	--
Indonesia	--	--	5.7	--
Italy	(3)	15.5	118.2	--
Japan	77.9	3.0	53.4	--
Korea, Republic of	33.7	--	25.1	--
Mexico	--	2.6	2.8	--
Netherlands	.1	3.6	12.1	2,915
Portugal	--	.2	6.5	--
Romania	--	5.9	--	--
Saudi Arabia	--	--	8.0	--
Spain	21.8	11.8	22.1	--
Sweden	7.8	--	10.4	761
Taiwan	7.4	--	17.1	--
Turkey	8.1	24.4	--	--
United Kingdom	--	13.2	44.3	264
United States	.1	29.5	132.2	--
Yugoslavia	--	13.9	1.7	--
Other	--	5.1	10.2	--
Total	270.7	199.4	895.7	6,115

[1]Table prepared by H. D. Willis.
[2]Includes cement copper and secondary copper.
[3]Less than 50 tons.
[4]Data do not add to total shown because of independent rounding.

Source: Estadisticas del Cobre, 1986 and 1987 monthly editions, Comisión Chilena del Cobre.

COMMODITY REVIEW

METALS

Copper.—Copper production reached a record-high level in 1986, which marked the 11th consecutive year with output of more than 1 million tons. This represented a slight increase over that of 1985, which firmly established Chile's position as the world's largest copper producer. Chile accounted for 17% of the world's output of copper. The value of Chilean copper exports increased slightly over that of 1985 to $1.77 billion because of the decline in the average annual price of copper from 64.3 cents per pound in 1985 to 62.4 cents per pound in 1986. Copper prices in real terms have fallen to depressed levels equivalent to those during the depression of the 1930's. The price of copper has tremendous importance in the Chilean economy, as a change of 1 cent per pound in the price of copper alters Chile's export revenue by about $30 million.

The largest copper producer in Chile and the world is the state-owned CODELCO-Chile. Its four divisions comprise the large mining sector. CODELCO-Chile continued as the country's dominant copper producer with 78.8% of domestic total output, a slight increase above that of 1985. The privately owned mines contributed 21.2% to the total output with an increase of 4.9% compared with that of 1985. CODELCO-Chile, in addition to producing copper, was the largest producer of molybdenum and silver, and the second largest producer of gold in the country. It contributed $455.1 million to the Chilean Treasury Department (about 10% of the total Government's revenue) and exported $1.46 billion worth of copper and $165.5 million worth of byproducts. CODELCO-Chile earned a net profit of $126.5 million, maintaining profitability during the year by keeping operating costs low despite falling ore grades and declining copper prices. CODELCO-Chile's total copper production reached 1.10 million tons of copper. The Chuquicamata Div. accounted for 46.9% of CODELCO-Chile's output; El Teniente Div., 33.1%; Andina Div., 10.7%; and El Salvador Div., 9.3%. The company invested $378 million in several expansion projects distributed among their four divisions in order to improve its level of competitiveness in the international market. Plans were also announced for additional investments of $350 million per year over the next 5 years to increase ore extraction and treatment capacity to compensate for falling ore grades at the four operating divisions.

The state-owned Empresa Nacional de Minería (ENAMI) produced 172,910 tons of copper cathodes, 167,678 tons of blister copper, 6.3 million troy ounces of electrolytic silver, 247,239 troy ounces of gold, 16,267 kilograms of crude selenium, 120,300 kilograms of nickel sulfate, and 49,484 tons of sulfuric acid. ENAMI smelted copper concentrates from Chuquicamata for CODELCO-Chile on a toll basis (44,222 tons fine copper content in 1986) and also supports the small mining sector by purchasing ores, concentrates, and precipitates. ENAMI operated four concentrating plants, two smelters (Paipote and Las Ventanas), and one refinery (Las Ventanas). ENAMI planned to invest $100 million in 19 projects to improve capacity and energy efficiency and to maintain product quality between 1987 and 1991. These projects include an expansion of copper refining capacity to 200,000 tons per year by adding El Teniente-type converters and an oxygen plant in both smelters. The company anticipates reductions in smelting and refining costs by 15% to 25%.

Phelps Dodge Chile, a subsidiary of Phelps Dodge Corp. of the United States, purchased 100% of Cía. Minera Ojos del Salado in 1985. The company operated two small copper mines, a gold mine, and a concentration plant near Copiapó Province. Production during 1986 totaled 14,400 tons of concentrate, grading 30% copper, 1.6 troy ounces of silver per ton, and 0.2 troy ounce of gold per ton. All production was sold to ENAMI. Phelps Dodge plans to expand the concentrator and begin a heap-leaching operation of the old tailings to recover gold.

The most promising copper investment project in Chile is the La Escondida porphyry copper deposit, 110 kilometers southeast of Antofagasta. The project is owned by Utah International Inc. (a subsidiary of The Broken Hill Pty. Ltd. of Australia) with a 60% share, The Rio Tinto Zinc Corp. PLC (United Kingdom) with 30%, and a Japanese consortium headed by Mitsubishi Corp. holding 10%. Project managers of Utah International continued negotiations with potential lenders during 1986.

Investment in La Escondida was expected

to reach $1.2 billion. The deposit contains proven and inferred reserves of 1.8 billion tons of ore grading 1.59% copper and 0.01% molybdenum, and consists of a secondary enriched blanket of chalcocite, chalcopyrite, bornite, and covellite overlying a zone of lower grade primary mineralization covered by a leached capping zone. Economically recoverable reserves consist of 675 million tons of ore grading 2.16% copper.

Current development plans called for construction of an open pit mine and a concentration plant at the La Escondida site. The mining plan called for production of 35,000 tons of ore per day with a stripping ratio of 5 to 1 during the first 10 years of operation. Copper concentrates will be transported by a 164-kilometer-long slurry pipeline to Antofagasta where port facilities will be built. Annual output from the plant will be 828,000 tons of copper concentrates (323,000 tons of fine copper content), containing 7,000 tons of molybdenum, 1.8 million troy ounces of silver, and 64,301 troy ounces of gold. Rio Algom Ltd. of Canada halted plans to develop the Cerro Colorado deposit when Outokumpu Oy of Finland backed out of the financing package in March 1986. The project cost was estimated at $250 million for the construction of an open pit mine and plant to produce 155,000 tons of copper concentrate per year. Proven reserves of Cerro Colorado, 100 kilometers east of Iquique Province, consists of 80 million tons of ore (mainly sulfides), grading 1.38% copper.

Chevron Minerals Corp. (United States), Billiton International Metals BV, and Shell Hydrocarbons BV (United Kingdom-Netherlands) were jointly conducting intensive studies of the Collahuasi porphyry copper deposit 100 kilometers east of Iquique. The consortium (Cía. Minera Doña Inés) had plans to spend about $6 million during the next 2 years in exploration costs, including the drilling of a 350-meter exploration shaft. Preliminary results indicated at least 20 million tons of secondary enriched ore grading at least 2% copper with some silver values.

Gold and Silver.—Chile's official gold production increased 4.1% over that of 1985 to 577,012 troy ounces. The value of metallic gold exports increased 7% over that of 1985 to $97 million, while that of gold ore and concentrate shipments increased 6% to $64 million. Of the total output of gold, El Indio supplied 260,421 troy ounces and ENAMI supplied 247,239 troy ounces. The Government's "Gold Plan," designed to relieve rural unemployment, contributed 40,188 troy ounces, and the rest of the national production came from CODELCO-Chile's copper mines.

Government officials announced that Cía. Minera San Jose (El Indio), a subsidiary of St. Joe Gold Corp., plans to go ahead with its gold project development at El Tambo, 12 kilometers southeast of the El Indio Mines. The property has proven reserves of 1 million tons of ore containing 0.24 troy ounce of gold per ton. The company was planning to install a new staff camp and heap-leaching facilities at El Tambo. Mining operations will be at the rate of 1,000 tons of ore per day. One-half of this will be leached on-site, and the rest will be processed at El Indio facilities. This will require an expansion of the existing El Indio flotation plant to 2,400 tons of ore per day. Capital investments at El Indio and El Tambo were estimated at $14 million. Exploration of the property, to date, has cost $11 million. Startup of the new operation was targeted for late 1987.

Exploration for precious metals in Chile has intensified owing to the favorable outlook for gold and silver prices over the next few years. Exploration efforts were concentrated in the 2d, 3d, and 4th regions in the north, and in the 10th region in the south-central part of Chile, as follows:

1. Region II (Antofagasta Province). Freeport Chile Exploration Co. signed a joint venture agreement with Cía. Minera El Bronce de Petorca to study possible development of the Sierra Gorda "Faride" gold-silver deposit near Calama City. Preliminary results indicate at least 1 million tons of ore grading 0.11 troy ounce of gold per ton and 6.7 troy ounces of silver per ton.

Minera Tenneco Chile, which was purchased by Echo Bay Mines Ltd. of Canada in 1986, was exploring the "Bufalo" Prospect and was planning to begin drilling in 1987. Empresa Inversiones del Inca S.A. of Santiago, Chile, was conducting exploration and evaluation of the San Cristobal disseminated gold deposit 110 kilometers northeast of Antofagasta. Preliminary ore reserves were estimated at 4.0 million tons of ore grading 0.06 troy ounce of gold per ton with a stripping ratio of about 2 to 1 and 75% gold recovery. Costs to establish a 4,000-ton-per-day heap-leaching operation was estimated at $20 million.

2. Region III (Copiapó Province). Consolidated Gold Fields PLC (Cía. Minera Sierra Morena) development of the La Coipa de-

posit, northeast of Copiapó, was delayed by legal disputes over land titles. Ore reserves at La Coipa were estimated at 10 million tons grading 0.22 troy ounce of gold per ton.

Empresa Minera de Mantos Blancos began geological studies of the Marte gold prospect near the El Salar de Maricunga. A feasibility study was in progress at yearend. El Bronce de Petorca purchased options on the "Tinajas" and "Falda" Prospects and has started drilling. Both prospects appear to be low-grade gold deposits suitable for heap leaching.

3. Region IV (La Serena Province). Chevron Minerals continued intensive geological studies of the Andacollo area near La Serena and began feasibility studies. Preliminary studies indicate ore reserves of 10 to 12 million tons, grading 0.08 troy ounce of gold per ton with some veins containing 0.13 to 0.19 troy ounce of gold per ton. The estimated cost for a 3,000-ton-per-day agitated heap-leaching operation was $20 million. Chevron Minerals planned to construct a pilot plant at Andacollo during 1987.

4. Region X (Puerto Montt Province). The southern end of Chile's central zone is attracting gold exploration. American Metal Climax Inc. (AMAX) and Tenneco Minerals were jointly conducting studies of the Futa area south of Valdivia in 1986. Tenneco was also exploring the "Ramon" Prospect nearby. AMAX had a partnership with Billiton-Shell in drilling areas of the "Tucapel" north of Valdivia Province.

Chilean silver production decreased 3.3% from that of 1985 to 16.1 million troy ounces, and the value of silver exports fell 4% to $74 million owing to weaker silver prices during the year.

CODELCO-Chile continued as the largest silver producer in the country. CODELCO-Chile produced 6.3 million troy ounces (196,657 kilograms) of silver, or about 39% of the nation's total. CODELCO-Chile recovered silver from anode slimes at the Chuquicamata and El Salvador refineries.

ENAMI produced 6.2 million troy ounces (194,831 kilograms) of silver at its Las Ventanas precious metals refinery from concentrates purchased from small- and medium-size silver mines. These mines increased production almost 30% over that of 1985. The most important silver mines were Choquelimpe, Caracoles, Cachinal de la Sierra, El Bronce, and Vaquillas.

Iron Ore.—Production of iron ore increased 7.3% over that of 1985 to 7.0 million tons. Cía. Aceros del Pacífio S.A. de Inversiones (CAP) further rationalized production at its three principal mines operated by its subsidiary Cía. Minera del Pacífico S.A. Ore production was shut down at the lower grade Santa Fé (Los Colorados) Mine in 1984, while output at the El Romeral Mine (62% average iron ore grade) increased sharply to 2.9 million tons.

The Algarrobo Mine produced iron ore feed for the Kobe steel-type pellet plant at Huasco. CAP's iron ore mines have about 350 million tons of reserves, and about 80% of its production of iron ore and pellets was exported, mostly to Japan. The value of iron ore and pellets exports increased slightly over that of 1985 to $88.4 million. Pellets are self-fluxing and contain 66% iron ore. Production costs at the pellet plant have decreased significantly owing to the conversion to coal from fuel oil. Cía. Minera del Pacífico, despite increasing its net earnings by 19% over that of 1985, lost $4.5 million.

Iron and Steel.—Production of ferroalloys, pig iron, and crude steel increased 22.2%, 1.9%, and 2.6%, respectively, above those of 1985; semimanufactured (hot-rolled) products increased 3.4% over that of 1985. Compañía Siderúrgica de Huachipato S.A. (CSH), a subsidiary of CAP, earned $17.2 million, up 26% from the $13.6 million earned in 1985. Almost 75% of CAP's production was consumed domestically, and the balance was exported to Ecuador and Costa Rica. CSH maintained profitability through cost saving investments, including reduction in energy consumption and improving worker productivity. CAP planned investments of $317 million over the next 5 years, including a $110 million, 500,000-ton-per-year coke plant; a $15 million lamination plant; and a $36 million continuous casting line to produce 70,000 tons of zinc-aluminum alloy per year and cast zinc sheet for domestic consumption. The plant was to be constructed by either Mitsubishi of Japan, or Klöckner-Kaiser of the Federal Republic of Germany. Both companies offered full financing support for the project. The Chilean state development agency, Corporación de Fomento de la Producción (CORFO), announced that it would sell its remaining 20% share of the country's steel and mining group, CAP. The group will then be 100% privately owned. Thirty percent of the shares already in private hands were reportedly owned by the company's employees. The most profitable company in the group in 1986 was CSH.

Lead and Zinc.—Chile's lead and zinc

production declined sharply 39.3% and 52.9%, respectively, compared with those of 1985. Sociedad Contractual Minera El Toqui Ltda., with its El Toqui Mine in Aysen Province, southern Chile, was the largest producer of lead and zinc. However, falling lead and zinc prices and heavy debt servicing costs of about $30 million forced the mine to shut down in November 1985. The company's debt was restructured and the mine reopened in October. The labor force was cut by one-half, and the company received a loan from CORFO. The El Toqui officials planned to increase ore production at the San Antonio zinc mine from 700 tons per day to 1,100 tons per day by investing $2 million. The increase in ore production should lower operating costs. The El Toqui officials also planned a joint venture to develop the Katerfeld II gold deposit. Preliminary exploration indicates that Katerfeld II is a polymetallic vein deposit with at least 100,000 tons of ore grading 0.96 troy ounce of gold per ton. Other small lead and zinc producers in the region include Empresa Minera de Aysén Ltda., owned by CORFO, and Compañía Minera Catemu Ltda.

Molybdenum.—The three major world producers of molybdenum are AMAX (of Greenwich, Connecticut), Cyprus Minerals Co., and CODELCO-Chile. The Chilean company produces molybdenum as a byproduct of copper. Following cutbacks by U.S. producers, CODELCO-Chile could become the world's largest molybdenum producer in 1987. CODELCO-Chile production declined 9.8% from that of 1985 to 16,581 tons of molybdenum concentrate. Of this total, 5,380 tons was converted into molybdenum trioxide at the Chuquicamata Div. roasting plant and 7,076 tons of molybdenum concentrate was sent to the Molibdenos y Metales S.A. (Molymet) plant near Santiago for conversion into molybdenum trioxide, ferromolybdenum, and ammonium perrhenate. Molymet also imported 2,860 tons of molybdenum concentrate from Canada, Peru, and the United States, for conversion and export in the form of ferromolybdenum and molybdenum oxides. Total revenue from the sale of molybdenum amounted to $125 million, for the equivalent of 19,401 tons of fine molybdenum content, an increase of 12.2% in volume and a slight increase in value from those of 1985.

Rhenium.—Chile is the world's largest producer of rhenium and holds about 37% of world reserves. In 1986, Chile exported 18,607 pounds of ammonium perrhenate worth $2.2 million, an increase of 51.7% over that of 1985. Molymet was Chile's sole producer of rhenium in the form of ammonium perrhenate, which is recovered by a solvent extraction process from gases produced from the roasting of porphyrytic molybdenum concentrates. Molymet is evaluating the feasibility of producing rhenium metal powder. Because of Molymet's toll roasting contract with CODELCO-Chile, Molymet returns some of its rhenium production to CODELCO-Chile for export. The ammonium perrhenate price increased slightly to $261 per kilogram.

In 1976, Molymet separated from Carburo y Metalúrgia S.A. to specialize in the production of molybdenum oxide, ferromolybdenum, ammonium perrhenate, and others. The privately owned firm processes molybdenum concentrate on a toll basis delivered from all four divisions of CODELCO-Chile (75%), and the remainder is purchased from mines in Canada, Peru, and the United States. Molymet purchases molybdenum concentrates from mines relatively rich in rhenium content. In January 1986, Molymet expanded its activities to industrial mineral mining by participating with 11.3% of the shares in the Sociedad Minera Salar de Atacama Ltda. (MINSAL Ltda.) project along with AMAX Exploration Inc. (63.8%) of the United States and CORFO (25%). Molymet employs about 250 workers, operating in 3 shifts.

INDUSTRIAL MINERALS

Lithium and Potassium.—The Sociedad Chilena del Litio Ltda. (SCL), a subsidiary of Foote Mineral Co. (55%) of the United States and CORFO (45%) of Chile, produced 4,458 tons of lithium carbonate in 1986, equivalent to about 25% of world supply. The plant was inaugurated in 1984 and has an annual capacity of 7,500 tons of lithium carbonate but operates at about 60% capacity owing to slack market demand. The entire output in 1986, valued at about $18 million, was exported. SCL was studying the feasibility of expanding the capacity to 9,000 tons and to also recover magnesium and potash from the Salar de Atacama's brines. The Salar de Atacama's reserves represent about 40% of the world's economically available lithium supply.

A contract creating MINSAL Ltda. was signed in Santiago on January 31, 1986, by representatives of AMAX Exploration (a subsidiary of AMAX) of the United States, Molymet, and CORFO. Under the terms of

the agreement, CORFO assigned to MINSAL Ltda. its Atacama salt-flat mining holdings and rights, as well as technical and feasibility studies pertaining to the potassium salts and boric acid project.

CORFO officials announced that the project will require a $200 million investment and is expected to generate sales of $130 million per year and 600 jobs. The contract calls for final studies and detailed engineering studies to be completed within the next 3 years. The plant would come on-stream in 1992. The project expects an annual production of 500,000 tons of potassium chloride, 200,000 tons of potassium sulfate, 30,000 tons of boric acid. Also, 2,800 tons of lithium metal would be produced, and this could be gradually increased in the future. The Chilean Nuclear Energy Commission approved this plan. The agreement also stipulates that AMAX and Molymet immediately initiate independent negotiations with SOQUIMICH to jointly develop and produce potassium nitrate.

Nitrates and Iodine.—Chile's largest producer and exporter of natural nitrate products and iodine was SOQUIMICH. As part of the Government's policy of reducing the size of the public sector participation in the company, SOQUIMICH was partially sold to private investors. By yearend 1986, CORFO owned 35% of SOQUIMICH, while company employees held 12.5%, private pension funds held 23%, and other investors, 29.5%.

SOQUIMICH produces sodium nitrate and potassium nitrate from two major sources, the María Elena and Pedro de Valdivia Mines in the Atacama Desert region in northern Chile. It is also a producer of sodium sulfate and supplies one-third of the world's iodine exports. SOQUIMICH's nitrate (salitre) production has increased steadily in recent years from 690,000 tons in 1983 to a record-high level of 827,000 tons in both 1985 and 1986. Both plants operated at virtually 100% capacity. Both the María Elena and Pedro de Valdivia plants have recently been expanded. The company also began production of pure potassium nitrate at Coya Sur plant. In 1982, 12.1 million tons of caliche (the ore from which the natural nitrate is recovered) was processed. This increased to 16.1 million tons in 1986.

Approximately 350,000 tons of nitrate products was sold on domestic markets, and the remainder was being sold to more than 60 countries on all 5 continents. Demand for SOQUIMICH sodium and potassium nitrate was principally for fertilizer use, although sodium nitrate was also purchased by industrial users. Primary markets for nitrate were the United States, 37%; Western Europe, 28%; and Brazil, 17%.

SOQUIMICH invested $6.1 million primarily for the construction of a new iodine plant at María Elena, which will increase output by 8%. SOQUIMICH planned to invest $11 million in various projects in 1987, including the installation of a new nitrate refinery, which will produce 30,000 tons of finished fertilizer annually.

SOQUIMICH's consolidated sales reached $154.3 million, an increase of 3.8% over that of 1985. Of this total, $38.1 million was for domestic consumption and the remainder was for foreign sales. Physical production in 1986 was 764,000 tons of nitrates, 68,500 tons of sodium sulfate, and 3,076 tons of iodine. Exports were sodium nitrate, 359,200 tons; potash nitrate, 108,200 tons; sodium sulfate, 31,100 tons; and iodine, 3,000 tons. SOQUIMICH's aftertax profit was $30 million, up 38.8% from $21.66 million in 1985. There have been steady increases in sales of nitrate products in recent years. In the domestic market, the main market was for agricultural nitrate. There were also significant sales to Brazil, China, the Netherlands, and the United States. The U.S. Department of Commerce continued an investigation to determine if SOQUIMICH has exported industrial-grade sodium nitrate to the United States at less than allocated production costs (dumping). The case against SOQUIMICH was originally initiated in the period November 15, 1982, to March 15, 1983.

Sulfur.—Chile's native sulfur production derived from caliche decreased 31.5% from that of 1985, and refined native sulfur fell 9.9% from that of 1985. Chile's total production of sulfur, including sulfur derived from industrial gases, declined 9.7% from that of 1985. Native sulfur was produced in Region II near Antofagasta. Chile imports most of its sulfur for domestic consumption, but the country has extensive reserves of volcanic sulfur (100 million tons at 50% cut off grade). Most of the sulfur imported was from Canada and mainly used in the production of sulfuric acid. Sulfuric acid plants were still in the planning stage at ENAMI's Las Ventanas smelter (280,000 tons per year) and at CODELCO-Chile's Chuquicamata smelter (985,000 tons per year). The objective would be to increase Chile's production and reduce the need for sulfur imports.

Several investment projects for sulfur production were under study. Empresa Azufrera Chile Ltda., a $25 million joint venture, formed by Real International Marketing (Canada), Devco Overseas (United States), and SASAULCO (Saudi Arabia). This group was evaluating a $10 million project to produce 120,000 tons of pelletized sulfur per year for export from the Tacora Volcano ore body on the Peruvian border. Reserves were estimated at 7 million tons. Bolivian, Chilean, and U.S. investors (Andes Sulfur Co.) were planning an $8 million investment to produce up to 100,000 tons of pelletized sulfur per year from the Yandu volcano near the Bolivian border.

Freeport Minerals Co. was conducting studies on the Sillajhuay volcano, 150 kilometers east of Iquique City. Preliminary results indicate reserves of 6 to 7 million tons grading 40% to 45% sulfur. The project would require a unique metallurgical process to remove impurities. Placer Development Co. of Canada completed geological work of the Purico volcano east of Calama, and will continue to evaluate sulfur prospects.

MINERAL FUELS

Coal.—Coal output increased 15.7% over that of 1985 to 1.45 million tons. Concepción Province continued to be the most important coal producer in the country with 90% of the total; the remainder came from the Puerto Montt Province. Coal production in Chile has grown steadily, although the country imports metallurgical-grade coal. Chile produces little metallurgical coal. The country imported 544,000 tons of coal and coke from Australia, Canada, and the United States in 1986. Chile has proven and indicated coal reserves of 744 million tons, of which 3% is bituminous. However, geologists estimated Chile's resources at 5 billion tons.

The state-owned Empresa Nacional del Carbón S.A. (ENACAR) produced 836,000 tons of coal (52% of the national output) at its Lebu, Lota, and Trongol Mines. ENACAR also purchased about 200,000 tons of coal per year from small coal mining operations. Cía. Carbonífera Schwager Ltda., a wholly owned ENACAR subsidiary, produced another 329,000 tons of coal. ENACAR planned to expand production at its Lota Mine from 500,000 tons to 750,000 tons per year by investing $32 million in various projects. These include $12.6 million to install a retreating longwall system and $4.2 million in modernization of mine infrastructure.

Compañía de Carbones de Chile Ltda. (COCAR) signed a formal contract with CODELCO-Chile in 1986 for the supply of coal to the Tocopilla power station in northern Chile. Initial deliveries of coal to the plant, which provides power to CODELCO-Chile's largest copper operation, Chuquicamata, were scheduled to begin in September 1987.

The 1.1-million-ton-per-year open pit coal mining project is on Pecket Island in the Magallanes region of southern Chile and has proven and indicated subbituminous coal reserves of 52 million tons. The project was being sponsored by the International Bank for Reconstruction and Development (World Bank) affiliate, International Finance Corp. (IFC) (10%); two Chilean companies, Compañía de Petróleos de Chile S.A. (COPEC) (45%), and Ultraterra S.A. (36%), a subsidiary of the Ultramar Chilean shipping group; and Northern Strip Mining Ltd. of the United Kingdom (9%).

The coal project will reduce Chile's dependence on imported oil and save about $10 million per year in foreign exchange. The coal will produce the energy equivalent of about 500,000 tons of oil per year, about one-quarter of Chile's oil imports.

The $65 million Pecket coal mining project investment is being financed as follows: Northern Strip Mining is providing $20 million, and the IFC is providing $2.2 million in equity and loans of $13.5 million. IFC is also making available a $3.0 million standby loan. Export credits of $17.5 million are being provided through the Export Development Corp. of Canada and other potential export lenders. Chilean bank loans of $8.0 million and $3.8 million in cash generation complete the financial plan.

Petroleum and Natural Gas.—The state-owned Empresa Nacional del Petróleo (ENAP) is Chile's only producer of oil and gas. ENAP reported that Chile's production of crude oil in 1986 was about 12.2 million barrels, a 6.5% decrease from that of 1985. This continued the decline that started in 1983. Output was at 15.6 million barrels in 1982. Offshore production, with 30 platforms in operation, represented 66% of the total annual production. Production from wells on Tierra del Fuego Island accounted for 22.3%, while mainland production has dropped sharply and in 1986 supplied only 11.7% of the total.

ENAP conducted geophysical exploration activities in the Magallanes region (inland

and offshore) and began exploration in the northern zone, outside of the Magallanes region (Salares de Atacama, Punta Negra, and Pedernales). In the central-southern zone, the seismic exploration and interpretation of the Osorno-Llanquihue areas was completed. In the Continental Shelf between Mocha Island and Valdivia, exploration drilling is required in order to prove the gas reserves. The Jurassic sediment basins in the Salar de Atacama are the most interesting sites because of their extension and thickness of sediments that reach 10 kilometers, larger than the production area of Magallanes. Investment by ENAP and its subsidiaries during 1986 amounted to $112.8 million, 9.1% more than that of 1985. Foreign crude oil supplies came mainly from China, Colombia, Ecuador, and Venezuela by direct agreement with the respective state enterprises.

Chile imported 19.1 million barrels of crude oil for a total c.i.f. value of $293 million, 26.1% more in volume, and 31.5% less in value compared with those of 1985.

Output of natural gas decreased 6% from that of 1985 to almost 153.9 million cubic feet, continuing the declining trend since 1982. From the total production, 111.5 billion cubic feet, or 72.5%, was reinjected; of the remainder, 4.9% was flared and 22.6% was marketed internally. Two industrial plants were under development near Punta Arenas to utilize this gas. The Signal Companies United States, the IFC, and others were investing in a $300 million methanol plant, which should go on-stream in 1988. Combustion Engineering Inc. of the United States was planning a $342 million ammonia-urea plant in the same area. Both plants combined should consume about 53 billion cubic feet of natural gas per year. ENAP was also constructing a 185-kilometer-long gas pipeline, 18 inches in diameter, to link these plants with the gas treatment plant at Posesión and Cabo Negro. The pipeline will also deliver gas to the city of Punta Arenas. The investment is in the order of $20 million and will be partially financed by loans from the Inter-American Development Bank.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Chilean pesos (Ch$) to U.S. dollars at the average rate of Ch$192=US$1.00, as of Dec. 31, 1986.

The Mineral Industry of China

By E. Chin[1]

In the first year of the seventh 5-year plan (1986-90), China's gross national product reached $293 billion,[2] up 8% from that of 1985. Although there was a decline in output of some agricultural commodities and industrial manufactures, production showed a steady overall growth. National output of cement and steel was up 13% and 12%, respectively, and crude oil output rose 9%. Under the current economic development plan, the Government continued to emphasize the policy of introducing structural reforms for agriculture and industry, opening to the international community, and invigorating the domestic economy by way of decontrolling market mechanisms. Technological transformation of major enterprises was accelerated, the domestic market flourished, foreign trade was brisk, and the average annual income increased. In addition, progress was made in elevating the levels of science and technology, culture and education, and health. The major problems in the economy were heavy investments to upgrade fixed assets, inordinate growth in consumer demand, and the lack of domestic currency as well as foreign currency to finance the development and modernization of the industrial sector.

The total value of output by agriculture, animal husbandry, fishery, and forestry reached $123 billion, 4% more than in 1985. During the year, 20 million tons of fertilizer was applied, a 10% increase. Consumption of electricity in rural areas totaled 58 billion kilowatt hours, up 14%.

The collective value of industrial output increased 9%. By sector, state-owned industry increased 6%; collectively owned industry, 17%; individually owned industry, 61%; and other ownership, 34%. The total output value of light industry in 1986 was $166 billion, an increase of 13%, while that for heavy industry was $182 billion, an increase of 10%. The growth of light industry was attributed to increased output of high-quality products; growth in heavy industry was a result of a rapid growth in raw material output. However, industrial production was insufficient to meet consumer demand. Of 100 major products, 90 fulfilled or overfulfilled the planned production target, including cement, coal, electricity, chemical fertilizers, crude oil, and steel. Those that did not fulfill the planned targets included computers and motor vehicles (including tractors).

Strengthening of enterprise management continued to be stressed. Introduction of energy-efficient technology resulted in the saving of 20 million tons of energy in terms of coal equivalent. Profits of state-owned enterprises decreased slightly to $37 billion, largely owing to higher production costs. Despite the loss in profits and the uneven quality of the output of some goods and manufactures, per capita labor productivity increased 4%. During the year, 43% of the state-owned enterprises adopted a responsibility policy invested in a factory director. Eight percent of the small state-owned enterprises were either converted to collectively run enterprises or leased and/or contracted to individuals. Horizontal interprovincial and intraprovincial economic ties were increased for industrial enterprises. At the end of 1986, 15,740 enterprises were participating in 6,833 horizontal economic ties in industry above the county level, representing an aggregate investment of $3 billion.

Capital investment for construction totaled $93 billion. Investments in energy projects were $8 billion; communication, $6

billion; and the raw materials industry, $4 billion. Collectively, these sectors accounted for 50% of the total investment in construction. Construction of a number of key projects, including oilfields, coal mines, railroads, and ports, was completed during the year. New production capacity added during the year included 6 million kilowatts of power generation, 19 million tons of coal, 15 million tons of crude oil, 958 kilometers of railway, 286 kilometers of electrified railway, 27 million tons of port cargo, 3.7 million tons of steel production, and 5.4 million tons of cement.

Investment to modernize existing state-owned enterprises increased 30% to $25 billion. This included $9 billion to purchase equipment and machine tools, $6 billion to increase production capacity, and $1 billion to upgrade product quality. During the year, 42,000 projects were either replaced or modernized and put into operation. There were 163,000 construction projects under way, of which 982 were considered important large projects.

Transportation efficiency was improved during the year. The average daily productivity for each locomotive increased 5% to 806,000 tons per kilometer. Labor productivity of railroad workers rose 5%. The volume of transportation per ship managed by the Ministry of Communication increased 7% to 46,700 tons per kilometer. Working order at ports improved efficiency, reducing dockage time of foreign cargo ships from 11.1 days in 1985 to 7.2 days in 1986.

Cargo volume handled by transportation sector was as follows in billion tons per kilometer:

	1986	Percent increase over 1985
Railway	876.0	7.8
Waterway	842.0	11.0
Oil and/or gas pipeline	61.4	1.2
Highway	37.9	7.1
Air	.5	20.5

In 1986, the country's birthrate was 20.77 per thousand, and the mortality rate was 6.69 per thousand. By yearend, China had 1.06 billion people, 14.8 million more than at yearend 1985.

To ensure future economic and technologic development, the Government implemented a 9-year compulsory education program. There were 131.8 million pupils in primary schools, 41.2 million in junior middle schools, and 12.5 million in senior middle schools, of whom 4.8 million were in secondary vocational and technical senior middle schools. University and college enrollment in 1986 was 1.9 million. New enrollment during the year was 100,000, and 400,000 students graduated. Postgraduate enrollment in 1986 was 110,000 with 41,000 as new enrollment and 17,000 completing their degree programs. In addition, adult education was flourishing. There were 1.9 million adults attending universities and colleges, 1.5 million at secondary technical schools, and 4.4 million at technical training schools. Moreover, the Government implemented a "sparking program" on a nationwide scale to introduce necessary technological innovations (sparks) in the rural areas. The intent was to invigorate and upgrade local township enterprises in order to boost rural economic development.

Urban employment in 1986 was 127.7 million persons, including 5.18 million contract workers and 4.6 million self-employed workers. Employment of science professionals and technicians by state-owned units totaled 8.3 million. The annual per capita family income rose 21% to $259 in 1986 compared with $133 for an agrarian household.

Exports increased 13.1% to $30.9 billion, and imports increased slightly to $42.9 billion. The value of countertrade was valued at $1.3 billion. Nontrade foreign exchange income increased 9.9% to $5.61 billion, and nontrade expenditures increased 12.9% to $1.82 billion. China used $6.99 billion of foreign funds, 56.6% more than in 1985. In addition, 845 contracts, valued at $1.27 billion, were ratified and signed for overseas projects and labor service. Moreover, China was promoting tourism to garner foreign exchange currency. China received 22.82 million tourists, earning $1.53 billion, up 22.4% over the tourist revenues of 1985.[3]

China is endowed with an extensive range of mineral resources. Since the 1950's, the Ministry of Geology and Mineral Resources has carried out comprehensive geological surveying to delineate these resources. According to the Ministry, China leads worldwide in proven reserves of antimony, barite, coal, fluorspar, graphite, lithium, magnesite, mercury, molybdenum, phosphate, pyrite, rare earths, tin, titanium, tungsten, vanadium, and zinc. China ranks third in the world in total reserves of 45 minerals, but ranks very low in terms of reserves per capita because of its large population.

Quantitative data on China's mineral re-

sources are largely not available. The country's iron ore reserves are estimated at 45 billion tons. The ore, however, is mainly of low quality. China's coal reserves are estimated at 5 trillion tons. Its reserves of tungsten are equivalent to three times those of the rest of the world, and reserves of rare earths are equivalent to four times those of other countries.[4]

The Ministry has established relations with more than 60 countries. Bilateral cooperative agreements in geological science and technology have been signed with Australia, Brazil, Canada, France, the German Democratic Republic, the Federal Republic of Germany, Greece, Japan, Portugal, the United Kingdom, and the United States. To expand its activities, the Ministry created two commercial arms—China Geological Engineering Corp. and China Geological Technology Development Import/Export Corp. Foreign purchases of advanced equipment included digital seismographs, large computers, oil drilling equipment, marine geological surveying equipment, geophysical prospecting equipment, remote-sensing equipment, and laboratory analyzers. Production technology for certain instruments has also been imported. The Ministry has 40 factories engaged in the manufacture of surveying equipment and laboratory instruments. During the seventh 5-year plan, the Ministry was to focus on the survey and exploration of oil, natural gas, and geothermal energy, and on general prospecting of mineral deposits. It was also to make comprehensive appraisals of its finds with the view of developing mineral deposits.

PRODUCTION

The aggregate output value of China's economy in 1986 was $450 billion, an 8.7% increase over that of 1985. The output value for light industry was $152 billion, up 9.5%; heavy industry, $175 billion, up 8%; and agriculture, $123 billion, up 4%. China ranks fourth in the world in terms of the output value of the mining industry. In 1986, mine output value was $23 billion, or 7% of the total annual industrial output value. However, the value-added output of the mining industry by the processing and manufacturing sectors was $196 billion, accounting for 60% of the total industrial output value.[5]

China has a wide array and vast resources of fuel and nonfuel minerals, and the Ministry of Geology and Mineral Resources conducts continuous reconnaissance and delineation for new reserves. The mining industry is well developed, and its output is extensive as well as significant by world standards. However, in some instances of downstream production, processing capacity is limited and China imports materials to supplement domestic output such as aluminum, copper, fertilizers, and soda ash.

Table 1.—China: Estimated production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985	1986
METALS					
Aluminum:					
Bauxite, gross weight	1,600,000	1,600,000	1,600,000	1,650,000	1,650,000
Alumina, gross weight	800,000	800,000	800,000	825,000	825,000
Metal, refined, primary	380,000	400,000	400,000	410,000	410,000
Antimony, mine output, Sb content	12,000	15,000	15,000	15,000	15,000
Bismuth, mine output, Bi content	260	260	260	260	260
Cadmium, smelter	300	300	300	300	300
Copper:					
Mine output, Cu content	175,000	175,000	180,000	185,000	185,000
Metal:					
Smelter, primary and secondary	205,000	195,000	210,000	225,000	225,000
Refined, primary and secondary	300,000	310,000	310,000	400,000	400,000
Gold, mine output, Au content thousand troy ounces	1,800	1,850	1,900	1,900	2,100
Iron and steel:					
Iron ore, gross weight thousand tons	75,000	75,000	75,000	66,000	90,000
Pig iron do.	35,535	37,380	39,980	43,600	50,200
Ferroalloys do.	880	900	900	r1,500	1,500
Steel, crude do.	37,160	40,020	43,370	46,700	52,100
Steel, rolled do.	29,008	30,720	33,710	36,900	40,500

See footnotes at end of table.

Table 1.—China: Estimated production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985	1986
METALS —Continued					
Lead:					
Mine output, Pb content	160,000	160,000	160,000	160,000	160,000
Metal, refined, primary and secondary	175,000	195,000	195,000	r210,000	240,000
Magnesium metal, primary	7,000	7,000	7,000	7,000	7,000
Manganese ore, gross weight thousand tons	1,600	1,600	1,600	1,600	1,600
Mercury, mine output, Hg content 76-pound flasks	20,000	20,000	20,000	20,000	20,000
Molybdenum, mine output, Mo content	2,000	2,000	2,000	2,000	2,000
Nickel:					
Mine	12,000	13,000	15,000	r25,000	26,000
Smelter	12,000	13,000	14,000	r22,500	22,500
Silver, mine output, Ag content thousand troy ounces	2,500	2,500	2,500	2,500	3,000
Tin:					
Mine output, Sn content	15,000	15,000	15,000	15,000	15,000
Metal, smelter	15,000	15,000	15,000	15,000	15,000
Tungsten, mine output, W content	12,500	12,500	13,500	15,000	15,000
Zinc:					
Mine output, Zn content	160,000	160,000	160,000	r200,000	200,000
Refined, primary and secondary	160,000	175,000	185,000	r275,000	336,000
INDUSTRIAL MINERALS					
Asbestos	110,000	160,000	160,000	160,000	150,000
Barite thousand tons	900	1,000	1,000	1,000	1,000
Cement, hydraulic do.	94,072	108,250	121,080	142,500	161,600
Fluorspar	550,000	650,000	650,000	650,000	650,000
Graphite	185,000	185,000	185,000	185,000	185,000
Gypsum thousand tons	3,500	4,300	4,800	5,000	6,500
Kyanite and related materials	2,500	2,500	2,500	2,500	2,500
Lithium minerals, all types	14,000	15,000	15,000	15,000	15,000
Magnesite thousand tons	2,000	2,000	2,000	2,000	2,000
Nitrogen: N content of ammonia do.	12,711	13,766	14,000	15,000	15,500
Phosphate rock and apatite, P_2O_5 equivalent do.	r3,500	3,750	r3,500	r2,100	2,000
Potash, marketable, K_2O equivalent do.	26	29	40	40	40
Salt do.	16,384	16,130	16,000	14,450	17,300
Sodium compounds: Sodium carbonate, natural and synthetic do.	1,734	1,793	1,880	2,000	2,100
Sulfur:					
Native do.	200	200	200	200	300
Content of pyrite do.	1,800	2,300	2,300	2,300	2,500
Byproduct, all sources do.	300	350	350	350	300
Total do.	2,300	2,850	2,850	2,850	3,100
Talc and related materials	950,000	950,000	950,000	950,000	1,000,000
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Anthracite thousand tons	130,000	143,000	154,000	155,000	160,000
Bituminous and lignite do.	521,000	572,000	618,000	695,400	710,000
Total do.	651,000	715,000	772,000	850,400	870,000
Coke, all types do.	33,245	34,510	35,000	39,000	41,400
Gas, natural:					
Gross billion cubic feet	455	480	490	510	540
Marketed do.	414	431	438	455	485
Petroleum:					
Crude (including crude from oil shale) thousand 42-gallon barrels	744,994	774,311	836,069	873,500	953,500
Refinery products do.	475,000	500,000	550,000	655,000	700,000

rRevised.

[1]Table includes data available through Sept. 2, 1987.

[2]In addition to the commodities listed for which quantitative estimates of output have been made, China is known or believed to have produced other commodities for which no estimates have been prepared.

TRADE

China's total trade in 1986 reached $73.8 billion, an increase of 10.6% over that of 1985. Exports were valued at $30.9 billion, up 13.1% over those of 1985, while imports were valued at $42.9 billion, up 7.2%. China's major trading partners, in descending order, were Japan, Hong Kong and Macao, the United States, and the Federal Republic of Germany. However, Hong Kong and Macao are largely regarded as transship-

ment points for Chinese receipts and shipments of merchandise and goods.

Major export commodities showing a higher growth rate in 1986 included antimony, charcoal, coal, copper materials, iron and steel wire, rolled steel, and zinc and zinc alloys. Exports showing a decline included crude oil and oil refinery products.

There was a substantial growth in imports of iron ore, iron and steel wire, crude oil, oil refinery products, and soda ash. Imports registering decreases included aluminum and aluminum alloys, copper and copper alloys, fertilizers, and rolled steel.

The ranking of China's major trading partners in 1986 follows:

Destination	Value (millions)	Percent of total exports
Hong Kong and Macao	$9,930	32.1
Japan	4,764	15.4
United States	2,622	8.5
United Kingdom	1,433	4.6
Singapore	1,215	3.9
U.S.S.R	1,200	3.9
Germany, Federal Republic of	1,003	3.2
Netherlands	461	1.5
Poland	439	1.4
Italy	363	1.2
France	321	1.0
Canada	307	1.0
Other	6,872	22.3
Total	30,930	100.0

Origin	Value (millions)	Percent of total imports
Japan	$12,436	29.0
Hong Kong and Macao	5,436	12.7
United States	4,714	11.0
Germany, Federal Republic of	3,555	8.3
U.S.S.R	1,440	3.4
Australia	1,407	3.3
Italy	1,137	2.7
United Kingdom	1,011	2.4
Canada	1,010	2.4
France	731	1.7
Brazil	709	1.7
Singapore	553	1.3
Romania	544	1.3
Poland	540	1.3
Other	7,677	17.5
Total	42,900	100.0

Pursuant to the meeting of the fourth session of the China Tax Regulations Commission, customs tariffs were lifted for 16 export commodities effective January 1, 1987. These items included coal, ferrochromium, ferromanganese, ferromolybdenum, ferrosilicon, ferrotitanium, ferrotungsten, other ferroalloys, pig iron, and tin ingot. Customs duties, however, will continue to be levied on antimony and tungsten ore.

The Ministry of Foreign Economic Relations and Trade (MOFERT) lifted export license controls on 43 export commodities and placed 22 commodities under export license control, reducing the number of export commodities to 212 under the licensing control system. Commodities removed from control included bismuth, cobalt, magnesium, mercury, molybdenum concentrate and ammonium molybdate, and selenium. Commodities placed under license control included fluorspar, flake graphite, talc, and heavy water. On January 1, 1987, the changes were to go into effect.

Commodities under export license control are divided into two groups—exports to places other than Hong Kong and Macao, and exports regardless of destination. Salt is included in the former category, while alumina, barite, potassium permanganate, rare earths, and steel tubes are in the latter group.

According to MOFERT, the value of Chi-

na's countertrade in 1986 was about $1.3 billion. China exchanges commodities such as cloth, rice, and tea, which are in oversupply, for cement, pig iron, and steel manufactures, which it needs for industrial raw materials.

On the national level, the major mineral trading arms of MOFERT were China National Chemicals Import and Export Corp. and China National Metals & Minerals Import and Export Corp. The key trading arms in other ministries and enterprises included China National Offshore Oil Corp., China Petroleum Corp., China Petrochemical Corp., China National Oil and Gas Exploration and Development Corp., China National Metallurgical Import and Export Corp., and China National Nonferrous Metals Import and Export Corp.

Table 2.—China: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	215	107	--	West Germany 61; Japan 24; Canada 15.
Aluminum:				
Ore and concentrate	528,387	475,459	220,099	Canada 51,496; Japan 51,319; Italy 45,003.
Oxides and hydroxides	11,279	8,782	500	Hong Kong 1,750; Thailand 1,605; Sweden 1,500.
Metal including alloys:				
Scrap	237	166	--	All to Hong Kong.
Unwrought	642	715	--	Thailand 680.
Semimanufactures	5,772	4,967	41	Hong Kong 4,502; Yugoslavia 270.
Antimony:				
Ore and concentrate	7,062	1,867	--	West Germany 1,550; Spain 100.
Oxides	1,163	915	--	West Germany 759; United Kingdom 124.
Metal including alloys, all forms	5,510	821	--	West Germany 295; United Kingdom 289; Belgium-Luxembourg 77.
Arsenic:				
Ore and concentrate	2	--		
Oxides and acids	327	76	--	Thailand 61; Indonesia 15.
Beryllium: Oxides and hydroxides	20	--		
Bismuth: Metal including alloys, all forms	--	17	--	All to West Germany.
Chromium:				
Ore and concentrate	30	--		
Oxides and hydroxides	1,460	665	176	France 288; Hong Kong 125.
Metal including alloys, all forms	253	83	--	West Germany 73.
Cobalt: Oxides and hydroxides	17	10	--	Hong Kong 7.
Copper:				
Sulfate	201	--		
Metal including alloys:				
Scrap	729	1,002	--	Hong Kong 1,000.
Unwrought	1,125	481	7	Hong Kong 310; Thailand 148.
Semimanufactures	8,299	5,101	21	Hong Kong 4,947.
Germanium: Metal including alloys, all forms	1	--		
Gold: Metal including alloys, unwrought and partly wrought troy ounces	4,608	835	--	All to Italy.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	251	350	--	Thailand 300; France 50.
Pyrite, roasted	4,000	NA		
Metal:				
Scrap	13,184	21,349	3,048	Japan 13,070; Hong Kong 5,231.
Pig iron, cast iron, related materials	3,375	1,927	1,785	Japan 78; Hong Kong 64.
Ferroalloys:				
Ferrochromium	3,470	NA		
Ferromanganese	1,926	662	--	Pakistan 532; Indonesia 80.
Ferrosilicon	2,550	NA		
Silicon metal	14,318	NA		
Unspecified	1,948	4,973	50	Japan 2,803; Hong Kong 649; Sweden 564.
Steel, primary forms	392	5,429	18	Yugoslavia 5,174.
Semimanufactures	328,170	176,424	4,100	Hong Kong 149,553; Singapore 12,058.

See footnotes at end of table.

Table 2.—China: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides	525	876	--	Japan 390; Pakistan 332; Hong Kong 60.
Metal including alloys:				
Scrap	6	108	--	All to Hong Kong.
Unwrought	1,212	1,069	--	Hong Kong 1,009.
Semimanufactures	79	6	--	All to Hong Kong.
Lithium:				
Oxides and hydroxides	389	252	--	All to West Germany.
Metal including alloys, all forms kilograms	251	--		
Magnesium: Metal including alloys, all forms	243	--		
Manganese:				
Ore and concentrate	12,983	4,427	--	Japan 3,808; Hong Kong 243.
Oxides	2,017	1,157	--	Hong Kong 612; Indonesia 203; Pakistan 193.
Metal including alloys, all forms	325	383	--	West Germany 242; United Kingdom 72; Netherlands 52.
Mercury 76-pound flasks	2,845	7,695	2,379	Hong Kong 2,814; United Kingdom 580; Pakistan 493.
Molybdenum:				
Ore and concentrate	41	--		
Oxides and hydroxides	20	--		
Metal including alloys, all forms	--	51	41	Japan 10.
Nickel:				
Oxides	20	--		
Metal including alloys, all forms	4	68	--	Hong Kong 52; Japan 10.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$1,128	$1,296	$379	Japan $435; United Kingdom $239; West Germany $202.
Rare-earth metals	141	112	112	
Silver:				
Ore and concentrate	10	--		
Waste and sweepings[2] value, thousands	$39	--		
Metal including alloys, unwrought and partly wrought do.	$9,342	$12,238	$7	France $12,194.
Tin:				
Ore and concentrate	37	7,702	--	Hong Kong 6,100; Singapore 978; Netherlands 396.
Oxides	231	208	--	Netherlands 206.
Metal including alloys:				
Scrap	1	20	--	All to Hong Kong.
Unwrought	3,924	14,164	4,752	Japan 5,630; Hong Kong 3,445.
Semimanufactures	471	749	--	Hong Kong 745.
Titanium:				
Oxides	2,045	3,397	123	Japan 1,016; Hong Kong 849; United Kingdom 379.
Metal including alloys, all forms	133	100	--	West Germany 66; United Kingdom 34.
Tungsten:				
Ore and concentrate	4,632	7,136	2,453	Hong Kong 3,781; Singapore 298.
Oxides and hydroxides	55	15	--	United Kingdom 10; Belgium-Luxembourg 5.
Metal including alloys, all forms	103	[3]83	28	Singapore 55.
Uranium and/or thorium:				
Ore and concentrate	300	32	--	Indonesia 30.
Metal including alloys, all forms	[4]15	([5])	--	All to Pakistan.
Vanadium: Oxides and hydroxides	2,048	2,290	--	Belgium-Luxembourg 1,871; West Germany 315.
Zinc:				
Oxides	2,599	2,055	88	Singapore 562; Japan 499; Hong Kong 395.
Blue powder	10	--		
Metal including alloys	1,677	2,787	--	Japan 1,805; Hong Kong 915.
Zirconium: Ore and concentrate	--	1,107	--	All to West Germany.
Other:				
Ores and concentrates	10,024	21,965	4,286	France 6,708; Hong Kong 3,503; Japan 1,785.
Oxides and hydroxides	1,041	8,302	1,275	Japan 2,976; Hong Kong 2,352; Austria 1,316.
Ashes and residues	6,707	4,646	150	Hong Kong 4,493.

See footnotes at end of table.

Table 2.—China: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Other —Continued				
Base metals including alloys, all forms:				
Quantity, reported	3,385	5,050	4,169	France 403.
Value only, reported thousands	$11,536	$30,784	--	Japan $17,470; Hong Kong $12,560; Canada $656.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	513,106	3,086	--	Hong Kong 2,526; Japan 270.
Artificial:				
Corundum	16,428	22,205	165	Japan 11,808; Hong Kong 10,183.
Silicon carbide	3,043	1,073	--	Canada 800; West Germany 273.
Dust and powder of precious and semiprecious stones value, thousands	$90	$20	$19	Japan $1.
Grinding and polishing wheels and stones	5,718	5,068	50	Hong Kong 3,338; Indonesia 1,096.
Asbestos, crude	2,808	348	22	Hong Kong 150; Thailand 114.
Barite and witherite	920,112	970,983	882,299	Japan 50,170; West Germany 32,201.
Boron materials:				
Crude natural borates	[6]15	NA		
Oxides and acids	1,567	1,513	--	Japan 955; Pakistan 311; Hong Kong 101.
Cement	128,250	97,220	--	Hong Kong 97,169.
Chalk	750	17	--	Jordan 12; France 5.
Clays, crude	220,535	251,339	27	Japan 150,377; Hong Kong 84,174; West Germany 7,099.
Cryolite and chiolite	22	200	--	All to Thailand.
Diamond:				
Gem, not set or strung value, thousands	$6,056	$7,588	$133	Hong Kong $3,689; Belgium-Luxembourg $2,898.
Industrial stones do	$2,587	$966	--	Hong Kong $488; Belgium-Luxembourg $478.
Diatomite and other infusorial earth	103	11	--	Denmark 10.
Feldspar, fluorspar, related materials	415,167	433,703	20,605	Japan 349,735; West Germany 33,382.
Fertilizer materials:				
Crude, n.e.s	2,382	120	--	Hong Kong 111.
Manufactured:				
Ammonia	1,682	9,528	8,082	Hong Kong 1,446.
Nitrogenous	1,269	2,113	533	Hong Kong 1,353; Singapore 205.
Phosphatic	192	20,623	--	Japan 20,416.
Potassic	21	1,411	1,411	
Unspecified and mixed	7,785	[7]47	3	Hong Kong 44.
Graphite, natural	78,154	62,801	13,078	Japan 31,640; United Kingdom 9,089.
Gypsum and plaster	3,581	3,082	--	Hong Kong 2,418; Indonesia 319.
Iodine including bromine and fluorine	3	--		
Kyanite and related materials	25	--		
Lime	51,134	43,555	--	Hong Kong 42,545; Singapore 1,010.
Magnesium compounds	320,168	237,847	45,929	West Germany 50,056; Netherlands 31,731; Italy 26,440.
Mica:				
Crude including splittings and waste	15,751	16,743	--	United Kingdom 10,430; West Germany 3,420; Japan 2,164.
Worked including agglomerated splittings	94	55	([8])	United Kingdom 34.
Nitrates, crude	32	--		
Phosphates, crude	656	1,349	--	All to Japan.
Phosphorus, elemental	1,682	18	--	All to Thailand.
Pigments, mineral:				
Natural, crude	1,446	595	--	Indonesia 270; Philippines 175; Thailand 150.
Iron oxides and hydroxides, processed	5,163	5,726	--	Hong Kong 1,368; Egypt 1,071; Japan 1,019.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$3,593	$2,528	$221	Hong Kong $1,874; Japan $264.
Synthetic do	$124	$78	$3	United Kingdom $38; Hong Kong $18.
Salt and brine	776,692	785,447	--	Japan 680,819; Hong Kong 96,554.
Sodium compounds, n.e.s.:				
Carbonate, natural and manufactured	3,065	2,542	--	Hong Kong 2,420.
Sulfate, natural and manufactured	62,323	8,145	--	Thailand 4,120; Philippines 2,668.

See footnotes at end of table.

Table 2.—China: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	95,493	92,484	--	Japan 80,847; Hong Kong 6,113.
Worked	21,830	22,060	2,646	Japan 12,677; Singapore 3,109; Hong Kong 2,528.
Gravel and crushed rock	2,195,181	3,065,967	(9)	Hong Kong 3,061,968.
Limestone other than dimension	23,745	40,523	14,715	Hong Kong 25,808.
Quartz and quartzite	18,236	2,962	17	Hong Kong 2,794.
Sand other than metal-bearing	1,157,603	1,103,276	--	Hong Kong 1,099,823; Japan 3,310.
Sulfur:				
Elemental:				
Crude including native and by-product	1	11,764	801	Thailand 10,961.
Colloidal, precipitated, sublimed	76	6,022	--	Indonesia 5,000; Philippines 1,000.
Sulfuric acid	3,566	5,140	--	Hong Kong 5,139.
Talc, steatite, soapstone, pyrophyllite	534,705	490,449	902	Japan 452,466; Hong Kong 14,793.
Other:				
Crude	17,257	24,150	1	United Kingdom 7,120; Netherlands 6,577.
Slag and dross, not metal-bearing	9,811	8,258	--	Japan 6,026; United Kingdom 1,717.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	9,868	20	--	Singapore 15; Indonesia 5.
Carbon black	3,249	2,613	84	Hong Kong 688; Thailand 634; Indonesia 590.
Coal:				
Anthracite and bituminous thousand tons	4,850	4,729	--	Japan 3,598; Hong Kong 710; Philippines 217.
Lignite including briquets	1,305	759	--	All to Japan.
Coke and semicoke	15,270	18,778	--	Thailand 16,100; Hong Kong 2,573.
Petroleum:				
Crude thousand 42-gallon barrels	134,953	98,789	26,906	Singapore 60,160; Philippines 7,694.
Partly refined do	90	--		
Refinery products:				
Liquefied petroleum gas do	78	163	32	Hong Kong 51; Japan 49; Thailand 30.
Gasoline do	24,558	22,614	7,222	Japan 14,754; Hong Kong 379.
Mineral jelly and wax do	618	553	1	Singapore 177; Hong Kong 151; Thailand 60.
Kerosene and jet fuel do	3,308	3,036	18	Japan 1,568; Hong Kong 1,450.
Distillate fuel oil do	13,467	15,411	815	Singapore 6,622; Hong Kong 4,189; Thailand 1,935.
Lubricants do	424	871	438	Thailand 236; Hong Kong 148.
Residual fuel oil do	2,708	3,360	--	Japan 2,063; Hong Kong 1,158.
Bitumen and other residues do	69	27	6	Hong Kong 21.
Petroleum coke do	985	799	--	Japan 798.

[p]Preliminary. NA Not available.

[1]Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by China, this table should not be taken as a complete presentation of this country's mineral exports. These data have been compiled from United Nations information and data published by the trading partner countries.

[2]May include platinum-group metals.

[3]Excludes unreported quantity valued at $225,000.

[4]Excludes unreported quantities exported to Pakistan and Hong Kong valued at $16,000 and $3,000, respectively.

[5]Unreported quantity valued at $14,000.

[6]Excludes unreported quantity exported to Pakistan valued at $9,000.

[7]Excludes unreported quantity exported to Japan valued at $347,000.

[8]Unreported quantity valued at $2,000.

[9]Unreported quantity valued at $4,000.

Table 3.—China: Apparent imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	1	--		
Aluminum:				
Ore and concentrate	--	127	--	Canada 90; Singapore 37.
Oxides and hydroxides	70,012	80,972	--	Hong Kong 61,572; Singapore 10,722; Japan 8,625.
Metal including alloys:				
Scrap	84	459	1	Hong Kong 384; United Kingdom 54.
Unwrought	94,234	164,512	19,677	Australia 80,027; Indonesia 24,052; Spain 17,874.
Semimanufactures	17,073	74,099	142	Hong Kong 36,220; Japan 17,465; Belgium-Luxembourg 7,599.
Antimony: Oxides	10	--		
Beryllium: Metal including alloys, all forms value, thousands	--	$2	$2	
Chromium:				
Ore and concentrate	20,407	16,913	--	Philippines 14,257.
Oxides and hydroxides	1,636	56	50	Japan 3.
Metal including alloys, all forms	--	2	--	All from United Kingdom.
Cobalt:				
Oxides and hydroxides	16	--		
Metal including alloys, all forms	14	--		
Columbium and tantalum: Metal including alloys, all forms, tantalum value, thousands	--	$3	--	All from Japan.
Copper:				
Ore and concentrate	74,481	53,519	8,205	Canada 16,025; Philippines 14,674; Papua New Guinea 9,153.
Oxides	90	54	--	Hong Kong 36; West Germany 18.
Sulfate	9	8	--	All from Thailand.
Metal including alloys:				
Scrap	3,620	7,291	1,701	Hong Kong 5,187; Singapore 281.
Unwrought	59,545	98,423	5,631	Japan 43,202; Canada 24,063; Poland 10,982.
Semimanufactures	31,474	27,892	125	Japan 22,804; Hong Kong 3,037.
Gold:				
Ore and concentrate value, thousands	$7,026	$5,107	--	All from Philippines.
Metal including alloys, unwrought and partly wrought troy ounces	8,248	11,000	--	All from Hong Kong.
Iron and steel:				
Iron ore and concentrate	4,904,830	7,535,258	--	All from Australia.
Metal:				
Scrap	67,361	496,545	351,400	Netherlands 60,797; Japan 35,835; Hong Kong 26,283.
Pig iron, cast iron, related materials	1,690,356	1,073,795	--	Japan 1,003,992; Pakistan 57,574.
Ferroalloys:				
Ferrochromium	4,155	NA		
Ferromanganese	9,900	6,664	--	Japan 3,464; Spain 3,000.
Unspecified	7,717	564	--	Italy 449; France 100.
Steel, primary forms	1,383,261	1,742,182	42	Japan 756,456; Australia 279,663; West Germany 161,115.
Semimanufactures thousand tons	10,842	14,009	26	Japan 9,126; West Germany 962; Spain 949.
Lead:				
Oxides	19	28	--	Japan 25.
Metal including alloys:				
Scrap	218	1,229	2	Hong Kong 1,227.
Unwrought	6,323	3,423	1	Australia 1,997; Japan 1,095.
Semimanufactures	531	139	--	Japan 113; Hong Kong 26.
Magnesium: Metal including alloys, all forms	1,307	3,078	2,842	Japan 236.
Manganese: Oxides	35	24	(2)	Hong Kong 23.
Mercury 76-pound flasks	206	118	--	All from Hong Kong.
Molybdenum: Metal including alloys, all forms	2	2	--	All from Japan.
Nickel: Metal including alloys, all forms	146	211	21	Hong Kong 100; United Kingdom 29; Canada 23.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$1,805	$4,574	$664	United Kingdom $2,461; Japan $1,065; Hong Kong $320.
Selenium, elemental	20	--		

See footnotes at end of table.

Table 3.—China: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Silver:				
Ore and concentrate	6	(3)	--	All from Canada.
Metal including alloys, unwrought and partly wrought thousand troy ounces	13,030	1,113	(4)	Japan 978; Hong Kong 125.
Tin:				
Ore and concentrate	--	257	--	All from Hong Kong.
Oxides	32	--		
Metal including alloys, all forms	93	147	14	Hong Kong 106; Japan 27.
Titanium: Oxides	4,350	10,852	2,640	Japan 5,827; Hong Kong 1,417; France 500.
Tungsten: Metal including alloys, all forms	9	5 6	NA	All from Japan.
Uranium and/or thorium: Ore and concentrate	--	4	--	All from Hong Kong.
Zinc:				
Ore and concentrate	15,775	21,826	--	Australia 20,826.
Oxides	1,821	3,311	--	Australia 2,354; Singapore 525; France 353.
Metal including alloys, all forms	195,921	161,121	2	Canada 46,058; Netherlands 30,494; Australia 21,770.
Zirconium: Ore and concentrate	60	100	--	All from West Germany.
Other:				
Ores and concentrates	13,905	16,935	--	Pakistan 5,785; Australia 5,703; Hong Kong 5,447.
Oxides and hydroxides	23	31,167	--	West Germany 31,148.
Ashes and residues	84	394	--	Hong Kong 248; United Kingdom 146.
Base metals including alloys, all forms	153	532	21	Hong Kong 384; Japan 82.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	581	611	--	Hong Kong 509; Japan 102.
Artificial:				
Corundum	58	15	--	All from Japan.
Silicon carbide	18	18	--	All from Italy.
Dust and powder of precious and semi-precious stones excluding diamond value, thousands	$69	$9	$2	Belgium-Luxembourg $3; Hong Kong $2.
Grinding and polishing wheels and stones	273	325	--	Hong Kong 264; Italy 27.
Asbestos, crude	600	839	--	Canada 700; Greece 80.
Barite and witherite	157	NA		
Boron materials: Oxides and acids	14	40	16	Netherlands 23.
Cement	819,059	644,347	1	Hong Kong 425,716; Japan 121,467.
Chalk	80	--		
Clays, crude	3,094	3,026	507	Hong Kong 1,645; United Kingdom 481.
Diamond:				
Gem, not set or strung value, thousands	$6,569	$8,581	$408	Belgium-Luxembourg $5,589; Hong Kong $1,472.
Industrial stones do.	$8,996	$8,453	$799	Belgium-Luxembourg $5,459; Hong Kong $1,354.
Diatomite and other infusorial earth	90	1,277	981	Hong Kong 239; France 44.
Feldspar, fluorspar, related materials	9	28	--	All from Hong Kong.
Fertilizer materials:				
Crude, n.e.s	258	224	--	Hong Kong 164; Japan 60.
Manufactured:				
Ammonia	45	1	--	Mainly from Denmark.
Nitrogenous thousand tons	1,321	1,617	76	U.S.S.R. 788; Pakistan 248; Netherlands 109.
Phosphatic do.	442	84	--	Morocco 55; Philippines 29.
Potassic do.	767	276	--	Canada 194; Greece 32; West Germany 29.
Unspecified and mixed do.	1,656	989	654	Yugoslavia 81; Belgium-Luxembourg 72; Italy 63.
Graphite, natural	35	26	--	West Germany 23.
Gypsum and plaster	99	1,362	16	Hong Kong 1,314.
Iodine including bromine and fluorine	51	10	--	Australia 9.
Lime	64	189	--	Hong Kong 114; United Kingdom 61.
Magnesium compounds	110	220	--	All from Japan.
Mica:				
Crude including splittings and waste	--	8	--	All from Hong Kong.
Worked including agglomerated splittings	19	27	--	Mainly from Hong Kong.

See footnotes at end of table.

Table 3.—China: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Phosphates, crude	235,740	111,000	--	Morocco 100,000.
Pigments, mineral:				
Natural, crude	4	--		
Iron oxides and hydroxides, processed	598	1,131	1	Hong Kong 956; Japan 112.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$4,947	$7,659	$10	Hong Kong $7,263; West Germany $383.
Synthetic do	$45	$275	--	Australia $194; Hong Kong $61; Japan $10.
Salt and brine	587	696	--	Hong Kong 673; Japan 22.
Sodium compounds, n.e.s.:				
Carbonate, natural and manufactured	207,840	187,579	33,000	Poland 84,448; France 35,194; Japan 18,177.
Sulfate, natural and manufactured	104	315	--	All from Hong Kong.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	553	314	--	Hong Kong 197; Greece 36; Italy 34.
Worked	5,976	10,733	2	Hong Kong 10,443; Italy 228.
Dolomite, chiefly refractory-grade	98	36	--	All from Hong Kong.
Gravel and crushed rock	578	964	--	Hong Kong 958.
Limestone other than dimension	806	2,034	--	All from Hong Kong.
Sand other than metal-bearing	4,083	1,516	42	Hong Kong 1,402; Japan 69.
Sulfur.				
Elemental:				
Crude including native and by-product	248,669	162,610	33	Canada 162,577.
Colloidal, precipitated, sublimed	1	17	--	All from Hong Kong.
Sulfuric acid	98,956	16,129	12	Japan 15,880; Hong Kong 208.
Talc, steatite, soapstone, pyrophyllite	496	514	--	Hong Kong 462; Austria 52.
Other:				
Crude	847	254	--	Singapore 100; Japan 90; United Kingdom 59.
Slag and dross, not metal-bearing	2	6	--	All from Hong Kong.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	23	18	--	Mainly from Hong Kong.
Carbon black	7,520	11,253	322	Hong Kong 7,883; Japan 2,211; West Germany 740.
Coal:				
Anthracite and bituminous	184,641	524,272	--	Australia 504,547; Canada 19,725.
Lignite including briquets	20	7	7	
Coke and semicoke	1,506	NA		
Petroleum refinery products:				
Liquefied petroleum gas[6] 42-gallon barrels	26,506	58	58	
Gasoline do	20,855	52,955	706	Hong Kong 41,922; Belgium-Luxembourg 8,738.
Mineral jelly and wax do	6,917	2,723	71	Hong Kong 2,267; Netherlands 165.
Kerosene and jet fuel do	21,397	15,415	--	Yugoslavia 9,656; Hong Kong 4,627; Singapore 1,008.
Distillate fuel oil do	248,713	260,530	--	Hong Kong 243,494; Spain 14,480.
Lubricants do	115,199	147,669	7,588	Hong Kong 68,922; Japan 44,279; West Germany 8,015.
Residual fuel oil do	458,500	114,080	--	Hong Kong 102,218; Spain 10,330.
Bitumen and other residues do	5,606	19,543	--	Singapore 18,180; Hong Kong 1,339.
Bituminous mixtures do	273	303	--	Hong Kong 206; Japan 97.
Petroleum coke do	--	37,836	--	Hong Kong 36,296; Japan 1,540.

[p]Preliminary. NA Not available.

[1]Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by China, this table should not be taken as a complete presentation of this country's mineral imports. These data have been compiled from United Nations information and data published by the trading partner countries.

[2]Unreported quantity valued at $6,000.

[3]Unreported quantity valued at $735,000.

[4]Unreported quantity valued at $4,000.

[5]Excludes unreported quantity imported from Hong Kong valued at $720,000.

[6]Excludes unreported quantities valued at $7,637 in 1984 and $14,000 in 1985.

COMMODITY REVIEW

METALS

Aluminum.—China has large reserves of bauxite, principally in Guangxi, Guizhou, Hunan, and Shanxi. The largest Bayer plant in China is at Zhengzhou, Hunan, and has an annual output capacity of 500,000 tons of alumina. Capacity at Zhengzhou was slated to be expanded to 700,000 tons per year by 1990. The Bayer plant at Pingguo, Guangxi, has a capacity of 300,000 tons per year, which was to be expanded to 1 million tons by the year 2000. The plant at Guiyang, Guizhou, has a capacity of 400,000 tons of alumina, but because of technical difficulties, capacity production has not been reached. China's bauxite is the diasporic type, which is recalcitrant to digestion. In 1986, China National Nonferrous Metals Corp. negotiated with Aluminium Pechiney S.A. of France for expertise, technology, and digesting facilities.

China's primary aluminum plants were as follows, in metric tons:

Location	Present capacity	Projected capacity[1]
Anhui, Hefei	25,000	25,000
Gansu:		
Baiyan	--	(1987) 50,000
Lanzhou	30,000	30,000
Guangxi, Pingguo	40,000	(1990) 100,000
Guizhou, Guiyang	40,000	(1987) 110,000
Hubei, Wuhan	35,000	35,000
Hunan, Changsa	15,000	15,000
Jilin, Changchun	15,000	15,000
Liaoning, Fushun	100,000	100,000
Nei Monggol, Baotou	NA	NA
Ningxia, Yinchuan, Qintangxi	30,000	30,000
Qinghai, Xining	--	(1987) 100,000
	--	(1990) 200,000
Shandong:		
Nanding	NA	NA
Qingdao	15,000	15,000
Shaanxi:		
Tongchuan	9,500	9,500
Xi'an	--	(1990) 200,000
Shanxi, Taiyuan	25,000	25,000
Yunnan, Kunming	15,000	15,000
Total	394,500	(1987) 614,500 (1990) 1,074,500

NA Not available.
[1]Year projected capacity should be attained is given in parentheses.

China currently imports about one-half of its demand for aluminum. If the industry's expansion program is realized, China should be self-sufficient for aluminum. In addition, China International Trust and Investment Corp. negotiated a 10% share in Aluminum Co. of America's Portland smelter project in Australia. This 300,000-ton-per-year smelter was expected to come on-stream in 1990, further supplementing China's supply.

Antimony.—China has large reserves of antimony, and the mines at Xikuangshan, Hunan, are the largest producers in the country. Antimony is recovered as a byproduct in tin smelting operations in Guangdong, Guangxi, and Hunan. China has traditionally been ranked as one of the three top world producers along with Bolivia and the Republic of South Africa. The difficulty with Chinese antimonial material is uncertainty over the impurity levels of arsenic, lead, mercury, and selenium, which is a distinct marketing hindrance. Bolivian material usually carries trace elements amounting in all to under 20 parts per million. Chinese concentrates can range from 30 to 300 parts per million of mercury and selenium. The arsenic and lead content of Chinese material can range from 0.55% to 0.60%. Because of this variation in impurity levels, the price for Bolivian material is used as a benchmark to gauge the price of Chinese concentrates.

Beryllium.—Very little is known about China's resources of beryllium except that it markets both beryl and bertrandite. Beryl occurs in pegmatites in the Xinjiang Autonomous Region. Xinjiang Nonferrous Metal Corp. was constructing a plant to produce

100 tons of beryllium oxide per year. The Xibei copper fabrication plant in Lanzhou, Gansu, was installing equipment to produce 2,000 tons of beryllium-copper master alloy per year. China exported 455 tons of beryl to the United States in 1986.

Cobalt.—Cobalt was recovered as a byproduct of nickel production at Jinchuan, Gansu. Production of cobalt at Jinchuan is about 200 tons per year. Small amounts of cobalt were recovered from copper by the copper refinery in the Yangpoo District of Shanghai. In early 1986, the development of a primary cobalt deposit in Changjiang, Hainan Dao, Guangdong, was completed. The Hainan cobalt mine has an annual ore output of 50,000 tons.[6] This mine has the potential to produce an estimated 2,500 tons of elemental cobalt annually. Hainan Dao also has a copper deposit with high associated values of cobalt.

Columbium and Tantalum.—First-phase development of the Yichun Mine in Jiangxi was completed in mid-1986, whereby ore throughput capacity was increased from 250,000 to 500,000 tons per year.[7] Beneficiation produced a 28% tantalum pentoxide concentrate with a recovery of 60%. A second-phase development program was being proposed under which Yichun will be the largest producer of columbium and tantalum in China. Yichun is an apogranite-type tin deposit with reserves of 100 million tons containing 200 grams of tantalum pentoxide per ton of ore.

The recovery of byproduct columbium and tantalum at the Limu tin mine, Gangchen, Guangxi, began in 1966. Annual ore production was about 300,000 tons containing 150 grams of tantalum pentoxide. Limu was to import advanced technology and equipment to produce 10 tons of tantalum powder annually by 1988.

In 1986, columbium and tantalum were reportedly recovered from mining operations outside Guangzhou, Guangdong, and from pegmatites in Altai Shan north of Urumqi, Xinjiang.

Copper.—China has rich copper resources, estimated to exceed 50 million tons, placing it fourth worldwide in copper reserves. Thirty of the larger copper deposits account for 80% of the total reserves. Overall, Chinese ores are mostly low grade. Most have a copper content of 0.6% to 1.0%, and a considerable proportion (primarily porphyritic ores) have average contents of less than 0.5%. There are no extremely large deposits; a few have reserves exceeding 5 million tons. The reserves of the large deposits generally range from 1 million to 2 million tons. Most of the larger deposits occur in the middle and lower reaches of the Chang Jiang in northeastern Jiangxi; in the Zichang, Dianzhong, Zhongtiaoshan, Wilinshan, Nanling, and Yulong areas of Xizang; and in Nenjiang.

The principal ores are porphyritic, skarn, sedimentary-metamorphic, copper-nickel sulfide, and marine volcanic deposits, which represent 45%, 27%, 12%, 8%, and 5%, respectively, of the total reserves.[8] The remainder are in copper-containing sandstones, hydrothermal veins, and solution-cavern accumulations. Skarn deposits are China's main commercial ores. These include many of the larger deposits in the middle and lower reaches of the Chang Jiang, parts of northeastern and southeastern China, and the Yanshan and Nanling mountain areas.

China's annual metal production capacity is 495,000 tons. The Guixi smelter was commissioned and placed in operation in April 1986. Expansion of the Bayin smelter began in midyear. The State Planning Commission approved the construction of a 100,000-ton-per-year smelter in Tianjin as a key project of the seventh 5-year plan. China's metal production capacity was as follows, in metric tons:

	Present capacity	Projected capacity (1990)
Anhui:		
Tongling No. 1	30,000	30,000
Tongling No. 2	30,000	30,000
Gansu:		
Baiyin	40,000	[1]110,000
Hezheng Xian	35,000	35,000
Wu Wei	35,000	35,000
Henan, Zhuzhou	10,000	10,000
Hubei, Daye	30,000	30,000
Jiangxi, Guixi	90,000	90,000
Liaoning, Shenyang	50,000	50,000
Shanghai	65,000	65,000
Shanxi: Taiyuan	35,000	35,000
Tianjin	([2])	100,000
Yunan, Kunming	45,000	45,000
Total	495,000	665,000

[1]Expansion under way.
[2]Construction to begin in 1987.

China's annual demand for copper was increasing, and consumption in 1986 was about 800,000 tons. Imports of metal constituted about 45% of the supply. Recovery of scrap metal, principally from shipbreaking operations, was about 40,000 tons, or 5% of the total supply. Domestic primary production was expected to increase modestly to 665,000 tons in 1990. Secondary recovery was also to increase as China expands its shipbreaking capacity. China will continue to be a net importer of metal to the year 2000 because of the increase in demand as a result of the country's modernization program.

Third-phase expansion of the Dexing copper mine complex in Jiangxi began in late 1986. When completed, the daily mine output of ore will increase from 30,000 to 105,000 tons. In September 1986, mine construction was started to accommodate the expansion in smelter output at Baiyin, Gansu. On the provincial level, one of the key projects for Xinjiang was the development of the copper-nickel deposit at Halatonk.

The Jiangxi Copper Industrial Corp. was to develop the copper deposits at Chengmenshan. The mine complex would include an ore dressing plant with an annual capacity of 500,000 tons. The Lala copper deposits at Huili, Sichuan, were also to be developed. The proposed annual mine output of ore was 1.5 million tons.

Gold.—China's output of gold increased 14% in 1986.[9] China Gold Co. expected to maintain an average annual growth rate in production of 15% during the next 4 years. By the end of 1990, production would be double that of 1985, the last year of the sixth 5-year plan.

In 1987, the Government was to invest $190 million to develop gold mining; annual output would be increased by 250,000 troy ounces.[10]

Collectives and individuals were permitted to resume mining gold in 1978. In 1986, there were 400 gold-producing counties in 25 Provinces, Autonomous Regions, and Municipalities. Twenty-two counties had an annual output of more than 10,000 troy ounces. The largest producing county was Zhaoyuan in Shandong with an annual output of 161,000 troy ounces, followed by Lingbao in Henan with 89,000 troy ounces. Output from alluvial deposits accounted for 50% of total production. Two hundred small mines operated by local governments, collectives, or individuals produced more than one-half of the national output. Production by this sector has increased at an annual rate of 17% since 1980.

The three major gold-producing Provinces were Heilongjiang, Henan, and Shandong, each of which sustained a 10% output growth in the past few years. By 1990, these Provinces will account for 51% of the nation's aggregate output. Hebei, Jilin, Liaoning, and Nei Monggol each presently produce 50,000 to 100,000 troy ounces annually.

Estimated gold output in 1986 was as follows, in thousand troy ounces:

Shandong	550
Heilongjiang	165
Henan	120
Hebei	75
Jilin	75
Liaoning	75
Nei Monggol	75
Shanxi	20
Other areas	20
Individuals and collectives	925
Total	2,100

A gold refinery was completed in September 1986 and commissioned on November 26 in Zhaoyuan County, Shandong. With the support of the Ministry of Metallurgical Industry and China Gold, Zhaoyuan County invested $7 million for construction costs. The refinery is capable of handling 75 tons of gold concentrates annually. Byproduct output will include copper, silver, and sulfuric acid.

The People's Bank of China issued the first series of a gold and silver collectors' coin featuring Chinese historical figures in September 1984. The second series was issued in September 1985. A third series was issued in September 1986 consisting of one gold and four silver coins. The gold coin contains one-third ounce of 91.6% purity gold and has a face value of 100 yuan ($30). The silver coins contain 0.6 troy ounce of silver of 90% purity and have a face value of 5 yuan ($1.50). Sales of the Panda gold coins were expected to increase from 124,000 troy ounces in 1985 to 250,000 troy ounces each in 1986 and 1987. Although the Panda is a bullion commodity, its limited availability and annual design change make it a collector's item. When the Panda was introduced in 1982, a 1-ounce coin sold for $410; in 1986, the same coin sold for at least $1,630. The 1983 and 1984 1-ounce Pandas, which were sold for $500 and $420, respectively, have more than doubled in value.

According to the Ministry of Geology and Mineral Resources, China's reserves of gold rank fourth in the world, after the Republic of South Africa, the U.S.S.R., and the United States. However, its gold output stands sixth in the world after the Republic of South Africa, the U.S.S.R., the United States, Canada, and Australia.

A high-grade disseminated gold deposit was discovered in the southwestern part of Guizhou Province. The size of the deposit was not reported. A large silver deposit was discovered in Dachang, 300 kilometers northwest of Nanning, Guangxi. The Dachang area has the largest reserves of tin in China. Gold was also found in the region.

Iron and Steel.—China's mine output of iron ore in 1986 was 141 million tons averaging 35% elemental content. Most of the output was by the larger steel complexes, which operated captive mines. To supplement its needs, China imported 13.7 million tons of ore principally for consumption by the steel complexes in and around Shanghai. To meet the growing demand by the steel industry, several mine expansion programs were in progress. Output by the Nanfen Mine in Liaoning, operated by the Benxi steel complex, reached 7.5 million tons in 1986. Five main sections were being mined at the surface operation at Nanfen. A crusher was installed at the site. When fully operable, the designed annual capacity of ore will reach 10 million tons. Expansion of the iron ore mines at Shilu, Hainan Dao, was completed, increasing annual output from 3.8 million to 4.6 million tons.[11] The mine at Shilu is one of the few high-grade iron ore deposits in China. Iron ore output by the mine at Yangjiaba, Shaanxi, was being increased to 800,000 tons per year. Completion of the expansion project was expected in late 1987.

During the sixth 5-year plan, scrap iron and steel recovery averaged 20.6 million tons annually compared with 17 million tons in the previous plan period.[12] In 1985, China became the third largest country in the world for shipbreaking. Total deadweight breakage by China in 1986 was 1.5 million tons, compared with 9.3 million tons by Taiwan and 2.3 million tons by the Republic of Korea. There are 120 shipscrapping enterprises along China's coast and the banks of inland waterways.[13] The Government was seeking foreign assistance for technology to salvage sunken vessels along the coast and inland waterways. About 2,500 sunken ships were considered valuable enough for salvaging along the coast. More than 360 vessels have been located in the Chang Jiang. The Ministry of Communication was promoting legislation for marine salvage regardless of profitability.

According to the Ministry of Metallurgical Industry, production of crude steel will increase modestly during the seventh plan period. Most of the increases will be from modernization of existing facilities. As China purchases about 20 million tons of steel annually, it will continue to be a net importer. China's average per capita steel production is 50 kilograms, well below the level of developed countries. The Ministry selected 9 out of 15 steel projects in which it hoped to obtain foreign participation for expanding steel output. The overall expansion of the steel sector was as follows, in metric tons:

Steel facility	Existing capacity	Proposed capacity
Anhui, Ma'anshan	2,300,000	3,200,000
Fujian, Meizhouwan	--	300,000
Guangdong, Guangzhou	--	300,000
Guangxi, Beihai	--	300,000
Hebei, Xuanhua	600,000	1,050,000
Hubei, Wuhan	4,000,000	7,000,000
Jiangsu:		
Maanshan	1,600,000	3,200,000
Meishan	--	2,000,000
Liaoning:		
Anshan	7,000,000	10,000,000
Benxi	1,600,000	3,600,000
Shandong, Laiwu	160,000	800,000
Shanghai, Baoshan	3,700,000	6,700,000
Shenzhen, Guangdong	--	3,900,000
Sichuan, Panzhihua	1,700,000	2,500,000
Zhejiang, Ningbo	--	3,000,000
Total	22,660,000	47,850,000

Financing for the new projects and the expansion of existing mills were to be from domestic as well as foreign funds. Completion was targeted during the eighth 5-year plan (1991-95), at which time China's annual steel production capacity would reach 73 million tons.

Lead and Zinc.—China's largest lead-zinc operation is the Fankuo Mine at Shao Guan, Renhua County, Guangdong. Reserves are estimated at 30 million tons of combined lead-zinc. The Fankuo Mine was opened in 1959. In 1986, it had 5,000 employees, of whom 400 were technical personnel. Expansion of the capacity at Fankuo was a key project in the seventh 5-year plan. The mining and concentration plant output was to be expanded from 3,000 to 4,500 tons per day.

The lead-zinc mine at Chungxian, Gansu, has confirmed reserves of 3.8 million tons of high-grade ore and inferred reserves of 10 million tons. The mine, opened in 1982, has a daily output of lead-zinc concentrates of 4,000 tons. In September 1986, Baiyin Nonferrous Metals Co., which operates the mine, began construction of a 50,000-ton-per-year lead smelter and a 100,000-ton-per-year zinc smelter. Initial production of lead and zinc metal was expected in 1988.

A deposit at Lanping, Yunnan, was being developed to produce annually 60,000 tons of combined lead and zinc. First-stage construction includes both mine development and smelter construction. A small mine was being developed at Jishuimen, Guangdong, to produce annually 1,200 tons of lead, 110 tons of zinc, and 220 tons of tin.

The smelter at Zhuzhou, Hunan, was to import technology and equipment to expand electrolytic zinc production from 100,000 to 135,000 tons per year.

Magnesium.—China's resources of magnesium in dolomite and magnesite are huge. However, its production of metal is very small in comparison with that of magnesium compounds. Because of the growing demand for magnesium metal, especially for aluminum alloying, two small thermic plants using dolomite as raw materials were to be built under the seventh economic plan. Construction was scheduled to start on a 10,000-ton-per-year plant at Changbai, Liaoning. A similar-size plant will be built at Minhe, Qinghai.

Mercury.—According to the Ministry of Geology and Mineral Resources, China ranks first in the world in mercury ore reserves. The mercury belt runs through Guizhou and Hunan. Guizhou is known as the mercury province, and its five mines account for 90% of the national aggregate output. The mercury production level is unknown, but China could be a major influence in world trade. In 1986, China displaced Turkey as the second largest purveyor of mercury to the United States, almost doubling its shipments to 4,741 flasks. Exports to Japan were less than 1,000 flasks. China National Nonferrous Metals Industry Corp. markets mercury of 99.99% and 99.999% purity, and its subsidiary, Gem Mineral Corp., markets cinnabar as crystal specimens.

Molybdenum.—China has large resources of molybdenum associated with copper and tungsten ores. Little is known regarding Chinese production. Some Western analysts estimate Chinese annual output levels at 20 to 25 million pounds.

The Yangjiachangzu Mine in Linxi, Liaoning, produces 1,000 tons of molybdenum concentrates annually. Mine development of the Xinhun molybdenite deposit at Xiaojia Yingzi (Kazhuo County, Chaoyang Prefecture), Liaoning, was completed in 1986.

This skarn deposit covers an area of 60 square kilometers with proven reserves estimated at 46 million tons averaging 0.228% molybdenum. Mine output of ore at Xinhun is 330,000 tons per year.

Nickel.—The nickel-copper sulfide deposit at Jinchuan, Gansu, was discovered in 1958 and is considered to have the second largest nickel reserves in the world after the Sudbury Basin in Canada. Jinchuan has reserves of over 5 million tons of contained nickel. The deposit is on the north slope of Longshu Shan, 50 kilometers north of Jin Chang City, and borders on the southernmost edge of the Gobi Desert Plateau. Development of the Longshu underground mine of the No. 1 mining area began in 1959 and present ore production capacity is 1,000 tons per day. The open pit mine was brought into operation in 1966 with an ore output of 5,500 tons per day; this operation was closed in 1982. The East Extension of the open pit was placed in operation in 1983 with an ore output capacity of 2,200 tons per day.

Development of the No. 2 mining area began in 1974. Ore reserves of this area are 322 million tons containing 4.1 million tons of elemental nickel. The No. 2 mining area has seven shafts and about 40 kilometers of underground workings. Mining began in 1982, and ore output capacity is 3,000 tons per day.

Metallurgical facilities at Jinchuan include a concentrator, smelter, and refinery. The complex was designed to produce annually 20,000 tons of electrolytic nickel. Cobalt, copper, and platinum-group and other precious metals are produced as byproducts. China's demand was expected to reach 70,000 tons by 1990 and 120,000 tons by 2000. In an attempt to meet the growth in demand, the No. 2 underground mine will be expanded into a highly efficient operation with an ore production capacity of 8,000 tons per day by 1990 and 17,000 tons per day by 1995. Correspondingly, a new metallurgical complex will be constructed to produce 40,000 tons of electrolytic nickel annually by 1990, and 80,000 tons annually by 1995.

Rare-Earth Minerals and Yttrium.—China has large resources of rare earths and yttrium in bastnaesite, monazite, and xenotime. China claims that its reserves of 36 million tons are equivalent to four times the reserves in the rest of the world. Ninety-eight percent of the reserves are in Nei Monggol. The largest mine is at Bayan Obo, Nei Monggol, and produces 80% of China's rare earths. This deposit contains both bastnaesite and monazite and has high values of europium and samarium, which are consumed for phosphors and magnets, respectively. The remainder of the reserves are in monazite in Jiangxi; in monazite and xenotime in Guangdong, Guangxi, and Hunan; and in bastnaesite in Shandong. The monazite in eastern China is rich in yttrium, which is also used as a phosphor.

The Gansu Rare Earth Corp. refinery is China's largest with an annual output capacity of 6,000 tons of individual and mixed rare-earth compounds. The Yao Long chemical plant specializes in separated, individual rare-earth compounds, which account for 70% of its 1,000-ton-per-year output. Yao Long's best selling export is yttrium. The 6,000-ton-per-year-capacity plant at Baotou, Nei Monggol, hitherto specialized in mischmetal but has expanded into high-purity separation of rare-earth compounds.

Tin.—Total output of tin was 21,500 tons.[14] Seventy percent of the production was from the 2,000-year-old mine at Gejiu, Yunnan. The mining complex, operated by Yunnan Tin Industrial Co., had 48,000 employees working 12 underground and surface placer sites, 10 ore dressing plants, and 3 smelters. Mechanization has raised Gejiu's annual tin output to 15,000 tons per year. The rich deposits were being exhausted, and Gejiu's output has fallen from a peak of 20,000 tons per year in the 1960's to 15,000 tons per year in 1986. The average grade of ore processed has fallen from over 0.5% to 0.2%-0.4%; tin recovery is very low, about 55%.

China's second largest tin mining area is at Dachang, Guangxi. The mine was to be enlarged and output expanded during the current plan period.

Tin particle size of Chinese ore is small. In addition, the industry possesses poor ore processing technology. Production at both Gejiu and Dachang is limited also as a result of an electrical power shortage.

The Limu tin mine in Gongcheng, Guangxi, began production in 1934. Limu was slated for expansion and modernization through the import of advanced technology and equipment by 1988. Coproducts at Limu include columbium, tantalum, and tungsten.

China's annual exports of tin are small, averaging less than 10,000 tons per year. There has been growing domestic demand for tinplate, which has limited the trading of tin. In addition, nondissipative uses such as in new float-glass plants have consumed

a considerable part of China's tin output. Moreover, exports were reduced as a result of the collapse in prices for tin, which had been previously supported artificially under the International Tin Council Agreement.

Titanium.—China has large resources of titanium in titaniferous magnetite in Panzhihua, Sichuan, and ilmenite in Hainan Dao, Guangdong. The estimated reserves of ilmenite in the Counties of Lingshiu, Qionghai, Sanya, Wanning, and Wenchang in Hainan Dao alone are 700 million tons. Because of the growing demand for titanium, both metal and oxide, foreign participation was invited to treat the slag at Panzhihua. The chloride process was to be used to produce titania. Output was to be used for pigment initially and later partly for metal production. A small metal plant was proposed for construction at Minhe, Qinghai. This plant would use the metal produced by the proposed magnesium plant at the same site as the reductant for titanium tetrachloride.

Tungsten.—China has large resources of tungsten in scheelite and wolframite. China's reserves are equivalent to threefold of the reserves in the rest of the world. China's tungsten belt stretches from Zhejiang through Jiangxi, Hunan, and Guangdong to Guangxi. The largest deposit is at Xikuang, Hunan; however, it has a low grade of 0.22% tungsten. The oldest operating mine, at Xi Huashan, Jiangxi, has an annual output of 2,500 tons of 65% tungsten concentrate. The following is a partial listing of tungsten mines in China: Dachishan, Tangjiang, and Yaoling in Guangdong; Dangxing, Limu, Lingma, and Nashan in Guangxi; Xiangdong, Xikuang, and Yangohiatan in Hunan; Dajishan, Dayu, Gueimeishan, Pangu Shan, and Xi Huashan in Jiangxi; and Dajishan in Zheijiang.

The largest producing Province is Jiangxi, which has 10 major mines in operation.

The China Tungsten Industry Association was established at Nanchang, Jiangxi. This association was to oversee the development of industry technology to produce value-added tungsten products for overseas marketing. China exports material mostly in the form of concentrates. During the first 9 months of 1986, China exported 17,347 tons of concentrates compared with 281 tons of metal.

China shipments represent about 40% of the world's export market for tungsten. Producers in Western Europe and the United States were petitioning for restraint in China's export volume and price.

INDUSTRIAL MINERALS

Jurisdiction over industrial minerals was largely divided between the Ministry of Chemical Industry, State Administration of Building Materials, and China Nonmetallic Minerals Industry Corp. (CNMIC). There are 10 major chemical bases in China, which collectively account for over 60% of the total chemical production.[15] Each base is also complete with petrochemical production. The major industrial minerals output of Shanghai and Taiyuan includes chlorine, fertilizers, caustic soda, soda ash, and sulfuric acid. The common feature for Beijing, Daqing, and Lanzhou is fertilizers. For Jilin, Nanjing, and Sichuan, it is chlorine, fertilizers, caustic soda, and soda ash. Liaonan produces boron, salt, and soda ash, while the output of Tianjin includes chlorine, salt, caustic soda, and soda ash. The State Administration of Building Materials is responsible for the manufacture of cement, the demand for which is rapidly growing as a result of the country's modernization program. CNMIC markets 80 industrial minerals and a host of mineral products and operates mines for asbestos, bentonite, graphite, gypsum, mica, and talc. According to CNMIC, China's resources of apatite, barite, bentonite, graphite, gypsum, talc, and troilite stand in the world's forefront in terms of reserves. In addition, the reserves of asbestos, diatomite, kaolin, and zeolite are of considerable size. Although China has abundant resources of industrial minerals, production falls short of demand. Long-range planning calls for increasing output by four to six times by the end of the century.

The percent output of open pit and underground mining in China of selected industrial minerals in 1986 was as follows:

	Open pit	Underground
Asbestos	69	31
Diamond	75	25
Graphite	92	8
Gypsum	42	58
Kaolin	28	72
Mica	5	95
Talc	46	54

Asbestos.—Total annual asbestos production capacity is about 150,000 tons, of which 98% is chrysotile. Mines operated by CNMIC include Akesai Hesaki, Gansu; Baotou, Nei Monggol; Jinzhou, Liaoning; Lai Yuan and Lu Liang, Shanxi; Mang Ya,

Qinghai; and Shan Nam and Ziao Ba Bo, Gansu. Fifty-one percent of domestic asbestos consumption is for asbestos-cement products, and the remainder is for alkali production and other.

Barite.—China has a large resource of barite, is one of the world's largest producers, and is also a significant exporter. However, principally because of the dip in world petroleum prices, the demand for barite as a drilling mud entailed a slump in the domestic market as well as in international markets. The mines in Xiangzhou County, Guizhou, are China's largest producers. The deposits in Xiangzhou have 180 veins with total reserves of 25 million tons. One-third of the reserves have a purity of 95%. A large deposit was discovered in Tianzhu County, Guizhou, containing 100 million tons. The Tianzhu deposit constitutes 60% of the total barite reserves in China.

Cement.—During 1981-85, a number of 1-million-ton-per-year cement plants were installed in industrial areas throughout China. Cement production grew from 83 million tons in 1981, the first year of the sixth economic plan, to 162 million tons in 1986, the first year of the seventh economic plan. As a result of phenomenal growth in urban and, especially, rural construction for housing, civil engineering construction, and industrial construction, the State Administration of Building Materials and the Ministry of Construction curbed growth through allocation of cement supplies. Priority allocations were given to China's major national projects.

The supply of cement was expected to remain tight in light of proposed construction activities for such projects as the Three Gorges Dam, the Ningbo steel complex, nuclear powerplants, and a host of other projects, especially for energy production. Production capacity for cement was expected to reach at least 250 million tons per year by 1990. Installations of smaller plants were to serve the needs of the developing areas, while larger plants were to be constructed around the industrial hub, such as the route along the Chang Jiang.

Fertilizer Materials.—China was the world's third largest producer of fertilizer, after the United States and the U.S.S.R. Production of nitrogenous fertilizer in 1986 was about 12.4 million tons (nitrogen content); phosphate fertilizer, 1.8 million tons (phosphorus pentoxide content); and potassic fertilizer, 35,000 tons. In specific types of fertilizer, China was the world's third largest producer of nitrogenous fertilizer, after the United States and the U.S.S.R.; the fourth largest producer of phosphatic fertilizer, after the United States, the U.S.S.R., and Morocco; and a very minor producer of potassic fertilizer. However, domestic production was inadequate to meet demand as well as inadequate in terms of nutrient-ingredient demand by the agricultural sector.

Prior to 1984, China's technical ability was limited to the construction of ammonia plants in the 10,000- to 15,000-ton-per-year range. In the 1970's, China imported 13 large-scale plants—the majority from M. W. Kellogg Co. of the United States. These large plants produced about 25% of China's nitrogenous fertilizer. Since the 1970's, China has been developing its own technology. By 1984, Nanjing Chemical Industry Co. in Jiangsu and the Jinzhou heavy machinery plant in Dalien, Liaoning, each had the technology and capability to design and build a nitrogenous fertilizer plant to produce 300,000 tons of ammonia per year and 520,000 tons of urea per year. During the sixth plan period, construction resumed on the imported units in Xinjiang and Zhejiang. Both nitrogen units were in trial runs by 1985, and in full production in 1986.

Nitrogenous fertilizer output was expected to increase further as a result of the large natural gas find (reserves of 3 billion cubic feet) off Yinggehai, Hainan Dao, Guangdong. Plans were being made to pipe natural gas to Guangzhou, Guangdong, for use as a fuel as well as for fertilizer production.

About one-half of China's resources of phosphate are in Guizhou, Hubei, and Yunnan. The reserves at Dianchi, Yunnan, are estimated at 42 billion tons, accounting for about 21% of China's total reserves. Moreover, 80% of the reserves at Dianchi can be mined by opencast operations. Output at Dianchi was to rise from 3.5 million to 12 million tons in 1990 and to 15.6 million tons in 2000, representing 45% of the projected national output at that time.

The industry is planning to expand phosphate production and increase the effectiveness of phosphatic fertilizer. Jacobs Engineering Co. of the United States is conducting feasibility studies of phosphate deposits in Guizhou and Hebei, which are scheduled for completion in 1987. In 1987, the following fertilizer plants were scheduled to come on-stream: a 264,000-ton-per-year diammonium phosphate plant in Dalien, Liaoning; an equivalent-size plant in Nanjiang, Sichuan; and a 900,000-ton-per-

year nitrophosphate plant at Weizizhen, Lucheng County, Shanxi. In addition, there is a Chinese agreement with Kuwait and Tunisia for the construction of a chemical fertilizer plant at Jing Hewang Dao, Tianjin, to produce 480,000 tons of diammonium phosphate or 600,000 tons per year of nitrogenous-phosphatic-potassic fertilizer.

China's production of potassic fertilizer is woefully inadequate. In 1985, production was only about 25,000 tons. In January 1986, production began at the 40,000-ton-per-year potash operation at Qaidam Basin, Qinghai. In 1982, Jacobs International Ltd. of Dublin, Ireland, was commissioned to conduct a feasibility study to harvest 1.2 million tons per year of potassium chloride from Qinghai via solar evaporation. Subsequently, Jacobs International was dropped as a contractor, and Chinese technicians were to design a facility to produce 1 million tons of potash per year. Since that time, according to the Chinese press, plans were being made to construct a 1-million-ton-per-year potassic salt facility at the site.

Graphite.—Flake mica deposits occur at Laixi, Pingdu, and Wendang in Shandong. The graphite at Lutang, Hunan, is the amorphous type. Graphite mines operated by CNMIC included Liu Mao, Heilongjiang; Lutang, Hunan; Nan Shu, Shandong; Panshi, Jilin; and Xing He, Nei Monggol. Seventy percent of the production was domestically consumed, and the remainder was exported mainly to France, Italy, Japan, and the United States. Sixty percent of the consumption was for steelmaking and castings, 15% for pencil lead, 10% to 12% for electrical uses, 7% to 8% for refractory uses, and the remainder for other uses.

Gypsum.—China's gypsum mines are distributed over Hunan, Jiangsu, Ningxia, and Shanxi. CNMIC operates the mines at Lingshi, Shanxi; Shaodong, Hunan; and Yingching, Jiangsu. Ninety-four percent of the gypsum consumed was in cement manufacture, 3% in ceramics, and 3% in other uses. Fifty percent of the consumption of fibrous gypsum was in agriculture, 19% in light industry, 8% each for ceramics and paper, and 15% in other uses. Gypsum production does not meet domestic demand, especially for fibrous gypsum, which satisfies only about 30% of the demand.

Kaolin.—The largest kaolin enterprise in China is the Suzhou China Clay Corp. in Suzhou, Jiangsu, which produces both hand-picked and molded China clay classified into 7 grades in 16 specifications according to quality. Domestic production satisfies 95% of the demand. High-quality clays such as papercoating grade are imported from the United Kingdom and the United States. Kaolin consumption for electrical and ceramic uses accounted for 29% each; refractory, 26%; rubber, 4%; and abrasives, cement, and paper, 1% each; 9% was for miscellaneous uses.

Perlite.—There are over 100 perlite mining operations in China, mostly operated by local governments. Annual ore output is about 500,000 tons with an average specific gravity of ore of 2.232 to 2.305. In addition, there are 160 perlite processing plants with a collective annual capacity of 3 million cubic meters of expanded perlite. In 1985, the Beijing perlite factory and the Jinzhou perlite factory in Liaoning purchased expansion furnaces as well as filtering equipment from the Perlite Corp. of the United States. Equipment installation and the adjusting test-run period were completed in mid-1986, followed by commercial production of expanded perlite in September. China's demand for expanded perlite was growing rapidly for such uses as thermal insulation, mortar, sound absorption, lightweight refractory, and as a filtering medium.

Salt.—The output of salt in China was 17.3 million tons in 1986; it is unclear whether this is gross output or whether the output excludes sodium chloride for human consumption. Over one-half of the reported salt output is by evaporite operations by salterns in the Bohai area. Bohai is composed of the Liaodong Peninsula, the Shandong Peninsula, Beijing, Tianjin, and Tanggu. The Bohai area, incidentally, contains four of China's major oilfields—Dugang, Huabei, Liaohe, and Shengli.

A salt deposit with estimated reserves of 250 billion tons was reported in Huaian, Jiangsu, and development was under way; the deposit was believed to be one of the largest in the world. Two other deposits were also discovered in Jiangsu, one with reserves of 44 billion tons and the other with 3 billion tons.

The saltworks at Tanggu, Tianjin, was to construct a facility to produce 100,000 tons of refined salt per year.

Talc.—CNMIC operated four talc mines—the Haicheng Mine in Liaoning and the Hai Yang, Pingdu, and Qi Xia mines in Shandong. A large deposit was being mined as a provincial-level enterprise in central Guangxi. China produces both powder and lump talc. Domestic consumption accounted for 68% of the total output; the remainder was exported mainly to Japan, the United Kingdom, and countries in Southeast Asia. Sixty percent of the domestic consumption

was for paper, 14% for asphalt felt, and the remainder for other.

Sobre Clay Co. of Japan established a joint venture for talc production outside Dalian, Liaoning. Pfizer Co. of the United States established a joint venture with Heicheng Talc Co. in Liaoning to construct a flotation facility to produce 100,000 tons per year of talc for plastic coatings.

Other Industrial Minerals.—Shichester Diamond Services Ltd., a subsidiary of De Beers Consolidated Mines Ltd. (Republic of South Africa), established a joint venture to prospect for diamonds in Shandong Province and other areas in China. Yunnan Provincial authorities established a joint venture with Hong Kong interests to process jade and other gem stones for export.

Australian and West German companies were installing equipment for a 500,000-ton-per-year magnesite sintering plant for Liaoning Magnesite Co. The contract included electrical and special laboratory equipment.

SCM Corp. of the United States established a joint venture with Sichuan Nonferrous Metals Industrial Corp. to produce synthetic rutile. SCM is evaluating the upgraded ilmenite produced at the Zygong pilot plant, and, if satisfied, will proceed in its participation for the proposed 120,000-ton-per-year-capacity titania plant.

The salt lake at Yuncheng north of the Zhongtiao Mountains in Shanxi has supplied north China with salt for centuries. The brine contains significant values of such elements as boron, bromine, calcium, and iodine. Chemical plants around the lake produce mirabilite, sodium sulfate, and other sulfur compounds. The operations at Yuncheng account for 60% of China's output of mirabilite.

MINERAL FUELS

China is a huge producer of fuels. In 1986, China produced 870 million tons of coal, over 131 million tons of oil, and close to 14 billion cubic meters of natural gas. Total generation of electricity by thermal and hydropower generation was over 445 billion kilowatt hours. In addition, there is energy production from unaccounted noncommercial sources such as animal chips, biogas, geothermal sources, wind power, and wood burning. Given the magnitude of supplies, there was still insufficient energy to meet the nation's demand. Energy consumption in China was as follows, in terms of 10,000 yuan (about $3,200), of industrial output value:

	Tons of standard coal equivalent	Kilowatt hours
Shanxi	11.779	5,811
Ningxia	11.660	8,644
Nei Monggol	11.190	5,200
Gansu	10.640	8,071
Xinjiang	9.610	3,446
Qinghai	9.450	7,579
Guizhou	9.370	7,589
Hebei	8.990	5,272
Heilongjiang	7.920	4,169
Jilin	7.660	4,881
Hunan	7.580	4,873
Henan	7.390	5,102
Yunnan	7.310	5.135
Liaoning	7.120	4,221
Anhui	6.810	4,478
Jiangxi	5.940	4,472
Guangxi	5.630	4,716
Shandong	5.500	3,572
Hubei	5.470	3,633
Beijing	4.670	2,818
Fujian	4.550	3,798
Guangdong	3.570	2,928
Tianjin	3.500	2,332
Jingsu	3.350	2,633
Zheijiang	2.620	2,387
Shanghai	2.300	2,086

Curiously, Shanxi, which produces about 25% of China's total output of coal, was also the largest consumer of energy in terms of coal equivalent. Moreover, Ningxia, one of the least populated and industrialized areas, was a high consumer of energy. As expected, Shanghai, the most vital industrial center of China, and the outlying areas of Zhejiang were the most efficient in terms of energy consumption for value-added production.

During 1986-90, the Government budgeted close to $37 billion for energy development, almost double the allocation of the sixth plan period. During the seventh plan period, the planned annual growth rates for production for electric power generation was 6%; oil, 4%; coal, 3%; and natural gas, 3%. By 1990, projected electric power generation was expected to reach 550 billion kilowatt hours. Seventy-five percent of the new power generation was to be by thermal powerplants, mostly, if not all, by coal-fired plants. About one-half of the new capacity will be from powerplants close to minesites. The remainder would be from plants sited near demand-load centers, primarily on the east coast.

During the seventh plan, 8,000 megawatts (MW) was programmed to come on-stream, and construction was to start on an additional 10,000 MW of capacity, excluding the 13,000-MW output from the controversial Three Gorges project on the Chiang Jiang. Priority has been given to the construction

of dams along the Hongshui for the Guangzhou grid, the 1,600-MW Ligiaxi Dam in Qinghai, enlarging the Qingtongxia Dam in Ningxia by 600 MW, and the construction of the 1,400-MW dam at Shuikou, Fujian.[16]

Hydropower projects proposed for construction during the seventh plan period were as follows:

Hydropower station	Capacity (kilowatts)	Annual output (100 million kilowatt hours)
Wuqiangxi, Yuan Shiu	1,200	53.7
Geheyan, Qing Jiang	1,200	30.6
Ertan, Yalong Jiang	3,000	165.0
Pengshui, Wu Jiang	1,200	61.0
Taipingyi, Min Jiang	260	17.0
Shanxi, Feiyun Jiang	240	4.1
Tankeng, Ou Jiang	600	10.3
Mianhuatan, Ting Jiang	600	14.0
Tianshengqiao, Nanpang Jiang	1,200	53.0
Longtan, Hongshui He	5,000	187.0
Dazia, Huang He	300	15.0

China has minimized its plans for electric energy production by nuclear energy. During the seventh plan period, only two nuclear projects were committed rather than the originally proposed three plants. In 1986, the Government ratified a letter of intent with British and French interests for the construction of the nuclear powerplant at Daya, Guangdong. This project calls for two 900-MW reactors. The Ministry of Nuclear Industry is currently building a 300-MW demonstration pilot plant at Qinshan, Zhejiang. During the seventh plan period, two 600-MW reactors are planned for construction at Qinshan.

Coal.—About one-half of China's coal is produced by locally operated and/or owned mines. These operations include mines run by Provinces, prefectures, and counties; collectives; groups of local people who finance the mines; and individuals who own the coal pits. In the sixth plan period, the state adopted a series of flexible policies for local mines, which included independent mine management, more available transportation, marketing, and pricing. As a result, output by local operations increased, reducing demand from state-owned mines and the strain on China's transportation system. Because small mines are numerous and geographically widespread, their increased output better served the local economy. Despite progress, local mines faced problems such as lack of capital and up-to-date equipment and inadequate transport equipment. Moreover, there is an above-average number of pit accidents. During the seventh plan, the Ministry of Coal Industry was to enhance the development of local mines through funding for equipment and technology. Output by the local mines was expected to reach 500 million tons by 1990.

During the sixth plan, 19 coal mines were placed in operation, adding 30 million tons to China's annual coal production capacity. Each of six mines had an annual production capacity of 3 million tons of raw coal. Thirty-one mines were still under construction and were expected to be completed in the early 1990's. These mines have an aggregate annual capacity of 74 million tons.

The major mining areas under construction include Kailuan in Hebei; Datong, Yangquan, Gujiao, Pingshuo, and Antaibo in Shanxi; Huolinhe in Nei Monggol; Pindingshan in Henan; Dadun in Jiangsu; Huainan and Huaihei in Anhui; Yanzhou in Shandong; Jixi Xiaohengshan, Shuangyashan, and Tiefa Xiaonan in northeastern China; and Songzao Datong in Sichuan. Most of the major mining regions under development are near China's industrialized areas, where increased production will ease energy shortages to large users.[17]

Natural Gas.—China was intensifying exploration and development for gas to ease electricity shortages. In addition, natural gas would be used as feedstock for petrochemical production and for household fuel. China has verified reserves of 5,000 trillion cubic meters of natural gas, making it third after the U.S.S.R. and the United States. Most of the natural gas presently exploited is from the Sichuan Basin. Large reserves occur in the Tarim Basin in Xinjiang and the Yinggehai Basin in Beibu Wan. High-yield wells have been drilled in the Shaanxi-Gansu-Ningxia area in north-central China and the Songhua-Liaohe River Basin in northeastern China. Output of natural gas was expected to double by 1995, reaching 27 million cubic meters.[18] Data on some recently discovered gas-bearing structures in China follow:

Region	Gas-bearing structure	Strata	Lithology	Depth (meters)	Porosity (percent)	Permeability (percent)
Western margin of Shaanxi-Gansu-Ningxia.	Shengli	Lower Permian.	Sandstone	2,354-2,550	12.9	2.5- 15.8
Northern margin of Shaanxi-Gansu-Ningxia.	Yi-Shen	do	do	NA	2.5	371.0
Hebei	Suqiao	do	NA	3,342-3,392	16.3	227.0
Jilin	Lishu and Yashan.	Cretaceous	Sandstone	1,468-1,473	15.5	68.8
Do	Nong'an	do	do	800-1,400	11.7	10.08
Zhejiang	Dongpu Wen.	Lower Tertiary to Triassic.	do	2,995-3,011	11.9	2.1
Do	Dongpu Baimiao.	Lower Tertiary.	do	3,064-3,401	16.0	100.0-200.0
Beibu Wan	Yingge Hai Ya.	Lower Tertiary to Triassic.	do	3,708-3,907	15.1	NA

NA Not available.

Presently, Sichuan Province is China's major natural gas production base. Its gasfields account for more than one-half of the country's total natural gas reserves and output. Five new oil- and gas-bearing structures have been recently found, and 53 commercially viable sites for gas wells have been catalogued for future development.

Petroleum.—China's production of oil has steadily increased during this decade, reaching close to 131 million tons in 1986. Because output in the northeastern corridor comprises over 90% of the total oil produced, China was intensifying development of the Daqing, Dagang, Huabei, Liaohe, Shengli, and Zhongyuan Basins. Daqing, the largest producer, was expected to maintain its output of 55 million tons per year until 1990. Also at that time, Liaohe will produce 13 million tons; Huabei and Zhongyuan, 10 million tons each; and Dagong, 5.5 million tons.

During the seventh plan, detailed surveys will be made to explore oil-bearing formations in the Damintun area of Liaohe, the Gudong area of Shengli, the Dawangzhuang and Nanbao areas of Bohai, and the Wenliu area of Zhongyuan.[19]

Development was also to focus on northwestern China. There were two discoveries in the Junggar Basin, apparently with reserves equal to those of the Karamay Oilfield. Verified oil reserves in the Qaidam Basin were estimated at 200 million tons.[20]

China opened the onshore areas below the Chang Jiang to foreign oil companies for exploration. Prospects in this region were considered at best mediocre and did not attract much attention. One company, however, was negotiating an exploration contract for the 1.5-million-hectare Dongting Basin in Hunan. There were unconfirmed reports of three companies negotiating for other areas in the south.

Bohai Oil Co. completed an appraisal program on a condensate discovery in Liaodong Bay in the northern section of Bohai. Also, in its Chengbei joint venture with Japan, Bohai Oil completed the installation of the first Chinese-built offshore production platform. In late September 1986, the first commercial production from a well offshore southern China began with a shipment of 54,000 tons of crude oil. This well, Weizhou 10-3, is in Beibu Wan, northwest of Hainan Dao, Guangdong. In November 1986, commercial exploration began in the Dong Hai area. South Huanghai Oil Co. spudded its first well 400 kilometers southwest of Shanghai.

Refinery input was 590 million barrels in 1986 compared with 586 million barrels in 1985. China Petrochemical was intensifying its effort to improve product quality and increase the output of bitumen, chemical fibers, aviation gasoline, high-grade lubricating oil, paraffin, plastics, and synthetic rubber. China Petrochemical was constructing three ethylene plants, each with an annual production capacity of 300,000 tons. An ammonia plant with an annual capacity of 300,000 tons was under construction in Ningxia. The corporation was focusing on upgrading 27 existing facilities rather than building new plants.

[1]Physical scientist, Division of International Minerals.
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The Mineral Industry of Colombia

By Orlando Martino[1]

A major event during 1986 in Colombia's mineral development was its regaining of self-sufficiency in crude oil production. Moreover, there was a sizable surplus enabling Colombia to resume crude oil exports after the lapse of a decade. The recent large expansion of the production of steam coal has given Colombia a new position as Latin America's most important producer and exporter of coal. This new role was achieved as a result of large foreign and domestic mineral investments. The sizable growth in crude oil output resulted from development of the new oil discovery in the Llanos Basin by state-owned Empresa Colombiana de Petróleos (ECOPETROL) in an association contract with foreign oil companies.

For the third consecutive year, the mining and energy sector was the most dynamic sector of the Colombian economy. The value of mineral output—including coal but excluding oil—increased an unprecedented 50% while agriculture grew by 5.5%, and manufacturing, by 6.5%. The previously ailing metal processing sector registered a 15% rate of growth. Overall, Colombia's gross domestic product (GDP) grew in real terms by an estimated 5% to $31.5 billion[2] at current prices, bolstered also by a dynamic external sector. This was the highest national economic growth rate since 1980 and was above the average for Latin America and the world economy. This strong growth in Colombia's mineral industry was derived from large additions to productive capacity in crude oil, steam coal, and cement, in order of importance.

In addition to increased domestic demand, Colombia's economy was also stimulated by a 33% increase over that of 1985 in the value of total exports that included resumed exports of crude oil, and increased quantities of refinery products, steam coal, cement, and emerald, in order of export value. Increased domestic demand for mineral-related commodities, such as cement and steel, resulted from the growth in the manufacturing and construction industries.

Colombia's foreign debt increased by 110% between 1980-86 to a total of just under $15 billion, contracted mostly by the public sector. Colombia allocated about 35% of its export income to the service of its foreign debt. This was a favorable situation compared with other countries in Latin America, which did not force Colombia to engage in a series of debt renegotiations.

Government Policies and Programs.—The basic background studies sponsored by the Government for the purpose of formulating a national mining development plan were completed as a joint effort of the Institute of Colombian Studies and a private firm of consulting engineers—INTEGRAL S.A. of Medellín. The final report presented to the Ministry of Mines and Energy and to the National Planning Department required almost 3 years of work. The report covered economic, technical, legal, and mineral information areas. This sector report is composed of 37 partial reports on such items as strategic minerals, exploration programs, international markets, financing possibilities, and tax and environmental laws. Working groups were formed to review the numerous reports who will then have the reponsibility of producing the national mining development plan.

The Ministry of Mines and Energy in conjunction with the Banco de la República (Bank of the Republic) and the state mining agency, Empresa Colombiana de Minas

(ECOMINAS) was developing a financial program to assist the small- and medium-sized mining sector with special interest in those involved in gold mining. The proposed budget for 1986 was $50 million.

The Government created the National Coal Fund (NCF) in 1979 to provide financing for the development of the coal industry and mining in general. The income of the NCF is based on 5% of the value of the coal produced at the mine. The startup of the large El Cerrejón coal project has become an important source of production royalties for NCF. As of yearend 1986, NCF was an important source of financing for exploration of the Alto San Jorge and La Loma coal projects. In addition to NCF, revenues have also been produced by production royalties on emerald, gold, iron ore, nickel, platinum, and salt. In 1985, 80% of these revenues were derived from royalties on gold and platinum production.

A division on environmental control was established within the General Directorate of Mines in the Ministry of Mines and Energy. In April 1985, this new division initiated the coordination of its activities with other Government agencies concerned over environmental pollution. Decree 3050 of 1984 requires the presentation of an environmental impact statement in order to obtain an exploration license from the Government, while Decrees 384 and 2645 of 1985 established technical norms to be followed by those given mining rights.

As a Government-sponsored national development agency founded in 1940, the Instituto de Fomento Industrial (IFI) has played an important role as a source of credit as well as equity capital for a variety of mineral projects. As of yearend 1985, IFI made direct investments in 32 companies in the industrial sector, of which 5 were related to mining: Cerro Matoso S.A., Carbones de Colombia S.A. (CARBOCOL), Compañía Colombiana de Clinker S.A., Concesión de Salinas, and Empresa Ejecutora de Fosfatos del Norte de Santander S.A. These five companies represented 55% of IFI's portfolio of direct investments. Two other mineral-related companies with IFI equity participation were involved in the production of fertilizer materials: Fertilizantes Colombianos S.A. and Monomeros Colombia Venezolanos S.A. IFI's total assets in 1985 amounted to $550 million.

Access to the Colombian economy by foreign investors improved in late 1985 and 1986. The Government favored the mineral sector for foreign investment and development. In accord with the Government's policy to encourage foreign investment, the new Government, which assumed power in August 1986, increased the level of profit remittance permitted to an average of 20% plus the New York prime rate. Areas where foreign investment could be pursued were liberalized and new incentives for export-oriented investment projects were created. However, foreign investors were slow to react to these policy changes. Terrorism and violence related to drug trafficking were negative factors in investment decisions. Guerrilla groups have been involved in the sabotage of oil and mining projects. Despite these problems in 1986, a large number of foreign oil companies signed association contracts with ECOPETROL to explore potential oil-producing regions. In addition to these changes in the investment climate, import restrictions were reduced with 36% of all tariff schedule items on the free import list.

Studies to evaluate the possibility of constructing an interoceanic canal in Colombia linking the Atlantic with the Pacific were reportedly completed in late 1985. The route already plotted by economists, civil engineers, and nuclear energy experts commissioned by the Government would traverse the Departments of Chocó and Antioquia and permit the passage of large ships not able to use the Panama Canal. The project, estimated to cost $2.5 billion, would be completed by the year 2000 if started shortly. French and Japanese as well as Colombian interests have been promoting the proposed canal.

PRODUCTION

Colombia achieved historic record-high levels in its production of crude oil and steam coal, which increased, respectively, 72% and 27% compared with that of 1985. In each case, the expanded output was derived from the further development of new projects in the Llanos Basin and at El Cerrejón. Historic record highs were also reached in the production of cement, ferronickel, gold, iron ore, pig iron, refinery products, crude steel, and zinc. The large increases in lead and zinc output compared with small historic levels resulted from the first full year of operation of a new mine. Output of emerald increased 36% over the reduced level of 1985. Production of plati-

num and silver reached historic record-high levels compared with that of the past decade.

After a period of stagnation, employment in the mineral industries increased to 88,900 people by yearend 1985 as a result of new projects involving coal, nickel, and petroleum. Mineral-related activities in the industrial sector such as cement, iron, petroleum processing, and steel production account for 8% of employment in this sector. Coal mining employed the largest group of about 16,000 workers because of the large number of labor-intensive mining activities. During construction of the El Cerrejón coal project, almost 11,000 workers were required, but this number will fall to 3,000 needed to operate mine, rail, and port facilities. The Cerro Matoso nickel project employed 1,280 persons in mining and processing. Acerías Paz del Río S.A. (APR) was the largest single employer with about 7,500 workers for its complex activities involving steel, coke, and cement plants and iron ore, coal, and limestone mines. ECOPETROL employed about 7,000 workers in oil exploration, production, and refining.

Table 1.—Colombia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
METALS					
Aluminum, bauxite	560	560	560	--	NA
Copper, mine output, Cu content	113	162	234	--	NA
Gold, troy ounces	r459,559	r416,517	r730,670	1,142,385	1,285,878
Iron and steel:					
Iron ore and concentrate, thousand tons	470	456	441	439	523
Pig iron, do.	246	241	271	246	319
Ferroalloys: Ferrosilicon[e]	1,200	1,200	1,200	1,200	1,200
Steel, crude, thousand tons	423	482	499	570	607
Semimanufactures, hot-rolled, do.	333	374	412	468	512
Lead:					
Mine output, Pb content	196	154	51	82	e2,000
Refined (secondary)[e]	3,000	3,000	3,000	3,000	4,000
Nickel:					
Mine output, Ni content	1,800	17,457	21,885	15,434	e22,000
Ferronickel, Ni content	1,320	13,060	17,064	11,800	e18,600
Platinum-group metals, troy ounces	11,886	r10,302	r10,106	11,650	14,368
Silver	r124,222	r132,392	r153,445	168,770	187,188
Zinc, mine output, Zn content	--	--	--	2,000	e11,000
INDUSTRIAL MINERALS					
Asbestos[2]	5,400	5,400	9,982	12,435	e13,000
Barite	3,500	3,839	3,340	5,050	4,198
Cement, hydraulic, thousand tons	5,031	4,721	5,276	5,710	6,460
Clays: Kaolin	855,684	1,010,543	938,307	1,041,151	1,155,267
Diatomite[e]	630	630	630	630	630
Feldspar	30,091	31,400	r32,000	34,308	35,722
Fluorspar	57	--	--	--	--
Gypsum, thousand tons	281	238	260	250	295
Lime, hydrated and quicklime[e], do.	1,300	1,300	1,300	1,300	1,300
Magnesite[e]	1,600	1,600	1,600	1,600	14,936
Mica	78	NA	NA	NA	NA
Nitrogen: N content of ammonia	97,800	101,900	93,700	99,400	e100,000
Phosphate rock	20,393	16,944	11,480	24,249	28,626
Precious and semiprecious stones: Emerald[3], carats	395,960	1,011,345	394,181	337,950	634,561
Salt:[4]					
Rock, thousand tons	r300	r271	r271	236	227
Marine, do.	r294	r423	r664	494	501
Total, do.	r594	r694	r935	730	728
Sodium compounds, n.e.s.: Sodium carbonate	110,800	118,290	129,440	113,209	112,920
Stone and sand:					
Calcite	8,700	6,454	4,575	3,107	5,334
Dolomite, thousand tons	20	12	15	15	14
Limestone, do.	10,620	10,685	11,565	11,756	NA
Marble	16,843	15,500	15,171	16,993	19,568
Sand excluding metal-bearing	497,118	507,000	521,578	511,587	516,215
Sulfur:					
Native (from ore)	32,601	31,476	36,245	41,374	36,038
Byproduct, from petroleum	e3,000	5,530	10,430	9,790	e10,000
Total	e35,601	37,006	46,675	51,164	46,038
Talc, soapstone, pyrophyllite	6,240	6,639	6,785	8,611	18,500

See footnotes at end of table.

Table 1.—Colombia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[e]	[5]18,415	18,000	18,000	18,000	18,000
Coal:					
Metallurgical thousand tons	592	593	603	618	630
Steam do	3,830	4,460	6,034	9,088	11,540
Total do	4,422	5,053	[r]6,637	9,706	12,170
Coke, all types[e] do	550	550	550	550	550
Gas, natural:					
Gross million cubic feet	174,540	184,950	[r]182,100	182,700	NA
Marketed do	120,560	132,640	NA	NA	NA
Natural gas liquids:					
Propane[e] thousand 42-gallon barrels	2,800	2,800	2,840	2,840	2,840
Butane[e] do	600	600	600	600	600
Natural gasoline[e] do	800	800	800	800	800
Total do	4,200	4,200	4,240	4,240	4,240
Petroleum:					
Crude do	[r]51,729	[r]55,488	[r]61,153	64,352	110,714
Refinery products:					
Gasoline:					
Aviation do	[r]405	423	[r]317	342	313
Motor do	[r]18,444	[r]21,152	[r]22,916	21,432	24,589
Jet fuel do	[r]4,259	[r]4,140	[r]3,487	3,651	3,829
Kerosene do	[r]2,213	[r]2,246	[r]2,017	2,156	2,147
Distillate fuel oil do	[r]9,702	[r]10,367	[r]10,507	11,150	11,152
Residual fuel oil do	[r]17,936	[r]20,257	[r]20,027	19,825	21,017
Lubricants do	[e]550	657	657	657	730
Liquefied petroleum gas (propane) do	[r]2,949	[r]3,388	[r]3,641	3,702	2,782
Asphalt and bitumen do	1,114	[r]981	[r]967	926	973
Refinery fuel and losses and unspecified products do	[r]1,347	[r]1,138	[r]1,208	1,029	1,915
Total do	[r]58,919	[r]64,749	[r]65,744	64,870	69,447

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Table includes data available through Aug. 21, 1987.
[2]Startup of open pit asbestos mine was in 1981.
[3]Based on registered exports by the Banco de la República.
[4]Revised data given in Rivista del Banco de la República, Marzo, 1987, p. 118.
[5]Reported figure.

TRADE

Colombia resumed exports of crude oil following its cutoff in 1975 and continued expansion of exports of steam coal. In addition, the expanded level of fuel oil, ferronickel, and cement, in order of export value, further increased the relative importance of mineral commodities in Colombia's export sector. Of 16 significant commodities traded by Colombia, 6 are mineral related, with crude oil, fuel oil, and steam coal in second, third, and fourth place; respectively, after coffee. The six mineral exports have greatly helped to underpin Colombia's external trade position. Although further export diversification has been achieved, coffee remained the most valuable export commodity, accounting for 60% of all exports in 1986. The six mineral-related items represented about 20% of all exports in 1986, compared with the 12% share in 1982 when crude oil was not an export item, as shown in the following tabulation, in million U.S. dollars:

Commodity	1983	1984	1985	1986
Crude oil	--	--	--	320
Fuel oil	378	444	407	284
Coal	29	59	151	224
Ferronickel	56	81	53	63
Cement	34	38	46	43
Emeralds	33	31	25	34
Total	530	653	682	968
Total exports	3,176	3,469	3,763	5,008

The value of coal exports was 13 times the level in 1982 when coal exports first became significant.

The most important mineral-related import commodities were crude oil and petroleum products valued at $180 million and iron and steel products valued at $207 million. Both categories were considerably below the corresponding values in 1985. Colombia imported crude oil only in the first part of 1986 before the new pipeline system to the Port of Coveñas from the Llanos Basin became operational.

COMMODITY REVIEW

METALS

Copper.—In cooperation with the Japanese International Cooperation Agency (JICA), the Government initiated the study of a copper-gold prospect in the municipality of La Vega, Cauca Department. A drilling program to determine the extent of mineralization was scheduled for the second half of 1986. JICA was also assisting with the evaluation of the Guachanez project in the municipality of Guachanez y Piedrancha, Nariño Department, involving a complex ore of copper, gold, silver, and zinc.

Gold.—Colombia's revival of gold mining continued with a third year of output growth. Another record-high level in gold output of over 1 million troy ounces was achieved compared with the old record high of 656,000 ounces established in 1941. The placer gold districts in Antioquia Department accounted for 75% of total gold output in 1985. Santander Department with 6.4% of the total displaced Chocó with 5.2% for second place. Nariño accounted for 3%, and the other Departments, 10.4%. The only significant hard-rock gold operation was run by Frontino Gold Mines Ltd., which was reportedly increasing output as the result of a large discovery. All gold mined in the country, apart from that needed by industry, was purchased by the Bank of the Republic.

In January, a law was approved authorizing the liquidation of Mineros del Chocó S.A., which had experienced labor and financial problems since 1983, and created a new mixed capital company, Metales Preciosos del Chocó S.A. This company will reactivate operations in the placer deposits of the San Juan and Atrato Rivers in Chocó under an evaluation plan prepared by the Instituto Nacional de Investigaciónes Geológico-Mineras (INGEOMINAS) and ECOMINAS.

The Government has been engaged in a number of geological studies with the purpose of determining the areas of greatest potential for increasing the country's output of gold and other precious metals. This effort included the El Diamante project in Nariño, the San Antonio project in Tolima, and the Guainía project in the Comisaría of Guainía in the Llanos Basin on the Brazilian border. INGEOMINAS and ECOMINAS, with the cooperation of Canada, have developed a project for the exploration and evaluation of gold prospects in Guainía. In 1986, rudimentary mining was taking place there in the Cuiari and Caño Tigre Rivers. INGEOMINAS has received geological service missions from Italy, Sweden, and the U.S.S.R. interested in evaluating gold mineralization in the central and western cordillera of Colombia.

Iron Ore.—Colombia's only integrated steel company, APR (privately owned), was the major producer of iron ore, metallurgical coal, and limestone for its blast furnace operations. In February 1985, APR signed an operations contract with ECOMINAS that specified the payment of royalties in connection with the mining of iron ore and limestone in the Departments of Cundinamarca and Boyacá. This arrangement was in accordance with Decree 1179 of 1980, which declared that the coal, iron ore, and limestone deposits in Cundinamarca and Boyacá needed for the steel industry are within the country's Special Reserve (Reserva Especial). By Resolution 0795 of 1980, the Ministry of Mines and Energy assigned control of the iron ore and limestone deposits to ECOMINAS and the coal deposits to CARBOCOL. Fifty percent of the production royalties are to be paid to the municipalities in which the deposits are situated.

Iron and Steel.—Colombia again produced historic record-high levels of pig iron, crude steel, and semimanufactures in line with the continued growth of the national economy. However, the country remained dependent on imports of a variety of steel products to meet domestic demand. Data available for 1985 show that Colombia's apparent steel consumption was 1.4 million tons, a 16% increase over 1984 consumption. Domestic production thus accounted for only 41% of the crude steel requirements in 1985.

Siderúrgica del Pacífico S.A. (SIDELPA), one of five regional semi-integrated steel

plants in Cali, Valle del Cauca, was in the process of expanding its productive capacity to 100,000 tons of steel per year. In 1985, SIDELPA shipped 54,700 tons of steel products, almost one-half of which were special steel products. SIDELPA was assisting another semi-integrated company, Siderúrgica del Muna S.A. in Churaca, Cundinamarca, in reactivating its steel plant, which in 1985 produced 48,670 tons. The largest semi-integrated plant, situated in Medellín, Antioquia, produced 90,630 tons of steel products in 1985 and was carrying out an expansion and modernization plan to expand its electric steel capacity to 130,000 tons per year by mid-1987.

Nickel.—Cerro Matoso in Córdoba Department produced a record-high level of ferronickel during its fourth full year of operation. The company apparently overcame the furnace problems that had plagued its nickel smelter in prior years. The smelter operated at about 85% of its capacity. The average world price of nickel was $1.85 per pound, continuing the downward trend compared with the price of $3.00 per pound in 1982 when operations began. The depressed price level continued to create financial difficulties for the company because of its foreign debt problem. IFI's equity participation in Cerro Matoso was through its subsidiary, Empresa Colombiana de Niquel Ltda.

Silver.—To date, deposits of silver have not been discovered in Colombia. Silver has been produced as a byproduct of the mining of vein-type gold deposits and generally reflects the output of gold. Silver output increased by 11% compared with that of 1985 and reached a record-high level compared with that of the last several decades.

Zinc.—The sharp increase in the production of zinc with lesser amounts of lead resulted from the first full year of operation of the new zinc-lead Equis Mine in Totudendo, Quibdó, Chocó Department. The mine was operated by Colombian Mineral Resources S.A., a 100%-foreign-owned company.

INDUSTRIAL MINERALS

Cement.—Colombia was the 3d most important exporter of cement in 1985 in the Latin America region after Mexico and Venezuela and ranked 15th worldwide. Cement production increased to a historic record high primarily in response to increased construction activity made possible by increased cement capacity. According to the Colombian Cement Institute, domestic consumption increased 9% over that of 1985 to 5.24 million tons. The production surplus made it possible for Colombia to increase cement exports of clinker, gray and white cement, by 25% over that of 1985 to a historic record-high level of 1.16 million tons, marketed mostly by Cementos del Caribe S.A. in the Caribbean, South America, and the United States. The company operated four wharfs with direct access to the Port of Barranquilla situated on the mouth of the Magdalena River. For comparison, in 1975, Colombia exported 408,000 tons of cement.

More than one-half of the domestic demand of 5.24 million tons was supplied by Compañía de Cemento Argos S.A. in Antioquia with an overall capacity of 3.5 million tons. Argos' output in 1986 amounted to 2.8 million tons. The only white cement producer was Cementos del Nare S.A., in Puerto Nare, Antioquia, with a 1986 output of 60,000 tons. White cement was consumed locally, and the surplus produced was exported to Ecuador, Jamaica, and Panama.

During 1986, new additions to capacity amounted to 1 million tons, giving Colombia a yearend capacity of 7.8 million tons for the country's 17 cement companies. Additions to capacity resulted from expansions by Cales y Cementos de Toluviejo S.A. and Cementos Boyacá S.A. with plants, respectively, in Toluviejo, Sucre, and Nobsa, Boyacá; and the startup in May of the new 500,000-ton-per-year plant built by Cementos Río Claro in Puerto Triunfo, Antioquia, near Medellín.

Gypsum.—ECOMINAS controlled gypsum deposits in Santander Department in the municipalities of Barichara, Los Santos, Villanueva, and Zapatoca, which were being mined under operations contracts with private cement companies, Cementos Boyacá and Cementos del Norte S.A. Open pit mining methods were being used. ECOMINAS also controlled a gypsum deposit in the Guajira Department, which was scheduled to be contracted out for mining by yearend 1986.

Salt.—After several years of operating losses, IFI's Concesión de Salinas achieved a profit in 1985 and 1986 as a result of new investments that improved operations at the installations at Manaure in La Guajira and Zipaquirá in Cundinamarca. Operating results also improved because of an increase in salt prices.

Talc.—The Ministry of Mines and Energy completed a comprehensive study of talc in Colombia covering production, demand,

technological development, and possibilities of exports. The study indicated the possibilities of increasing output for potential markets in Central America and Venezuela. Colombia's consumption of talc has been at the level of 21,000 tons per year. With national production at 18,500 tons per year and imports at 3,000 tons per year, 500 tons per year have been available for export.[3]

MINERAL FUELS

The Government's energy policy was to promote the development of its mineral fuel resources first to meet domestic energy demand, secondly as a means of earning foreign exchange, and finally, to generate employment and develop remote areas of the country. With respect to coal in particular, whenever feasible, the Government's effort was to stimulate the participation of the small and medium mining sector in coal development programs.

Coal.—The second full year of operations was completed in the El Cerrejón North Zone steam coal project by a joint venture of CARBOCOL and International Colombia Resources Corp. (INTERCOR), a subsidiary of Exxon Corp., following the startup of mining operations in 1984. Steam coal output from El Cerrejón in 1986 was 5.1 million tons, somewhat below the target of 6 million tons. The joint venture launched programs during the year to improve productivity and accelerate production buildup toward the project design capacity of 15 million tons per year by 1990. The Exxon share of El Cerrejón North Zone production was 2.6 million tons and represented 10% of Exxon's worldwide output of 26.9 million tons.

The $3.5 billion El Cerrejón's North Zone production and shipping project was in the final phase of completion. Project investments during the year amounted to $106 million. The coal handling facility at Port Bolívar at Bahía Portete on the Guajira Peninsula was completed to replace the temporary "early coal" facility at the port that made early shipment possible beginning in February 1985. Two airports have been constructed, one near the open pit mine along the Río Ranchería and the other near Port Bolívar. Both airports have modern installations for 24-hour operation. To provide energy for the mine-port project, a 220,000-volt transmission line was constructed by Corporacíon Eléctrica de la Costa Atlántica from the Termoguajira plant.

Active marketing efforts by CARBOCOL and INTECOR over the last 2 years led to the signing of 32 sales contracts under which shipments from El Cerrejón were made to 18 countries. Western Europe received 85% of El Cerrejón's steam coal production. During the year, Colombia obtained its second important U.S. contract to sell 8 million tons of steam coal over 10 years to Jacksonville Electric Co. of Florida, a contract worth $312 million. Financial results were affected by world prices that were lower than anticipated.

Coal operations at El Cerrejón's Central Zone remained suspended since shutdown in September 1985 because of high transportation costs to the coast, high production costs, and mining losses of $12 per ton. Since operations began in mid-1982, this zone produced a total of 1.7 million tons of steam coal, with 657,000 tons produced in 1985 alone, most of which was exported. Steam coal from the Central Zone was initially exported by trucking coal to Puerto Zuñiga where the private shipping facilities of Compañía PRODECO S.A. were used. Between March and September 1985, coal was trucked to the North Zone and then transported by the new railroad to Port Bolívar.

CARBOCOL was also involved in the San Juanito Mine in Zipaquirá-Cogua, Cundinamarca, under an exploration-exploitation contract with Productora de Minerales S.A. The mine started up in 1982 and by 1984 was producing at a level of 48,000 tons per year.

Although CARBOCOL has come to dominate Colombia's coal industry as direct operator and in joint ventures, private domestic coal companies also had an active role. APR, the private steel company, mined metallurgical coal in Boyacá for its own blast furnaces. The great majority in the private coal sector were small operators producing less than 2,000 tons per year of metallurgical or steam coal. The 1983 coal census gave a total of 1,450 active mines, of which 82% were small private operations. The General Directorate of Mines in the Ministry of Mines and Energy, CARBOCOL, and other Government entities were involved in a program of technical and financial assistance to stimulate the development of small and medium coal operators.

In 1986, CARBOCOL was engaged in the study and development of some 15 new coal projects, in varying states of readiness, among Colombia's 7 major coal regions. A number of the feasibility studies have

involved the participation of foreign countries such as La Loma coal project in Cesar Department (United States), Tibitá project, Cundinamarca (Federal Republic of Germany), and El Descanso project in Cesar (Italy).

Coal exports by CARBOCOL and private companies continued to grow in importance. The Ministry of Mines and Energy reported that coal exports have increased from 254,000 tons in 1982 to 3,450,000 tons in 1985. Coal exports in 1986 were estimated at 5.5 million tons, of which 4.7 million tons was shipped by CARBOCOL. In the period 1982-86, CARBOCOL shipped almost 10 million tons of steam coal. The Ministry projected that coal exports would grow to almost 21 million tons in 1990, of which 15 million tons would be supplied from El Cerrejón coal deposit.

Colombia's domestic coal consumption has grown gradually in line with the growth in the country's steel output and in line with its policy to increase coal use in industry and electrical energy generation. Domestic coal consumption was estimated at 5 million tons in 1986 and projected to increase to 7 million tons by 1990. Colombia would therefore have a considerable coal surplus to supply its growing export markets.

Natural Gas.—The Ministry of Mines and Energy reported that the natural gas basins of Catatumbo, Magdalena, and Putumayo have a life of 10 years at current rates of production while the gas basins of the Guajira and Llanos Basins have more than 39 years of life. In its 1985 annual report, ECOPETROL reported total gas reserves as of yearend 1985 at 3.79 trillion cubic feet.

In the last 4 years, the main gas pipelines have not been significantly extended. However, there has been a significant expansion of the gas distribution system in the large cities near the gasfields in the north such as Barranquilla, Bucaramanga, Cartagena, and Santa Marta, resulting in 83,000 household connections. The gas pipeline between Jobo Tablón and Montelíbano has been in operation since 1983 to supply the Cerro Matoso ferronickel plant. Natural gas was consumed in five major areas in 1985: Barrancabermeja, 32%; Barranquilla, 32%; Cartagena, 24%; Guajira, 7%; and Chinú, 5%. In the Barrancabermeja area, most of the natural gas was consumed by ECOPETROL, while in the Barranquilla area most of the gas was used for thermoelectric plants and industry.

The Government's encouragement of the use of natural gas had led to a decline in electrical consumption. In Colombia, more than 50% of residences use electrical power for other than lighting, one of the highest percentages in the world. The Government's plan was to increase gas consumption from 232 million cubic feet per day in 1986 to 432 million cubic feet per day by 1990.

Petroleum.—The upward trend in production of crude oil that began in 1980 continued with a sharp increase that established a new historic record high. The rate of output was 303,300 barrels per day compared with the prior historic record-high level of 218,000 barrels per day set in 1970. Colombia's total crude oil production was projected to peak in 1988 at 367,000 barrels per day. Most of the increase is attributed to production from the Caño Limón Field in the Llanos Basin under association contracts with foreign oil companies and from Cravo Norte by ECOPETROL.

In early 1986, ECOPETROL initiated commercial production from its rich Cravo Norte oil deposit estimated to contain reserves of 700 million barrels. The production rate was 30,000 barrels per day.

Oil companies with association contracts with ECOPETROL produced at the rate of 162,400 barrels per day in 1986 compared with the rate of 20,200 barrels per day in 1983. This represented 54% of Colombia's total crude oil output in 1986. During the year, a total of 49 exploration and 268 development wells were drilled for a cost of $141 million. Of the exploration wells, 36 were drilled by association contractors, 6 by concession contractors, and 7 by ECOPETROL.

Another notable event during the year was Colombia's resumption of crude oil exports in April. Colombia was last able to export to world markets in 1975. Oil exports from the Caño Limón Field were made possible by completion of construction of the oil pipeline between the new field and the shipping Port of Coveñas on the Atlantic coast. The final section of the 24-inch pipeline between Río Zulia and Coveñas was completed on March 21 as a part of the 200,000-barrel-per-day transportation system. Initial deliveries on April 2 were at the rate of 90,000 barrels per day, rising to 120,000 barrels per day by May. During 11 months of construction and under threat of guerrilla attack, the pipeline had to cross the Andes, tunnel under rivers, snake

Table 2.— Colombia: Production and trade in crude petroleum and refinery products

(Thousand 42-gallon barrels)

	1978	1979	1980	1981[r]	1982[r]	1983[r]	1984[r]	1985[r]	1986
Petroleum, crude:									
Production	47,742	45,298	45,944	48,819	51,729	55,488	61,153	64,352	110,714
Exports									16,513
Imports	8,834	8,995	7,339	7,627	7,315	13,819	9,801	6,748	--
Refinery products:									
Production	57,452	56,246	59,282	59,366	58,919	64,749	65,744	64,870	69,447
Exports[1]	11,153	9,037	9,485	11,960	13,367	17,053	17,888	20,072	21,507
Imports	7,784	10,341	12,997	11,160	11,044	7,448	5,747	9,414	7,757

[r]Revised.
[1]Principally residual fuel oil. Also includes petrochemicals.

Source: Revista del Banco de la República (Bogotá), Apr. 1986, p. 147.

through rain forests, and traverse plains and swampy terrain. The last section of the 700-kilometer pipeline project was constructed by Bechtel Inc. of the United States under a $400 million contract signed in April 1985 with the Cravo Norte Association composed of ECOPETROL, Occidental de Colombia Inc., and Compañía Shell de Colombia Inc. The construction contract for the eastern section of the pipeline had been awarded in late 1984 to a Western European consortium headed by Mannesman Anlagenbau AG of Dusseldorf, Federal Republic of Germany. The trans-Andean Caño Limón-Río Zulia-Coveñas pipeline system includes five pump stations and a modern telecommunications network as well as associated shipping and storage facilities. An estimated 300,000 barrels were lost when this new pipeline was dynamited in late July during a guerrilla attack.

Colombia's Council of State in August rejected petitions to suspend certain portions of Decree 128 of 1986, which gives ECOPETROL operational control of the Caño Limón-Coveñas pipeline and shipping terminal jointly owned by ECOPETROL and Occidental/Shell. Occidental was operating the new pipeline since ECOPETROL did not have enough trained operating personnel. Occidental was training more than 100 employees of ECOPETROL to operate the oil pipeline.

The Ministry of Mines and Energy reported that as of December 31, 1986, Colombia's oil reserves increased to 1.94 billion barrels compared with the low point of 1984 when reserves had declined to 0.52 billion barrels. In early 1986, the Ministry determined that on the basis of 1985 rates of production, the oil reserves of the Lower Magdalena Basin would be depleted in the near term, those of Catatumbo Basin in about 6 years, those of Putumayo Basin in 9 years, those of the Upper and Middle Magdalena in 10 years, and those of the Llanos Basin in 15 years. In April, Occidental announced an oil discovery from its Caño Gandul No. 1 wildcat 180 kilometers south of the giant Caño Limón Field. Texas Inc. acquired a one-half interest in exploratory rights on a new 262,000-acre block in the southern Llanos Basin near existing oil discoveries. This brought Texaco's gross holdings in the area to 2 million acres, the largest of any oil company operating in the basin.

The Government established a new entity, the Colombian Petroleum Institute, to reduce Colombia's dependence on foreign expertise. It initiated its activities in June 1985 at its headquarters in Bucaramanga, Santander, the Department supplying the greatest share of total oil output. The principal objective of this institute is to provide technical support to Colombia's petroleum and petrochemical industries in the areas of oil exploration, development, processing, and transportation.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Colombian pesos (Col$) to U.S. dollars at the average rate for 1986 of Col$194.3=US$1.00.

[3]Ministerio de Minas y Energía. Memoria al Congreso Nacional, 1982-1986. Bogotá, D.E. 1986, p. 274.

The Mineral Industry of Cyprus

By Thomas O. Glover[1]

The mining of minerals, important to the economy of Cyprus for many years, continued to decline in 1986. Exploitable mineral deposits had been depleted over the many years of mining. Employment in the mining sector declined during the year. The unemployment rate rose for the third successive year to 3.6%.

The Cypriot gross national product (GNP) in 1986 was $3.1 billion,[2] thus showing a growth rate of 29% compared with that of 1985. Annual per capita income was $5,677, up 29% from that of 1985. The average inflation rate of 1.2% was 73% lower than that of 1985. The national debt was 44.0% of the GNP, up 16.7% since 1985. Cyprus' trade balance with the United States showed a $43 million deficit compared with a $30 million deficit in 1985.

Cyprus remained geographically and politically divided for the 13th consecutive year despite much effort to reunite the country. The island was separated; the northern portion contained 37% of the land area and 18% of the population, while the southern portion contained 63% of land area and 82% of the population. The Turkish Cypriots controlled the northern portion while the Greek Cypriots controlled the southern portion. Only the southern portion was considered in this chapter because little or no information on mineral resources was available in the northern sector.

PRODUCTION AND TRADE

According to the Ministry of Commerce and Industry's Cyprus Mines Service, the production of minerals declined again in 1986, for the 16th consecutive year. The mining industry suffered from the depletion of high-grade ore bodies and the unsuccessful results of exploration activities. Prospecting continued throughout the year; no economic ore bodies were discovered. Both governmental and private funding were available for exploration activities.

Metallic minerals exploration activities included a search for massive sulfides in the Stavrovouni-Menoyia area and for chromite in the Akapanou Forest area.

Industrial minerals exploration activities were restricted to the assessment of reserves and quality of kaolin clays in an area near Parekklishia where only limited exploration work was carried out.

Cyprus had a positive trade balance in 1986, largely because of a fall in the cost of import commodities, particularly oil. A surplus of $132.5 million was recorded against a deficit of $35.6 million in 1985. The value of oil imported in 1986 declined nearly 40% from that of 1985, to $168.8 million.

Mineral exports made up less than 2% in value of all exports. The major minerals exported were asbestos, bentonite, cement, copper, and iron pyrites. Asbestos and iron pyrites made up 78.3% of the total value of mineral exports. Western European countries imported approximately 70% of the minerals exported from Cyprus; Arab countries, 15%; and other countries, 15%. The total value of all exported minerals was $1.68 million.

Table 1.—Cyprus: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[p]
METALS					
Chromium ore and concentrate, marketable	2,878	--	--	--	--
Copper: Cement copper	1,530	2,088	2,290	2,130	1,188
INDUSTRIAL MINERALS					
Asbestos, fiber produced	18,952	17,288	7,429	16,360	13,011
Celestite, concentrates	--	--	--	1,400	7,365
Cement, hydraulic thousand tons	1,068	943	853	659	864
Clays, crude:					
Bentonite	13,000	32,000	32,400	52,000	55,000
Other:					
For brick and tile manufacture thousand tons	187	230	220	212	220
For cement manufacture do.	250	250	e250	e250	e250
Total do.	437	480	e470	e462	e470
Gypsum:					
Crude	30,000	32,000	22,100	16,000	30,000
Calcined	25,000	10,000	11,900	8,500	5,500
Lime, hydrated	11,900	8,500	7,380	7,730	7,452
Mineral pigments, umber	20,000	16,000	13,100	12,200	10,000
Pyrites	55,525	46,665	23,322	69,600	56,672
Salt, marine	9,857	--	7,399	10,013	6,051
Stone, sand and gravel:					
Dimension stone: Marble	75,000	90,000	87,500	80,000	75,000
Crushed and broken stone:					
Havara (crushed limestone) thousand tons	3,475	4,500	3,560	2,800	2,500
Limestone:					
Marl for cement production	r613,809	533,970	567,155	540,221	567,949
Other for cement production	917,459	819,660	611,000	386,532	853,296
Unspecified building stone	980,000	500,000	450,000	343,000	280,000
Sand and aggregate thousand tons	3,975	4,100	4,075	4,450	4,370
Sulfide concentrates containing precious metals	116	--	--	--	--
Sulfur, S content of marketable pyrites	e25,500	21,430	10,495	30,972	24,936
MINERAL FUELS AND RELATED MATERIALS					
Petroleum refinery products:					
Liquefied petroleum gas thousand 42-gallon barrels	193	227	218	172	
Gasoline do.	805	890	856	789	
Kerosene and jet fuel do.	377	468	463	248	
Distillate fuel oil do.	1,019	1,147	1,160	990	NA
Residual fuel oil do.	1,068	1,101	1,148	924	
Asphalt do.	136	165	174	145	
Refinery fuel and losses do.	229	207	201	145	
Total do.	3,827	4,205	4,220	3,413	NA

eEstimated. pPreliminary. rRevised. NA Not available.

[1]Table includes data available through June 4, 1987.

[2]In addition to the commodities listed, a variety of other crude construction materials are produced, but available information is inadequate to make reliable estimates of output levels.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Scrap	557	381	--	West Germany 117; Netherlands 102; Sweden 84.
Unwrought	849	--		
Semimanufactures	85	57	--	Lebanon 25; Saudi Arabia 22.
Copper:				
Matte and speiss including cement copper	3,059	1,655	--	Spain 853; U.S.S.R. 492.
Metal including alloys, scrap	344	573	--	Greece 177; Belgium-Luxembourg 149; Sweden 69.
Iron and steel: Metal:				
Scrap	13,223	14,062	--	Italy 8,549; Greece 5,455.
Semimanufactures:				
Universals, plates, sheets	658	477	--	United Kingdom 329; Greece 148.
Wire	36	61	--	Qatar 37; United Arab Emirates 24.
Tubes, pipes, fittings	134	41	--	All to Iraq.
Lead:				
Oxides	3	201	--	All to Greece.
Metal including alloys, scrap	200	--		
Nickel: Metal including alloys, scrap	11	--		
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$5	--		
Silver: Waste and sweepings ---do---	$5	--		
Zinc: Metal including alloys:				
Scrap	68	110	--	Italy 55; West Germany 37.
Semimanufactures	23	--		
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc value, thousands	$1	--		
Grinding and polishing wheels and stones ---do---	$11	--		
Asbestos, crude	8,216	16,680	--	Belgium-Luxembourg 2,610; Denmark 2,402; Thailand 2,085.
Cement	401,850	64,877	--	All to Lebanon.
Clays, crude:				
Kaolin including bentonite	NA	12,537	--	All to United Kingdom.
Unspecified	9,942	--		
Diamond: Gem, not set or strung value, thousands	$292	$240	--	Switzerland $209; United Kingdom $27.
Fertilizer materials: Manufactured, unspecified and mixed	241	--		
Gypsum and plaster	6,928	1,315	--	Saudi Arabia 526; Kuwait 514; Bahrain 198.
Pigments, mineral: Natural, crude	NA	6,754	4,224	United Kingdom 1,076.
Precious and semiprecious stones other than diamond: Natural value, thousands	$1	--		
Pyrite, unroasted	31,044	64,390	--	Italy 49,327; Egypt 14,371.
Salt and brine	161	168	--	United Arab Emirates 93; Qatar 50.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	611	--		
Worked value, thousands	$62	$43	--	Bahrain $39; Oman $1.
Gravel and crushed rock	3,549	--		
Sulfur: Sulfuric acid	3,852	--		
Talc, steatite, soapstone, pyrophyllite	10	--		
Other: Crude	7,609	--		
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Gasoline, motor--42-gallon barrels	23,976	27,897	NA	NA.
Kerosene and jet fuel ---do---	567,905	708,652	NA	NA.
Distillate fuel oil ---do---	91,974	77,271	NA	NA.
Lubricants ---do---	4,067	33,896	NA	Israel 3,262.
Residual fuel oil ---do---	165,961	106,280	NA	NA.

NA Not available.

[1]Table prepared by Virginia A. Woodson.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Scrap	151	--		
Unwrought	10	--		
Semimanufactures	4,114	3,679	2	Greece 2,370; United Kingdom 252; Israel 189.
Chromium: Oxides and hydroxides	2	--		
Columbium and tantalum: Metal including alloys, all forms, tantalum	1	--		
Copper: Metal including alloys:				
Unwrought	22	--		
Semimanufactures	859	947	7	United Kingdom 345; West Germany 179; Finland 152.
Iron and steel: Metal:				
Scrap	41	--		
Pig iron, cast iron, related materials	363	1,555	--	Poland 1,554.
Ferroalloys: Ferromanganese	20	--		
Semimanufactures:				
Bars, rods, angles, shapes, sections	84,642	83,825	--	Spain 37,231; Greece 20,324; United Kingdom 10,377.
Universals, plates, sheets	20,082	20,815	--	West Germany 4,644; Greece 4,533; Belgium-Luxembourg 1,874.
Hoop and strip	7,465	5,075	--	Greece 3,206; Austria 1,349.
Rails and accessories	1	79	(2)	Netherlands 49; Belgium-Luxembourg 24.
Wire	2,912	2,303	--	United Kingdom 749; Hungary 607; Belgium-Luxembourg 490.
Tubes, pipes, fittings	19,912	19,876	21	France 10,211; Greece, 3,689; Italy 2,006.
Castings and forgings, rough	12	--		
Lead:				
Oxides	181	127	--	United Kingdom 126.
Metal including alloys:				
Scrap	19	--		
Unwrought	196	423	--	United Kingdom 201; Netherlands 49.
Semimanufactures	857	681	--	United Kingdom 324; Netherlands 157; Belgium-Luxembourg 101.
Manganese: Oxides	25	--		
Mercury 76-pound flasks	29	--		
Nickel: Metal including alloys, all forms	10	--		
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$141	$44	--	West Germany $43.
Silver: Metal including alloys, unwrought and partly wrought do.	$1,421	$1,506	$69	United Kingdom $1,034; West Germany $354.
Tin: Metal including alloys:				
Unwrought do.	$1	--		
Semimanufactures	6	--		
Titanium: Oxides	531	392	--	United Kingdom 237; Finland 70.
Zinc:				
Oxides	31	--		
Metal including alloys:				
Unwrought	206	--		
Semimanufactures value, thousands	$149	$203	$3	Italy $95; Belgium-Luxembourg $53; West Germany $49.
Other:				
Ores and concentrates	92	89	--	All from Australia.
Oxides and hydroxides	7	--		
Base metals including alloys, all forms	8	11	(2)	Italy 8; Greece 2.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc value, thousands	$67	--		
Artificial: Corundum	1	--		
Dust and powder of precious and semiprecious stones including diamond value, thousands	$2	--		
Grinding and polishing wheels and stones do.	$248	$263	$1	Italy $94; West Germany $58; United Kingdom $32.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Asbestos, crude	297	455	--	Zimbabwe 230; Botswana 225.
Barite and witherite	2	--		
Boron materials: Oxides and acids value, thousands	$1	--		
Cement	(3)	14,210	--	Greece 5,273; Italy 3,656; United Kingdom 2,001.
Chalk	308	--		
Clays, crude	2,237	4,957	--	Greece 2,845; United Kingdom 2,053.
Diamond:				
Gem, not set or strung value, thousands	$1,459	$1,240	--	Belgium-Luxembourg $499; United Kingdom $316.
Industrial stones do	$2	--		
Diatomite and other infusorial earth	176	154	118	West Germany 24.
Fertilizer materials:				
Crude, n.e.s	36	--		
Manufactured:				
Ammonia	37	3,825	--	Romania 1,429; Bulgaria 853; France 557.
Nitrogenous	27,965	4,521	20	Egypt 3,753; Portugal 358.
Phosphatic	2,850	3,262	--	Belgium-Luxembourg 2,368; Israel 894.
Potassic	1,164	879	--	Israel 700; Belgium-Luxembourg 179.
Unspecified and mixed	36,208	28,982	48	Greece 21,979; Italy 3,949.
Gypsum and plaster	37	--		
Lime	5	--		
Magnesite, crude	131	--		
Mica:				
Crude including splittings and waste	14	--		
Worked including agglomerated splittings value, thousands	$1	--		
Pigments, mineral: Iron oxides and hydroxides, processed	25	--		
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$445	$462	$5	West Germany $153; Thailand $126; United Kingdom $79.
Synthetic do	$74	$99	$2	Switzerland $33; Lebanon $20; United Kingdom $14.
Salt and brine	1,030	718	--	United Kingdom 427; Netherlands 269.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	927	3,152	--	France 596; Bulgaria 532; Greece 355.
Sulfate, manufactured	693	697	--	West Germany 318; United Kingdom 277.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	5,115	5,997	NA	Italy 4,544; Greece 1,294.
Worked value, thousands	$481	$598	--	Greece $470; Italy $122.
Dolomite, chiefly refractory-grade	40	--		
Gravel and crushed rock	868	1,421	--	Italy 747; Greece 550.
Quartz and quartzite	86	--		
Sand other than metal-bearing	572	666	--	West Germany 270; Netherlands 165; Belgium-Luxembourg 140.
Sulfur:				
Elemental, crude including native and byproduct	2,513	2,521	--	Egypt 1,187; Lebanon 1,155.
Sulfuric acid	252	269	--	Greece 251.
Talc, steatite, soapstone, pyrophyllite	429	237	--	Greece 116; Norway 54.
Other:				
Crude	1,787	--		
Slag and dross, not metal-bearing	20	--		
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	287	--		
Carbon black	4	--		
Coal:				
Anthracite and bituminous	51,818	55,132	20,777	U.S.S.R. 19,367; Australia 14,911.
Briquets of anthracite and bituminous coal	201	11,031	6,089	U.S.S.R. 4,913.
Lignite including briquets	90	--		
Coke and semicoke	110	--		
Peat including briquets and litter	1,909	1,576	--	West Germany 935; Ireland 193.
Petroleum:				
Crude thousand 42-gallon barrels	4,271	2,884	--	Iraq 2,159; U.S.S.R. 505.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	230	337	(2)	Greece 144; Italy 115.
Gasoline do	126	218	--	Italy 152; Saudi Arabia 52.
Mineral jelly and wax do	3	2	--	Mainly from Hungary.
Kerosene and jet fuel do	632	835	--	Italy 497; Greece 205.
Distillate fuel oil do	466	408	--	Italy 324; Saudi Arabia 48.
Lubricants do	64	44	1	Belgium-Luxembourg 13; United Kingdom 11; Italy 10.
Residual fuel oil do	2,102	1,419	--	Syria 570; Greece 416; Romania 194.
Bituminous mixtures do	4	--		

NA Not available.
[1]Table prepared by Virginia A. Woodson.
[2]Less than 1/2 unit.
[3]Unreported quantity valued at $1,776,000.

COMMODITY REVIEW

METALS

Chromite.—France's parastatal Bureau de Recherches Géologiques et Minières (BRGM) discovered chromite ore during 1985 in the Akapanou Forest area. No new developments were started during 1986 owing to the depressed price of chromite. The mining lease was held by Hellenic Mining Co. Ltd. (Helco).

Copper.—Cement copper was produced from a copper mine waste pile by an in situ leaching method. Helco produced 1,188 tons of copper valued at approximately $0.5 million.

Iron Pyrites.—Helco and Maconda Co., a new, small, private company, produced 56,672 tons of pyrites. Maconda initiated its operation during the year and was exploiting a small pyrites ore body that had been known to exist for many years. Maconda exported its first 6,000 tons of high-grade ore during the year. BRGM discontinued its exploration activities in Cyprus during 1986.

INDUSTRIAL MINERALS

Asbestos.—The production of asbestos fiber decreased approximately 20% in 1986 compared with that of 1985, dropping to 13,011 tons. Although the production of fiber decreased, its value still amounted to over 50% of the total value of all minerals exported. The market for asbestos remained depressed and thus exports decreased. Even though asbestos fiber production declined, the production of rock asbestos at the open pit mines increased 20% to over 1.8 million tons. Cyprus Asbestos Mines Ltd. introduced two new grades of fiber in 1985 for Middle East markets, but these had not grown as rapidly as had been expected.

Celestite.—The mining of celestite, a strontium sulfate ore ($SrSO_4$), in Cyprus commenced in October 1985. Production for 1985 was only 1,400 tons; however, in 1986, production increased to 7,365 tons, valued at $86.38 per ton. The celestite concentrates contain 92% $SrSO_4$. Helco operated the open pit and processing plant at Vassilikos, near Limassol, in southern Cyprus. Initial prospecting was carried out by the Cyprus Geological Survey. Although exploration was still in progress, reserves of approximately 200,000 tons of celestite grading 56% $SrSO_4$ had been outlined. The ore was mined by open pit methods and required beneficiation to increase the strontium content. All production in 1985 was exported to the Federal Republic of Germany and Japan.

Cement.—Vassilikos Cement Works Ltd. and Cyprus Cement Co. Ltd., both situated at Vassilikos, operated two plants in 1986 that produced 863,938 tons of cement, representing an increase in productivity of approximately 31% over that of 1985. The price of cement per ton increased by $2.00 over 1985 prices. The principal exports of cement went to Lebanon and consisted of portland, pozzolanic, and sulfate-resisting types of cement.

Clays.—Production of bentonite was

55,000 tons, a 5.8% increase over production in 1985. The sale price per ton increased 8.4% over that of 1985. Cyprus' bentonite total value amounted to 3.7% of the total value of all minerals produced; however, the production of bentonite was estimated to account for less than 1% of the total world production. Only limited exploration work was carried out in an area near Parekklishia for the assessment of reserves and quality of kaolinitic clays. Samples from core drillings were sent abroad for mineralogical and other analytical studies. Peletico Plasters Ltd., west of Larnaca, produced the major part of the bentonite. Other companies involved in bentonite mining in Cyprus included Bentex Minerals Co. Ltd., Egeko Ltd., and Drapia Mining.

Gypsum.—Production of crude gypsum was 30,000 tons, an 87.5% increase over production in 1985. The prices per ton for raw and calcined gypsum remained the same ($4.16 per ton and $54.08 per ton, respectively), compared with 1985 prices. Most of the gypsum that was exported went to Saudi Arabia, Kuwait, and Bahrain, in decreasing order of tonnage; although exports accounted for less than 20% of the total produced.

MINERAL FUELS

Cyprus Petroleum Refinery Ltd. produced small quantities of asphalt, fuel oil, gasoline, jet fuel, kerosene, and liquefied petroleum gas from imported crude oil at its only refinery at Larnaca. The refinery had a throughput capacity of 16,000 barrels per day.

Salen Energy AB (Sweden), an affiliate of Saleninvest AB, requested Cyprus' permission to conduct oil exploration offshore near Lemesos. The company was specifically interested in an area south of Moni.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Cypriot pounds (£C) to U.S. dollars at the rate of £C1 = US$2.08.

The Mineral Industry of Czechoslovakia

By Vuko M. Lepetic[1]

Czechoslovak industry, including mining and energy, was controlled by the Government. The country experienced a 3.4% growth in the gross national income and a 3.1% rise in the gross industrial production compared with those of 1985. Industry generated about 60% of the produced national income. The main industrial areas were in Bohemia, North and South Moravia, and the area around Prague.

During 1986, the Czechoslovak mineral industry continued to perform at levels similar to those attained the year before. The country remained an important producer of coal, gallium, graphite, kaolin, magnesite, and steel. Petroleum and gas resources were limited. The importance of uranium mining was emphasized as nuclear power generation continued to be pursued as an increasingly significant source of energy. Metallurgical combines in Ostrava and ironworks in Trinec and Vitkovice were among the largest industrial complexes in the country.

Government Policies and Programs.—The Government's annual goals were met or slightly exceeded in all major sectors of the mineral industry during 1986. The data for cement, bituminous and brown coal, electricity, pig iron, lime, and crude steel, showed that the plan was either fulfilled or exceeded by up to about 3% for these commodities.

During the year, the existing legislation on joint ventures with Western firms was clarified, and the first experimental contracts were signed. Principles for restructuring the economic mechanism were adopted by the Government. These principles were in line with the economic reforms to be introduced in the Soviet Union and included greater independence for producers. The restructuring program was expected to extend into foreign trade, which suffered from the lack of competitiveness of Czechoslovak goods. According to the program, foreign trade activities were to be gradually transferred to the producers, who would then become responsible for maintaining competitiveness in exports to market economy countries and centrally planned economy countries.

PRODUCTION

The gross value of products of the metallurgical industry, including ore mining and processing, increased by 1.6% in 1986. Production in ore mining and concentration increased by 2.2%; in ferrous metallurgy, by 1.4%; and in nonferrous metallurgy, by 2.3%. Iron and steel production remained steady, but coal production showed a slight decline. Electricity generation was 5.1% higher than in 1985 and totaled 85 billion megawatt hours, of which 21% was generated by nuclear power stations.

The country produced about 10% of the world's gallium, 5% of the magnesite, 3% of the kaolin, and 2% of the pig iron and steel. Bituminous coal was produced in the Ostrava-Karviná Basin while brown coal came mostly from the North Bohemian Basin. Kaolin was produced around Karlovy Vary in West Bohemia. The center of steel production remained in Vitkovice, North Moravia.

Table 1.—Czechoslovakia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum:					
Alumina	80,000	80,000	85,000	[e]85,000	80,000
Aluminum ingot, primary only	33,830	36,156	31,635	[e]32,000	30,000
Antimony, mine output, Sb content	700	900	1,000	[e]1,000	1,000
Copper:					
Mine output, Cu content	9,300	9,800	10,000	[e]10,300	10,000
Metal:					
Smelter, primary only	10,800	10,000	10,000	[e]10,200	9,800
Refined including secondary	25,636	25,746	26,068	[e]26,500	25,000
Iron and steel:					
Iron ore:					
Gross weight thousand tons	1,861	1,903	1,869	1,824	[2]1,784
Fe content do	483	490	481	[e]490	470
Metal:					
Pig iron do	9,525	9,466	9,561	9,562	[2]9,573
Ferroalloys: Electric furnace do	164	162	151	161	160
Steel, crude do	14,992	15,024	14,831	15,036	[2]15,112
Semimanufactures do	12,185	12,254	12,431	[e]12,700	12,000
Lead:					
Mine output, Pb content	3,132	3,162	3,078	[e]3,200	3,200
Metal including secondary	21,071	21,030	21,134	21,500	21,500
Manganese ore, gross weight[e 3]	900	900	900	950	900
Mercury 76-pound flasks	4,380	4,177	4,409	4,400	4,400
Nickel metal, primary[e]	1,500	3,000	4,500	4,500	4,500
Silver thousand troy ounces	1,061	964	1,029	[e]1,000	1,000
Tin:					
Mine output, Sn content	200	200	200	[e]200	200
Metal including secondary	295	307	425	[e]430	400
Tungsten, mine output, W content[e]	50	50	50	50	80
Zinc:					
Mine output, Zn content	6,929	7,064	7,185	[e]7,300	7,300
Metal including secondary[e]	[2]9,184	9,100	9,100	9,250	9,250
INDUSTRIAL MINERALS					
Barite[e]	61,000	60,000	60,000	60,000	60,000
Cement, hydraulic thousand tons	10,325	10,498	10,530	10,265	[2]10,298
Clays: Kaolin do	527	[r]539	540	548	550
Fluorspar[e] do	96	96	96	95	95
Graphite[e] do	50	50	50	60	60
Gypsum and anhydrite, crude do	794	848	842	[e]850	850
Lime, hydrated and quicklime do	3,088	3,100	3,117	3,227	[2]3,329
Magnesite, crude do	672	662	660	[e]670	680
Nitrogen: N content of ammonia do	568	591	576	526	[2]614
Perlite	45,667	44,019	[e]44,000	[e]44,000	44,000
Pyrite, gross weight[e] thousand tons	140	140	140	145	140
Salt do	327	240	243	[e]245	250
Sodium compounds, n.e.s.:					
Caustic soda do	325	332	327	332	330
Carbonate, manufactured do	106	95	101	[e]100	100
Stone:					
Limestone and other calcareous stone do	23,818	23,519	23,684	[e]23,600	23,000
Quarry stone, not further described thousand cubic meters	32,988	32,844	32,274	32,500	32,000
Sulfur:[e]					
Native thousand tons	5	5	5	6	5
From pyrites do	60	60	60	62	60
Byproducts, all sources do	10	10	10	12	10
Total do	75	75	75	80	75
Sulfuric acid do	1,252	1,244	1,246	1,297	[2]1,292
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Bituminous do	[r]27,463	[r]26,315	26,421	26,223	[2]25,658
Brown and lignite do	[r]95,504	[r]98,878	102,857	100,387	[2]100,771
Coke:					
Metallurgical do	8,670	8,529	8,211	[e]8,200	8,200
Unspecified do	1,896	1,811	2,091	[e]1,900	1,900
Fuel briquets from brown coal do	1,111	1,104	1,069	[e]1,100	1,000
Gas:					
Manufactured, all types million cubic feet	275,737	268,532	271,710	[e]272,000	272,000
Natural, marketed[e 4] do	26,000	26,000	24,500	24,500	24,700

See footnotes at end of table.

Table 1.—Czechoslovakia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum:					
Crude:					
As reported ____ thousand tons__	89	93	95	125	[2]125
Converted _ thousand 42-gallon barrels__	603	629	644	848	[2]848
Refinery products ____ do____	117,530	112,785	[e]125,000	[e]127,500	125,000

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

[1]Table includes data available through Sept. 1987. In addition to the commodities listed, arsenic, feldspar, gold, uranium, and a variety of other petroleum products are produced, but information is inadequate to make reliable estimates of output levels.

[2]Reported figure.

[3]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 material ordinarily reported as manganese ore, which generally contains 25% or more manganese.

[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 a relatively inconsequential amount.

TRADE

The share of the Council for Mutual Economic Assistance (CMEA) member states in the total foreign trade of Czechoslovakia reached 78.6%. The Soviet Union was the country's largest trading partner, accounting for 46% of the total. Only 15% of total foreign trade was conducted with Western industrialized countries, mainly those of Western Europe. Exports declined marginally and imports rose by almost 10%. This resulted in a trade deficit, mostly with CMEA countries, about 7.5 times larger than that in 1985. The country's hard currency debt rose to about US$4 billion toward the end of 1986.

The U.S.S.R. continued to be Czechoslovakia's major supplier of chromium, ferroalloys, iron ore, manganese, natural gas, nitrogen fertilizer, petroleum, pig iron, and nonferrous metals. The largest trading partner from the West was the Federal Republic of Germany.

Table 2.—Czechoslovakia: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	--	22	--	All to Austria.
Oxides and hydroxides	54	34	--	Do.
Ash and residue containing aluminum	1,202	547	--	All to West Germany.
Metal including alloys:				
Scrap	226	259	--	West Germany 255; United Kingdom 4.
Unwrought	18,174	21,070	--	Japan 17,946; Poland 2,066; West Germany 943.
Semimanufactures	2,455	2,489	--	Poland 1,817; Hungary 478; West Germany 173.
Chromium: Oxides and hydroxides	--	31	--	All to Yugoslavia.
Copper:				
Ore and concentrate	1,040	1,184	--	All to United Kingdom.
Oxides and hydroxides	502	NA		
Sulfate	3,978	2,756	--	West Germany 2,491; Switzerland 105; Austria 80.
Ash and residue containing copper	300	NA		
Metal including alloys:				
Scrap	685	989	--	Austria 552; West Germany 411; Sweden 24.
Unwrought	--	57	--	All to Poland.
Semimanufactures	223	201	--	Egypt 110; Yugoslavia 77; West Germany 12.

See footnotes at end of table.

Table 2.—Czechoslovakia: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Gold: Waste and sweepings value, thousands	$166	$105	--	All to West Germany.
Iron and steel: Metal:				
Scrap	185,774	140,229	--	Italy 84,417; Austria 32,549; West Germany 15,104.
Pig iron, cast iron, related materials	2,016	2,780	--	West Germany 980; Sweden 688; Malta 419.
Ferroalloys:				
Ferrochromium	3,420	1,261	--	All to West Germany.
Ferromolybdenum	12	NA		
Ferrosilicomanganese	9,787	15,768	--	West Germany 11,822; United Kingdom 2,717; Italy 1,229.
Ferrosilicon	1,299	144	--	All to Italy.
Silicon metal	--	37	--	All to West Germany.
Unspecified	7,002	8,533	--	Austria 4,661; Hungary 1,358; Sweden 910.
Steel, primary forms[2] thousand tons	437	571	--	Yugoslavia 220; Hungary 35; unspecified 253.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	1,361	1,384	28	Egypt 334; West Germany 174; Yugoslavia 33.
Universals, plates, sheets do	1,018	1,010	13	Yugoslavia 270; West Germany 142; Austria 100.
Hoop and strip do	154	156	--	West Germany 18; Yugoslavia 8; unspecified 117.
Rails and accessories do	31	34	--	NA.
Wire do	134	133	--	West Germany 27; Hungary 13; Yugoslavia 13.
Tubes, pipes, fittings[2] do	701	631	1	U.S.S.R. 417; Poland 34; East Germany 25.
Castings and forgings, rough do	22	22	--	NA.
Lead:				
Ore and concentrate	5,757	5,943	--	All to West Germany.
Metal including alloys:				
Scrap	254	23	--	Do.
Unwrought	109	NA		
Manganese: Ore and concentrate, metallurgical-grade	1	NA		
Nickel:				
Oxides and hydroxides	20	78	--	Italy 48; West Germany 30.
Metal including alloys:				
Scrap	--	53	--	All to West Germany.
Unwrought	4	NA		
Platinum-group metals:				
Waste and sweepings value, thousands	--	$98	--	Do.
Metals including alloys, unwrought and partly wrought do	$286	$971	--	Yugoslavia $926; West Germany $43; United Kingdom $2.
Rare-earth metals including alloys, all forms	825	NA		
Silver:				
Waste and sweepings value, thousands	$150	NA		
Metal including alloys, unwrought and partly wrought do	$550	$344	--	All to West Germany.
Tin: Ash and residue containing tin	--	241	--	All to United Kingdom.
Titanium: Ore and concentrate	2,461	2,124	--	Italy 720; West Germany 632; United Kingdom 297.
Tungsten: Metal including alloys, all forms	2	NA		
Uranium and/or thorium: Metal including alloys, all forms	--	1	--	All to Belgium-Luxembourg.
Zinc:				
Ore and concentrate	14,441	15,651	--	All to Yugoslavia.
Oxides	1,270	938	--	Yugoslavia 776; West Germany 142; Italy 20.
Ash and residue containing zinc	4,096	4,707	--	All to West Germany.

See footnotes at end of table.

Table 2.—Czechoslovakia: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Zinc —Continued				
Metal including alloys:				
Scrap	147	108	--	All to West Germany.
Unwrought	345	25	--	All to Greece.
Semimanufactures	3,509	163	--	All to Yugoslavia.
Other:				
Oxides and hydroxides	116	NA		
Ashes and residues	5,706	3,297	--	Austria 3,288; Netherlands 8; United Kingdom 1.
Base metals including alloys, all forms	7	1	--	All to West Germany.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	2	NA		
Artificial:				
Corundum	4,964	4,286	--	Italy 2,488; West Germany 769; Netherlands 441.
Silicon carbide	612	500	--	West Germany 455; Austria 45.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$4	NA		
Grinding and polishing wheels and stones	587	334	1	Italy 79; Yugoslavia 53; United Kingdom 42.
Asbestos, crude	50	36	--	All to United Kingdom.
Barite and witherite	2,030	2,003	--	All to Austria.
Boron materials: Crude natural borates	--	20	--	All to Netherlands.
Cement[2] thousand tons	336	366	--	West Germany 145; Hungary 142; Poland 24.
Chalk	--	43	--	All to Denmark.
Clays, crude:				
Bentonite	500	NA		
Chamotte earth	117,335	26,636	--	Austria 10,362; Italy 8,864; West Germany 6,804.
Fire clay	--	43,278	--	All to West Germany.
Kaolin[2]	389,000	386,000	--	West Germany 144,000; Poland 73,000; Austria 36,000.
Unspecified	150,028	117,285	--	Hungary 51,885; West Germany 46,517; Austria 16,370.
Diamond: Industrial stones value, thousands	$13	NA		
Diatomite and other infusorial earth	3,062	4,050	--	All to Austria.
Feldspar, fluorspar, related materials	360	320	--	All to Yugoslavia.
Fertilizer materials:				
Crude, n.e.s	3,418	97	--	Austria 88; West Germany 9.
Manufactured:				
Ammonia	37,106	5,245	--	Switzerland 2,198; Greece 1,905; West Germany 787.
Nitrogenous, N_2 content[3]	332,000	436,000	--	NA.
Potassic	49	112	--	All to Yugoslavia.
Unspecified and mixed	310	20	--	All to Austria.
Graphite, natural	2,794	1,746	--	Poland 1,724; Greece 22.
Kyanite and related materials	--	20	--	All to Greece.
Lime	23,292	27,774	--	Hungary 20,370; West Germany 7,404.
Magnesium compounds:				
Magnesite, crude	--	2,974	2,500	Italy 474.
Oxides and hydroxides[2] thousand tons	428	446	--	Hungary 83; Poland 72; East Germany 53.
Mica:				
Crude including splittings and waste	--	11	--	All to Yugoslavia.
Worked including agglomerated splittings	104	82	--	Yugoslavia 46; Austria 13; Italy 9.
Nitrates, crude	20	NA		
Pigments, mineral: Iron oxides and hydroxides, processed	1,277	1,401	--	Italy 837; Egypt 312; Yugoslavia 170.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$165	$276	--	Hong Kong $144; Canada $125; Venezuela $7.
Synthetic do	$72	$26	--	France $21; Spain $3; Switzerland $1.
Pyrite, unroasted	--	20,766	--	All to Hungary.
Salt and brine	3,040	2,064	--	Hungary 2,062; West Germany 2.

See footnotes at end of table.

Table 2.—Czechoslovakia: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Sodium compounds, n.e.s.:				
Carbonate, manufactured	[3]9,300	[3]12,900	--	West Germany 10,162; Yugoslavia 1,856.
Sulfate, manufactured	189	567	--	All to West Germany.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,899	NA		
Worked	12,681	9,428	--	West Germany 9,388; France 24; Netherlands 16.
Gravel and crushed rock	9,617	7,654	--	West Germany 6,879; Austria 559; Sweden 196.
Limestone other than dimension	26,775	26,792	--	All to West Germany.
Sand other than metal-bearing	278,637	263,776	--	Austria 161,798; Hungary 88,922; Yugoslavia 13,032.
Sulfur:				
Elemental, crude including native and byproduct	29,191	10,289	--	All to Austria.
Sulfuric acid[3]	5,900	10,600	--	NA.
Talc, steatite, soapstone, pyrophyllite	7,200	6,549	--	Poland 6,489; Yugoslavia 60.
Other:				
Crude	28,553	29,584	--	Hungary 16,284; Austria 7,338; West Germany 5,693.
Slag and dross, not metal-bearing	16,284	12,317	--	All to West Germany.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	94	110	--	Italy 62; West Germany 48.
Coal:[2]				
Anthracite and bituminous thousand tons	2,672	2,676	--	East Germany 687; Austria 653; Hungary 401.
Lignite including briquets do.	2,644	2,832	--	West Germany 2,486; Hungary 38; Austria 7.
Coke and semicoke[2] do.	1,312	1,157	--	East Germany 440; Austria 355; Hungary 163.
Gas, natural: Gaseous[3] million cubic feet	950	NA		
Peat including briquets and litter	35	222	--	Denmark 128; Austria 73; Greece 21.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	972	998	--	West Germany 623; Italy 197; Netherlands 100.
Gasoline do.	[3]901	931	--	West Germany 495; Austria 217; Italy 145.
Mineral jelly and wax do.	1	(4)	--	NA.
Kerosene and jet fuel do.	650	630	--	West Germany 307; Austria 227; Yugoslavia 88.
Distillate fuel oil do.	[3]1,984	1,385	--	West Germany 865; Switzerland 262; Austria 258.
Lubricants do.	276	776	--	Austria 610; Belgium-Luxembourg 52; Yugoslavia 31.
Residual fuel oil do.	3,701	4,477	--	Austria 2,300; West Germany 2,050; Italy 126.
Bitumen and other residues do.	20	21	--	All to Austria.

[p]Preliminary. NA Not available.

[1]Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Czechoslovakia, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from various sources, which include United Nations information and data published by trading partner countries.

[2]Official trade statistics of Czechoslovakia.

[3]Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

[4]Less than 1/2 unit.

Table 3.—Czechoslovakia: Apparent imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate[2] thousand tons	349	356	--	Hungary 221; Yugoslavia 95.
Oxides and hydroxides	10,646	24,842	--	Hungary 16,546; Yugoslavia 8,085; West Germany 124.
Metal including alloys:				
Scrap	1,310	452	--	West Germany 434; Netherlands 18.
Unwrought[2]	90,000	80,000	--	U.S.S.R. 70,000; Yugoslavia 9,000; Hungary 1,000.
Semimanufactures	16,199	21,090	--	Yugoslavia 16,917; Hungary 3,512; West Germany 328.
Antimony: Oxides	23	NA		
Cadmium: Metal including alloys, all forms[2]	303	164	--	Finland 56; Bulgaria 42; Yugoslavia 28.
Chromium:				
Ore and concentrate[2] thousand tons	176	174	--	U.S.S.R. 129; Albania 17; Yugoslavia 13.
Oxides and hydroxides	880	761	--	U.S.S.R. 450; United Kingdom 287; Poland 24.
Cobalt: Oxides and hydroxides	1	2	--	All from United Kingdom.
Columbium and tantalum: Metal including alloys, all forms:				
Columbium (niobium)	68	1	--	All from West Germany.
Tantalum	(3)	NA		
Copper:				
Metal including alloys:				
Scrap	330	265	--	West Germany 209; Ivory Coast 38; Morocco 18.
Unwrought[2]	62,000	67,000	--	U.S.S.R. 40,000; Poland 9,000; United Kingdom 8,000.
Semimanufactures	18,810	21,157	--	Poland 16,026; Yugoslavia 4,293; West Germany 398.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	556	1,318	--	All from West Germany.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite[2] thousand tons	11,108	11,268	--	U.S.S.R. 9,734; Brazil 997; India 202.
Metal:				
Scrap do	156	44	--	West Germany 37; U.S.S.R. 5; Austria 2.
Pig iron, cast iron, related materials[2] do	745	869	--	U.S.S.R. 867.
Ferroalloys:				
Ferrochromium	1,037	3,169	--	West Germany 2,627; Italy 542.
Ferromanganese	--	10	--	All from West Germany.
Ferrosilicomanganese	--	25	--	All from Yugoslavia.
Ferrosilicon	32	232	--	Do.
Silicon metal	1,319	7	--	All from United Kingdom.
Unspecified	2,178	3,389	--	Sweden 1,342; United Kingdom 1,069; West Germany 555.
Steel, primary forms	154,000	318,000	--	NA.
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	229	193	--	Yugoslavia 16; Hungary 10; unspecified 167.
Universals, plates, sheets do	147	140	--	Bulgaria 30; Yugoslavia 10; unspecified 93.
Hoop and strip do	22	18	--	West Germany 3; Hungary 2; unspecified 11.
Rails and accessories do	4	5	--	NA.
Wire do	3	3	--	Italy 1; Yugoslavia 1.
Tubes, pipes, fittings do	193	150	--	West Germany 75; Italy 65; Hungary 2.
Castings and forgings, rough do	14	9	--	NA.
Lead:				
Oxides	1,196	1,051	--	France 1,050; United Kingdom 1.
Metal including alloys:				
Scrap	978	494	--	All from West Germany.
Unwrought[2]	27,000	25,000	--	Yugoslavia 10,000; U.S.S.R. 9,000; West Germany 3,736.
Semimanufactures	301	40	--	United Kingdom 36; Yugoslavia 3; France 1.

See footnotes at end of table.

Table 3.—Czechoslovakia: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Magnesium: Metal including alloys:				
Scrap	7	2	--	All from Belgium-Luxembourg.
Unwrought	44	112	--	All from Yugoslavia.
Semimanufactures	29	49	--	All from West Germany.
Manganese:				
Ore and concentrate, metallurgical-grade[2] thousand tons	482	457	--	U.S.S.R. 260; Switzerland 76; India 32.
Oxides	--	60	--	All from Spain.
Mercury 76-pound flasks	754	NA		
Molybdenum:				
Ore and concentrate	308	327	--	Netherlands 286; West Germany 41.
Oxides and hydroxides	--	28	--	All from Netherlands.
Metal including alloys, all forms	10	3	--	Japan 2; France 1.
Nickel:				
Ore and concentrate	--	47	--	All from Yugoslavia.
Matte and speiss, Ni content	1,616	1,162	--	All from Cuba.
Oxides and hydroxides	2,438	2,261	--	Do.
Metal including alloys:				
Unwrought[2]	6,483	6,558	--	U.S.S.R. 3,684; Cuba 1,592; United Kingdom 649.
Semimanufactures	52	36	--	West Germany 31; Switzerland 2; Austria 1.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$205	$1,634	--	West Germany $1,039; United Kingdom $394; Japan $186.
Selenium, elemental	--	1	--	All from United Kingdom.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$6,230	$3,914	--	Yugoslavia $2,920; Belgium-Luxembourg $670; Netherlands $137.
Tin:				
Oxides	--	1	--	All from United Kingdom.
Metal including alloys, unwrought[2]	2,896	3,058	--	Indonesia 975; Bolivia 832; Malaysia 747.
Titanium:				
Ore and concentrate	70,569	563	--	West Germany 448; Netherlands 60; Italy 55.
Oxides	555	465	--	West Germany 234; United Kingdom 231.
Metal including alloys, all forms	4	7	--	All from West Germany.
Tungsten:				
Ore and concentrate	40	41	--	All from Netherlands.
Metal including alloys, all forms	1	1	(3)	Mainly from Japan.
Zinc:				
Ore and concentrate	--	1,916	--	Morocco 1,900; Greece 16.
Oxides	90	NA		
Metal including alloys:				
Unwrought[2]	59,000	58,000	--	Yugoslavia 12,000; Finland 11,000; Bulgaria 10,000.
Semimanufactures	6,287	7,145	--	Yugoslavia 5,653; Poland 1,248; Belgium-Luxembourg 200.
Zirconium:				
Ore and concentrate	1,577	2,307	--	West Germany 2,209; Italy 98.
Metal including alloys, all forms	--	1	--	All from West Germany.
Other:				
Ores and concentrates	414	470	--	Belgium-Luxembourg 288; France 182.
Oxides and hydroxides	3,486	12	--	United Kingdom 11; Switzerland 1.
Ashes and residues	1,893	NA		
Base metals including alloys, all forms	77	47	--	France 32; Austria 8; Japan 6.
Nonferrous metals and alloys, rolled[2]	10,000	11,000	--	All from U.S.S.R.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	281	276	--	Italy 265; West Germany 9; United Kingdom 2.
Artificial:				
Corundum	2,108	223	--	Japan 88; Yugoslavia 64; West Germany 52.
Silicon carbide	291	248	--	All from Italy.

See footnotes at end of table.

Table 3.—Czechoslovakia: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Abrasives, n.e.s. —Continued				
Dust and powder of precious and semiprecious stones including diamond value, thousands	$711	$1,109	$8	Switzerland $1,101.
Grinding and polishing wheels and stones	709	632	--	West Germany 295; Austria 245; France 30.
Asbestos, crude[2]	45,335	46,783	--	U.S.S.R. 30,554; Canada 7,651.
Barite and witherite	85	20	--	All from West Germany.
Boron materials:				
Crude natural borates	7,260	NA		
Oxides and acids	2,625	440	--	All from France.
Cement[2] thousand tons	178	77	--	East Germany 34; U.S.S.R. 29.
Chalk	1,473	1,487	--	Belgium-Luxembourg 649; France 460; Austria 288.
Clays, crude:				
Chamotte earth	752	NA		
Kaolin	5,320	8,035	--	Hungary 6,609; United Kingdom 1,426.
Unspecified	227	885	--	Poland 559; West Germany 224; Austria 51.
Diamond:				
Gem, not set or strung value, thousands	$36	$39	--	Belgium-Luxembourg $31; West Germany $8.
Industrial stones do	$1,664	$1,512	--	Switzerland $1,024; Belgium-Luxembourg $458; United Kingdom $30.
Diatomite and other infusorial earth	2,652	2,878	--	Iceland 2,209; France 492; Austria 158.
Feldspar, fluorspar, related materials:				
Fluorspar	144	144	--	All from West Germany.
Unspecified	16	10	--	All from Yugoslavia.
Fertilizer materials:				
Crude, n.e.s	14,799	NA		
Manufactured:				
Ammonia	4	50	--	All from Belgium-Luxembourg.
Nitrogenous, N_2 content[2] thousand tons	175	174	--	U.S.S.R. 172.
Phosphatic, P_2O_5 content do	[4]127	[4]124	16	Yugoslavia 6; unspecified 100.
Potassic, K_2O content[2] do	556	556	--	East Germany 419; U.S.S.R. 137.
Unspecified and mixed	(3)	4	--	All from Yugoslavia.
Graphite, natural	331	307	--	West Germany 176; Japan 125; Italy 6.
Gypsum and plaster[2] thousand tons	24	26	--	East Germany 25.
Iodine	15	NA		
Lime	52	21	--	All from West Germany.
Magnesium compounds:				
Oxides and hydroxides	856	1,617	--	West Germany 899; France 413; Austria 280.
Other	23	NA		
Mica:				
Crude including splittings and waste	54	24	--	All from France.
Worked including agglomerated splittings	8	18	--	All from Austria.
Nitrates, crude	1,067	NA		
Phosphates, crude, P_2O_5 content[2] thousand tons	276	282	--	U.S.S.R. 135; Morocco 51; Jordan 38.
Pigments, mineral:				
Natural, crude	38	20	--	All from West Germany.
Iron oxides and hydroxides, processed	1,098	1,175	--	West Germany 1,057; Belgium-Luxembourg 89; Italy 29.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$46	$22	--	West Germany $11; France $6; Switzerland $5.
Synthetic do	$22	$33	--	Switzerland $27; Japan $4; Italy $2.
Pyrite, unroasted	124	32	--	All from Italy.
Salt and brine	120,358	139,964	--	U.S.S.R. 120,065; Poland 19,890; West Germany 5.
Sodium compounds, n.e.s.: Carbonate, manufactured[2] thousand tons	175	203	--	East Germany 80; Bulgaria 32; Poland 28.

See footnotes at end of table.

Table 3.—Czechoslovakia: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	15,961	NA		
Worked	2,865	1,829	--	Yugoslavia 1,142; Italy 687.
Dolomite, chiefly refractory-grade	339	91	--	All from West Germany.
Gravel and crushed rock	2,028	5,944	--	Yugoslavia 3,861; France 1,580; United Kingdom 450.
Quartz and quartzite	1,027	970	--	All from West Germany.
Sand other than metal-bearing	377	4,701	--	Hungary 3,430; Belgium-Luxembourg 1,035; West Germany 111.
Sulfur:				
Elemental:				
Crude including native and by-product[2] thousand tons	469	505	--	Poland 485; West Germany 17.
Colloidal, precipitated, sublimed	80	70	--	All from France.
Dioxide	282	261	--	All from West Germany.
Sulfuric acid[2]	66,845	73,980	--	U.S.S.R. 69,170; East Germany 4,418.
Talc, steatite, soapstone, pyrophyllite	699	1,516	--	Austria 967; Belgium-Luxembourg 422; West Germany 97.
Other:				
Crude	6,334	9,264	--	Hungary 6,528; West Germany 2,652; Italy 48.
Slag and dross, not metal-bearing	81	111	--	Netherlands 103; Austria 8.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	63	60	--	All from West Germany.
Carbon black[2]	14,606	16,422	--	U.S.S.R. 9,938; Romania 2,649; France 836.
Coal:[2]				
Anthracite and bituminous thousand tons	4,565	4,686	--	U.S.S.R. 3,252; Poland 1,374.
Lignite including briquets do	708	736	--	All from East Germany.
Gas, natural: Gaseous million cubic feet	371,367	381,785	--	U.S.S.R. 381,043.
Peat including briquets and litter	51	NA		
Petroleum:				
Crude[4] thousand 42-gallon barrels	126,420	124,215	--	Mainly from U.S.S.R.
Refinery products:				
Liquefied petroleum gas do	6	(3)	--	All from Austria.
Gasoline do	[4]4,318	[4]3,859	--	Yugoslavia 426; unspecified 3,423.
Mineral jelly and wax do	10	7	--	West Germany 6.
Kerosene and jet fuel do	55	46	--	West Germany 36; Italy 6; Yugoslavia 4.
Distillate fuel oil do	[4]141	[4]50	--	NA.
Lubricants do	[4]65	237	--	Austria 137; Yugoslavia 67; West Germany 18.
Residual fuel oil do	62	92	--	Austria 59; West Germany 33.
Bitumen and other residues do	--	17	--	All from Yugoslavia.
Bituminous mixtures do	(3)	(3)	--	Mainly from Austria.
Petroleum coke do	16	44	--	All from West Germany.
Unspecified do	1,026	NA		

[p]Preliminary. NA Not available.

[1]Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Czechoslovakia, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from various sources, which include United Nations information and data published by the trading partner countries.

[2]Official trade statistics of Czechoslovakia.

[3]Less than 1/2 unit.

[4]Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

COMMODITY REVIEW

METALS

Antimony.—Antimony ore was produced by the Dubrava Mine in the Loptovsky Mikulas District, Central Slovakia. More than 42,000 tons of high-quality antimony ore yielded, after processing at the Slovak National Enterprise in Vajskova, about 1,000 tons of antimony metal. The country planned to achieve self-sufficiency in antimony in 1990 by reaching an annual output of 55,000 tons of ore at Dubrava.

Gallium.—The production of this rare metal increased from about 0.5 ton in 1970 to about 3.4 tons in 1986. Gallium, which was obtained from aluminum production wastes, was much in demand by the world's electronics industry. About 80% of the country's production was exported to Western Europe. The SNP plant in the town of Ziar nad Hronom planned to increase the annual production level to at least 4 tons by the end of the decade.

Gold.—Great attention was paid to prospecting for gold. The objectives of this considerable exploration effort were to identify viable gold reserves, establish mining operations, and begin production as soon as possible to take advantage of rising gold prices and to provide the country with foreign currency.

Deposits of auriferous ore were discovered at Sturec, near the ancient mining town of Kremnica in Central Slovakia. A pilot plant, rated at 1 ton per hour, was built at the site with assistance from the Ore Research Institute of Prague. The program was designed to examine the amenability of the ore to concentration. If the outcome of the study proved to be satisfactory, a 300,000-ton-per-year open pit and ore processing operation was to be established to produce gold along with some silver.

Prospecting was also in progress in the area of Kasperske Hory and in the Sumava Mountains. Both prospects showed occurrences of gold along with tungsten.

Iron and Steel.—According to the federal plan for 1986-90, production of iron and steel was expected to remain at the level of the previous 5 years, namely 9 to 10 million tons of pig iron and 15 million tons of steel annually. In 1990, production could decline somewhat. An intensified development program for the industry was worked out. It provided for the maximum use of home-produced raw materials, reduced consumption of metals and energy, and the solution of ecological problems. Some inefficient production was to be limited or ended, including the shutting down of iron production at Bohumin in North Moravia and the partial reduction of operations at the Vitkovice ironworks in the same region. Modernization plans were to concentrate on construction of new facilities for continuous casting of steel. The proportion of total steel output continuously cast was planned to rise from 7% in 1986 to about 13% in 1990 and to about 50% by 1995.

The Government decided to participate in the construction of an iron treatment plant at Krivoi Rog, in the Ukraine, U.S.S.R. According to the arrangement, Czechoslovakia was to construct the grinding and magnetic separating installations for the plant. After completion in 1990, Czechoslovakia would receive 1.33 million tons of iron pellets per year for 10 years as payment for its share of construction costs. The arrangement was expected to ease the pressure on domestic supply and to provide high-quality pellets at stable prices and at lower transportation costs.

Other Metals.—Exploration for various metals continued, and new occurrences of lead and zinc, tin, and tungsten were discovered. It was hoped that a significant part of the country's demand for tin could be met through domestic production during the next decade. Additional tin would also come from the new Kovosrot recycling plant near Brno, which was rated at 170 tons of tin metal per year. A large metallurgical complex was being built in Bruntal, North Moravia, to process nonferrous ores, possibly including newly found lead and zinc ore from Central Bohemia and the Bohemian-Moravian Highlands. Recently found occurrences of tungsten, in the area of Kasperske Hory and the Sumava Mountains, were being investigated. Czechoslovakia produced only about 80 tons of tungsten metal in 1986 while importing 1,250 tons.

INDUSTRIAL MINERALS

Clays.—The country's abundant reserves of various types of clays were intensively exploited to meet the substantial demand for its bentonite and particularly fine-quality kaolin.

The beneficiated, high-grade kaolin was of the quality sought after by manufacturers of ceramics as well as paper fillers and

coatings. About 550,000 tons of this material was produced using modern beneficiation technology, composed of sizing and high-intensity magnetic removal of impurities such as iron oxide. The major producers were Chlumcanske Keramicke Zavody, Keramicke a Sklarske Suroviny, Moravske Keramicke Zavody, and Zapodceske Keramicke Zavody.

Almost all bentonite produced in the country was internally consumed, mostly as binders by the metallurgical industry, drilling muds and absorbents by the oil industry, and fillers by the paint industry.

Fertilizer Materials.—Facing the need to both conserve foreign exchange and develop agriculture as far as possible, the Government formulated various policies related to, among other things, better utilization of available domestic raw materials and reduction in dependence on imports, particularly from the West. Both the quality and the range of fertilizers available were to be improved, along with the efficiency of fertilizer manufacture and use. The latter was to result in reduced imports, which amounted to 842,000 tons of phosphate rock in 1986.

MINERAL FUELS

Coal.—The country produced a total of 126 million tons of coal in 1986. The North Bohemian mines yielded almost 70 million tons, with the Nastup Mine, at Tusimice, contributing 20 million tons. Hard coal production at Ostrava-Karviná totaled 23 million tons for the year.

Although coal was to remain the major source of energy, the development of nuclear power made it possible for the Government to plan a moderate reduction in coal use and output. Major reasons for reducing the output, to 119 million tons in 1990, were conservation of the country's reserves and ecological considerations. Considerable environmental damage was caused in the country by the burning of sulfur-bearing coals in conventional thermal powerplants. Production of desulfurization equipment was initiated at Tusimice to lessen the environmental damage and control sulfur omissions. This equipment, adding up to 40% to the cost of a thermal powerplant, was to be installed at the Prunerov-2, Pocerady, Novaky, Tisova, and Melnik stations. Development of fluidized-bed furnaces for conventional powerplants as well as methods for dust control was under way during the year.

Prospecting for new coal deposits continued in the Beskydy Mountains and in the Ostrava-Karviná Coalfield in North Moravia where deposits of coking coal were estimated to contain more than 1,500 million tons. Coking coal deposits in the Melnik-Benatky region of Central Bohemia were estimated at 800,000 tons. Exploration continued in North Bohemia and East Bohemia where deposits containing several million tons of bituminous coal were indicated.

Natural Gas.—While reducing the country's dependence on coal, the Government saw an increased role for natural gas as a source of energy. It was planned to increase domestic production, which covered about 10% of needs, by about 50% by 1990. A new deposit at Gbely in West Slovakia was prepared to yield 35 million cubic feet per day. The recoverable reserves of the deposit, the biggest in the country, were estimated at 670,000 million cubic feet. Natural gas was found at Nemcicky in South Moravia. Under an agreement on joint gas production with Austria, Czechoslovakia received 700 million cubic feet of gas from the jointly operated deposits in the border area. The increased supply of Soviet natural gas, to be about 20% higher in 1990 than in 1986, was to be paid for by Czechoslovak participation in the construction of the Karachaganak gas processing complex in the U.S.S.R. and by expanding the throughput capacity of the Progress gas pipeline on Czechoslovak territory.

Nuclear Power.—The share of electrical power generated by nuclear plants increased from 14.6% in 1985 to 21% in 1986. The second unit of the nuclear power station at Jaslovske Bohumice was commissioned, and the entire project was completed. The third block of Dukovany was put into trial operation. Construction of the Mochovec and Temelin nuclear plants continued. The standard for all Czechoslovak stations except Temelin was 440-megawatt reactors; 1,000-megawatt reactors were included in Temelin's design. Both were of the Soviet VVER design.

The Czechoslovak nuclear energy development program was not reduced or changed in any way following the Chernobyl accident. However, greater emphasis was given to additional safety measures. The program relied on the domestic sources of uranium, which was produced in Moravia (Rozna), West Bohemia (Vitkov II, Zadni Chadov, Okrouhla Radoun, and Dylen), and Central Bohemia (Pribram). Development of several mines (Krizany 1, Hamr I and II) in North Bohemia continued.

Petroleum.—In 1986, Czechoslovakia produced 848,000 barrels of crude oil, compared with the total of 115 million barrels consumed by the country. All domestic production originated from small fields situated mostly in Moravia. Almost all of the crude oil needed was imported from the U.S.S.R.

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The Mineral Industry of Denmark and Greenland

By Richard H. Singleton[1]

DENMARK

Denmark has no commercial metallic ore deposits. Petroleum resources in the North Sea continued to be developed as production of crude petroleum and natural gas continued to increase significantly. More than one-half of domestic consumption of these products was supplied from the North Sea in 1986. Coal imports continued to supply about 40% of total energy requirements. Exploration for new petroleum deposits continued in the North Sea, although at a reduced rate, and a search began in the Baltic Sea for the first time.

Output of cement, steel from imported scrap and iron ore, and dimension granite each increased significantly.

A high standard of living was maintained in Denmark as the economy continued to show strong growth during the first half of the year. This was dampened during the second half as the conservative Government raised personal taxes and took other measures to encourage saving and discourage borrowing. Growth of the gross domestic product (GDP) decreased to 3.4% compared with 4.2% in 1985. The budget deficit was eliminated for the first time in 12 years. The net foreign debt continued to increase as it had for the past 24 successive years reaching $32 billion[2] by yearend, equal to 39% of the GDP. The 1986 deficit was $4.2 billion, an all-time high. The inflation rate was held below 4%, the smallest in 30 years, and unemployment continued to decrease, to below 8% by yearend.

PRODUCTION AND TRADE

Output of North Sea gas and crude petroleum each again increased to new record highs as field development continued. Production of raw steel increased significantly as did sales of cement and dimension granite. Approximately one-fifth of cement production continued to be exported, primarily to the Middle East. Most of diatomaceous earth sales continued to be foreign, mostly to Western Europe.

Denmark continued to rely on imports for its entire supply of coal, which continued to account for about 40% of energy consumption. Most of the balance was oil and gas, slightly over one-half of which was supplied domestically from the North Sea in 1986. Imports of coal from the Republic of South Africa were terminated.

Table 1.—Denmark: Sales of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
Cement, hydraulic thousand tons	1,770	1,657	1,668	1,739	2,029
Clays:					
Kaolin[e]	[2]4,996	10,000	14,000	[r]13,000	[2]10,404
Other	4,514	[e]4,500	4,168	4,686	[e]6,000
Cryolite[3]	[r]18,000	[r]17,200	[r]20,300	17,900	18,000
Diatomaceous materials:					
Diatomite[e]	[2]3,903	6,000	[r]10,000	[r]6,000	6,000
Moler	70,484	[e]65,000	63,745	72,029	72,958
Gas, natural: Marketed million cubic feet	--	--	[r]8,228	38,811	67,274
Iron and steel:[3]					
Iron ore (less than 42% Fe):					
Gross weight thousand tons	8	--	--	--	--
Fe content of ore do.	3	--	--	--	--
Steel, crude do.	560	493	548	528	632
Semimanufactures do.	467	410	[r]462	511	539
Lead, metal including alloys, secondary[4]	15,927	10,052	13,019	4,503	[e]560
Lime, hydrated and quicklime thousand tons	[r]99	108	[r]128	129	142
Nitrogen: N content of ammonia	30,700	11,700	([5])	([5])	--
Peat thousand tons	36	[e]34	[r]32	39	48
Petroleum:[3]					
Crude thousand 42-gallon barrels	[r]12,900	16,460	[r]17,700	22,120	27,710
Refinery products:					
Gasoline do.	8,475	10,548	10,438	10,226	11,305
Jet fuel do.	[r]180	[r]271	[r]681	1,017	1,525
Kerosene do.	[r]70	[r]78	[r]429	125	164
Distillate fuel oil do.	[r]19,223	[r]22,178	[r]23,162	22,326	24,723
Residual fuel oil do.	[r]11,398	[r]12,762	[r]13,498	12,256	13,370
Liquefied petroleum gas do.	1,345	1,495	1,656	1,506	1,863
Naphtha do.	946	1,074	1,320	1,401	1,638
Bitumen do.	471	446	533	521	378
Refinery fuel and losses do.	[r]2,620	[r]2,850	[r]3,020	2,880	3,160
Total do.	[r]44,728	[r]51,702	[r]54,737	52,258	58,126
Salt[3] thousand tons	447	407	523	432	564
Sand, industrial thousand cubic meters	845	[e]900	1,026	1,368	1,629
Sand and gravel[3]	[r]21,900	[r e]22,000	[r]23,200	24,600	28,500
Sodium carbonate thousand tons	119	144	126	114	117
Stone:					
Crushed:					
Flint thousand cubic meters	[e]75	[e]60	47	54	59
Limestone:					
Agricultural thousand tons	[r]2,146	[e]2,200	2,163	1,916	1,972
Industrial do.	144	[e]140	145	142	153
Chalk do.	154	[e]180	220	203	249
Other thousand cubic meters	893	[e]1,000	1,183	1,275	1,365
Dimension (mostly granite) do.	55	[e]100	154	156	213
Sulfur, byproduct	7,421	[e]9,000	10,859	7,376	12,810

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through May 29, 1987.
[2]Reported figure.
[3]Data represent production.
[4]Includes antimonial lead.
[5]Revised to zero.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals: Alkali metals	--	1	--	All to Norway.
Aluminum:				
Ore and concentrate	3,089	2,042	--	Norway 2,015; Sweden 27.
Oxides and hydroxides	192	166	66	United Kingdom 41; West Germany 14.
Ash and residue containing aluminum	89	58	--	All to Sweden.

See footnote at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Aluminum —Continued				
Metal including alloys:				
Scrap	15,726	16,669	--	West Germany 10,219; Netherlands 2,383; Norway 1,954.
Unwrought	9,733	12,129	--	West Germany 5,748; Belgium-Luxembourg 2,549; Sweden 1,461.
Semimanufactures	28,459	27,672	393	Sweden 8,337; West Germany 7,721; United Kingdom 4,600.
Antimony: Metal including alloys, all forms	(2)	3	--	Peru 2; Sweden 1.
Bismuth: Metal including alloys, all forms	(2)	1	--	All to Sweden.
Cadmium: Metal including alloys, all forms	1	1	--	Do.
Chromium:				
Oxides and hydroxides	3	4	--	Sweden 3; West Germany 1.
Metal including alloys, all forms	7	1	--	All to West Germany.
Cobalt: Oxides and hydroxides	6	4	--	West Germany 3.
Columbium and tantalum: Metal including alloys, all forms, tantalum	1	(2)	--	All to United Kingdom.
Copper:				
Oxides and hydroxides	8	37	--	All to Ecuador.
Sulfate	9	3	--	West Germany 2.
Ash and residue containing copper	1,470	915	--	Sweden 594; West Germany 175; Belgium-Luxembourg 98.
Metal including alloys:				
Scrap	14,458	15,767	--	West Germany 13,963; Belgium-Luxembourg 615; Sweden 459.
Unwrought	3,841	1,558	--	Sweden 774; West Germany 284; Norway 192.
Semimanufactures	3,746	3,999	1	West Germany 1,337; United Kingdom 752; Ireland 697.
Germanium: Metal including alloys, all forms	(2)	NA		
Gold:				
Waste and sweepings value, thousands	$6,503	$5,298	--	Netherlands $3,014; Switzerland $1,081; West Germany $434.
Metal including alloys, unwrought and partly wrought _troy ounces	10,499	NA		
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	6,647	6,834	--	Netherlands 4,114; United Kingdom 2,269; West Germany 381.
Pyrite, roasted	(2)	--		
Metal:				
Scrap	234,100	269,535	--	West Germany 227,227; Netherlands 17,740; Sweden 13,075.
Pig iron, cast iron, related materials	236	392	--	Sweden 303; West Germany 48; Iceland 21.
Ferroalloys:				
Ferrosilicon	27	--		
Silicon metal	9	83	4	Netherlands 72; Sweden 7.
Unspecified	2	21	--	All to West Germany.
Steel, primary forms	11,624	8,833	--	West Germany 5,948; Sweden 2,755; United Kingdom 97.
Semimanufactures:				
Bars, rods, angles, shapes, sections	87,661	105,817	7	West Germany 38,112; Sweden 20,823; United Kingdom 16,327.
Universals, plates, sheets	294,056	309,283	5,432	West Germany 111,121; Sweden 66,536; United Kingdom 46,284.
Hoop and strip	22,290	22,074	(2)	Sweden 14,075; United Kingdom 4,326; Norway 1,133.
Rails and accessories	90	2,731	--	Italy 2,602; West Germany 115; Norway 6.
Wire	5,110	4,939	205	Sweden 1,484; Finland 690; West Germany 686.
Tubes, pipes, fittings	214,590	85,543	735	Sweden 38,299; West Germany 14,222; United Kingdom 10,669.
Castings and forgings, rough	33,837	35,686	--	West Germany 15,777; Sweden 11,664; United Kingdom 2,458.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides	10	16	--	West Germany 8; Ecuador 4; Kenya 2.
Ash and residue containing lead	1,071	2,204	--	United Kingdom 1,455; Sweden 309; West Germany 220.
Metal including alloys:				
Scrap	14,158	14,530	--	Sweden 10,769; East Germany 2,342; West Germany 1,090.
Unwrought	10,825	3,985	--	Belgium-Luxembourg 2,078; Japan 676; Sweden 382.
Semimanufactures	127	50	--	Sweden 32; Iceland 4; United Kingdom 4.
Magnesium: Metal including alloys:				
Scrap	256	130	--	West Germany 127; Belgium-Luxembourg 3.
Semimanufactures	2	4	--	Sweden 2; Norway 1.
Manganese: Oxides	37	13	--	All to Sweden.
Mercury 76-pound flasks	220	174	--	West Germany 87; United Kingdom 58; Sweden 29.
Molybdenum: Metal including alloys:				
Scrap	3	--		
Unwrought	1	--		
Nickel:				
Ash and residue containing nickel	465	438	--	West Germany 228; United Kingdom 179; Belgium-Luxembourg 18.
Metal including alloys:				
Scrap	76	14	--	All to West Germany.
Semimanufactures	1	2	--	Sweden 1.
Platinum-group metals:				
Waste and sweepings value, thousands	$1,154	$1,920	--	West Germany $1,499; United Kingdom $276; Netherlands $85.
Metals including alloys, unwrought and partly wrought do.	$894	$788	--	Sweden $655; Netherlands $43; Finland $33.
Selenium, elemental	(2)	(2)	--	All to Sweden.
Silver:				
Waste and sweepings value, thousands	$6,921	$6,801	--	United Kingdom $3,444; France $1,783; Switzerland $616.
Metal including alloys, unwrought and partly wrought do.	$3,476	$2,969	--	Sweden $1,343; Finland $681; Switzerland $432.
Tellurium, elemental and arsenic	(2)	2	--	All to Sweden.
Tin:				
Ash and residue containing tin	678	486	--	United Kingdom 431; Netherlands 32; Belgium-Luxembourg 23.
Metal including alloys:				
Scrap	67	180	--	Sweden 117; Netherlands 52; West Germany 8.
Unwrought	1,822	1,341	--	Belgium-Luxembourg 1,019; Sweden 166; West Germany 42.
Semimanufactures	76	15	--	Sweden 4; Norway 3; Iceland 2.
Titanium:				
Oxides	224	86	--	Iceland 20; West Germany 18; Ecuador 17.
Metal including alloys:				
Scrap	7	9	--	West Germany 5; United Kingdom 4.
All forms	2	4	--	West Germany 2; Sweden 2.
Tungsten: Metal including alloys:				
Scrap	22	28	--	All to West Germany.
Unwrought	--	2	--	All to France.
Semimanufactures	2	(2)	--	All to Austria.
Zinc:				
Oxides	29	13	--	Malta 8; Saudi Arabia 2; Ivory Coast 1.
Blue powder	132	NA		
Matte	--	1,309	--	Norway 912; West Germany 342; Belgium-Luxembourg 24.
Ash and residue containing zinc	1,387	1,304	--	Norway 975; India 141; West Germany 113.
Metal including alloys:				
Scrap	4,304	4,078	--	West Germany 1,976; Norway 1,448; Netherlands 183.
Unwrought	287	42	--	West Germany 37; Uruguay 4.
Semimanufactures	67	270	20	West Germany 160; Greenland 27; Norway 20.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Zirconium: Metal including alloys, all forms	1	(2)	--	All to Sweden.
Other:				
Ores and concentrates	580	483	54	West Germany 240; Sweden 166; Norway 23.
Oxides and hydroxides	1	1	--	All to Norway.
Ashes and residues	266	263	--	West Germany 164; Netherlands 48; Norway 33.
Base metals including alloys, all forms	--	3	--	Finland 1; Norway 1; Sweden 1.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	9	21	--	Norway 20; Iceland 1.
Artificial:				
Corundum	1	--		
Silicon carbide	(2)	3	--	Morocco 2; Norway 1.
Dust and powder of precious and semi-precious stones including diamond value, thousands	--	$1	--	All to Sweden.
Grinding and polishing wheels and stones	1,347	794	2	Ethiopia 436; Saudi Arabia 107; Yemen (Sanaa) 41.
Asbestos, crude	1	50	--	All to Malaysia.
Barite and witherite	19	12	--	Iceland 5; Ecuador 4.
Boron materials:				
Crude natural borates	6	10	--	All to Iceland.
Oxides and acids	5	19	--	Sweden 15; Norway 4.
Cement	388,566	308,441	59,245	Saudi Arabia 52,116; Israel 27,803.
Chalk	80,280	75,724	60	Finland 60,760; Sweden 5,688; United Kingdom 3,094.
Clays, crude:				
Bentonite	29	16	--	Sweden 8; Oman 6; Finland 2.
Chamotte earth	1,087	1,222	--	Sweden 724; Norway 498.
Kaolin	686	599	--	Sweden 329; West Germany 115; Norway 87.
Unspecified	1,150	1,612	3	Sweden 589; West Germany 322; Netherlands 243.
Cryolite and chiolite	22,113	20,940	NA	NA.
Diamond: Gem, not set or strung value, thousands	$433	$196	--	Belgium-Luxembourg $55; Norway $43; Sweden $42.
Diatomite and other infusorial earth	67,880	71,948	--	West Germany 23,027; United Kingdom 16,221; Netherlands 14,571.
Feldspar, fluorspar, related materials:				
Feldspar	1	37	--	West Germany 24; France 13.
Fluorspar	--	24	--	Belgium-Luxembourg 13; Sweden 11.
Fertilizer materials:				
Crude, n.e.s	14	2	NA	NA.
Manufactured:				
Ammonia	655	570	--	Sweden 526; Cameroon 14; Greenland 8.
Nitrogenous	36	3,330	--	Sweden 2,259; West Germany 908; Netherlands 74.
Phosphatic	79,206	71,441	--	Sweden 292; Norway 127; undetermined 70,855.
Potassic	34	39	--	France 16; Libya 10; Sweden 10.
Unspecified and mixed	478,810	535,039	--	Netherlands 1,571; Sweden 646; undetermined 532,327.
Graphite, natural	9	(2)	--	Mainly to Thailand.
Gypsum and plaster	1,841	2,013	--	Sweden 1,521; West Germany 449; Norway 26.
Iodine	7	34	--	Sweden 26; Taiwan 4; Thailand 2.
Kyanite and related materials	157	13	--	West Germany 8.
Lime	14,536	10,367	--	Norway 6,060; Finland 2,765; Greenland 897.
Magnesium compounds: Oxides and hydroxides	39	12	--	Belgium-Luxembourg 5; Saudi Arabia 5; Sweden 1.
Mica: Crude including splittings and waste	(2)	1	--	All to United Kingdom.
Phosphates, crude	1,789	1,713	260	United Kingdom 1,396; Finland 19.
Pigments, mineral:				
Natural, crude	56	33	--	Turkey 27; Indonesia 5.
Iron oxides and hydroxides, processed	295	212	10	Canada 50; Sweden 29; Iceland 26.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Precious and semiprecious stones other than diamond:				
Natural ----- value, thousands--	$62	$85	$2	Norway $33; Switzerland $9; Sweden $8.
Synthetic ----------do----	$7	$10	$1	Norway $4; Sweden $2; Iceland $1.
Pyrite, unroasted----------	--	20	--	All to Venezuela.
Salt and brine----------	232,515	236,945	11	Sweden 129,441; Norway 72,860; Finland 17,205.
Sodium compounds, n.e.s.: Carbonate, manufactured ----------	66	54	--	West Germany 20; Iceland 15; Greenland 13.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked -----	77,660	87,616	--	West Germany 87,461; Iceland 41; Sweden 35.
Worked----------	10,824	11,361	6	West Germany 8,232; Sweden 1,818; Norway 775.
Dolomite, chiefly refractory-grade --	204	139	--	Iceland 100; Sweden 8; Greenland 7.
Gravel and crushed rock --------	790,947	679,089	--	West Germany 661,261; Sweden 9,220; Netherlands 4,705.
Limestone other than dimension ---	147,044	126,741	--	West Germany 47,362; Norway 43,275; Sweden 28,053.
Quartz and quartzite----------	82	340	--	Sweden 117; France 88; West Germany 49.
Sand other than metal-bearing ----	202,264	212,798	84	Sweden 169,659; West Germany 18,303; Norway 15,600.
Sulfur:				
Elemental:				
Crude including native and byproduct ----------	3,368	3,242	--	West Germany 3,241; Norway 1.
Colloidal, precipitated, sublimed-	327	499	--	All to Belgium-Luxembourg.
Dioxide----------	1	2	NA	NA.
Sulfuric acid----------	6,828	14,163	--	Belgium-Luxembourg 11,409; Iceland 2,274; Norway 216.
Talc, steatite, soapstone, pyrophyllite --	90	81	--	Ecuador 37; Indonesia 5; Singapore 5.
Vermiculite, perlite, chlorite--------	92	40	--	All to Norway.
Other:				
Crude----------	817	694	4	West Germany 495; Greenland 78; Norway 33.
Slag and dross, not metal-bearing ---	133,825	139,097	--	Norway 103,592; West Germany 20,609; France 11,040.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural --------	78	548	--	Sweden 312; West Germany 179; Turkey 15.
Carbon:				
Carbon black ----------	32	15	--	Sweden 4; Saudi Arabia 2; United Kingdom 2.
Gas carbon ----------	NA	21	--	United Kingdom 16; Saudi Arabia 2; Yemen (Aden) 2.
Coal:				
Anthracite----------	2,594	16	--	Sweden 4; Hong Kong 2; United Kingdom 2.
Bituminous ----------	74,156	71,183	--	Sweden 54,748; West Germany 12,892; United Kingdom 3,236.
Briquets of anthracite and bituminous coal----------	2	5	--	All to Iceland.
Lignite including briquets --------	2	--		
Coke and semicoke----------	2,665	1,499	--	Sweden 990; West Germany 358; Norway 122.
Gas, natural: Gaseous million cubic feet--	5,628	18,018	--	West Germany 14,584; Sweden 3,434.
Peat including briquets and litter -----	4,028	6,741	--	Netherlands 5,428; United Kingdom 630; Norway 353.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum:				
Crude thousand 42-gallon barrels	6,150	7,977	--	Sweden 5,501; United Kingdom 1,936; Netherlands 540.
Refinery products:				
Liquefied petroleum gas do	265	342	--	Netherlands 132; United Kingdom 39; Sweden 34.
Gasoline do	4,517	5,452	--	Sweden 3,921; Netherlands 686; West Germany 264.
Mineral jelly and wax do	7	6	[2]	Sweden 4.
Kerosene and jet fuel do	546	868	--	West Germany 760; Sweden 59; Greenland 45.
Distillate fuel oil do	5,385	5,249	--	Sweden 4,075; Greenland 608; West Germany 413.
Lubricants do	178	141	1	Norway 97; Greenland 12; West Germany 8.
Residual fuel oil do	5,608	4,683	158	United Kingdom 2,908; Netherlands 388; West Germany 304.
Bitumen and other residues do	100	118	--	Finland 114; West Germany 1; Sweden 1.
Bituminous mixtures do	31	11	--	West Germany 4; Norway 2; Sweden 2.
Petroleum coke do	103	66	--	Sweden 25; United Kingdom 19; Ireland 14.

NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals: Alkali metals	263	249	--	West Germany 215; France 34.
Aluminum:				
Ore and concentrate	18	723	--	China 708; Netherlands 15.
Oxides and hydroxides	4,285	4,403	491	United Kingdom 2,867; West Germany 867.
Ash and residue containing aluminum	1,345	1,497	--	West Germany 1,175; Sweden 300; Norway 22.
Metal including alloys:				
Scrap	4,295	8,881	--	West Germany 4,794; Norway 1,242; United Kingdom 1,235.
Unwrought	29,776	28,391	12	Norway 14,461; West Germany 6,725; Netherlands 3,741.
Semimanufactures	68,999	66,587	173	West Germany 19,513; Norway 8,899; Sweden 8,807.
Antimony:				
Oxides	--	32	--	United Kingdom 24; Belgium-Luxembourg 8.
Metal including alloys, all forms	16	[2]	--	Mainly from West Germany.
Arsenic: Oxides and acids	75	80	--	Sweden 65; Belgium-Luxembourg 15.
Beryllium:				
Oxides and hydroxides	45	73	--	France 72; Norway 1.
Metal including alloys, all forms	1	[2]	[2]	
Bismuth: Metal including alloys, all forms	1	2	--	Mainly from West Germany.
Cadmium: Metal including alloys, all forms	3	3	--	Norway 2; West Germany 1.
Chromium:				
Ore and concentrate	1,463	1,323	--	Netherlands 1,299; Norway 24.
Oxides and hydroxides	186	183	[2]	West Germany 135; Italy 46.
Metal including alloys, all forms	[2]	1	--	All from West Germany.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Cobalt:				
Oxides and hydroxides	10	6	--	All from United Kingdom.
Metal including alloys, all forms	27	25	(2)	Belgium-Luxembourg 18; France 2; West Germany 2.
Copper:				
Ore and concentrate	--	23	--	All from West Germany.
Oxides and hydroxides	876	773	--	West Germany 451; Norway 166; Italy 114.
Sulfate	2,320	2,486	--	Belgium-Luxembourg 1,386; Italy 518; France 242.
Ash and residue containing copper	2,118	1,005	--	All from West Germany.
Metal including alloys:				
Scrap	5,147	4,482	1	Sweden 2,936; Ireland 569; West Germany 491.
Unwrought	1,776	2,002	(2)	Sweden 1,078; United Kingdom 719; West Germany 131.
Semimanufactures	37,447	37,164	40	West Germany 17,095; Sweden 7,574; Belgium-Luxembourg 3,137.
Germanium: Metal including alloys, all forms	(2)	(2)	--	Mainly from Belgium-Luxembourg.
Gold:				
Waste and sweepings value, thousands	$128	$164	--	Norway $77; Finland $71; Sweden $11.
Metal including alloys, unwrought and partly wrought, troy ounces	24,317	NA		
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	1,331	1,993	--	Sweden 1,617; United Kingdom 331; France 36.
Pyrite, roasted	20,348	19,710	--	All from Norway.
Metal:				
Scrap	131,536	47,649	--	United Kingdom 29,026; West Germany 11,890; Sweden 4,088.
Pig iron, cast iron, related materials	43,009	62,676	16	Algeria 22,593; Brazil 20,908; Norway 7,881.
Ferroalloys:				
Ferrochromium	234	115	--	Sweden 80; Turkey 22; United Kingdom 7.
Ferromanganese	2,708	2,023	--	Norway 1,267; West Germany 747; Sweden 8.
Ferromolybdenum	14	17	--	Sweden 12; United Kingdom 3; Austria 2.
Ferrosilicochromium	16	28	--	Sweden 25; West Germany 3.
Ferrosilicomanganese	3,540	4,002	--	Norway 3,739; West Germany 256; United Kingdom 7.
Ferrosilicon	3,140	2,774	--	Norway 1,752; West Germany 703; Sweden 318.
Silicon metal	553	853	--	Norway 509; France 222; West Germany 122.
Unspecified	1,155	971	4	Norway 607; West Germany 219; United Kingdom 88.
Steel, primary forms	108,693	218,643	(2)	West Germany 63,172; Belgium-Luxembourg 44,015; Finland 40,184.
Semimanufactures:				
Bars, rods, angles, shapes, sections	345,999	357,280	54	Sweden 86,330; West Germany 67,970; United Kingdom 45,259.
Universals, plates, sheets	751,870	717,213	59	Sweden 141,758; West Germany 133,513; Finland 74,130.
Hoop and strip	73,705	73,781	3	West Germany 35,053; Sweden 14,390; Austria 7,358.
Rails and accessories	9,907	9,414	--	France 5,454; West Germany 1,581; Belgium-Luxembourg 1,117.
Wire	35,155	37,737	17	West Germany 13,763; Belgium-Luxembourg 11,054; Sweden 5,825.
Tubes, pipes, fittings	236,498	282,487	32	West Germany 131,252; United Kingdom 25,626; Netherlands 21,792.
Castings and forgings, rough	3,472	5,413	(2)	West Germany 2,847; Norway 1,492; Belgium-Luxembourg 336.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides	282	355	1	West Germany 314; East Germany 23; United Kingdom 15.
Ash and residue containing lead	4,610	NA		
Metal including alloys:				
Scrap	5,864	994	--	West Germany 240; Sweden 223; Nigeria 162.
Unwrought	16,073	20,468	--	West Germany 8,332; Sweden 8,113; Belgium-Luxembourg 2,984.
Semimanufactures	3,945	4,249	1	West Germany 3,967; Sweden 140; France 57.
Lithium: Metal including alloys, all forms	1	2	--	All from West Germany.
Magnesium: Metal including alloys:				
Scrap	195	202	--	Sweden 199; Norway 3.
Unwrought	115	107	--	West Germany 106; Sweden 1.
Semimanufactures	88	111	22	Switzerland 46; Sweden 20.
Manganese:				
Ore and concentrate, metallurgical-grade	416	1,085	--	Sweden 515; Netherlands 495; Gabon 50.
Oxides	1,839	1,541	--	Belgium-Luxembourg 856; Greece 360; West Germany 133.
Metal including alloys, all forms	27	3	--	Sweden 2; Switzerland 1.
Mercury 76-pound flasks	348	464	--	Sweden 290; Turkey 87; Mexico 29.
Molybdenum:				
Oxides and hydroxides	11	1	--	All from West Germany.
Metal including alloys, all forms	2	1	--	Mainly from Belgium-Luxembourg.
Nickel:				
Matte and speiss	15	NA		
Oxides and hydroxides	3	1	--	All from West Germany.
Ash and residue containing nickel	465	NA		
Metal including alloys:				
Scrap	1	--		
Unwrought	349	145	--	Finland 61; Canada 29; West Germany 28.
Semimanufactures	173	194	7	West Germany 98; Norway 35; Finland 16.
Platinum-group metals:				
Waste and sweepings value, thousands	$16	NA		
Metals including alloys, unwrought and partly wrought do.	$5,689	$4,357	$50	Netherlands $1,550; Switzerland $1,179; West Germany $779.
Selenium, elemental	2	1	1	
Silver:				
Ore and concentrate value, thousands	$1	NA		
Waste and sweepings[3] do.	$911	$1,618	--	Sweden $782; Norway $522; Finland $286.
Metal including alloys, unwrought and partly wrought do.	$11,263	$10,267	$5	France $2,657; West Germany $2,650; Netherlands $1,562.
Tellurium, elemental and arsenic	12	NA		
Tin:				
Oxides	1	1	--	All from United Kingdom.
Ash and residue containing tin	2,630	39	--	Taiwan 18; Spain 12; United Kingdom 9.
Metal including alloys:				
Scrap	120	2	--	Norway 1; United Kingdom 1.
Unwrought	751	362	5	Belgium-Luxembourg 206; West Germany 64; Sweden 63.
Semimanufactures	43	259	(2)	Sweden 176; West Germany 52; United Kingdom 24.
Titanium:				
Oxides	8,211	8,281	182	Norway 2,802; United Kingdom 2,409; Finland 1,313.
Metal including alloys:				
Scrap	(2)	--		
Unwrought	1	(2)	(2)	
Semimanufactures	88	62	(2)	West Germany 37; Finland 10; Japan 9.
Tungsten: Metals including alloys:				
Scrap	1	8	--	Sweden 7; Norway 1.
Unwrought	1	1	--	All from West Germany.
Semimanufactures	9	10	--	Sweden 6; West Germany 1; United Kingdom 1.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Vanadium: Metal including alloys, all forms	5	--		
Zinc:				
Oxides	2,737	2,763	198	West Germany 1,810; France 391.
Blue powder	919	847	--	Norway 517; Belgium-Luxembourg 161; West Germany 119.
Ash and residue containing zinc	244	172	--	All from West Germany.
Metal including alloys:				
Scrap	248	52	--	Do.
Unwrought	13,287	14,574	--	Finland 7,031; Norway 5,690; Netherlands 711.
Semimanufactures	3,644	3,793	--	France 1,982; West Germany 1,319; Norway 77.
Zirconium:				
Ore and concentrate	226	236	--	West Germany 207; Austria 24.
Metal including alloys, all forms	10	(2)	--	Mainly from United Kingdom.
Other:				
Ores and concentrates	142	98	--	Sweden 60; Netherlands 24; Italy 11.
Oxides and hydroxides	66	6	--	Netherlands 3; West Germany 1; Spain 1.
Ashes and residues	670	97	--	Sweden 87; West Germany 6; Norway 4.
Base metals including alloys, all forms	2	1	1	
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	8,314	10,331	5	Iceland 9,625; Netherlands 352; Italy 117.
Artificial:				
Corundum	665	374	--	West Germany 368; France 6.
Silicon carbide	918	969	--	West Germany 594; Norway 368; France 5.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$354	$368	$43	Switzerland $276; Ireland $45.
Grinding and polishing wheels and stones	1,087	1,205	4	West Germany 365; Austria 338; Sweden 111.
Asbestos, crude	13,536	10,362	2	Canada 7,762; Cyprus 2,000; Greece 496.
Barite and witherite	11,097	1,914	--	Netherlands 910; West Germany 572; United Kingdom 356.
Boron materials:				
Crude natural borates	4,085	4,704	3,646	West Germany 496; Belgium-Luxembourg 358.
Oxides and acids	411	433	--	Italy 174; France 122; United Kingdom 114.
Bromine	74	130	--	Israel 73; United Kingdom 34; Netherlands 23.
Cement	41,977	63,382	23	Poland 30,620; West Germany 19,047; East Germany 7,539.
Chalk	13,405	15,246	(2)	West Germany 6,814; France 3,632; Austria 2,898.
Clays, crude:				
Bentonite	3,234	2,669	35	West Germany 1,252; Italy 778; France 199.
Chamotte earth	947	4,558	--	France 4,344; West Germany 184; Netherlands 28.
Kaolin	38,167	36,182	25	United Kingdom 31,849; Czechoslovakia 1,294; West Germany 1,267.
Unspecified	5,872	7,555	339	West Germany 5,709; Netherlands 870; United Kingdom 541.
Cryolite and chiolite	67,205	111,530	--	All from Greenland.
Diamond:				
Gem, not set or strung value, thousands	$2,124	$2,459	$1	Belgium-Luxembourg $1,131; Sweden $558; Switzerland $268.
Industrial stones do	$21	$39	--	Belgium-Luxembourg $33; Netherlands $3; West Germany $2.
Diatomite and other infusorial earth	6,054	5,536	1,233	Iceland 2,826; France 735.
Feldspar, fluorspar, related materials:				
Feldspar	5,678	6,558	--	Norway 5,853; Sweden 571; West Germany 111.
Fluorspar	586	499	--	Spain 383; East Germany 64; France 44.
Unspecified	45	56	--	West Germany 54; Netherlands 2.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Fertilizer materials:				
Crude, n.e.s	428	514	--	West Germany 421; Sweden 92.
Manufactured:				
Ammonia	419,992	354,938	15,750	West Germany 180,723; U.S.S.R. 52,172; Trinidad and Tobago 41,802.
Nitrogenous	159,246	176,780	--	Norway 38,996; West Germany 37,688; Yugoslavia 30,494.
Phosphatic	4,505	4,815	--	Morocco 2,170; Republic of South Africa 1,163; Tunisia 1,042.
Potassic	288,013	288,541	1	West Germany 165,312; East Germany 56,786; Canada 33,166.
Unspecified and mixed	740,457	621,729	30,596	Norway 317,194; Romania 60,923; West Germany 52,565.
Graphite, natural	1,414	1,316	52	West Germany 1,222; Switzerland 16.
Gypsum and plaster	208,130	158,825	26	Spain 150,178; West Germany 8,534; United Kingdom 32.
Iodine	4	4	--	West Germany 2; Japan 1; Switzerland 1.
Kyanite and related materials	415	641	69	West Germany 320; Netherlands 252.
Lime	23,081	19,908	--	West Germany 14,348; Sweden 5,389; Switzerland 168.
Magnesium compounds:				
Magnesite	24	--		
Oxides and hydroxides	11,374	10,121	121	Austria 3,155; Spain 1,899; China 1,688.
Other	70,960	78,963	--	East Germany 57,175; West Germany 19,572; Norway 2,216.
Mica:				
Crude including splittings and waste	254	273	--	United Kingdom 85; Norway 63; Canada 51.
Worked including agglomerated splittings	57	61	--	Belgium-Luxembourg 50; Austria 3; West Germany 2.
Phosphates, crude	315,995	328,663	--	Morocco 187,941; Republic of South Africa 101,105; U.S.S.R. 39,000.
Pigments, mineral:				
Natural, crude	225	475	4	Turkey 326; Cyprus 144.
Iron oxides and hydroxides, processed	5,632	4,850	22	West Germany 3,977; Spain 439; Italy 197.
Potassium salts, crude	--	3,350	--	All from West Germany.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$737	$1,106	$86	West Germany $364; Sweden $312.
Synthetic do.	$76	$185	$55	Ireland $57; Switzerland $34.
Pyrite, unroasted	74	80	--	West Germany 32; Norway 28; Sweden 20.
Salt and brine	217,428	304,656	41	West Germany 107,661; East Germany 80,234; U.S.S.R. 59,148.
Sodium compounds, n.e.s.: Carbonate, manufactured	48,688	50,369	--	West Germany 23,766; Netherlands 16,435; East Germany 9,770.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	269,429	429,616	--	Sweden 277,710; Norway 138,161; West Germany 11,403.
Worked	39,512	43,396	--	Portugal 16,086; Sweden 12,210; Italy 6,186.
Dolomite, chiefly refractory-grade	25,012	35,234	--	Norway 19,296; Sweden 8,086; West Germany 4,547.
Gravel and crushed rock	835,579	909,212	5	Sweden 671,351; Norway 223,793; West Germany 10,069.
Limestone other than dimension	179,173	185,997	--	Sweden 99,035; United Kingdom 85,969; Norway 606.
Quartz and quartzite	19,573	30,433	8	Sweden 29,281; Norway 704; West Germany 355.
Sand other than metal-bearing	91,772	101,345	2	Sweden 43,843; Belgium-Luxembourg 37,797; Norway 12,542.
Sulfur:				
Elemental:				
Crude including native and byproduct	63,460	72,939	1	West Germany 71,721; Belgium-Luxembourg 910; Poland 300.
Colloidal, precipitated, sublimed	76	122	--	West Germany 121; United Kingdom 1.
Dioxide	2,167	1,165	--	West Germany 656; Sweden 316; Norway 180.
Sulfuric acid	5,743	12,226	--	West Germany 6,140; Norway 5,469; East Germany 591.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Talc, steatite, soapstone, pyrophyllite	9,612	9,971	437	Finland 3,407; Norway 3,402; Austria 1,318.
Vermiculite, perlite, chlorite	3,975	5,697	1	Republic of South Africa 2,672; Greece 2,035; Turkey 897.
Other:				
Crude	11,127	12,892	1,732	Norway 5,723; West Germany 1,377.
Slag and dross, not metal-bearing	27,337	30,282	--	Norway 10,532; West Germany 6,781; Sweden 5,997.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	5,894	5,971	276	Netherlands 5,213; West Germany 294.
Carbon:				
Carbon black	4,730	4,702	70	Sweden 2,322; West Germany 988; Netherlands 978.
Gas carbon	--	400	--	West Germany 235; East Germany 135; United Kingdom 18.
Coal:				
Anthracite and bituminous thousand tons	10	6	(2)	West Germany 3; Spain 2.
Bituminous do	9,797	12,706	5	Poland 151; United Kingdom 8; undetermined 12,537.
Briquets of anthracite and bituminous coal do	(2)	1	--	Mainly from Poland.
Lignite including briquets do	39	46	--	East Germany 33; West Germany 12.
Coke and semicoke do	63	77	4	France 25; West Germany 16; Belgium-Luxembourg 12.
Gas, natural million cubic feet	1,787	1	(2)	Mainly from West Germany.
Peat including briquets and litter	22,929	24,653	--	Sweden 10,189; U.S.S.R. 6,358; West Germany 5,233.
Petroleum:				
Crude thousand 42-gallon barrels	38,673	34,700	--	United Kingdom 17,088; Kuwait 10,353; U.S.S.R. 3,359.
Refinery products:				
Liquefied petroleum gas do	1,338	1,304	--	United Kingdom 729; Norway 252; Sweden 159.
Gasoline do	6,021	6,318	1	Sweden 3,324; Finland 1,476; Netherlands 472.
Mineral jelly and wax do	92	85	1	West Germany 55; China 5; United Kingdom 5.
Kerosene and jet fuel do	6,043	5,987	--	Netherlands 2,526; Norway 861; Sweden 348.
Distillate fuel oil do	17,842	21,095	(2)	Sweden 7,361; Norway 3,771; Finland 2,591.
Lubricants do	1,468	1,267	6	U.S.S.R. 508; West Germany 298; Netherlands 171.
Residual fuel oil do	8,764	10,080	11	Sweden 3,428; East Germany 1,931; U.S.S.R. 1,253.
Bitumen and other residues do	1,168	1,251	(2)	Sweden 596; West Germany 386; Netherlands 133.
Bituminous mixtures do	26	13	(2)	West Germany 5; Sweden 3; United Kingdom 2.
Petroleum coke do	1,834	1,743	NA	NA.

NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.
[3]May include other precious metals.

COMMODITY REVIEW

Metals.—Danish Steel Works Ltd., Denmark's only steel producer, based largely on scrap, improved steel quality and costs by bringing a ladle furnace into production. Rolled products included heavy plate and sections for shipbuilding, manufacturing, and construction. Although production costs per ton decreased 18%, the company operated at a loss because product prices had not increased since 1984.

Industrial Minerals.—*Cryolite.*—Construction of the new factory, proposed by Kryolitselskabet Öresund A/S for recovering cryolite from used aluminum pot liners

and other sources, was delayed pending government approval. Increased production of raw cryolite from the cleanup of the closed quarry in Greenland allowed production of beneficiated cryolite by Kryolitselskabet at Denmark's sole cryolite plant at Strandboulevardin for another 3 years. Kryolitselskabet remained Denmark's sole producer of cryolite.

Fertilizer Materials.—Plans by Superfos A/S to construct a potassium sulfate plant based on phosphogypsum as feed material were shelved. Superfos closed its phosphoric acid plant at Fredericia in April because of the continuing weak international market for fertilizers and because of environmental danger caused by cadmium in the phosphate rock raw material.

Mineral Fuels.—Denmark's total energy supply was derived mostly from domestic and imported oil and gas, 58%, and imported coal, 40%; the balance was supplied by indigenous recoverable resources including trash incineration, 40%; wood, 25%; straw, 25%; and wind, 10%. More than one-half of Denmark's oil and gas supply was from the Danish North Sea, and this source supplied nearly one-third of total energy consumption. The total energy use breakdown was heating, 30%; commercial processes including agriculture, 28%; transportation, 20%; and electrical appliances, 19%.

Coal.—Parliament in May banned all importation of South African coal, including coal from Namibia, and industry was given 6 months to secure alternate sources. Coal imports from the Republic of South Africa were completely phased out by yearend. The United States was the fourth largest source of Danish coal, after Poland, Colombia, and Australia.

Natural Gas.—Denmark's output of gas from the North Sea, mostly from the Tyra Field, nearly doubled to approximately 70 billion cubic feet. Of this, about 20% was exported. About two-thirds of the exports went to the Federal Republic of Germany and the balance to Sweden. Sweden contracted to import another 7 billion cubic feet per year, increasing the total contracted by Denmark for export to about 21 billion cubic feet per year for nearly 20 years. The contract with the Federal Republic of Germany remained at about 13 billion cubic feet per year for nearly 20 years, near the actual 1986 delivery rate. Proven gas reserves in the North Sea, including the Lulu structure, were sufficient for 50 years at a projected average annual production rate of about 90 billion cubic feet. Projected production increases were limited because domestic demand appeared to be fairly saturated and no further foreign marketing contracts were in sight except for a Swedish option to procure additional minor amounts of gas. A 22-mile gas pipeline was constructed from the Dan Field to the Tyra Field so that Dan byproduct gas could enter the main gas pipeline to Denmark. Development of the Roar Field was postponed in view of the reduced projected market.

Petroleum.—Production of crude petroleum increased 25% to about 28 million barrels, mainly as a result of the startup of the smaller Rolf Field. Expected total investment there was about $70 million, and annual production was to be 2.5 million barrels. The main thrust of North Sea petroleum development was Dan F, an extension of the Dan Field, with production expected to begin in 1987, rising to 7 million barrels per year after a total investment of approximately $500 million.

Nine exploration licenses were granted in the second licensing round in June. Four groups were recipients; included in the various groups were 19 companies, 3 of them from the United States, and the Danish Government's Dansk Olie og Naturgas A/S (DONG). For the first time, an area in the Baltic Sea was included, comprising a 400-square-mile area near Bornholm Island. Six of the nine licenses were awarded to three groups in a 900-square-mile area of the North Sea: One headed by Norway's Norsk Hydro A/S; Norway's Det Norske Stats Oljeselskap A/S (Statoil), which received three licenses; and Italy's Agip Danmark Olie og Gasefterforskning A/S, which received one. In the Bornholm Island area, a group headed by the U.S.-owned Amoco Denmark Exploration Co. received one license and another group headed by Norsk Hydro received two licenses. Two U.S. companies held heavy investments in all four of Norsk Hydro's activities: Texas Eastern Denmark A/S held 19.5% and Amerada Hess Denmark A/S held 9.8% in both the North Sea and the Baltic Sea. Exploration and appraisal during 1986 was largely disappointing.

GREENLAND

Operation of the Greenex A/S Black Angel lead-zinc-silver mine was ensured until yearend 1987 as a result of procurement of a controlling interest in the debt-laden operation by a Swedish firm supported by new financial grants from and commitments by the Governments of Denmark and Greenland. Exploration near the mine indicated a possibility of opening a second mine with sufficient reserves to ensure lead-zinc mining for an additional 5 to 8 years.

Exploration for oil ceased when the Atlantic Richfield Co. halted search activities in Jameson Land near the east coast of Greenland, apparently because of low oil prices and high local taxes.

Table 4.—Greenland: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
Cryolite, crude ore[2]	43,900	46,500	67,200	111,500	70,343
Lead: Concentrate, Pb content	26,500	r21,600	r17,800	17,800	16,500
Silver: In lead concentrate, Ag content[e] thousand troy ounces	r405	r492	r334	r e300	385
Zinc: Concentrate, Zn content	80,000	r79,200	71,300	70,300	62,100

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through May 29, 1987.
[2]Shipments.

Table 5.—Greenland: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
Aluminum: Metal including alloys, scrap	1	1	--	All to Denmark.
Copper: Metal including alloys, scrap	26	39	--	Do.
Cryolite and chiolite	67,205	19,000	NA	NA.
Iron and steel:				
Metal, scrap	24	18	--	Do.
Semimanufactures, tubes, pipes, fittings	--	3	--	Do.
Lead: Ore and concentrate	29,376	26,313	--	France 16,019; West Germany 7,363; Belgium-Luxembourg 2,930.
Stone, sand and gravel: Dimension stone:				
Crude and partly worked	--	22	--	All to Denmark.
Worked	2	1	--	Do.
Petroleum refinery products:				
Gasoline, 42-gallon barrels	--	1,224	NA	NA.
Kerosene and jet fuel, do.	--	43,323	NA	NA.
Zinc: Ore and concentrate	133,759	121,621	--	West Germany 44,027; France 27,806; Belgium-Luxembourg 23,913.

NA Not available.
[1]Table prepared by Jozef Plachy.

Table 6.—Greenland: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, semimanufactures	95	62	(2)	Denmark 44; West Germany 13; Switzerland 2.
Columbium and tantalum: Metal including alloys, all forms: Tantalum	(2)	--		
Copper: Metal including alloys:				
Unwrought	--	(2)	--	All from Sweden.
Semimanufactures	75	91	(2)	Denmark 78; West Germany 11; Sweden 2.

See footnotes at end of table.

Table 6.—Greenland: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel: Metal:				
Scrap	7	--	--	All from Denmark.
Pig iron, cast iron, related materials	(2)	2	--	Denmark 1; Yugoslavia 1.
Steel, primary forms	1	--		
Semimanufactures:				
Bars, rods, angles, shapes, sections	2,697	2,896	--	Denmark 2,374; Belgium-Luxembourg 290; Sweden 136.
Universals, plates, sheets	474	557	--	Denmark 474; Norway 29; Sweden 23.
Hoop and strip	12	10	--	Denmark 8; Sweden 2.
Rails and accessories	45	15	--	Canada 10; Denmark 5.
Wire	15	17	--	Denmark 14; Sweden 1; United Kingdom 1.
Tubes, pipes, fittings	1,148	1,332	3	Denmark 995; Sweden 212; West Germany 106.
Castings and forgings, rough	520	333	--	Italy 204; Denmark 129.
Lead: Metal including alloys:				
Unwrought	1	4	--	All from Denmark.
Semimanufactures	2	2	--	Do.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$62	$13	--	Canada $6; United Kingdom $4; Republic of South Africa $2.
Silver: Metal including alloys, unwrought and partly wrought do	$21	$12	--	Denmark $4; Switzerland $3; United Kingdom $3.
Zinc: Metal including alloys, all forms:				
Semimanufactures	16	28	1	Denmark 27.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1	--		
Grinding and polishing wheels and stones	2	3	--	Denmark 2.
Cement	(3)	9,760	--	Denmark 9,734; Norway 26.
Clays, crude	19	25	3	Denmark 19; United Kingdom 2.
Diamond:				
Gem, not set or strung value, thousands	$20	$7	--	All from Belgium-Luxembourg.
Industrial stones do	$1	--		
Diatomite and other infusorial earth	3	2	--	All from Denmark.
Fertilizer materials: Manufactured:				
Ammonia	5	8	--	Denmark 6; Norway 2.
Nitrogenous	1,023	1,136	--	Sweden 746; Norway 374; Denmark 16.
Phosphatic	6	15	--	All from Denmark.
Unspecified and mixed	216	272	--	Denmark 271; Sweden 1.
Gypsum and plaster	r8	2	--	All from Denmark.
Lime	1,026	897	--	Do.
Precious and semiprecious stones other than diamond: Natural value, thousands	$2	$1	--	All from Brazil.
Salt and brine	3,770	4,678	--	Denmark 4,354; West Germany 224; Spain 99.
Sodium compounds, n.e.s.: Carbonate, manufactured	11	13	--	Denmark 9; West Germany 4.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1	10	--	Denmark 9; Italy 1.
Worked	20	109	--	Denmark 107; Portugal 2.
Dolomite, chiefly refractory-grade	1	7	--	Denmark 5; West Germany 2.
Gravel and crushed rock	14	22	--	All from Denmark.
Quartz and quartzite	--	45	--	Do.
Sand other than metal-bearing	330	507	--	Denmark 502; Switzerland 4.
Sulfur: Elemental: Sulfuric acid	33	18	--	Denmark 14; United Kingdom 3.
Talc, steatite, soapstone, pyrophyllite	--	1	--	All from Denmark.
Other:				
Crude	60	78	--	Denmark 62; Sweden 16.
Slag and dross, not metal-bearing	20	10	--	All from Denmark.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1	18	--	Do.
Coal: Anthracite and bituminous	818	296	--	Poland 295; Denmark 1.
Peat including briquets and litter	2	1	--	All from Denmark.

See footnotes at end of table.

Table 6.—Greenland: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	1	1	--	Mainly from Denmark.
Gasoline ---do---	62	51	--	Denmark 50.
Mineral jelly and wax ---do---	(2)	(2)	NA	NA.
Kerosene and jet fuel ---do---	139	70	--	Denmark 45; Sweden 25.
Distillate fuel oil ---do---	1,172	1,160	--	Denmark 606; Sweden 302; Norway 250.
Lubricants ---do---	11	12	(2)	Denmark 10; United Kingdom 1.
Bitumen and other residues ---do---	1	1	--	All from Denmark.
Bituminous mixtures ---do---	1	1	--	Mainly from Denmark.

[r]Revised. NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.
[3]1984 imports were valued at $754,000.

COMMODITY REVIEW

Metals.—Boliden AB in July obtained a controlling 65% interest in the Black Angel Mine, Greenland's largest private enterprise. Boliden paid immediately $3 million to Vestgron Mines Ltd., the former owner of Greenex, the mine operator, and assumed Vestgron's $4 million debt to Canada's Cominco Ltd., the former majority owner of Vestgron. Vestgron was then no longer involved in the mine except to receive certain funds, provided previously mined concentrates were sold at above an agreed price. Boliden and the Governments of Denmark and Greenland assumed responsibility for Greenex's debts totaling $10 million to Cominco and certain Danish-Greenlandic banks. A significant immediate payment was made on Cominco's loan and loans from two U.S. banks were paid in full. The Governments of Denmark and Greenland returned to Greenex $4.1 million in concessionary fees, thus guaranteeing operation of the mine through 1987, at which time all proven reserves were expected to be used up.

Exploratory drilling in the early fall in areas near the Black Angel Mine indicated the possibility of opening a second mine with sufficient reserves for possible operation until about the mid-1990's. A drift was started into the Deep Ice Zone, and a decision whether to open the mine was expected by yearend 1986. Further exploration drilling was being conducted in the Disko area 120 miles southwest of the Black Angel Mine.

Industrial Minerals.—Cryolite extraction resulting from cleaning out the depleted cryolite mine at Ivigtut produced more crude ore than anticipated. The final cryolite shipment and the mine closing were rescheduled for 1987. Analyses of drillings from explorations in the mine vicinity showed an absence of profitable ore, and it appeared that the end of cryolite mining in Greenland was imminent.

[1]Physical scientist, Division of International Minerals.
[2]Where necessary, values have been converted from Danish krone (DKr) to U.S. dollars at the rate of DKr8.09=US$1.00, the average for 1986.

The Mineral Industry of Egypt

By John R. Lewis[1]

Egypt's depressed economy declined further in 1986 as crude oil prices decreased worldwide. The petroleum sector contributed approximately one-fifth of Egypt's gross domestic product (GDP) and about 70% of its export earnings. Home remittances from about 3 million Egyptians working mainly in Middle Eastern countries, income from tourism, sales of cotton and textiles, and Suez Canal tolls were the country's other important sources of foreign exchange. Because of rapid growth in domestic demand for petroleum products, less of Egypt's crude oil could be exported, thus reducing earnings from that source. Although virtually self-sufficient in food in the mid-1970's, by 1986 more than one-half of Egypt's food was imported at a cost of $4 billion.[2] With the exception of the petroleum sector, mineral production continued to be small by international standards; only iron ore and phosphate rock were mined in important amounts during the year. U.S. direct investment in Egyptian projects was $1.5 billion, of which about $1.3 billion was in petroleum exploration; the balance was in manufacturing, banking, and other services.

Table 1.—Egypt: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum metal	141,000	140,194	166,000	208,587	175,000
Copper, refined, secondary	2,400	2,400	2,600	2,600	2,500
Iron and steel:					
Iron ore and concentrate thousand tons	2,140	2,223	1,901	1,950	[2]2,135
Pig iron do.	113	196	225	225	[2]121
Steel, crude do.	480	125	200	533	[2]281
Semimanufactures do.	900	378	500	500	NA
Ferroalloys: Ferrosilicon [e]	6,000	6,000	7,500	7,500	[2]7,221
INDUSTRIAL MINERALS					
Asbestos	424	245	325	229	[2]476
Barite	3,101	3,185	5,456	4,426	[2]3,385
Cement: Hydraulic thousand tons	4,260	5,500	6,500	5,749	[2]7,612
Clays:					
Bentonite	5,200	2,512	3,000	3,000	[2]5,126
Fire clay	975,263	205,000	250,000	250,000	364,300
Kaolin	49,787	100,176	120,000	108,378	[2]127,784
Feldspar, crude	8,436	5,945	7,281	19,073	19,287
Fluorspar	90	12	50	85	[2]80
Gypsum and anhydrite, crude	931,150	721,340	750,000	841,467	[2]905,688
Lime	94,000	93,660	97,500	97,000	--
Nitrogen: N content of ammonia thousand tons	639	905	686	647	NA
Phosphate: Phosphate rock do.	708	623	1,043	599	[2]1,271
Pigments, mineral, natural: Iron oxide	150	--	--	--	--
Salt, marine thousand tons	829	918	865	1,061	[2]976

See footnotes at end of table.

Table 1.—Egypt: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
INDUSTRIAL MINERALS —Continued					
Sodium compounds:					
Sodium carbonate	41,273	43,000	48,146	49,108	50,000
Sodium sulfate	3,000	1,950	2,000	2,000	1,758
Stone, sand and gravel:					
Basalt thousand cubic meters	90	NA	100	720	[2]899
Dolomite thousand tons	500	500	500	500	500
Granite, dimension cubic meters	4,765	NA	4,000	4,000	[2]2,938
Gravel thousand cubic meters	6,480	7,000	7,500	10,736	11,214
Limestone and other calcareous n.e.s do	7,037	9,276	10,000	12,059	[2]13,476
Marble blocks (including alabaster) cubic meters	19,380	16,400	17,500	43,312	40,000
Quartz	10,000	NA	7,500	7,500	NA
Sand including glass sand thousand cubic meters	6,874	166	1,500	12,677	13,122
Sandstone do	785	613	710	486	475
Sulfur:					
Elemental, byproduct	2,281	1,000	1,250	3,000	[2]5,000
Sulfuric acid	45,118	44,899	45,000	46,452	[2]55,000
Talc, steatite, soapstone, pyrophyllite	8,291	4,519	12,213	7,699	8,500
Vermiculite	280	300	325	488	[2]495
MINERAL FUELS AND RELATED MATERIALS					
Coke: Oven and beehive thousand tons	974	916	950	895	[2]908
Gas, natural:					
Gross production million cubic feet	114,074	120,000	140,000	172,000	180,000
Marketed do	78,000	95,000	110,000	134,000	155,000
Petroleum and refinery products:					
Crude thousand 42-gallon barrels	245,645	262,486	302,000	319,000	262,800
Refinery products:					
Gasoline and naphtha do	16,200	20,500	25,000	25,000	27,000
Kerosene and jet fuel do	14,100	18,500	20,000	20,000	20,000
Distillate fuel oil do	19,250	25,000	25,000	25,000	30,000
Residual fuel oil do	52,650	70,000	75,000	65,000	60,000
Lubricants do	650	1,000	1,000	1,000	1,000
Liquefied petroleum gas do	1,900	2,000	2,500	2,000	5,000
Asphalt do	1,900	2,200	2,500	2,500	2,000
Unspecified do	450	800	1,000	1,000	4,500
Refinery fuel and losses do	4,650	6,000	6,500	6,500	6,500
Total do	111,750	146,000	158,500	148,000	156,000

[e]Estimated. [p]Preliminary. NA Not available.
[1]Table includes data available through Oct. 1, 1987.
[2]Reported figure.

TRADE

When the price of oil dropped, Egypt's ability to buy from its trading partners also declined, and foreign exchange revenues were reduced. The Egyptian Cabinet decided to reduce imports by the public sector, particularly capital goods, and to allow the expansion of import activity by the private sector. The Government continued its efforts to improve the investment climate and export sales, while discouraging domestic consumption and controlling population growth.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Unwrought	1,506	--		
Semimanufactures	93,535	123,842	--	Netherlands 80,852; Belgium-Luxembourg 17,058; Iraq 11,791.
Iron and steel: Metal:				
Pig iron, cast iron, related materials	64,600	10,000	--	All to Bangladesh.
Steel, primary forms	13,211	--		
Semimanufactures:				
Bars, rods, angles, shapes, sections	4,807	498	--	All to Saudi Arabia.
Universals, plates, sheets	14,893	1,469	--	Jordan 799; Sudan 621.
Tubes, pipes, fittings	982	28	--	All to Sudan.
Manganese: Oxides	103	--		
Zinc: Metal including alloys:				
Unwrought	--	360	--	Spain 300; India 60.
Semimanufactures	--	400	--	All to Italy.
INDUSTRIAL MINERALS				
Cement	750	4,346	--	Sudan 3,845; Yemen (Aden) 500.
Chalk	2	--		
Clays, crude	360	--		
Fertilizer materials: Manufactured, nitrogenous	231,837	25,345	--	Burma 24,500.
Phosphates, crude	97	141,705	--	Romania 53,000; North Korea 21,250; Belgium-Luxembourg 15,900.
Salt and brine	9,539	9,551	--	Cameroon 6,000; Lebanon 3,500.
Sodium compounds, n.e.s.: Carbonate, manufactured	200	--		
Stone, sand and gravel: Gravel and crushed rock	800	--		
Sulfur: Elemental, crude including native and byproduct	--	745	--	All to Cyprus.
Talc, steatite, soapstone, pyrophyllite	522	665	--	East Germany 630; Iceland 35.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	200	4	--	All to Sudan.
Coal: Anthracite and bituminous	41	35	--	All to Saudi Arabia.
Coke and semicoke	4,911	31,422	--	Romania 17,850; Italy 9,230.
Petroleum:				
Crude- thousand 42-gallon barrels	53,616	75,665	535	Israel 17,212; Italy 16,311; Romania 15,381.
Refinery products:				
Gasoline ---do---	121	--		
Mineral jelly and wax ---do---	89	114	(2)	Mainly to West Germany.
Kerosene and jet fuel ---do---	4,033	5,969	--	Italy 2,329; France 2,277.
Distillate fuel oil ---do---	1,036	1,089	9	Bunkers 1,080.
Residual fuel oil ---do---	6,418	11,903	--	Italy 3,679; bunkers 6,500.
Petroleum coke ---do---	--	152	--	Romania 105; Italy 23.

[1]Table prepared by Virginia A. Woodson.
[2]Less than 1/2 unit.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	1,667	26,111	--	Australia 24,050; China 2,000.
Oxides and hydroxides	1,741	1,131	42	Brazil 357; West Germany 336; France 207.
Metal including alloys:				
Scrap	50	--		
Unwrought	--	2	--	All from Japan.
Semimanufactures	9,979	3,615	NA	West Germany 1,420; Italy 883; France 442.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Chromium: Oxides and hydroxides	6	55	--	All from United Kingdom.
Cobalt: Oxides and hydroxides	16	2	--	Mainly from United Kingdom.
Columbium and tantalum: Metal including alloys, all forms, tantalum	31	--		
Copper:				
Matte and speiss including cement copper	500	--		
Metal including alloys:				
Scrap	92	6	NA	NA.
Unwrought	1,505	--		
Semimanufactures	15,418	14,541	702	United Kingdom 4,697; France 2,369; Greece 1,372.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	450	18	--	All from United Kingdom.
Pyrite, roasted	--	850	--	All from Italy.
Metal:				
Scrap	1,133	2,197	500	Jordan 1,250.
Pig iron, cast iron, related materials	1,019	49,858	1	Greece 26,000; France 10,016; North Korea 4,600.
Ferroalloys:				
Ferromanganese	5,236	11,016	--	Switzerland 4,622; Japan 3,600; West Germany 2,620.
Unspecified	464	122	--	Poland 79; West Germany 43.
Steel, primary forms	16,398	66,311	2,850	Australia 18,748; Spain 16,096; Japan 10,997.
Semimanufactures:				
Bars, rods, angles, shapes, sections	1,309,463	2,045,135	48,792	Romania 511,979; Spain 377,769; Czechoslovakia 333,583.
Universals, plates, sheets	291,258	328,890	39,528	Italy 65,489; West Germany 42,578; Bulgaria 38,378.
Hoop and strip	1,846	23,864	--	France 11,016; West Germany 10,815.
Rails and accessories	49,427	29,071	--	Poland 20,265; Italy 3,734.
Wire	16,664	23,657	298	West Germany 6,207; Belgium-Luxembourg 3,032; France 2,846.
Tubes, pipes, fittings	133,691	84,259	3,814	Japan 14,119; France 12,498; West Germany 9,932.
Castings and forgings, rough	42,406	33,592	3,435	France 4,955; West Germany 4,778; United Kingdom 4,147.
Lead:				
Oxides	2,107	1,302	--	United Kingdom 537; France 509; East Germany 121.
Metal including alloys:				
Scrap	499	838	333	West Germany 300; Oman 104; Sudan 101.
Unwrought	11,859	16,096	--	United Kingdom 4,241; West Germany 3,061; Spain 2,946.
Semimanufactures value, thousands	$117	$3	--	All from Italy.
Magnesium: Metal including alloys:				
Scrap	12	--		
Unwrought	12	15	--	Yugoslavia 10; Norway 5.
Semimanufactures	--	18	--	All from United Kingdom.
Manganese: Oxides	1,183	2,080	993	West Germany 581; Belgium-Luxembourg 255.
Mercury 76-pound flasks	841	609	--	Spain 522; Netherlands 87.
Nickel:				
Matte and speiss	--	40	--	United Kingdom 21; Canada 11.
Metal including alloys, semimanufactures	54	20	--	Italy 9; France 4; West Germany 3.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, platinum value, thousands	$9	$190	--	All from United Kingdom.
Silver: Metal including alloys, unwrought and partly wrought do.	$28	$143	--	West Germany $137.
Tin: Metal including alloys:				
Scrap	283	--		
Unwrought	5	440	--	Malaysia 261; United Kingdom 112.
Semimanufactures	5	8	--	Japan 4; Netherlands 4.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Titanium: Oxides	1,733	60	--	France 52; Netherlands 5.
Tungsten: Metal including alloys, all forms	16	3	--	Netherlands 2.
Zinc:				
Oxides	381	1,385	--	United Kingdom 577; Belgium-Luxembourg 545; France 225.
Metal including alloys:				
Scrap	887	5	--	All from Netherlands.
Unwrought	8,925	10,730	256	France 3,309; Switzerland 2,451; Zaire 2,101.
Semimanufactures	440	4,935	--	Yugoslavia 2,702; Switzerland 1,002; Cameroon 1,000.
Other:				
Ores and concentrates	773	3,834	--	United Kingdom 2,741; West Germany 921.
Oxides and hydroxides	56	94	--	Yugoslavia 50; France 13.
Base metals including alloys, all forms	21	922	--	West Germany 363; Belgium-Luxembourg 360.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	103	10	5	Italy 5.
Artificial: Corundum	--	80	69	Switzerland 11.
Grinding and polishing wheels and stones	2,194	1,406	NA	Italy 995; West Germany 184.
Asbestos, crude	15,258	13,090	61	Canada 7,055; Cyprus 1,485; Switzerland 1,287.
Barite and witherite	50	268	--	Turkey 203; France 49.
Boron materials: Oxides and acids	114	309	--	Turkey 150; United Kingdom 150.
Cement thousand tons	7,769	8,804	32	Greece 2,586; Spain 1,602; Romania 1,340.
Chalk	213	84	--	Austria 61; West Germany 23.
Clays, crude	27,928	51,540	374	United Kingdom 16,401; Cyprus 2,373; unspecified 24,971.
Cryolite and chiolite	--	52	--	All from West Germany.
Diamond: Industrial stones		--		
value, thousands	$11			
Diatomite and other infusorial earth	146	72	18	West Germany 53.
Feldspar, fluorspar, related materials	2,648	990	--	Italy 531; Norway 210; Sweden 192.
Fertilizer materials:				
Crude, n.e.s	--	36	--	All from United Kingdom.
Manufactured:				
Ammonia	60	12	--	France 8; United Kingdom 3.
Nitrogenous	107,200	552,803	24,115	Romania 154,839; U.S.S.R. 129,175; France 100,150.
Phosphatic	92,872	--		
Potassic	73,219	29,046	--	Switzerland 12,060; Italy 8,442; Belgium-Luxembourg 8,040.
Unspecified and mixed	--	2,106	371	West Germany 1,209; Switzerland 280.
Graphite, natural	921	518	--	China 264; Italy 247.
Lime	9,122	50	--	All from West Germany.
Magnesite, crude	2,424	9,210	--	North Korea 4,990; Japan 3,807.
Mica:				
Crude including splittings and waste	80	258	--	West Germany 202; India 53.
Worked including agglomerated splittings	41	97	--	India 95.
Phosphates, crude	--	54	--	All from West Germany.
Pigments, mineral: Iron oxides and hydroxides, processed	3,276	4,984	--	West Germany 1,584; China 1,071; Italy 538.
Pyrite, unroasted	8	16,100	--	Iraq 10,000; Italy 6,100.
Salt and brine	216	1,037	--	Netherlands 613; Finland 206.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	2,296	5,231	--	Romania 3,030; Poland 2,004.
Sulfate, manufactured	83,590	60,110	--	Romania 33,199; Italy 9,944; West Germany 8,736.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	25,492	26,441	--	Italy 19,001; Spain 1,162.
Worked	3,419	5,290	51	Italy 4,356; France 666.
Dolomite, chiefly refractory-grade	389	6	--	All from West Germany.
Gravel and crushed rock	754	712	--	Italy 430; France 165.
Quartz and quartzite	--	67	--	Sweden 51; Belgium-Luxembourg 15.
Sand other than metal-bearing	1,869	3,442	--	Belgium-Luxembourg 2,943; West Germany 154.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Sulfur:				
Elemental:				
Crude including native and by-product	195,110	127,132	31,252	Iraq 78,031; Poland 17,673.
Colloidal, precipitated, sublimed	142	26,131	--	Iraq 25,983.
Sulfuric acid	44	52	1	West Germany 23; France 14; Italy 10.
Talc, steatite, soapstone, pyrophyllite	1,247	1,027	--	Norway 636; West Germany 259.
Other: Crude	16,017	532	NA	Cyprus 292; India 122; West Germany 51.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	33	43	--	All from Italy.
Carbon black	4,487	4,237	86	Belgium-Luxembourg 2,013; West Germany 1,548.
Coal: Anthracite and bituminous	987,352	1,266,273	521,258	U.S.S.R. 441,784; Australia 302,846.
Coke and semicoke	6,278	5,000	--	All from Italy.
Peat including briquets and litter	1,981	1,822	--	Ireland 1,068; Netherlands 383.
Petroleum:				
Crude thousand 42-gallon barrels	2,085	--		
Refinery products:				
Liquefied petroleum gas do	1,532	1,781	--	Greece 967; Italy 653.
Gasoline do	27	(2)	--	Mainly from United Kingdom.
Mineral jelly and wax do	24	48	(2)	West Germany 14; Hungary 9; United Kingdom 3.
Kerosene and jet fuel do	162	500	(2)	Italy 247; Kuwait 78; Israel 59.
Distillate fuel oil do	7,262	5,777	190	Kuwait 2,563; Italy 1,143; Bulgaria 457.
Lubricants do	449	384	10	United Kingdom 117; Greece 94; Netherlands 61.

NA Not avaialble.
[1]Table prepared by Virginia A. Woodson.
[2]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Gold.—In March, Minex Minerals (Egypt) Ltd., a subsidiary of Greenwich Resources PLC of the United Kingdom, received Government approval to explore for gold at Barramiya and El Sid in the Red Sea hills. Under the agreement, Minex would provide a minimum of $1 million for exploration during a 2-year period, and, if warranted, a capital investment of up to $15 million. Also, mining profits would be split 48% to Minex and 52% to the Government, after recovery of Minex's development costs. Greenwich Resources expected production of about 300 tons of high-grade ore per day to start toward yearend 1986.

Iron Ore.—During recent years, the Middle Eocene sedimentary iron ore deposits at El Gedida, located about 225 miles southwest of Cairo, have been open pit mined at a rate of 2 million tons of ore per year grading 52% iron. El Gedida was operated by the Egyptian Iron and Steel Co. for use at the company's steel mill at Helwan, a Cairo suburb. Plans to double the output were realized when new 75-ton Euclid dump trucks began removing overburden and carrying ore to the railroad loading point for the 200-mile journey to the steel mill. A new 10-cubic-meter Poclain 1000 CKE hydraulic shovel, the first to be used in Egypt, replaced a Soviet electric excavator of about one-half the capacity.

Iron and Steel.—Egypt's largest private sector project, the Alexandria National Iron & Steel Co.'s (ANSDK) $836 million integrated steel mill was commissioned and began partial operation on May 3, 1986. The plant and infrastructure, under development since 1980 by Japan's Nippon Kokan K.K., Kajima Corp., and others, were at El Dikheila, about 10 miles west of the port city of Alexandria. At the outset, not all of the plant's components were in operation, but ANSDK expected all units to be in full operation by 1988 and producing 840,000 tons of raw steel per year for domestic consumption. The project consisted of a 600-Series Midrex, direct-reduced-iron (DRI)

plant; four electric furnaces; and three continuous casters that would process billets and bars for rerolling into 745,000 tons of rebars and rods per year for the domestic housing and construction industry.

Natural gas for the DRI plant came from the nearby offshore Abu Qir Gasfield. Iron ore pellets were supplied under a contract with Utah International Inc. of the United States directly to ANSDK's quay. A mix of 75% direct-reduced sponge iron and 25% scrap from domestic sources would be used at first, but later a certain amount would be imported. A new seaport was nearing completion at yearend 1986 that would be capable of handling a variety of cargo ships delivering scrap, coal, and iron ore. Electricity for the four 70-ton electric arc furnaces in the melting shop was supplied by the French-built, gas-fired electric powerplant at Abu Qir.

The estimated project cost would exceed $800 million; $685 million would be from loan agencies, banks, and Japanese participating capital, and the balance would be from loans from the involved contracting companies.

Even as the DRI plant was starting up in the fall of 1986, ANSDK was considering plans to expand production to 1.09 million tons per year of raw steel by adding two 70-ton electric arc furnaces. El Dikheila was 90% owned by Egyptian investors, and the remainder was owned by Japanese investors. Meanwhile, the Egyptian Iron and Steel plant at Helwan was being studied for upgrading and modernization. Six European firms bid on the installation of a slab-casting machine that would eliminate the reheating of steel ingots for slab production.

Manganese.—The Government was actively promoting the economic development of the Sinai Peninsula since the Arab-Israeli conflict of June 1967. One project was of the rehabilitation of the Abu Zenima manganese mines and ferromanganese smelter. Work began about 1982 and was completed by 1986 by the Sinai Manganese Co. of Egypt with Government funds. The mine was reported to contain between 1 and 2 million tons of manganese-iron ore containing 22% to 38% manganese and 15% to 36% iron. Output was to be 60,000 to 70,000 tons of ore per year, which would be used to produce 14,000 to 19,000 tons of ferromanganese alloy per year. By 1986, Sinai Manganese had the Abu Zenima Mine in operation, but the ferromanganese smelting plant, stripped of most of its equipment during Israel's occupation of the Sinai, was just beginning to be reconstructed. Although the planned scale of production was not disclosed, a 17-megavolt-ampere (MV•A) furnace would be used rather than the originally specified 13.5-MV•A furnace. New equipment would be required for 80% of the plant. Brown Boverie & Cie. AG was awarded a $6 million contract in the fourth quarter of 1985 to work on the 21-megawatt gas turbine powerplant for the smelter, while Elkem Engineering would reconstruct the metal plant.

The mine's production was being sold to other ferromanganese producers until the Abu Zenima smelter was complete. Output of the Abu Zenima complex would eventually go to Egypt's two active steel mills at Helwan and Alexandria.

INDUSTRIAL MINERALS

Cement.—The decline in cement production to 5.7 million tons in 1985 from 6.5 million tons in 1984 was dramatically reversed to 7.6 million tons in 1986. Industry's goal was 10.2 million tons of cement by 1987 to significantly reduce imports. In 1986, imports were 9.2 million tons, about 60% of Egypt's annual cement consumption of about 16.8 million tons.

The Government entity owning public-sector cement plants was the Building Materials Organization (BMO). BMO was planning to acquire an experienced cement plant operator to oversee operation management and maintenance of BMO's plants. Two French, two Japanese, and a Spanish company met the prequalification requirements.

Six cement plants were under construction in Egypt. Alexandria Portland Cement Co. was adding two 3,300-ton-per-day kilns. Contractors were Polysius S.A. of France with Brown Boverie of Belgium. One kiln was to be started up in 1987; the other, in 1988. At Tourah, the Tourah Portland Cement Co. completed modernization of its plant in December and was expected to start its new No. 9 kiln during 1987. The contractor was France's Fives-Cail Babcock S.A.; technical assistance was provided by the Société des Ciments Français. Helwan Portland Cement Co. at Assiut was adding two new 3,700-ton-per-day production lines due for commissioning in 1988. The contractor was Uzinexportimport of Romania. The Suez Cement Co. was extending its Suez II plant, where a 15-foot-diameter, 240-foot-long, Fuller-designed flash calciner kiln was

being supplied by Korea Heavy Industries Construction Co. Ltd., which was also responsible for blending systems, dust collectors, and conveying systems. No startup date was available. At National Cement Co.'s El Tabbin plant, a new 5,000-ton-per-day kiln line was due to go into service in 1987. The new kiln was 200 feet long and about 12 feet in diameter. A bypass was provided to recover up to 100% of the kiln's sulfur- and chlorine-rich waste gases. Electrostatic precipitators preceeded by spray towers would de-dust the gas.

Clays (Kaolin).—Discovery of a deposit of good-quality kaolin was announced early in 1986 by the Egyptian Geological Survey and Mining Authority (EGSMA) and the Sinai Co. for Manganese, after 3 years of cooperative exploration. Situated in the El Teh Plateau, the deposit was estimated to have 100 million tons of kaolin. Described as 8- to 20-foot-thick layers of pure kaolin containing 32% to 36% ammonia, the deposit was in an area of 45 square kilometers. EGSMA stated that the ammonia could be used by Egypt's aluminum industry and in the production of water-purifying alum, most of which was currently being imported.

Fertilizer Materials.—Plans were under study for modernization of the Kima fertilizer works in Aswan, which would be converted from electricity to natural gas to greatly reduce costs. Fertilizers were subsidized by the Government, and energy reduction would decrease the total cost of the Government subsidy program.

All of Egypt's growing reserves of natural gas were consumed domestically. One such use, to make a value-added product that could also be used locally, was for ammonia production for nitrogenous fertilizer. At Suez, construction of a gas-fueled ammonia plant to produce 400 tons per day was about to commence. Société el Nasr d'Engrais et d'Industries Chimiques invited bids, and Italy's TechniPetrol bid $33 million to win.

At Abu Qir, near Alexandria, the plant of the Abu Qir Co. for Fertilizers and Chemicals Industries was under renovation to increase its output to 1,000 tons of ammonia, 1,800 tons of nitric acid, and 2,300 tons of ammonium nitrate. Again, natural gas from Egypt's nearby wells was to be the feedstock. Value of the project was $90 million, and it was to be financed by Kreditanstalt fuer Wiederaufbau of the Federal Republic of Germany. Consultant for this project was the Scientific Design Co. of the United Kingdom.

Sulfur.—EGSMA also oversees domestic non-oil mineral exploitation and development by foreign companies. It, therefore, was the Government agency with which Freeport Sulphur Co. signed an agreement during the year to explore for sulfur in an area south of El'Arish in the Sinai covering about 1,250 square kilometers. The agreement, when ratified by Parliament, would require Freeport to spend about $1 million during 2 years of preliminary exploration. Freeport would then have the option of renewing the agreement to perform the next two phases over a period of 5 years. EGSMA estimated that Freeport would spend $120 million to $160 million on the project if sulfur were found.

During the spring, EGSMA announced availability of several large areas in and near the Red Sea for one or more sulfur concessions. By June, five international companies, including Freeport, submitted proposals that were under consideration by EGSMA.

MINERAL FUELS

Coal.—Egypt had limited coal reserves, estimated at 80 million tons. The reserves were in several small deposits near Suez and in the Sinai Peninsula. The primary deposit, near Maghara in the Sinai Desert, was exploited from 1964 to 1967, but the mine was destroyed during the Arab-Israeli War. Egypt intended to renew the mining of these deposits to supply nearby electric generating plants scheduled for completion in 1990. Thus, domestic coal would replace fuel oil, which would allow about 2% more oil to be exported. Egyptian authorities planned to exploit the Maghara deposits at a rate of as much as 600,000 tons per year during the 1990's. During prewar operations, output was in the 18,000- to 20,000-ton range.

A $2 billion coal-fired powerplant was in the planning stages by Egypt's Ministry for Electricity at the town of Zafarana, southeast of Cairo. The 2,500-megawatt plant would consume 6.5 million tons of Australian steam coal per year, which would be brought by collier to a proposed coal transshipment port on the Gulf of Suez. The port would have an annual capability to handle 15 million tons of coal per year and would become a distribution center for delivery of steam coal to Egypt and throughout the Mediterranean region.

Natural Gas.—Egypt was thought by oil industry experts to have promising poten-

tial for the production of natural gas. Some gas had been found in association with oil, and nonassociated gas was known to exist in at least one large concession in the Western Desert and another in the Nile Delta. Maps indicated about 12 known gas deposits. Development of gas for domestic use would eliminate use of oil in many applications, thus freeing oil for export to obtain badly needed foreign exchange. Negotiations had begun with a number of foreign oil companies with concessions in the country to encourage them to explore for and develop gas by offering them, for the first time, a share of the gas produced on about the same terms under which they participated in oil production. The companies appeared to be enthusiastic, provided the legal formalities could be worked out. The magnitude of company participation was still under advisement at yearend, however, and once decided upon would have to go before the Cabinet and the People's Assembly.

Meanwhile, development of a pipeline network from the Western Desert and the northern Egyptian seacoast gasfields to serve an estimated 640,000 customers in Cairo was going forward, with the goal of completion of the entire system planned for the year 2005.

Petroleum.—The worldwide downward slide in crude oil prices late in 1985 and early in 1986 affected Egypt very seriously. The price of Egypt's marker crude, the Gulf of Suez blend, dropped from $26.70 per barrel in late 1985 to less than $8.00 per barrel at mid-1986. Egypt was not a member of the Organization of Petroleum Exporting Countries (OPEC), but it generally closely followed OPEC pricing. Egypt had been setting prices for its crude on a monthly basis, but the rapid downward pressure on prices proved very unwieldly and hurt Egypt's ability to compete in world markets. Exports of oil in the first few months of the year were almost nonexistent. The resulting loss of export revenue and other budget problems were very serious for the Government. The industry, nevertheless, continued active exploration for additional reserves, particularly in the Western Desert and also offshore in the Mediterranean Sea and Gulf of Suez and in the construction of oil and gas pipelines.

Eventually, a two-stage, twice-monthly, price-fixing system was tried, but it also proved to be too inflexible. By midyear, export prices that were about $24.00 per barrel in January were still falling to between $9.60 and $7.35 per barrel. Many companies were rapidly losing interest in further exploration. By October, prices had firmed to $12.50 per barrel and were then raised again for November by the Government to about $14.00 per barrel.

Exploration.—In a period when worldwide petroleum exploration activities were in retrenchment, Egypt was having considerable success in attracting new firms and funding. International oil firms accounted for 95% of the country's oil production, and some were sharply reducing their exploration outlays. To provide an incentive, new joint venture agreements were proposed that were indexed to oil prices on a sliding scale. Under this scheme, terms of production sharing between the companies and the state company, Egyptian General Petroleum Corp. (EGPC) would be tied to oil prices. Other proposals aimed at creating incentive included raising the foreign partners' share of profit oil and reducing the cost-recovery period.

Late in 1986, EGPC invited bids on 23 exploration blocks in the Western Desert area, which was beginning to attract serious interest among companies after a long, slow start when not much oil or gas was discovered. Most of Egypt's 19 oil and gas discoveries in 1985 had been made in the Western Desert. Blocks up for bid included a large area in the westernmost part of the Western Desert and offshore in the Mediterranean Sea from Alexandria near the modest Abu Qir Gasfield to the Libyan border.

In June 1986, EGPC signed five agreements for Western Desert concessions with Continental Oil Co. (Conoco) of the United States, the Egyptian subsidiary of Ente Nazional Idrocarburi-Azienda Generali Italiana Petroli S.p.A. (AGIP), and with Britoil PLC. A sixth concession was signed with Amoco Egypt Oil Co. for an onshore tract covering 435 square miles at Darag in the northern part of the Gulf of Suez, an area where EGPC and Amoco had operated successfully for a number of years as Gulf of Suez Petroleum Co.

Offshore, in the Egyptian Mediterranean Sea, a consortium led by Cie. Française des Pétroles S.A. (CFP)-TOTAL discovered the Mango reservoir, which had to be shut in owing to low oil prices. The well tested between 5,000 and 10,000 barrels per day (bbl/d) of 30° to 34° API gravity oil. In addition to CFP-TOTAL, the partners were AGIP, 27.5%; British Petroleum Ltd., 22.5%; and Société Nationale Elf Aquitaine,

22.5%.

There were a number of other exploration projects under way in the Western Desert and in the Gulf of Suez area. The Khalda concession in the Western Desert was under way by Conoco Khalda Inc., an affiliate of Conoco of the United States. EGPC signed exploration accords for onshore and offshore tracts on the Gulf of Suez's northern and southern ends, and several Japanese firms formed the Japan Suez Petroleum Development Co. to farm-in to Union Oil Co. of California's prolific territory in the gulf, the 231-square-mile Zafarana concession.

Production.—Crude oil production throughout 1986 averaged about 720,000 bbl/d, about 154,000 bbl/d below that of 1985. With first quarter 1986 production running at 800,000 bbl/d, then dropping to 720,000 bbl/d in April and even lower in May and June, production finally bottomed at about 600,000 bbl/d. Rapidly rising domestic consumption, brought about because subsidized motor fuel prices were artificially low, took almost all the crude that Egypt was producing, leaving about 100,000 bbl/d for the foreign oil-producing partners and very little else with which to earn foreign exchange. However, toward yearend, world prices started upward, and there was improvement in the country's crude production situation. Egypt still had as its goal a production of 1 million bbl/d of crude.

In the Belayim Field, lying both onshore and offshore of the east side of the Gulf of Suez, an expansion project was completed that brought output to a reported 175,000 bbl/d from the previous level of 68,000 bbl/d. The cost to open new producers was $700,000, and Belayim Petroleum Co. was the operator for a joint venture of the International Egyptian Oil Co. and EGPC. Other new production began in several areas of the gulf, such as the Amal Field south of the Shuhkeir Field, where CFP-TOTAL of France had a discovery well and three confirmation wells that together tested at 12,950 bbl/d.

The Western Desert continued to attract increasing attention during 1986 because of high success ratios in exploratory wells. At the Khalda concession, in the northwestern sector of the desert, affiliates of Conoco Inc. and Texas International Co. of Oklahoma City, Oklahoma, in a joint exploration effort with EGPC had two additional discoveries after drilling two successful wildcat wells in the area in 1984-85.

The two new discovery wells prompted the operators to designate each as a field discovery and named the fields "Hayat" and "Safir." The Hayat well, 6 miles southwest of the 1-year-old Salam Field, flowed 36° to 43.3° API gravity crude at a maximum rate of 5,000 bbl/d through relatively small chokes. There were three producing intervals, ranging from 8,710 feet to 9,074 feet below the surface. The Safir discovery, 10 miles southeast of the Salam Field, flowed at a rate of 2,000 bbl/d, producing 43° API crude from a 31-foot-thick horizon slightly below the 8,000-foot level.

Still another discovery was made in a Lower Cretaceous reservoir 5 miles north of the Salam well. This well, 8,500 feet deep, tested at 1,100 bbl/d of oil and 200,000 cubic feet of gas per day. The field was named "Salam Tut."

Meanwhile, Western Desert Operating Petroleum Co. was planning a crude gathering pipeline network in the northern reaches of the Western Desert. A main trunk line 16 inches in diameter would then extend 65 kilometers from the Khalda area to Meleiha.

Refining.—In 1985, Egypt had six simple operating oil refineries, all run by EGPC subsidiaries. Their combined output capacity was 408,000 bbl/d, enough to allow some export of petroleum products. There was no catalytic cracking capability and only limited upgrading capability. About one-half of Egypt's refined products were middle distillates or fuel oils. No new plants came onstream in 1986, but a new refinery was under construction for EGPC at Assiut that would have a 50,000-bbl/d capacity at the outset and 86,000-bbl/d capacity by completion of the second stage in 3 years. The first stage was scheduled to begin operating in 1987 and would produce middle distillates for use in Upper Egypt. Bechtel Corp. of the United States was project manager.

The state-owned Suez Petroleum Processing Co.'s refinery at Suez underwent remodeling and upgrading, which was completed during 1986. EGPC, Egypt's Government-owned oil company, owned the refinery and was in charge of construction of a 40,000-bbl/d distillation unit. Work was done by a subsidiary of EGPC. Engineering services, procurement of equipment, and area supervision of construction were carried out by another EGPC subsidiary, in cooperation with TechniPetrol of Italy. Total capacity prior to the improvement had been rated at 66,500 bbl/d.

Pipelines.—In November, Agiba Petrole-

um Co.'s newly completed 103-mile, 16-inch crude oil pipeline was dedicated by Egypt's Oil Minister. The $50 million line linked the company's Meleiha Field in the Western Desert with the oil export terminal at al-Hamra on the Mediterranean, 5 miles west of El Alamein. Agiba Petroleum was a joint venture between EGPC and Denison Egypt Ltd., Conoco Egypt Inc., and Phoenix Resources, with the International Finance Corp., a subsidiary of the International Bank for Reconstruction and Development, owning a 5% interest. The line was built by Entrepose GTM pour les Travaux Pétrolières Maritime of France, and although initial throughput was only 10,000 bbl/d, capacity was 90,000 bbl/d, expandable to 140,000 bbl/d. The line eliminated expensive trucking arrangements and was to transport crude from concessions operated by Denison, Phillips Petroleum Co. of the United States, and Conoco Egypt in conjunction with EGPC.

Phillips Petroleum and Conoco Egypt were installing spur lines into the Meleiha al-Hamra line from their concessions in the Khalda, Salam, Badr al-Din, and Umm Braka Fields.

The pipeline had a $2.8 million fiber-optic control and communications system made necessary because frequent sandstorms made traditional radio systems impractical. The crude was waxy and had to be treated with pour-point depressants before it went into the pipeline.

Another crude line, about 75 miles long, was planned to link Royal Dutch/Shell Oil Co.'s Badreddin Field directly with al-Hamra. The loading capacity at al-Hamra was about 80,000 bbl/d, but if development strains this capacity, a link was planned to connect al-Hamra with the Suez-Mediterranean (Sumed) Pipeline terminal just west of Alexandria, which had excess capacity available.

Petrochemicals.—The $450 million petrochemical complex at Ameriya, near Alexandria, was nearing completion and scheduled for startup in 1987, according to the Ministry of Petroleum and Mineral Wealth. The Egyptian Petrochemical Co. will operate the complex, which comprised an 80,000-ton-per-year polyvinyl chloride unit built by Italy's TechniPetrol and three plants built by Japan's Toyo Engineering Corp. These are a 100,000-ton-per-year vinyl chloride monomer unit, a 60,000-ton-per-year chlorine unit, and a 67,000-ton-per-year caustic soda unit. The complex will operate on power from a combined cycle generating plant built by Brown Boverie in conjunction with the Egyptian firm, Engineering for the Petroleum and Process Industries. Petrochemicals produced will go to domestic plastics, textiles, detergent, and water treatment industries.

Uranium.—By yearend, construction of the multibillion dollar El Dabaa nuclear powerplant had not commenced, although U.S., French, and West German companies had submitted bids. Fuel would come from the United States and Niger at the outset. Meanwhile, unidentified international companies had been invited to look into the possibility of a feasibility study on producing uranium from phosphoric acid at the Abu Zaabal chemicals complex north of Cairo. The yellow-cake uranium would then be taken by the domestic nuclear power industry. Abu Zaabal's phosphate mine and associated facilities at West Sebaya in Upper Egypt were nearing completion by yearend 1986.

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[1]Supervisory physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Egyptian pounds (£) to U.S. dollars at the rate of £1=US$1.42.

The Mineral Industry of Finland

By Vuko M. Lepetic[1]

In 1986, the total tonnage of all ores and minerals mined in Finland continued to decline. This trend was particularly strong for metals owing to the depletion of domestic ore bodies as well as mine closures caused by low metal prices.

The share of domestic raw materials used by the metallurgical industry continued to decrease rapidly, and the country depended heavily on imports of ores and concentrates. To provide these raw materials, Finnish mining companies expanded their foreign operations. While importing raw materials, the mining industry, one of the most modern and efficient in the world, exported its know-how and technology.

The most significant mining events of the year were related to the phenomenal growth of chrome ore production, the bringing of the Enonkoski nickel mine to full production capacity, and the closure of titanium and vanadium operations as well as the copper-zinc mine at Hammaslahti.

PRODUCTION

The output of metals was 6.9 million tons, 16% less than that of 1985. Nevertheless, the country accounted for 10% of the world cobalt market, 5% of the world chrome, and 3% of the world nickel. Copper, iron ore, and zinc production were significant because they contributed to the raw material needs of the domestic metallurgical industry. Production of industrial minerals was almost at the same level as that of 1985, amounting to 5 million tons of limestone and 7.2 million tons of other industrial minerals.

The most important producing entities were Government-owned giants, namely Outokumpu Oy (base metals and stainless steel), Rautaruukki Oy (iron and steel), and Kemira Oy (fertilizers and chemicals).

Table 1.—Finland: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum, secondary	9,400	13,200	17,100	17,200	17,000
Cadmium, refined	566	616	614	565	[2]522
Chromium: Chromite:					
Gross weight:					
Lump ore thousand tons	160	85	312	[e]347	400
Concentrate do	160	141	119	[e]150	200
Foundry sand do	25	19	15	[e]25	78
Total do	345	245	446	522	[2]678
Cr_2O_3 content:					
Lump ore do	46	24	151	[e]168	194
Concentrate do	64	58	47	[e]60	80
Foundry sand do	12	9	7	[e]12	38
Cobalt:					
Mine output, Co content	1,036	1,035	912	[e]665	[2]627
Metal, refined	1,455	1,550	1,453	1,427	[2]1,348
Copper:					
Mine output, Cu content	37,800	39,300	31,285	27,897	[2]25,987
Metal:					
Smelter:					
Primary	66,333	74,455	71,216	[e]71,000	71,000
Secondary	19,051	12,597	12,050	[e]12,000	12,000
Total	85,384	87,052	83,266	[e]83,000	83,000
Refined:					
Primary	37,969	45,376	47,318	[e]46,766	51,325
Secondary[e]	10,000	10,000	10,000	12,000	13,000
Total	47,969	55,376	57,318	58,766	[2]64,325
Gold metal troy ounces	36,780	25,206	28,067	19,130	[2]37,680
Iron and steel:					
Iron ore, marketable, all types:					
Gross weight thousand tons	1,238	1,277	1,231	1,122	[2 3]973
Fe content do	786	822	788	806	[2]634
Metal:					
Pig iron do	1,957	1,898	[r]2,044	1,891	[2]1,978
Ferroalloys, ferrochromium do	55	59	59	133	[2]134
Steel, crude do	2,414	2,416	[r]2,630	2,518	[2]2,586
Semimanufactures, rolled do	[r]1,848	1,964	[r]1,985	[e]2,000	2,000
Lead:					
Mine output, Pb content	1,883	2,125	2,478	2,422	[2]1,980
Refined, secondary	4,400	6,000	[e]4,500	[e]4,400	4,400
Mercury 76-pound flasks	2,068	1,857	2,292	3,630	[2]4,235
Molybdenum	216	218	265	326	[2]256
Nickel:					
Mine output, Ni content	6,332	5,314	6,929	8,547	[2]11,886
Metal, electrolytic	12,615	14,837	15,282	15,656	[2]17,791
Platinum-group metals:					
Palladium troy ounces	4,662	2,283	1,093	1,125	[2]3,086
Platinum do	4,147	2,186	1,061	1,125	[2]3,858
Selenium kilograms	10,020	11,172	16,975	14,038	[2]5,693
Silver thousand troy ounces	1,188	980	1,123	998	[2]1,193
Titanium concentrate: Ilmenite:					
Gross weight	167,800	163,900	167,000	53,300	--
Ti content	75,846	74,083	75,317	24,145	--
Vanadium (V_2O_5):					
Gross weight	5,619	5,694	5,469	3,805	--
V content	3,147	3,189	3,063	2,132	--
Zinc:					
Mine output, Zn content	54,568	55,913	60,200	60,606	[2]60,351
Metal	[r]143,885	155,336	158,819	160,377	[2]155,397
INDUSTRIAL MINERALS					
Barite	--	3,400	8,704	8,690	[2]6,969
Cement, hydraulic thousand tons	1,907	1,969	1,645	1,608	[2]1,422
Feldspar	69,600	52,066	56,265	52,940	[2]47,049
Lime thousand tons	263	231	241	[e]250	350
Nitrogen: N content of ammonia	64,800	67,700	68,700	[e]70,000	70,000
Phosphate rock, apatite concentrate:					
Gross weight thousand tons	233	381	477	512	[2]527
P_2O_5 do	83	141	176	189	195
Pyrite, gross weight do	385	499	[r]426	493	[2]547
Sodium sulfate[e] do	40	35	35	35	35

See footnotes at end of table.

Table 1.—Finland: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
INDUSTRIAL MINERALS —Continued					
Stone, crushed:					
Limestone and dolomite:					
For cement manufacture thousand tons	2,446	2,609	2,287	2,217	[2]1,968
For agriculture do	864	1,370	1,192	1,453	[2]1,108
For lime manufacture do	359	344	367	357	[2]380
Fine powders do	258	287	316	313	[2]318
Metallurgical do	52	52	45	26	[2]13
Total do	3,979	4,662	4,207	4,366	[2]3,787
Quartz silica sand do	249	213	262	223	[2]232
Sulfur:					
S content of pyrite do	177	224	211	[e]225	[2]275
Byproduct:					
Of metallurgy do	270	264	265	[e]260	250
Of petroleum do	40	48	45	[e]45	45
Total do	487	536	521	[e]530	570
Sulfuric acid do	1,032	[r]1,149	1,418	1,439	[2]1,500
Talc do	325	318	327	319	[2]284
Wollastonite	14,962	15,402	14,669	16,917	[2]16,795
MINERAL FUELS AND RELATED MATERIALS					
Peat:					
For fuel use thousand tons	5,500	3,355	2,713	[e]3,000	3,000
For agriculture and other uses do	578	275	225	[e]200	200
Petroleum refinery products thousand 42-gallon barrels	70,000	78,788	[e]80,000	[e]82,000	85,000

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through July 1987.
[2]Reported figure.
[3]Includes 643,000 tons of iron concentrates (67% Fe) and 330,497 tons of pyritic residue (61.7% Fe) presently stored.

TRADE

Finland's trade surplus, in which the decline in oil prices played a major role, was $980 million in 1986. The country exported goods and services valued at $19 billion, of which 5.4% went to the United States. The imports were valued at $18 billion, of which the U.S. share was 5%.

The major export items were machinery, ships, and semifinished and finished goods, while energy and other raw materials remained the largest import items. Of the raw materials used by the metallurgical industry, about 80% of iron concentrate, 70% of zinc concentrate, 50% of copper concentrate, and 40% of nickel matte and nickel concentrate had to be imported.

COMMODITY REVIEW

METALS

Chromium.—Kemi, the largest chromite mine in Western Europe, continued to expand its output. The production of chromite concentrates and lumpy ore increased by almost 30% in 1986. Following the expansion of the plant in Tornio, the country produced 134,000 tons of charge-grade ferrochrome, the primary chrome raw material of the steel industry, thus enabling Finland to resume its role as an exporter of substantial quantities with a potential to produce more if the market demanded it.

This remarkable expansion was possible because Outokumpu, responsible for all chromium-related production in the country, advantageously used the availability of its own extensive chromite reserves at Kemi (150 million tons containing 26% Cr_2O_3), its own novel ferrochrome production technology, the proximity of the large Western European chromium markets, and the world market situation in general.

Cobalt.—The world consumption of cobalt remained lower than the available supply, causing world market prices to fall to levels that forced Outokumpu to consider an extended shutdown of its Keretti Mine (cobalt, copper, zinc) as well as the Kokkola cobalt plant. The shutdown was to be put into effect in the beginning of 1987 and would follow the closure of the Vuonos Mine (cobalt, copper, zinc) in 1985 and subsequent loss of about 260 tons of cobalt from that source.

A substantial cobalt deposit was at Polvijarvi, but owing to the prevailing market conditions, there were no plans for its development.

Copper.—Production of domestic copper mines declined by almost 7% owing to the closing of the Hammaslahti (copper) and Vuonos Mines. However, electrolytic copper output increased by almost 8% as Outokumpu continued to acquire foreign concentrate sources in order to provide the copper works at Harjavalta and Pori with raw materials.

Following its foreign expansion policy, Outokumpu purchased the northern Sweden Viskaria copper mine from Sweden's Luossavaara Kiirunavaara AB (LKAB). The mine, opened in 1982, was designed to produce 120,000 tons of copper concentrates per year containing 28,000 tons of copper metal. Less successful was an attempt to form a joint venture project with Rio Algom Ltd. of Canada for the exploitation of the Cerro Colorado copper deposit in Chile. Outokumpu decided to withdraw from the project because of delays in obtaining the financing as well as certain unspecified technical drawbacks.

Gold.—A feasibility study was under way on the gold deposit at Laivankongas. The deposit was said to average about 4 grams of gold per ton of ore (0.12 troy ounce per short ton). It appeared amenable to use open pit methods for ore extraction and flotation for concentration of gold-bearing minerals.

A gold deposit containing as high as 5 grams of gold per ton (0.16 troy ounce per short ton) was discovered at Kuusamo near Mount Rukatunturi. The deposit was being evaluated to decide whether an economical mining operation could be established at this location.

Iron and Steel.—Finland's three main steel producers were Rautaruukki, Outokumpu, and Ovako Oy AB. Rautaruukki was the country's largest steel producer. The company's Raahe Steel Works produced 1.69 million tons of steel. The output by the hot-rolling mills was 1.52 million tons. The Hämeenlinna cold-rolling mill supplied 630,000 tons of sheet. The production of welded tubes and pipes was 260,000 tons; formed sections, 27,000 tons; and welded girders, 11,000 tons. The company also produced 1,662 special railway cars and tank assemblies. Rautaruukki initiated a major investment program aimed at automation and modernization of its plants at Oulu and Raahe. A coking plant was also under construction. These programs were undertaken to upgrade machinery and production systems and meet projected increase in output for the 1990's.

The Outokumpu Group was a major producer of stainless steel. Taking advantage of its nickel and chromium, important ingredients of stainless steel that were readily available from its own domestic sources, the company positioned itself for a major increase of production in 1986. The stainless steelworks at Tornio in northern Finland had a total output of 153,000 tons of rolled products, an increase of nearly 20% compared with 1985 results.

Construction of the Steckel hot-strip mill at Tornio continued. The mill should reach its full annual capacity of 200,000 tons of hot-rolled coil by the end of June 1988. This would give Outokumpu full integration of its stainless steel production capabilities.

Final approval of the merger between Ovako Oy and SKF Steel AB was given by the Governments of Finland and Sweden. The new company, to be called Ovako Steel, would produce 1.2 million tons of specialized steel annually. The merger combined Ovako Oy's continuous casting know-how with SKF Steel's worldwide sales network.

Nickel.—In 1986, the major nickel producers were the Enonkoski, Vammala, and Kotalahti Mines. Together they mined a total of 1.28 million tons of ore to yield 110,000 tons of nickel concentrates. The average content of nickel in the concentrates was 10.8%. All three mines were operated by Outokumpu. The newest of them, Enonkoski, was fully operational early in the year. It produced 453,000 tons of ore by yearend, working reserves that totaled about 4 million tons of ore containing 1.2% nickel, 0.3% copper, and 0.06% cobalt. Enonkoski was Finland's most modern mine in 1986, providing numerous examples of the latest in Finnish high-tech mining and mineral processing know-how, equipment, and control systems.

Continuing Outokumpu's expansion abroad, Outokumpu Mines Ltd., Outokumpu's subsidiary in Canada, and Hudson Bay Mining and Smelting Co. Ltd. established a joint venture for the development of a high-grade nickel ore discovered near Namew Lake in northern Manitoba. The Hudson Bay-Outokumpu joint effort was owned on a 50-50 basis. The Namew Lake discovery was reported to contain about 2.5 million tons of ore with 2.44% nickel, 0.9% copper, and minor amounts of platinum and palladium.

Zinc.—Earlier in 1986, Outokumpu purchased the entire capital stock of Tara Exploration and Development Co. Ltd., a

public Canadian company that had held 75% of the shares in Tara Mines Ltd. The Government of Ireland held the remaining 25% of the shares. Tara Mines Ltd. owned and operated the Tara Mine in Ireland. Annual mine production at Tara, which was the largest zinc-lead mine in Europe and the sixth largest in the world, amounted to about 2.4 million tons of ore. The metal content of the concentrates produced was about 200,000 tons of zinc and 45,000 tons of lead per year. The proven reserves were 11 million tons of ore containing 11% zinc and 2.4% lead. The probable reserves were in addition, about 16 million tons of ore grading 8.3% zinc and 2.1% lead.

With the Tara purchase, Outokumpu secured the raw material needs of the Kokkola zinc plant as well as a position as one of Europe's largest zinc producers for years to come. Raw material for Kokkola was also supplied by the Vihanti and Pyhasalmi Mines in Finland. The zinc production of Outokumpu was 155,400 tons for the year. Small amounts of cadmium, mercury, and selenium were also obtained as byproducts of the zinc refinery. The most important market for Outokumpu's zinc was Western Europe. Only about 15% of its production was sold in Finland.

Exploration for zinc and related base metals by the Government of Finland-financed National Geological Research Center resulted in a discovery of a potentially minable base and precious metals deposit at Yliniesta near Oulu in northwestern Finland. The drilling survey of the area established the presence of zinc, 3.6%; copper, 1.24%; lead, 0.67%; and some silver and gold values as well. It was likely that the state-owned Outokumpu will request and be granted permission to exploit the find.

INDUSTRIAL MINERALS

Ammonia.—Despite the generally weak market conditions of 1986, Kemira concentrated on identifying areas for increased profitability in the fertilizer industry. In April, it purchased NIS Fertilizers Ltd. of Northern Ireland. NIS Fertilizers produced and sold fertilizers and straight nitrogen (about 200,000 tons of mixed fertilizer per year) in Northern Ireland and Eire. Kemira also reached a preliminary agreement with Belgium's Gechem (the Chemical Industries Group of the Société Générale de Belgique SA) regarding the acquisition of its fertilizers and nitrogen business.

On the home front, Kemira started modifications of an ammonia plant at Oulu, changing it from heavy oil over to peat. The changeover will raise the 20-year-old plant output from 55,000 to 80,000 tons of nitrogen per year when completed in 1988. The newly refurbished unit will use a process developed by Rheinische Braunkohlenwerke AG to gasify the plant.

Phosphate Rock.—Kemira appeared to be in the early stages of developing a new phosphate rock deposit in Lapland. The Sokli deposit was believed to be fairly large and of a high grade. In 1986, the company mined phosphate rock at Siilinjarvi, which was considered to be the world's lowest grade phosphate deposit exploited commercially. Siilinjarvi yielded over 6 million tons of phosphate rock for the year, but it could eventually become uneconomic because of its low-grade ore and the depth limitations on the mining operation itself.

Kemira, along with several other Finnish mining and chemical companies, and representatives of various Soviet Union ministries formed a joint Finnish-Soviet working group that was to look at collaboration in the mining of apatite (as well as copper, nickel, and zinc) in the Kola Peninsula. This mineral-rich Soviet region was to be a beneficiary of advanced mining and mineral processing technology and know-how to be provided by the Finnish companies.

Wollastonite.—Finland was Europe's only supplier of high-grade wollastonite in 1986. Partek Oy produced about 17,000 tons of wollastonite from its Lappeenranta Mine in the southeastern part of country. The wollastonite concentrates were produced from wollastonite-calcite ore. The technique used to obtain high-purity wollastonite concentrates involved calcite flotation followed by the high-intensity magnetic separation removal of iron-bearing impurities from the nonfloating wollastonite.

The reserves of Lappeenranta were put at 4 million tons of ore minable by open pit methods. Such reserves were sufficient for many years at the prevailing production levels. In addition to Lappeenranta, new wollastonite deposits, estimated to be on the order of 20 million tons, were discovered at Savitapale, only about 30 kilometers from the present facilities. These potential reserves were under further exploration.

MINERAL FUELS

Finland did not produce coal, crude petroleum, or natural gas in 1986. Most of the energy requirements of the country were satisfied by importing the above commodities. A smaller portion of the energy needs

was covered from domestic sources, mainly peat, wood, and hydroelectric power.

Natural Gas.—By yearend, Finland and the U.S.S.R. completed the natural gas pipeline from the Soviet Union to Kouvola with extensions to Lahti, Tampere, and the Helsinki area, thus setting the stage for doubling imports of Soviet natural gas. Up to that point, natural gas provided only about 3% of the country's energy supply.

Nuclear Power.—A major overhaul of energy policy followed in the wake of Chernobyl. Plans to buy a fifth and possibly a sixth nuclear powerplant were shelved. The basic long-term national plan for power station construction did not include nuclear energy for the 1986-95 period.

Peat.—Finland was one of the few countries where peat was extensively used as fuel. A new peat-fired power station was to be built to supply the Kivisenniemi industrial area. The plant was rated at 60 megawatts for power generation and 135 megawatts for regional heating requirements. It was to be completed in 1990. Peat found other uses as an agricultural aid as well as raw material for production of coal, alcohol, and activated charcoal.

Petroleum.—Record volumes of Soviet oil (as well as gas and electricity) were imported in an attempt to correct an imbalance in trade between the two countries. The imbalance was caused by the fall in world oil prices. The state-owned Neste Oy reported that oil consumption rose by 4.6%. The main supplier was the Soviet Union followed by Saudi Arabia, Norway, and the United Kingdom.

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The Mineral Industry of France

By John R. Craynon[1]

The mining and metallurgical industries in France experienced another difficult year in 1986. The stagnation in the sector continued and the output of many commodities continued to decline in terms of world importance. However, French production of alumina, arsenic, bromine, cadmium, diatomite, feldspar, ferroalloys, fluorspar, gypsum, magnesium metal, potash, talc, and zinc metal remained important to the world supply. The country was also an important processor of imported crude minerals and fuels.

Government Policies and Programs.—As a result of policies enacted by the newly elected conservative Government, plans were made to denationalize many of the companies that were nationalized in 1945 and 1981. The list of the 65 companies to be sold before 1989 included the mineral-related companies Pechiney and St. Gobain S.A. The state-owned steel and oil companies were not included on the list.

PRODUCTION

Most mining, metallurgical, and energy companies remained under Government control. Much of the involvement was through the activities of the Bureau de Recherches Géologiques et Minières (BRGM) or its subsidiary, Compagnie Française des Mines S.A. The Government also had direct financial interests in other companies including Charbonnages de France (CdF), Compagnie Générale des Matières Nucléaires, Imetal S.A., Pechiney, Société des Aciéries et Laminoirs de Lorraine (Sacilor), Société Nationale Elf Aquitaine (Elf), and Union Sidérurgique du Nord et de l'Est de la France S.A. (Usinor). French companies were active in many foreign mineral projects as domestic reserves of many minerals moved close to exhaustion.

Table 1.—France: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[p]
METALS					
Aluminum:					
Bauxite, gross weight thousand tons	1,662	1,663	1,607	1,530	1,379
Alumina:					
Crude do	1,087	1,009	1,034	877	884
Calcined do	960	853	898	734	740
Metal:					
Primary do	390	361	342	293	322
Secondary do	154	170	r169	170	173
Antimony:					
Mine output, Sb content	308	111	--	--	--
Metal, including regulus	r5,919	r6,487	7,036	7,333	6,822
Arsenic, white	e6,000	4,727	3,828	r e8,000	e10,000
Cadmium metal	793	513	568	337	431
Cobalt metal including powder	568	131	116	123	e100
Copper:					
Mine output, Cu content	199	114	79	253	294
Metal:					
Blister, secondary	8,100	7,210	6,796	7,000	6,100
Refined:					
Primary[e]	r20,060	r7,763	r15,031	r13,699	18,294
Secondary	27,000	37,300	25,900	30,000	e23,000
Total	47,060	45,063	40,931	43,699	41,294
Gold, mine output, Au content troy ounces	67,967	71,659	70,279	76,519	75,618
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	19,391	15,930	14,839	14,447	12,436
Fe content do	6,186	5,061	4,680	4,536	3,861
Metal:					
Pig iron do	15,031	13,856	15,039	15,072	13,708
Ferroalloys:					
Blast furnace: Spiegeleisen and ferromanganese do	r332	270	329	334	274
Electric-furnace:					
Ferrochrome do	r38	20	19	1	e1
Ferromanganese do	(3)	(3)	(3)	24	22
Ferrosilicomanganese do	30	33	35	23	17
Ferrosilicon:					
50% Si do	169	193	205	197	196
Byproduct of corundum production, 15% Si do	e2	2	2	2	3
Silicon metal do	57	65	71	71	e75
Other do	r99	103	119	74	60
Total do	r727	r686	r780	726	648
Steel ingots and castings do	18,416	17,623	19,008	18,569	17,624
Semimanufactures do	16,431	15,348	16,543	16,285	15,343
Lead:					
Mine output, Pb content	5,859	1,512	2,263	2,488	2,478
Smelter:					
Primary	122,700	114,948	117,900	133,600	e140,000
Secondary	17,700	13,600	13,500	12,200	e12,500
Total	140,400	128,548	131,400	145,800	e152,500
Refined:					
Primary: Soft lead	122,700	114,948	117,900	133,000	132,000
Secondary:					
Soft lead	22,400	37,464	24,900	27,637	27,300
Lead content of antimonial lead	63,500	62,000	62,900	63,000	71,100
Total	208,600	214,412	205,700	223,637	230,400
Magnesium metal including secondary	r9,723	11,075	r12,953	13,775	13,376
Nickel metal	7,361	r7,300	5,217	7,020	8,241
Silver: Mine output, Ag content:					
Lead and zinc concentrates thousand troy ounces	NA	r552	r634	691	677
Mixed copper, gold, silver concentrates do	NA	136	r156	158	155
Total do	983	r688	r790	849	832
Metal, Ag content of final smelter products do	r31,540	28,903	25,540	24,856	e26,000

See footnotes at end of table.

Table 1.—France: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[p]
METALS —Continued					
Tin, smelter output of solder and other alloys, secondary	6,141	6,708	6,700	3,074	2,912
Tungsten concentrate, W content	727	832	796	735	982
Uranium:					
Mine output, U content	3,020	3,890	3,116	3,752	3,737
Chemical concentrate, U_3O_8 equivalent	2,872	3,299	3,676	3,940	4,106
Zinc:					
Mine output, Zn content	37,021	34,272	36,231	40,572	39,534
Metal including secondary:					
Slab	243,800	249,500	[r]258,514	285,600	289,500
Dust	9,400	9,300	7,400	8,200	[e]8,000
INDUSTRIAL MINERALS					
Barite	143,324	152,600	148,200	120,800	116,400
Bromine, elemental[e]	17,000	16,000	17,500	20,000	19,000
Cement, hydraulic thousand tons	26,150	24,504	22,724	22,219	22,596
Clays:					
Bentonite[4]	3,290	3,091	3,475	14,900	[e]10,000
Kaolin and kaolinitic clay (marketable) thousand tons	347	289	307	1,510	1,350
Refractory clay, unspecified do	[e]1,500	413	458	486	[e]500
Diatomite do	244	221	247	270	[e]240
Feldspar, crude do	173	[e]175	209	172	216
Fluorspar:					
Crude do	451	396	504	562	497
Marketable:					
Acid- and ceramic-grade do	161	141	159	160	148
Metallurgical-grade do	82	55	73	64	50
Total do	243	196	232	224	198
Gypsum and anhydrite, crude do	6,039	5,557	5,401	5,286	5,259
Kyanite, andalusite, related materials do	42	43	52	57	51
Lime: Quicklime, hydrated lime, dead-burned dolomite do	[r]2,994	2,946	3,130	3,100	2,900
Mica	7,950	9,286	10,854	10,084	10,834
Nitrogen: N content of ammonia thousand tons	1,900	1,960	2,350	2,010	[e]2,000
Pigments, mineral, natural: Iron oxides[e]	16,000	16,000	15,000	14,500	15,000
Phosphates: Thomas slag thousand tons	1,343	1,124	1,194	1,165	855
Potash:					
Gross weight (run-of-mine) do	10,904	10,874	12,480	12,021	[e]12,000
K_2O equivalent (run-of-mine) do	1,824	1,651	[r]1,873	1,882	1,748
K_2O equivalent (marketable) do	1,704	1,537	1,739	1,750	1,620
Pozzolan and lapilli do	716	607	500	496	410
Salt:					
Rock salt do	382	282	226	369	386
Brine salt (refined) do	1,071	1,074	[r]1,125	1,154	1,125
Marine salt do	1,539	1,354	1,381	1,423	1,610
Salt in solution do	3,711	4,239	4,417	4,167	3,963
Total do	6,703	6,949	[r]7,149	7,113	7,084
Sodium compounds:[e]					
Sodium sulfate do	150	150	120	125	110
Sodium carbonate do	1,000	1,000	900	900	750
Stone, sand and gravel:					
Limestone, agricultural and industrial do	5,854	6,625	[e]6,700	7,002	[e]6,000
Slate, roof do	70	52	[r]64	60	57
Sand and gravel:					
Industrial sand, total do	5,486	5,558	5,395	5,512	5,332
Other sand and gravel, alluvial do	211,000	199,000	181,000	178,300	186,800
Sulfur, byproduct:					
Of natural gas do	1,690	1,653	1,589	1,400	957
Of petroleum do	235	157	163	161	193
Of unspecified sources[e] do	110	[r]100	[r]110	[r]162	156
Total do	2,035	[r]1,910	[r]1,862	1,723	1,306
Talc:					
Crude	312,920	315,800	320,300	316,595	324,660
Powder	276,440	286,500	292,406	310,897	314,965
MINERAL FUELS AND RELATED MATERIALS					
Asphaltic material	50,230	47,000	44,500	40,942	37,817
Carbon black	205,730	218,600	165,900	[e]200,000	[e]175,000

See footnotes at end of table.

Table 1.—France: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[p]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Coal including briquets:					
Anthracite and bituminous thousand tons	16,896	17,021	16,594	15,124	14,394
Lignite do	3,060	2,591	2,426	1,839	2,142
Total do	19,956	19,612	19,020	16,963	16,536
Briquets do	1,320	1,512	1,450	1,408	1,176
Coke, metallurgical do	9,935	8,458	8,999	8,691	8,258
Gas, natural:					
Gross million cubic feet	369,054	234,313	224,601	275,753	210,619
Marketed do	258,321	221,953	213,124	191,359	148,932
Natural gas liquids thousand 42-gallon barrels	8,027	7,480	7,424	6,840	[e]7,000
Peat[e] thousand tons	120	110	228	[r]191	220
Petroleum:					
Crude thousand 42-gallon barrels	12,011	12,093	[r]15,040	19,252	21,482
Refinery products:					
Liquefied petroleum gas do	29,626	28,037	27,863	30,334	27,326
Gasoline, all kinds do	143,266	136,777	138,782	141,950	140,637
Jet fuel do	32,392	35,797	35,488	34,176	33,886
Kerosene do	938	1,434	388	481	376
Distillate fuel oil do	212,580	181,802	218,302	217,989	214,165
Heavy fuel oil do	128,771	115,983	103,889	89,636	85,227
Unspecified do	28,949	23,804	5,119	53,164	51,189
Refinery fuel and losses do	40,064	40,020	39,744	35,261	30,935
Total do	616,586	563,654	569,575	602,991	583,741

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

[1]Table includes data available through Sept. 15, 1987.

[2]In addition to the commodities listed, France also produces germanium from domestic ores and has been described as the world's leading producer of this commodity in French sources. Output was reported as 14 metric tons in 1980, all from the Saint-Salvy Mine. Unfortunately, actual output is not regularly reported, and the ore from this mine is not sufficiently uniform in grade to permit estimates of output based on reported concentrate production. In addition, France produces large quantities of dimension stone, but statistics on output are not available.

[3]Production of electric-furnace ferromanganese was not reported. Output is presumably included in "Ferroalloys: Electric-furnace: Other."

[4]Includes smectic clay.

TRADE

France remained highly dependent on foreign sources for many raw materials, especially fuels. Imports of mineral-related commodities accounted for approximately 60% of the value of all imports. The low world price for oil decreased the country's fuel expenditures. However, petroleum exporting countries represented a relatively important market for French goods and services, so those savings were largely offset by decreased exports. The balance of trade with Norway and the United Kingdom improved dramatically as a result of lower fuel prices. The trade deficit with the country's most important European Economic Community (EEC) trading partner, the Federal Republic of Germany, continued to increase despite increased exports.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	69	3,191	14	Italy 1,354; Greece 867; United Kingdom 650.
Alkaline-earth metals	665	3,017	108	Italy 2,122; West Germany 264; Yugoslavia 154.
Aluminum:				
Ore and concentrate	245,208	200,733	(2)	West Germany 175,155; Sweden 17,011; Portugal 5,081.
Oxides and hydroxides	231,793	300,111	4,633	Italy 95,705; Netherlands 82,024; Belgium-Luxembourg 31,507.
Ash and residue containing aluminum	16,393	27,855	--	Belgium-Luxembourg 13,133; Italy 9,265; West Germany 3,632.
Metal including alloys:				
Scrap	88,858	90,939	2	Italy 40,591; West Germany 22,509; Belgium-Luxembourg 18,702.
Unwrought	146,404	115,371	589	West Germany 41,565; Italy 29,001; Belgium-Luxembourg 13,889.
Semimanufactures	287,402	283,043	24,495	West Germany 74,665; United Kingdom 35,279; Belgium-Luxembourg 21,958.
Antimony:				
Ore and concentrate	54	209	--	Czechoslovakia 182; Spain 26.
Oxides	5,931	5,359	1,234	West Germany 1,439; Netherlands 630.
Metal including alloys, all forms	55	126	--	Belgium-Luxembourg 30; West Germany 27; Spain 23.
Arsenic:				
Oxides and acids	7,280	10,289	3,828	United Kingdom 1,930; Sweden 1,039.
Metal including alloys, all forms	128	NA		
Beryllium:				
Oxides and hydroxides	--	(2)	--	All to Algeria.
Metal including alloys, all forms	(2)	(2)	(2)	
Bismuth: Metal including alloys, all forms	12	11	7	Hungary 3; United Kingdom 1.
Cadmium: Metal including alloys, all forms	490	275	(2)	Belgium-Luxembourg 129; West Germany 47; Netherlands 35.
Chromium:				
Ore and concentrate	1,069	3,124	--	Italy 2,929; Belgium-Luxembourg 102; Israel 54.
Oxides and hydroxides	174	384	(2)	Belgium-Luxembourg 114; Hungary 86; Algeria 46.
Metal including alloys, all forms	1,630	1,615	328	Netherlands 505; West Germany 435.
Cobalt:				
Ore and concentrate	17	2	--	All to Belgium-Luxembourg.
Oxides and hydroxides	47	9	2	West Germany 2; Netherlands 1.
Metal including alloys, all forms	1,216	964	82	West Germany 481; Netherlands 91.
Columbium and tantalum: Metal including alloys, all forms:				
Columbium (niobium)	(2)	(2)	--	Mainly to Belgium-Luxembourg.
Tantalum	10	32	7	Netherlands 14; West Germany 8.
Copper:				
Ore and concentrate	293	341	--	All to West Germany.
Matte and speiss including cement copper	4,812	2,042	--	Spain 1,486; Belgium-Luxembourg 409; United Kingdom 121.
Oxides and hydroxides	193	77	(2)	Belgium-Luxembourg 49; Algeria 10; Tunisia 10.
Sulfate	5,388	2,307	18	Equatorial Guinea 475; Morocco 406; West Germany 396.
Ash and residue containing copper	11,263	11,427	119	Belgium-Luxembourg 7,346; Spain 2,710; West Germany 708.
Metal including alloys:				
Scrap	120,467	128,602	72	West Germany 50,737; Italy 31,913; Belgium-Luxembourg 30,457.
Unwrought	10,191	16,913	19	Belgium-Luxembourg 7,930; West Germany 2,765; United Kingdom 1,059.
Semimanufactures	276,323	243,300	8,765	West Germany 65,436; Italy 45,617; Switzerland 13,594.
Germanium: Metal including alloys, all forms	(2)	6	3	United Kingdom 3.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Gold:				
Waste and sweepings value, thousands	$31,004	$16,415	--	Spain $14,045; Belgium-Luxembourg $1,073; United Kingdom $1,069.
Metal including alloys, unwrought and partly wrought thousand troy ounces	1,415	1,125	NA	United Kingdom 418; West Germany 225; Switzerland 129.
Hafnium: Metal including alloys, all forms	(2)	1	1	
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	4,752	4,628	--	Belgium-Luxembourg 4,617; West Germany 9; Lebanon 1.
Pyrite, roasted do	(2)	--		
Metal:				
Scrap do	4,103	3,961	(2)	Italy 1,974; Spain 1,120; Belgium-Luxembourg 527.
Pig iron, cast iron, related materials	246,576	294,638	6,275	Belgium-Luxembourg 79,752; Italy 70,733; West Germany 31,407.
Ferroalloys:				
Ferrochromium	1,452	334	--	Netherlands 105; West Germany 96; Italy 76.
Ferromanganese	314,111	238,968	39,690	West Germany 41,292; Italy 30,002.
Ferromolybdenum	1,333	1,162	--	Netherlands 743; West Germany 243; Italy 124.
Ferronickel	56,408	55,671	--	West Germany 28,911; Italy 10,132; Sweden 5,056.
Ferrosilicochromium	121	346	--	Italy 275; West Germany 67; Portugal 2.
Ferrosilicomanganese	21,551	18,352	36	West Germany 8,279; Belgium-Luxembourg 5,172; Saudi Arabia 2,200.
Ferrosilicon	82,294	75,916	176	West Germany 22,674; Japan 18,050; Italy 14,743.
Silicon metal	--	23,791	1,967	United Kingdom 6,621; West Germany 5,632; Republic of Korea 3,919.
Unspecified	45,249	37,803	5,082	West Germany 7,886; United Kingdom 2,738.
Steel, primary forms thousand tons	3,037	3,089	540	Italy 788; Belgium-Luxembourg 340.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	2,684	2,781	281	West Germany 534; Belgium-Luxembourg 285.
Universals, plates, sheets do	3,291	3,469	291	West Germany 666; Italy 390.
Hoop and strip do	490	471	14	West Germany 163; Italy 66; Belgium-Luxembourg 58.
Rails and accessories do	180	158	16	Mexico 36; Netherlands 21; Morocco 20.
Wire do	241	234	50	West Germany 57; United Kingdom 15.
Tubes, pipes, fittings do	1,588	1,547	138	U.S.S.R. 295; West Germany 124.
Castings and forgings, rough do	65	73	6	West Germany 25; Belgium-Luxembourg 13; United Kingdom 11.
Lead:				
Ore and concentrate	122	15	(2)	Morocco 10; Switzerland 3; Israel 1.
Oxides	8,445	12,953	--	U.S.S.R. 4,456; Algeria 2,601; Czechoslovakia 1,050.
Ash and residue containing lead	15,835	11,269	--	West Germany 9,070; Belgium-Luxembourg 2,070; Netherlands 83.
Metal including alloys:				
Scrap	17,973	12,630	--	West Germany 5,983; Italy 3,846; Belgium-Luxembourg 2,352.
Unwrought	53,836	59,779	--	West Germany 21,738; Belgium-Luxembourg 15,226; Netherlands 5,434.
Semimanufactures	2,368	2,120	1	Belgium-Luxembourg 715; West Germany 361; Algeria 275.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Lithium:				
Oxides	79	48	--	West Germany 40; Ivory Coast 3; Trinidad and Tobago 2.
Metal including alloys, all forms	18	1	--	Mainly to Switzerland.
Magnesium: Metal including alloys:				
Scrap	597	608	18	Netherlands 202; Italy 190; West Germany 116.
Unwrought	6,739	6,934	644	West Germany 2,179; Belgium-Luxembourg 412.
Semimanufactures	1,771	1,293	(2)	West Germany 633; Italy 544; Belgium-Luxembourg 27.
Manganese:				
Ore and concentrate, metallurgical-grade	76,454	73,755	--	Norway 57,220; Italy 11,844; Switzerland 2,081.
Oxides	1,265	1,723	--	Spain 504; Ivory Coast 271; Belgium-Luxembourg 191.
Metal including alloys, all forms	6,434	5,790	395	Italy 1,027; Belgium-Luxembourg 935; West Germany 815.
Mercury 76-pound flasks	2,292	1,653	NA	West Germany 725; Belgium-Luxembourg 580; Netherlands 203.
Molybdenum:				
Ore and concentrate	227	193	--	Belgium-Luxembourg 99; Netherlands 47; Italy 46.
Oxides and hydroxides	(2)	1	--	Mainly to United Kingdom.
Metal including alloys:				
Scrap	76	71	13	Belgium-Luxembourg 25; West Germany 23.
Unwrought	172	110	(2)	West Germany 37; India 26; Austria 23.
Semimanufactures	40	98	1	United Kingdom 31; Italy 29; West Germany 17.
Nickel:				
Ore and concentrate	83	64	--	Japan 30; Netherlands 30; West Germany 4.
Matte and speiss	19	1	--	Mainly to Gabon.
Oxides and hydroxides	80	30	--	Yugoslavia 20; Venezuela 10.
Ash and residue containing nickel	3,650	1,715	24	Sweden 553; Canada 381; Netherlands 161.
Metal including alloys:				
Scrap	3,602	3,636	403	West Germany 1,310; Belgium-Luxembourg 546.
Unwrought	5,582	6,220	2,001	West Germany 2,176; Sweden 586.
Semimanufactures	5,762	5,702	493	West Germany 4,037; United Kingdom 397.
Platinum-group metals:				
Waste and sweepings value, thousands	$3,937	$7,453	$58	Spain $5,197; United Kingdom $1,695; Belgium-Luxembourg $464.
Metals including alloys, unwrought and partly wrought thousand troy ounces	214,813	304,994	591	Netherlands 88,673; Switzerland 78,935; United Kingdom 61,669.
Rare-earth metals including alloys, all forms	1,009	81	(2)	Austria 19; Netherlands 18; West Germany 15.
Rhenium: Metal including alloys, all forms	(2)	(2)	--	Mainly to Japan.
Selenium, elemental	2	25	--	Spain 22; West Germany 2; Morocco 1.
Silicon, high-purity	130	51	2	Switzerland 44; West Germany 5.
Silver:				
Ore and concentrate[3] value, thousands	$1,546	$4,266	--	All to Sweden.
Waste and sweepings do.	$32,756	$17,267	$12	Spain $10,524; Sweden $2,031; Switzerland $1,580.
Metal including alloys, unwrought and partly wrought thousand troy ounces	16,347	17,265	322	West Germany 6,559; United Kingdom 3,826; Switzerland 2,379.
Tellurium, elemental and arsenic	--	81	--	West Germany 30; India 18; Sri Lanka 18.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Tin:				
Ore and concentrate	7	7	--	All to Spain.
Oxides	30	27	--	Netherlands 19; Italy 5; Nigeria 2.
Ash and residue containing tin	84	191	--	West Germany 84; Belgium-Luxembourg 59; United Kingdom 33.
Metal including alloys:				
Scrap	287	353	--	West Germany 159; Belgium-Luxembourg 154; United Kingdom 23.
Unwrought	269	447	(2)	Belgium-Luxembourg 199; Netherlands 192; Switzerland 13.
Semimanufactures	249	148	1	Netherlands 33; Tunisia 18; Switzerland 12.
Titanium:				
Ore and concentrate	95	247	--	Ivory Coast 95; West Germany 64; Senegal 28.
Oxides	22,488	27,957	12,852	West Germany 5,897; Italy 1,014.
Metal including alloys:				
Scrap	1,067	1,189	145	United Kingdom 647; Spain 184.
Unwrought	1	2	(2)	Mainly to West Germany.
Semimanufactures	120	526	35	Republic of Korea 328; West Germany 50; Switzerland 44.
Tungsten:				
Ore and concentrate	522	484	--	Japan 149; Sweden 145; Netherlands 118.
Oxides and hydroxides	8	50	--	Romania 20; Hungary 10; Yugoslavia 7.
Ash and residue containing tungsten	189	3	--	All to West Germany.
Metal including alloys:				
Scrap	228	293	--	West Germany 186; Belgium-Luxembourg 47; United Kingdom 34.
Unwrought	112	133	--	West Germany 41; Switzerland 39; United Kingdom 28.
Semimanufactures	32	73	(2)	Switzerland 27; West Germany 8; Italy 8.
Uranium and/or thorium:				
Ore and concentrate	(2)	--		
Oxides and other compounds	232	NA		
Metal including alloys, all forms, uranium	r4	3	--	All to Belgium-Luxembourg.
Vanadium:				
Ore and concentrate	(2)	(2)	--	All to Cameroon.
Oxides and hydroxides	12	10	--	All to Belgium-Luxembourg.
Ash and residue containing vanadium	100	181	--	Italy 113; West Germany 67.
Metal including alloys:				
Scrap	237	120	--	All to Italy.
Unwrought	(2)	--		
Semimanufactures	(2)	(2)	--	NA.
Zinc:				
Ore and concentrate	117,188	102,857	--	Belgium-Luxembourg 84,383; Italy 16,813; Ireland 856.
Oxides	22,124	22,162	--	Belgium-Luxembourg 4,586; West Germany 3,251; Italy 1,721.
Blue powder	3,905	3,752	18	West Germany 2,129; Italy 516; Belgium-Luxembourg 170.
Matte	5,428	3,949	--	Italy 1,600; Spain 1,046; West Germany 859.
Ash and residue containing zinc	15,995	11,473	--	Belgium-Luxembourg 6,531; West Germany 3,284; Sweden 765.
Metal including alloys:				
Scrap	11,456	11,502	--	Italy 5,506; Belgium-Luxembourg 2,439; West Germany 1,876.
Unwrought	95,188	71,060	6,156	West Germany 22,843; Belgium-Luxembourg 12,079.
Semimanufactures	34,858	32,790	56	Belgium-Luxembourg 15,942; West Germany 9,576; Denmark 2,303.
Zirconium:				
Ore and concentrate	61	175	--	Switzerland 50; Netherlands 48; West Germany 38.
Metal including alloys:				
Scrap	NA	45	20	Belgium-Luxembourg 16; Netherlands 5.
Unwrought	NA	125	(2)	Japan 69; Sweden 55.
Semimanufactures	NA	475	185	West Germany 100; Japan 62.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Other:				
Ores and concentrates	15	169	--	Belgium-Luxembourg 141; West Germany 17; Netherlands 6.
Oxides and hydroxides	157	144	17	West Germany 90; Italy 11.
Ashes and residues	19,114	18,468	431	Belgium-Luxembourg 6,419; Sweden 5,437; West Germany 3,624.
Base metals including alloys, all forms	28	125	9	Japan 106; United Kingdom 7.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1,486	1,383	2	West Germany 367; Martinique 216; Spain 199.
Artificial:				
Corundum	21,362	20,706	1,902	Italy 4,244; Austria 2,421; Belgium-Luxembourg 2,120.
Silicon carbide	NA	2,459	37	Italy 923; West Germany 483; Spain 272.
Dust and powder of precious and semi-precious stones including diamond value, thousands	$478	$873	$140	Italy $304; Switzerland $280.
Grinding and polishing wheels and stones	7,821	8,689	989	West Germany 2,008; United Kingdom 951.
Asbestos, crude	921	980	--	Tunisia 645; West Germany 96; Morocco 64.
Barite and witherite	131,394	95,171	--	West Germany 89,853; Italy 2,204; Belgium-Luxembourg 665.
Boron materials:				
Crude natural borates	4,596	4,920	--	Spain 3,490; Italy 1,132; Martinique 157.
Elemental	8	(2)	--	Mainly to West Germany.
Oxides and acids	28,056	23,454	126	West Germany 8,818; United Kingdom 3,249; East Germany 2,943.
Bromine	NA	721	--	Switzerland 352; Italy 171; West Germany 133.
Cement thousand tons	3,157	2,630	506	Cameroon 365; West Germany 329.
Chalk	656,784	676,944	1,274	West Germany 312,940; Belgium-Luxembourg 91,719; Switzerland 46,045.
Clays, crude:				
Bentonite	7,676	8,297	--	West Germany 1,774; Portugal 1,637; Italy 1,024.
Chamotte earth	163,345	151,176	--	Italy 41,806; United Kingdom 34,577; West Germany 19,594.
Fuller's earth	12,033	5,460	--	Italy 5,389; Algeria 40; Central African Republic 20.
Kaolin	147,872	136,228	2	Italy 32,358; West Germany 30,502; Belgium-Luxembourg 30,270.
Unspecified	r323,531	318,431	4	Italy 139,679; West Germany 79,461; United Kingdom 35,829.
Cryolite and chiolite	43	41	--	Italy 16; Morocco 10; Spain 9.
Diamond:				
Gem, not set or strung value, thousands	$57,731	$70,451	$3,799	Switzerland $53,807; Belgium-Luxembourg $4,840.
Industrial stones do	$2,445	$1,608	$180	Ireland $1,148; Belgium-Luxembourg $202.
Diatomite and other infusorial earth	31,655	32,337	23	West Germany 10,985; Belgium-Luxembourg 3,848; Italy 3,808.
Feldspar, fluorspar, related materials:				
Feldspar	59,566	53,524	--	Spain 17,550; Belgium-Luxembourg 14,697; Netherlands 5,047.
Fluorspar	60,928	56,187	487	West Germany 23,232; Italy 20,426; Belgium-Luxembourg 4,841.
Unspecified	20	39	--	United Kingdom 34; Japan 4; Portugal 1.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Fertilizer materials:				
Crude, n.e.s	22,811	49,435	18	Belgium-Luxembourg 27,458; Switzerland 14,370; West Germany 3,299.
Manufactured:				
Ammonia	248,800	143,094	--	West Germany 84,182; Spain 30,698; United Kingdom 6,589.
Nitrogenous	757,762	651,059	1,245	Netherlands 244,090; Belgium-Luxembourg 73,123; Austria 41,963.
Phosphatic	180,559	205,611	--	Switzerland 62,621; Italy 39,169; Austria 36,147.
Potassic	457,875	433,726	4,014	Belgium-Luxembourg 107,095; West Germany 69,995; Italy 69,906.
Unspecified and mixed	507,346	553,666	3	West Germany 182,955; Belgium-Luxembourg 70,173; Ireland 57,948.
Graphite, natural	555	815	--	West Germany 592; Spain 70; Italy 43.
Gypsum and plaster -- thousand tons	1,189	1,294	(2)	West Germany 668; Belgium-Luxembourg 295; Netherlands 142.
Iodine	52	62	--	West Germany 16; United Kingdom 13; Belgium-Luxembourg 12.
Kyanite and related materials	51	180	--	West Germany 80; China 47; Belgium-Luxembourg 25.
Lime	316,666	319,809	9	West Germany 218,497; Belgium-Luxembourg 73,884; Guinea 12,031.
Magnesium compounds:				
Magnesite, crude	222	980	11	Switzerland 888; Italy 48.
Oxides and hydroxides	13,148	13,237	4	U.S.S.R. 2,650; Italy 3,052; Belgium-Luxembourg 1,049.
Other	71	424	--	Yugoslavia 300; Martinique 120; Tunisia 3.
Mica:				
Crude including splittings and waste	9,598	7,729	32	United Kingdom 2,448; West Germany 1,583; Belgium-Luxembourg 930.
Worked including agglomerated splittings	1,127	1,200	17	West Germany 210; Hong Hong 205.
Nitrates, crude	5	1	--	Mainly to Belgium-Luxembourg.
Phosphates, crude	1,931	4,239	--	Cameroon 2,340; Switzerland 1,024; West Germany 300.
Phosphorus, elemental	5	1,570	(2)	Switzerland 788; Denmark 398; Republic of Korea 154.
Pigments, mineral:				
Natural, crude	715	1,173	--	Algeria 460; West Germany 164; Togo 78.
Iron oxides and hydroxides, processed	4,116	4,570	8	Italy 1,776; West Germany 774; Spain 613.
Potassium salts, crude	3,378	7,889	--	Belgium-Luxembourg 7,888; West Germany 1.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$45,801	$39,902	$1,755	Switzerland $31,722; United Kingdom $1,449.
Synthetic do	$5,629	$9,540	$1,869	Switzerland $4,448; Spain $650.
Pyrite, unroasted	44	151	--	Spain 113; Republic of South Africa 18; West Germany 14.
Quartz crystal, piezoelectric kilograms	320	NA		
Salt and brine	606,316	740,237	205,768	Italy 238,809; West Germany 131,246.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	204,079	239,940	174	China 31,251; Argentina 29,281; United Kingdom 27,680.
Sulfate, manufactured	20,638	NA		
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	105	117	(2)	Belgium-Luxembourg 50; West Germany 25; Switzerland 13.
Worked do	57	61	5	Belgium-Luxembourg 23; West Germany 14; Switzerland 5.
Dolomite, chiefly refractory-grade do	31	29	--	Belgium-Luxembourg 12; Spain 3; West Germany 2.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel —Continued				
Gravel and crushed rock thousand tons	9,063	9,300	3	West Germany 4,752; Switzerland 2,370; Netherlands 1,203.
Limestone other than dimension do	441	544	--	West Germany 489; Belgium-Luxembourg 41; Netherlands 10.
Quartz and quartzite do	3	7	(2)	West Germany 3; Italy 2; Belgium-Luxembourg 1.
Sand other than metal-bearing do	3,406	3,502	(2)	West Germany 1,842; Switzerland 753; Italy 673.
Sulfur:				
Elemental:				
Crude including native and by-product	719,218	537,878	3	United Kingdom 200,247; Netherlands 69,600; Spain 41,958.
Colloidal, precipitated, sublimed	5,961	5,177	(2)	Algeria 3,004; Belgium-Luxembourg 719; West Germany 567.
Dioxide	4,069	714	--	Belgium-Luxembourg 587; Tunisia 59; Morocco 30.
Sulfuric acid	204,192	232,562	21	Belgium-Luxembourg 167,157; United Kingdom 28,933; Netherlands 13,660.
Talc, steatite, soapstone, pyrophyllite	94,011	103,471	4,408	West Germany 31,575; Netherlands 13,061; Belgium-Luxembourg 12,635.
Vermiculite	609	135	--	Algeria 39; Netherlands 31; Tunisia 27.
Other:				
Crude thousand tons	1,035	1,523	--	Belgium-Luxembourg 1,131; Switzerland 370; West Germany 14.
Slag and dross, not metal-bearing do	1,461	1,090	(2)	West Germany 577; Belgium-Luxembourg 213; Israel 126.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	62,152	81,082	--	Belgium-Luxembourg 76,612; United Kingdom 3,185; Morocco 466.
Carbon:				
Carbon black	r756	2,439	1	Italy 1,287; West Germany 260; Ghana 130.
Gas carbon	r97,237	87,684	115	West Germany 26,525; Spain 18,328; Belgium-Luxembourg 13,938.
Coal:				
Anthracite thousand tons	171	83	--	Belgium-Luxembourg 38; United Kingdom 17; Tunisia 12.
Bituminous do	721	958	(2)	West Germany 409; East Germany 263; Norway 107.
Briquets of anthracite and bituminous coal do	49	63	--	Belgium-Luxembourg 27; United Kingdom 11; Hungary 10.
Lignite including briquets do	2	2	--	Mainly to Spain.
Coke and semicoke do	1,082	647	--	West Germany 227; Norway 77; Italy 63.
Gas, natural: Gaseous million cubic feet	5,631	12,435	--	West Germany 7,392; Switzerland 2,522; Belgium-Luxembourg 2,520.
Peat including briquets and litter	814	2,283	--	West Germany 1,742; Belgium-Luxembourg 283; Morocco 81.
Petroleum:				
Crude thousand 42-gallon barrels	497	5	--	All to Austria.
Refinery products:				
Liquefied petroleum gas do	7,672	9,342	1,013	Spain 2,155; Italy 2,061.
Gasoline do	11,354	17,045	3,974	Netherlands 3,107; West Germany 2,143.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Mineral jelly and wax thousand 42-gallon barrels	520	496	2	West Germany 214; Netherlands 118; Belgium-Luxembourg 33.
Kerosene and jet fuel do	8,631	6,763	--	Switzerland 2,561; West Germany 2,071; United Kingdom 384.
Distillate fuel oil do	19,841	24,048	396	Switzerland 8,830; West Germany 8,182; Italy 1,903.
Lubricants do	5,529	6,169	255	Belgium-Luxembourg 1,254; United Kingdom 647; West Germany 534.
Residual fuel oil do	27,828	27,634	626	Italy 10,131; United Kingdom 5,320; Portugal 4,766.
Bitumen and other residues do	880	657	--	West Germany 201; Ireland 157; Switzerland 141.
Bituminous mixtures do	235	282	(2)	Algeria 151; Belgium-Luxembourg 39; United Kingdom 15.
Petroleum coke do	107	85	(2)	Italy 63; Belgium-Luxembourg 14; United Kingdom 7.

rRevised. NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.
[3]May include other precious metals.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	313	943	--	United Kingdom 876; West Germany 45; Italy 18.
Alkaline-earth metals	237	419	--	Canada 328; China 53; U.S.S.R. 16.
Aluminum:				
Ore and concentrate thousand tons	981	1,003	(2)	Guinea 663; Australia 167; Greece 63.
Oxides and hydroxides	49,999	138,926	725	Guinea 101,450; West Germany 27,097; Netherlands 4,895.
Ash and residue containing aluminum	8,845	12,977	--	Italy 5,070; West Germany 4,811; Cameroon 2,629.
Metal including alloys:				
Scrap	66,541	53,273	455	Netherlands 15,652; Belgium-Luxembourg 14,652; West Germany 7,654.
Unwrought	364,957	395,912	1,097	Netherlands 79,407; West Germany 63,476; Cameroon 53,816.
Semimanufactures	215,348	224,894	767	West Germany 74,467; Belgium-Luxembourg 56,990; Netherlands 18,912.
Antimony:				
Ore and concentrate	11,255	12,074	--	China 6,658; Bolivia 2,593; Australia 1,586.
Oxides	504	662	12	Belgium-Luxembourg 319; Netherlands 89; United Kingdom 58.
Metal including alloys, all forms	568	431	(2)	China 325; Spain 51; Belgium-Luxembourg 25.
Arsenic: Oxides and acids	214	409	--	Italy 191; United Kingdom 168; Belgium-Luxembourg 46.
Beryllium:				
Oxides and hydroxides	(2)	(2)	--	All from United Kingdom.
Metal including alloys, all forms	7	4	4	
Bismuth: Metal including alloys, all forms	232	207	2	Belgium-Luxembourg 126; United Kingdom 59; Netherlands 8.
Cadmium: Metal including alloys, all forms	921	892	5	Belgium-Luxembourg 443; Netherlands 215; Canada 45.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Cesium and rubidium: Metal including alloys, all forms	20	(2)	(2)	
Chromium:				
Ore and concentrate	57,596	25,094	--	Republic of South Africa 16,575; Albania 3,960; Netherlands 2,273.
Oxides and hydroxides	6,049	5,893	4	West Germany 2,479; United Kingdom 2,081; Italy 929.
Metal including alloys, all forms	290	198	3	United Kingdom 84; Japan 45; China 41.
Cobalt:				
Oxides and hydroxides	314	202	1	Finland 82; Belgium-Luxembourg 75; United Kingdom 23.
Metal including alloys, all forms	1,574	1,376	135	Zaire 529; Zambia 219; Norway 101.
Columbium and tantalum:				
Ore and concentrate	(2)	--		
Ash and residue containing columbium and tantalum	19	--		
Metal including alloys, all forms:				
Columbium (niobium)	37	73	1	West Germany 72.
Tantalum	48	48	31	West Germany 15; Austria 2.
Copper:				
Ore and concentrate	356	285	--	Zaire 205; West Germany 45; Australia 33.
Oxides and hydroxides	800	764	1	Italy 372; Belgium-Luxembourg 153; Norway 140.
Sulfate	4,297	4,541	--	Italy 1,407; Spain 918; U.S.S.R. 494.
Ash and residue containing copper	5,339	4,658	--	Japan 1,462; Switzerland 837; Belgium-Luxembourg 653.
Metal including alloys:				
Scrap	31,623	34,412	943	West Germany 6,647; United Kingdom 5,620; Belgium-Luxembourg 4,645.
Unwrought	364,154	351,455	949	Chile 118,155; Belgium-Luxembourg 63,786; Zambia 43,522.
Semimanufactures	169,545	176,646	1,453	West Germany 57,555; Belgium-Luxembourg 54,326; Italy 30,547.
Germanium: Metal including alloys, all forms	(2)	6	4	Belgium-Luxembourg 1; Japan 1.
Gold:				
Waste and sweepings thousands	$4,572	$4,605	--	Switzerland $3,441; Netherlands $404; Spain $351.
Metal including alloys, unwrought and partly wrought thousand troy ounces	2,958	3,633	2,282	French Guinea 579; Philippines 193.
Hafnium: Metal including alloys, all forms	(2)	1	(2)	Mainly from Switzerland.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	16,088	16,220	(2)	Brazil 3,975; Sweden 2,891; Mauritania 2,306.
Pyrite, roasted do	73	49	--	Belgium-Luxembourg 22; Italy 22; Spain 4.
Metal:				
Scrap	406,539	460,985	4,319	Belgium-Luxembourg 192,738; West Germany 163,626; United Kingdom 51,372.
Pig iron, cast iron, related materials	431,721	510,366	197	West Germany 431,616; Canada 27,636; Sweden 8,871.
Ferroalloys:				
Ferrochromium	154,506	160,071	98	Republic of South Africa 81,097; Sweden 17,759; West Germany 13,946.
Ferromanganese	40,990	35,480	2	Norway 9,222; Belgium-Luxembourg 8,138; West Germany 6,381.
Ferromolybdenum	1,367	1,514	23	Netherlands 552; United Kingdom 324; Belgium-Luxembourg 286.
Ferronickel	93,980	106,700	886	New Caledonia 85,605; Greece 5,003; Belgium-Luxembourg 4,618.
Ferrosilicochromium	849	493	--	West Germany 304; Zimbabwe 143; U.S.S.R. 45.
Ferrosilicomanganese	41,018	39,064	1	Norway 34,513; Belgium-Luxembourg 3,562; Netherlands 493.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Ferroalloys —Continued				
Ferrosilicon	136,656	38,525	33	West Germany 16,058; Norway 12,965; Italy 4,982.
Silicon metal	5,780	6,763	7	Norway 2,911; Sweden 1,560; Brazil 1,204.
Unspecified	5,765	7,110	1	West Germany 2,245; Italy 844; Norway 749.
Steel, primary forms thousand tons	2,453	2,252	(2)	Belgium-Luxembourg 1,386; West Germany 445; Italy 158.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	2,100	2,107	2	West Germany 609; Belgium-Luxembourg 533; Italy 519.
Universals, plates, sheets do	2,498	2,357	(2)	Belgium-Luxembourg 1,019; West Germany 561; Italy 254.
Hoop and strip do	370	398	(2)	West Germany 203; Belgium-Luxembourg 83; Italy 47.
Rails and accessories do	57	56	(2)	United Kingdom 22; Sweden 3; West Germany 2.
Wire do	210	220	(2)	Belgium-Luxembourg 68; West Germany 64; Italy 52.
Tubes, pipes, fittings do	519	539	2	Italy 177; West Germany 146; Belgium-Luxembourg 58.
Castings and forgings, rough do	47	45	(2)	West Germany 24; Italy 6; Belgium-Luxembourg 4.
Lead:				
Ore and concentrate	158,366	190,536	1,250	Republic of South Africa 49,048; Canada 20,838; Ireland 17,662.
Oxides	1,312	1,572	6	West Germany 949; Belgium-Luxembourg 294; United Kingdom 291.
Ash and residue containing lead	15,233	14,663	--	Netherlands 5,338; Belgium-Luxembourg 2,805; West Germany 2,140.
Metal including alloys:				
Scrap	4,870	9,279	1	Belgium-Luxembourg 4,371; Netherlands 2,261; Switzerland 1,113.
Unwrought	55,249	41,107	4	United Kingdom 16,132; Belgium-Luxembourg 11,991; West Germany 6,185.
Semimanufactures	5,778	5,936	15	Belgium-Luxembourg 3,446; West Germany 2,250; Netherlands 126.
Lithium:				
Oxides and hydroxides	474	473	153	West Germany 191; Netherlands 49.
Metal including alloys, all forms	29	18	--	West Germany 15; United Kingdom 3.
Magnesium: Metal including alloys:				
Scrap	239	349	--	Netherlands 103; West Germany 90; Benin 57.
Unwrought	4,685	4,347	1,191	Norway 2,888; West Germany 111.
Semimanufactures	471	459	24	Switzerland 109; Belgium-Luxembourg 94; Italy 91.
Manganese:				
Ore and concentrate, metallurgical-grade thousand tons	1,008	1,040	--	Gabon 692; Republic of South Africa 249; Brazil 45.
Oxides	7,092	8,183	36	Belgium-Luxembourg 3,628; West Germany 1,959; Greece 1,411.
Metal including alloys, all forms	1,184	825	10	Republic of South Africa 476; Netherlands 293; West Germany 17.
Mercury 76-pound flasks	4,293	4,582	29	Spain 2,784; China 522; Algeria 464.
Molybdenum:				
Ore and concentrate	6,246	5,677	1,577	Netherlands 1,374; Peru 604.
Oxides and hydroxides	77	145	1	Netherlands 79; Chile 30; Belgium-Luxembourg 21.
Metal including alloys:				
Scrap	50	49	--	Belgium-Luxembourg 20; Austria 13; West Germany 12.
Unwrought	104	85	14	United Kingdom 31; Austria 22; West Germany 13.
Semimanufactures	89	128	12	Austria 44; United Kingdom 26; West Germany 24.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Nickel:				
Ore and concentrate	20	--	--	
Matte and speiss	8,649	13,600	--	New Caledonia 11,970; Canada 814; Australia 664.
Oxides and hydroxides	283	204	--	Netherlands 152; Australia 22; Canada 20.
Ash and residue containing nickel	571	1,660	40	West Germany 1,185; Netherlands 132.
Metal including alloys:				
Scrap	917	942	78	United Kingdom 332; West Germany 221; Belgium-Luxembourg 128.
Unwrought	22,698	19,774	2,860	West Germany 4,227; U.S.S.R. 1,857.
Semimanufactures	4,567	4,851	645	United Kingdom 1,809; West Germany 1,234.
Platinum-group metals:				
Waste and sweepings value, thousands	$21,388	$23,292	$3	West Germany $8,294; Netherlands $3,943; Spain $2,543.
Metals including alloys, unwrought and partly wrought troy ounces	267,384	379,335	39,350	United Kingdom 152,461; Republic of South Africa 53,787; U.S.S.R. 39,484.
Rare-earth metals including alloys, all forms	162	235	--	Austria 232; West Germany 1; Japan 1.
Rhenium: Metal including alloys, all forms	(2)	(2)	(2)	
Selenium, elemental	46	35	--	Canada 15; Belgium-Luxembourg 8; West Germany 4.
Silicon, high-purity	15	60	--	Netherlands 22; Norway 20; West Germany 18.
Silver:				
Ore and concentrate[3] value, thousands	$4,096	$2,720	--	Greece $1,602; Bolivia $533; Peru $470.
Waste and sweepings do.	$6,183	$4,666	$1	Greece $1,626; Spain $747; Netherlands $690.
Metal including alloys, unwrought and partly wrought thousand troy ounces	15,778	18,648	514	United Kingdom 3,537; West Germany 2,218; China 2,154.
Tellurium, elemental and arsenic	165	113	3	Sweden 46; United Kingdom 22; Belgium-Luxembourg 20.
Tin:				
Ore and concentrate	--	1	--	All from Zaire.
Oxides	109	99	--	United Kingdom 47; West Germany 32; Italy 19.
Ash and residue containing tin	4	26	--	Belgium-Luxembourg 17; Zaire 9.
Metal including alloys:				
Scrap	41	15	2	United Kingdom 6; Gabon 4; West Germany 2.
Unwrought	8,187	7,126	25	Malaysia 3,333; Netherlands 1,562; Indonesia 624.
Semimanufactures	182	367	(2)	Netherlands 209; West Germany 106; Italy 22.
Titanium:				
Ore and concentrate	167,851	233,056	--	Canada 137,145; Australia 44,365; India 27,808.
Oxides	14,438	8,762	--	West Germany 3,451; Belgium-Luxembourg 1,677; Netherlands 1,562.
Metal including alloys:				
Scrap	182	132	24	West Germany 69; United Kingdom 26.
Unwrought	1,432	1,169	229	Japan 873; West Germany 38.
Semimanufactures	783	1,400	651	West Germany 298; United Kingdom 175.
Tungsten:				
Ore and concentrate	2,632	352	--	Canada 135; Australia 102; China 50.
Oxides and hydroxides	15	27	--	All from West Germany.
Ash and residue containing tungsten	10	--		
Metal including alloys:				
Scrap	15	87	--	Belgium-Luxembourg 35; Sweden 31; West Germany 10.
Unwrought	112	185	2	West Germany 123; Sweden 30; Belgium-Luxembourg 13.
Semimanufactures	56	59	5	Austria 16; West Germany 13; Netherlands 9.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Uranium and/or thorium:				
Ore and concentrate	12,947	--		
Oxides and other compounds	(2)	--		
Metal including alloys, all forms:				
Uranium	r8	14	--	United Kingdom 13; Belgium-Luxembourg 1.
Thorium	(2)	--		
Vanadium:				
Oxides and hydroxides	2,501	2,217	(2)	Finland 712; Republic of South Africa 696; China 426.
Metal including alloys:				
Unwrought	52	137	8	West Germany 78; Belgium-Luxembourg 51.
Semimanufactures	(2)	4	--	Belgium-Luxembourg 2; West Germany 2.
Zinc:				
Ore and concentrate	558,386	540,117	1,591	Peru 143,339; Canada 119,063; Sweden 90,662.
Oxides	8,465	8,120	1	Belgium-Luxembourg 2,632; West Germany 1,722; Italy 1,707.
Blue powder	2,952	1,041	--	West Germany 569; Belgium-Luxembourg 301; Italy 120.
Matte	5,511	4,897	--	Belgium-Luxembourg 2,043; United Kingdom 1,348; West Germany 1,087.
Ash and residue	34,887	39,382	1,700	Peru 14,113; Belgium-Luxembourg 8,812; West Germany 4,975.
Metal including alloys:				
Scrap	6,345	5,590	--	Belgium-Luxembourg 3,310; Netherlands 491; United Kingdom 477.
Unwrought	89,889	89,236	16	Belgium-Luxembourg 27,094; Netherlands 25,559; West Germany 19,105.
Semimanufactures	8,382	10,301	2	West Germany 5,137; Belgium-Luxembourg 2,487; Netherlands 1,352.
Zirconium:				
Ore and concentrate	36,624	51,305	688	Australia 39,276; Republic of South Africa 6,049; Netherlands 4,437.
Metal including alloys:				
Scrap	57	105	68	West Germany 29; Japan 7.
Unwrought	24	21	10	West Germany 11.
Semimanufactures	84	51	24	Italy 20; Sweden 4.
Other:				
Ores and concentrates	22,448	16,024	9	Peru 6,509; Canada 3,458; West Germany 1,833.
Oxides and hydroxides	956	869	34	Belgium-Luxembourg 368; United Kingdom 221; Spain 79.
Ashes and residues	26,359	22,485	224	Spain 9,051; Italy 8,510; West Germany 2,845.
Base metals including alloys, all forms	(2)	9	1	United Kingdom 4; Hungary 1.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	9,560	9,758	803	Italy 2,577; West Germany 2,353; Turkey 1,464.
Artificial:				
Corundum	9,483	10,249	320	West Germany 3,834; U.S.S.R. 2,349; Austria 2,114.
Silicon carbide	16,544	17,799	63	Norway 5,771; West Germany 2,618; Netherlands 2,084.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$8,583	$9,636	$2,117	Ireland $4,567; Republic of South Africa $828.
Grinding and polishing wheels and stones	9,868	10,226	50	Italy 2,976; West Germany 1,871; Belgium-Luxembourg 1,624.
Asbestos, crude	70,170	63,874	138	Canada 28,684; U.S.S.R. 22,137; Italy 9,662.
Barite and witherite	30,855	43,660	--	West Germany 22,637; Belgium-Luxembourg 10,909; Morocco 5,907.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Boron materials:				
Crude natural borates	132,794	83,289	773	Turkey 82,174; Netherlands 171.
Elemental	275	1,199	--	United Kingdom 1,196; West Germany 3.
Oxides and acids	1,517	1,651	(2)	Italy 1,275; Turkey 192; United Kingdom 67.
Bromine	5,173	6,784	--	Israel 4,748; United Kingdom 845; Netherlands 815.
Cement	408,715	429,641	16	Belgium-Luxembourg 357,456; West Germany 52,821; Italy 13,834.
Chalk	28,122	36,905	4	West Germany 26,607; Belgium-Luxembourg 8,441; Spain 1,642.
Clays, crude:				
Bentonite	95,069	98,366	9,621	Greece 39,747; Italy 32,628.
Chamotte earth	7,283	8,777	125	West Germany 5,795; Spain 1,869; Czechoslovakia 982.
Fuller's earth	1,898	1,922	76	West Germany 940; United Kingdom 665; Spain 123.
Kaolin	360,501	310,457	21,726	United Kingdom 219,533; West Germany 24,329.
Unspecified	r255,123	250,254	1,087	West Germany 176,016; Senegal 47,060; United Kingdom 13,271.
Cryolite and chiolite	733	615	--	Denmark 510; Greenland 93; West Germany 12.
Diamond:				
Gem, not set or strung value, thousands	$163,868	$172,683	$10,516	Switzerland $87,199; Belgium-Luxembourg $38,262; Israel $13,591.
Industrial stones do	$4,097	$4,249	$28	Ireland $1,491; Belgium-Luxembourg $1,158; Republic of South Africa $512.
Diatomite and other infusorial earth	8,638	7,216	2,126	West Germany 2,250; Spain 2,173.
Feldspar, fluorspar, related materials:				
Feldspar	19,846	23,497	--	West Germany 16,137; Spain 2,561; Portugal 2,268.
Fluorspar	15,425	13,151	--	Spain 7,849; Morocco 2,651; West Germany 1,685.
Unspecified	47,073	44,136	--	Norway 40,961; Netherlands 1,432; Belgium-Luxembourg 586.
Fertilizer materials:				
Crude, n.e.s	26,771	31,872	3	Belgium-Luxembourg 18,940; West Germany 5,444; Italy 3,485.
Manufactured:				
Ammonia thousand tons	195	464	60	Trinidad and Tobago 125; Netherlands 80; United Kingdom 74.
Nitrogenous do	2,388	2,731	88	Netherlands 1,168; Belgium-Luxembourg 969; West Germany 147.
Phosphatic do	690	846	101	Belgium-Luxembourg 209; Tunisia 186; Netherlands 129.
Potassic do	864	940	--	Israel 197; Belgium-Luxembourg 145; Jordan 109.
Unspecified and mixed do	1,585	1,636	73	Belgium-Luxembourg 803; Netherlands 310; West Germany 151.
Graphite, natural	4,578	5,277	38	China 1,919; Austria 971; Madagascar 754.
Gypsum and plaster	25,821	39,219	126	West Germany 13,964; Switzerland 11,957; Spain 10,799.
Iodine	880	894	--	Japan 678; Chile 172; United Kingdom 26.
Kyanite and related materials	4,221	3,452	1,008	West Germany 1,506; Republic of South Africa 918.
Lime	102,067	102,752	--	West Germany 73,325; Belgium-Luxembourg 13,141; Spain 5,372.
Magnesium compounds:				
Magnesite, crude	80	53	--	Netherlands 41; Belgium-Luxembourg 6; West Germany 5.
Oxides and hydroxides	167,233	171,556	3,383	Spain 42,962; Greece 40,454; Austria 21,517.
Other	101,651	105,651	--	West Germany 67,754; East Germany 27,836; Belgium-Luxembourg 9,317.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Mica:				
Crude including splittings and waste	4,047	4,309	186	India 2,315; Morocco 1,345; Canada 193.
Worked including agglomerated splittings	210	244	2	Belgium-Luxembourg 60; Switzerland 37; India 13.
Nitrates, crude	7,319	8,374	--	Chile 8,356; Netherlands 18.
Phosphates, crude thousand tons	4,652	4,254	731	Morocco 1,642; Togo 531.
Phosphorus, elemental	395	--		
Pigments, mineral:				
Natural, crude	585	226	--	West Germany 182; Netherlands 25; Belgium-Luxembourg 11.
Iron oxides and hydroxides, processed	72,854	50,139	711	West Germany 43,622; Belgium-Luxembourg 2,202; Italy 1,586.
Potassium salts, crude	255	120	--	Netherlands 52; Belgium-Luxembourg 30; Italy 18.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$75,031	$80,290	$2,611	Switzerland $54,201; Thailand $7,717; India $3,549.
Synthetic do	$2,018	$4,795	$1,260	Switzerland $1,465; West Germany $530.
Pyrite, unroasted	1,553	1,177	--	Italy 878; West Germany 169; Spain 95.
Quartz crystal, piezoelectric kilograms	809	NA		
Salt and brine	154,850	151,575	1	Belgium-Luxembourg 51,179; Netherlands 44,027; West Germany 28,479.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	56,110	62,400	--	West Germany 27,419; Poland 24,333; Belgium-Luxembourg 10,106.
Sulfate, manufactured	69,809	NA		
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	267	282	(2)	West Germany 63; Italy 42; Finland 38.
Worked do	287	269	(2)	Spain 161; Italy 73; West Germany 19.
Dolomite, chiefly refractory-grade do	319	284	--	Belgium-Luxembourg 251; West Germany 18; Italy 13.
Gravel and crushed rock do	3,230	3,592	(2)	Belgium-Luxembourg 3,065; West Germany 141; United Kingdom 140.
Limestone other than dimension do	158	178	--	Belgium-Luxembourg 177; West Germany 1.
Quartz and quartzite do	286	290	1	Belgium-Luxembourg 258; Spain 22; Italy 5.
Sand other than metal-bearing do	1,931	2,072	(2)	Belgium-Luxembourg 1,042; United Kingdom 758; Netherlands 158.
Sulfur:				
Elemental:				
Crude including native and by-product	553,174	624,351	101,026	Poland 316,331; Canada 166,840.
Colloidal, precipitated, sublimed	178	78	1	West Germany 38; Spain 35; Belgium-Luxembourg 1.
Dioxide	310	1,050	--	Netherlands 447; West Germany 351; Sweden 208.
Sulfuric acid	153,872	140,988	1	West Germany 104,656; Belgium-Luxembourg 27,248; Spain 4,391.
Talc, steatite, soapstone, pyrophyllite	20,976	16,145	501	Italy 5,359; Belgium-Luxembourg 3,552; Austria 2,398.
Vermiculite, perlite, chlorite	61,185	64,854	--	Republic of South Africa 23,792; Italy 13,208; Greece 11,863.
Other:				
Crude thousand tons	1,383	2,074	1	Switzerland 1,668; Norway 127; Spain 105.
Slag and dross, not metal-bearing do	1,666	2,155	3	West Germany 1,353; Belgium-Luxembourg 577; Spain 92.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,777	1,568	604	Belgium-Luxembourg 741; Netherlands 113.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Carbon:				
Carbon black	r8,756	6,778	404	West Germany 2,885; United Kingdom 1,998; Dominican Republic 432.
Gas carbon	r70,888	81,699	925	West Germany 33,726; Netherlands 29,702; Spain 10,952.
Coal:				
Anthracite thousand tons	1,140	1,284	2	Republic of South Africa 497; West Germany 459; United Kingdom 114.
Bituminous do.	19,491	17,173	3,620	Australia 3,012; West Germany 2,563.
Briquets of anthracite and bituminous coal do.	113	121	--	West Germany 115; Belgium-Luxembourg 3; Italy 3.
Lignite including briquets do.	130	151	--	West Germany 132; East Germany 17; Hungary 1.
Coke and semicoke do.	2,030	2,777	233	West Germany 1,370; Netherlands 381; Belgium-Luxembourg 339.
Gas, natural:				
Gaseous million cubic feet	511,162	701,983	--	Netherlands 328,936; U.S.S.R. 186,190; Norway 104,803.
Liquefied thousand tons	6,048	5,746	--	All from Algeria.
Peat including briquets and litter	253,849	321,486	76	West Germany 173,992; Netherlands 93,465; Belgium-Luxembourg 18,469.
Petroleum:				
Crude thousand 42-gallon barrels	538,261	501,201	--	United Kingdom 111,682; Nigeria 59,539; Saudi Arabia 35,912.
Refinery products:				
Liquefied petroleum gas do.	11,722	12,589	662	United Kingdom 5,179; Algeria 3,065; Saudi Arabia 1,258.
Gasoline do.	44,006	41,947	115	U.S.S.R. 6,142; Algeria 6,077; Netherlands 5,220.
Mineral jelly and wax do.	235	145	11	West Germany 42; Netherlands 34; Republic of South Africa 16.
Kerosene and jet fuel do.	375	1,675	53	Libya 390; Spain 387; Belgium-Luxembourg 189.
Distillate fuel oil do.	46,652	51,699	443	U.S.S.R. 10,107; United Kingdom 7,660; Netherlands 6,949.
Lubricants do.	1,424	970	70	Belgium-Luxembourg 193; Italy 169; Netherlands 167.
Residual fuel oil do.	35,763	50,660	643	U.S.S.R. 7,115; Kuwait 5,440; Saudi Arabia 5,313.
Bitumen and other residues do.	575	459	(2)	Belgium-Luxembourg 193; Netherlands 161; West Germany 84.
Bituminous mixtures do.	49	40	1	Belgium-Luxembourg 12; West Germany 8; Netherlands 5.
Petroleum coke do.	8,775	7,135	6,089	West Germany 441; United Kingdom 350.

rRevised. NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.
[3]May include other precious metals.

COMMODITY REVIEW

METALS

Alumina and Bauxite.—Aluminium Pechiney S.A. announced plans to close its 360,000-ton-per-year La Barrasse alumina plant in early 1987. The closure plans, which will leave Aluminium Pechiney with only its 620,000-ton-per-year plant at Gardanne, were a part of a restructuring scheme designed to ensure the future viability of the company's operations in France. Bauxite mining at Peygros was also to be ended in 1987 as a part of the plan.

Aluminum.—Production at the Issoire aluminum-lithium alloys plant operated by Pechiney's subsidiary Cédégur Pechiney S.A. was halted in late March when an explosion, apparently triggered by light-

ning, destroyed the plant's foundry, killing 4 people and injuring 25. The blast also damaged to a lesser degree the rolling mills and extrusion presses at the facility. Operations in the latter two areas of the plant were restarted soon after the accident, but it was unclear whether the reconstruction of the foundry was completed by yearend.

The new 90,000-ton-per-year primary smelter at Aluminium Pechiney's Saint-Jean-de-Maurienne facility came on-line at the end of January. The new line, which consists of 120 280,000-ampere pots, raised capacity at the plant to 120,000 tons per year. Closures of old potlines reduced capacity at Saint-Jean to 30,000 tons per year. The new potline operated at 40% to 50% capacity until late October when it became fully operational.

In July, the company announced its intentions to phase out the 115,000-ton-per-year Noguères and the 25,000-ton-per-year Rioupéroux smelters over a 5-year period beginning in 1987. The potlines at both installations were constructed prior to 1940 and were very inefficient. The high electricity cost in France made modernization of the lines unfeasible, according to company officials. The move was taken as part of a plan to shift the company's product base away from ingots toward more profitable alloys and specialty products.

Cédégur Pechiney unveiled the development of thick aluminum-lithium alloys products. Thick product advancements had previously been troubled by the inability to achieve suitably high elongation coefficients in short transverse sections. The company reported that it had successfully prepared 38.5-millimeter-thick plates of its 2091 alloy. Similar results were predicted for other forms of thick products using the same production techniques. The breakthrough was important because of the great weight savings achieved by replacing the 7000-series aluminum used in airframes with the lighter alloys. Thick products accounted for nearly 40% of the material purchased by Western European airframe manufacturers in 1985. The total potential market for aluminum-lithium alloys was estimated by company officials as 150,000 tons annually. The company's plans included commercial production of 3,500 tons annually starting in 1988, with possible expansion to 12,000 tons if market conditions warrant. Cédégur Pechiney was also able to produce clad sheet to meet the specifications for Boeing 7J7 aircraft.

The company stated that it will have a policy of buying lithium alloy production scrap from the aircraft manufacturers. The need to separate the lithium-containing scrap from standard alloy scrap may create problems for the airframe companies. Recycling of fine aluminum-lithium also was a concern to company officials because it cannot be processed in a furnace.

Cédégur Pechiney also began production of pure aluminum and aluminum alloy powders at its Hermillon facility in Savoie Department. The unit uses proprietary rapid cooling techniques developed at Pechiney's Voreppe research center to produce powders in the 5- to 7-micrometer range. The plant was reportedly capable of producing powder in 500-kilogram batches.

Late in the year, Pechiney renegotiated its 1985 power agreement with state-owned power company Électricité de France. The 10- to 18-year contract was replaced with a less expensive pact covering only 5 to 8 years. The agreement reduced the tariff on power by nearly 45% and also provided for a rate reduction of 35% if Pechiney's smelters close for the 3 winter months. The extension period of the contract beyond the basic 5 years was to be equivalent to the total period of the shutdowns.

Gold.—A 3-ton-per-day pilot plant to treat tailings came on-stream at Société des Mines et Produits Chimiques de Salsigne S.A.'s mine in Aude Department in July. The plant was being operated to test the efficiency of a new selective process for recovering gold from solution. The process, called DeVoe-Holbein after its developers, utilizes a specific proprietary metal-chelating agent bonded to a fine-grained porous substrate. The pilot plant was using some of the 7-million-ton tailings stockpile that has accumulated since the mine opened in 1925. The tailings average 1.6 to 2 grams of gold per ton (0.04 to 0.05 troy ounce per short ton). Plans called for the construction of a 3,000-ton-per-day unit if the tests are successful.

BRGM intensified its gold exploration in the Château-Gontier District of Mayenne, in the southern Central Massif, and in the Pyrenées. Through its subsidiaries, BRGM also held a stake in the only two operating mines, Salsigne and Le Bourneix. Le Bourneix, in the Haute-Vienne Department south of Limoges, was operated by Société Minère Le Bourneix S.A., partly owned by Sté. des Mines et Métallurgie de Penarroya. BRGM also had 50% involvement in the

Rouez gold-silver project. Elf, BRGM's partner in the project, was evaluating at yearend whether to proceed with mine development.

Iron and Steel.—The large, continued losses posted by the state-owned steel companies, Sacilor and Usinor, led the new conservative Government to conduct special investigations into their current and future viability, their organizational structure, and their strategic objectives. As a result of these studies, it was recommended that the two companies shed 2.8 million tons of capacity and 25,000 employees before 1990. In addition, large amounts of capital were advocated to cover the losses that were expected to continue through 1988. In September 1986, a single chief executive was appointed to head both companies. This action gave the groups coordinated management to plan and implement the required restructuring. However, the Government announced that there were no plans to merge the companies or to denationalize them. Reportedly, the Government also supported the EEC policy banning subsidies to steel companies, making new aid questionable.

In January, Usinor signed a contract with the U.S.S.R. worth a reported $1.7 billion.[2] The deal was a 3-year extension of a previous pact to deliver 800,000 tons per year for 1985 through 1987. The new contract increases the deliveries of sheet, pipe, heavy plate, and stainless sheet to 1 million tons annually from 1986 to 1990. The contract makes the Soviet Union the company's largest non-EEC customer, surpassing the United States.

Talks between Sacilor and Usinor aimed at rationalizing production in the wire sector produced plans to reduce the labor force at both companies' operations. Usinor's five plants, which employed 3,100 at yearend 1985, were to have their labor force reduced to 2,700 by yearend 1986 and to 2,100 by the end of 1988. Sacilor's work force of 1,100 was to be reduced to less than 800 by yearend 1986. In conjunction with the layoffs, Usinor was planning to invest nearly $58 million to improve productivity from 106 tons per worker annually to 158 tons per employee in 1988. Usinor and Sacilor were planning the eventual merger of the wire-making subsidiaries as a part of the overall restructuring plan.

Sacilor approved a $17.3 million investment by its subsidiary Ascométal S.A. for the installation of a continuous caster at its Marais works in Saint-Étienne. The new unit, which will produce both carbon and alloy steels, was scheduled for startup in 1988. This decision ended speculation that the Marais works might be slated for closure under the Government's steel plan.

Usinor closed the large tube plant of GTS-Industries de Sedan S.A. in September. The plant, situated in the Ardennes, was formerly a part of Vallorec S.A. and produced 100,000 to 130,000 tons of large-diameter tube used in the oil and gas industry. The decline in oil and gas prices caused sales to decline to the point where the Soviet Union was the company's only remaining customer.

The first denationalization conducted by the Government was that of St. Gobain, parent company of Western Europe's largest cast iron pipe producer, Pont-a-Mousson S.A. Twenty-eight million shares, representing over 60% of the company's capital, were sold. The shares were offered to three specific groups in different amounts: 70% to the French public, 20% to foreign investors, and 10% to St. Gobain employees. The total value of the stock offering was $1.32 billion.

Ferrosilicon.—Pechiney Electrométallurgie S.A. announced plans to halt production of standard ferrosilicon at its 12,000-ton-per-year Saint Beron and 35,500-ton-per-year Laudun facilities in the fourth quarter of 1987. The company planned to continue producing ferrosilicon at its 32,000-ton-per-year plant in Dunkirk.

Lead and Zinc.—In March, Société Aciéries de Montreau S.A. started a plant to recover lead and zinc from 12,000 tons per year of steelworks baghouse dust. Waste dust from electric furnaces was a major disposal problem for the company, which operated two mini-steelworks. The plant was designed to have a recovery of 86.7% for lead and 83.5% for zinc. As a result of the increased use of galvanized steel in car bodies, lead and zinc have been increasing in the ferrous scrap used by minimills. Feed dust to the facility was expected to contain 15% to 25% zinc and 3% to 6% lead. The process—in which the dust is dissolved, the lead recovered by precipitation, and the zinc by electrolysis, produces lead powder with 99% purity and zinc powder with 99.0% to 99.5% purity.

Silicon.—Pechiney Electrométallurgie announced plans to close the silicon furnaces at Sabart and Rioupéroux by 1988. The output of the plants was very small.

Production was planned to be concentrated at three sites: Anglefort, Les Clavaux, and Montricher. Anglefort and Montricher will be geared toward the silicones market and Les Clavaux toward specialty grades and silicon alloys.

Tungsten.—Société Minière d'Anglade S.A. closed its 15-year-old Salau Mine at Anglade in the Pyrenées at the end of July as a result of worldwide oversupply and low prices. The mine, which employed 144 persons, produced approximately 800 tons of tungsten oxide annually. The closure was made permanent after requests for operating subsidies from both the regional and national governments were rejected.

INDUSTRIAL MINERALS

Advanced Materials.—The Cricéram S.A. subsidiary of Pechiney began construction of a facility to produce ultrafine zircon powder for use in the engineering ceramics and advanced materials sectors. The plant, which was estimated to cost $1.4 million, will be capable of producing 80 tons per year of iron-free zirconia powder with an average particle size of 0.5 micrometer and a surface area of 4 to 30 square meters per gram. Startup was planned for early 1987. Cricéram was also a producer of 99.9%- to 99.999%-pure alumina powders, single-crystal alumina, synthetic sapphire, silicon nitride, silicon aluminum nitride, barium and strontium titanate, and aluminum nitride.

Pechiney also began work on a center for new materials research at Aix-en-Provence. The center was planned for completion in late 1987 and will allow all of Pechiney's subsidiaries and divisions to work jointly on the development of new materials and processes.

An $11.5 million carbon-carbon composites factory at Villeurbanne became operational. The plant will have a capacity of 50 tons of composites annually by 1990. Production at the facility, operated by Carbone Industrie S.A., was projected as 25 metric tons in 1986.

Sulfur.—Recovery of sulfur continued to decline as a result of decreased production at the Lacq Gasfield of Elf. Exports of sulfur, especially to North African countries, were greatly affected as the company increased its stockpiles to prepare for future production decreases.

MINERAL FUELS

Although the Government continued with its program to reduce the country's dependence on imported energy and to diversify the sources and types of imports, dwindling domestic energy resources hampered the progress. Nuclear power generation's role in the energy balance continued to grow, reaching approximately 70% of the primary energy requirement in 1986.

Coal.—Domestic coal production continued to decline. Indigenous coal accounted for 62% of total coal demand in 1973, but declined to only 45% in 1986. Production, which peaked at nearly 60 million tons in the late 1950's, was slated to decrease to 11 million tons by 1990. One-half of the mines operated by CdF were scheduled for closure before 1995, including most of the mines in the Nord/Pas-de-Calais Field near Douai.

Natural Gas.—In June, Gaz de France, along with companies from Belgium, the Federal Republic of Germany, and the Netherlands, entered into a $65 billion agreement with Den Norske Stats Oljeselskap A/S (Statoil), Norway's state-owned oil company, to buy natural gas from the Troll and Sleipner North Sea gasfields. However, the Government failed to ratify the contract before the October 15 deadline after negotiations with Norway to include trade incentives and preferential treatment for French contractors for the development of the fields broke down. An extension of the deadline to November 15 failed to produce ratification of the June agreement.

Petroleum.—Domestic crude oil production reached its highest level in two decades as output from the Paris Basin continued to increase. A number of discovery wells were drilled in the region although all of the finds were small.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from French francs (F) to U.S. dollars at the rate of F6.93 = US$1.00, the average rate in 1986.

The Mineral Industry of Gabon

By Thomas O. Glover and David J. Ellis[1]

The 650-kilometer Trans-Gabon Railroad, linking the manganese and other mineral deposits of the interior with the port at Owendo, was completed in December. Construction of the manganese ore-loading terminal at Owendo was suspended in mid-year, as the continued drop in oil prices, Gabon's principal revenue source, led to concern about financing for the project. On completion of the ore-loading terminal, and with the purchase of rolling stock for the railroad and continued use of the overhead tramway-railroad outlet through the Congo, Gabon's export capacity for manganese ore is expected to rise from 2.7 million tons to 4 million tons per year. Manganese ore production increased by 7% in 1986, and Gabon continued to be the world's largest supplier of battery-grade ore.

The extension of the Trans-Gabon Railroad, which would link the extensive iron ore deposits in the Belinga-Mekambo area in northeastern Gabon with the rail line to the coast, was put on hold until market conditions improved and further financing could be found. Construction of the link to the iron ore deposits would also necessitate construction of separate harbor facilities at Owendo to handle the loading of iron ore for export.

Oil production decreased slightly in 1986, but the discovery of the Kounga-Rabi Field, the largest oilfield yet found in Gabon, lifted hopes for the future of the Gabonese oil industry. The discovery, made by a consortium led by Shell-Gabon Oil Co., was estimated to have reserves of 500 million barrels of oil.

PRODUCTION AND TRADE

The continuation of the decline in oil prices that began in 1985 exacerbated problems stemming from rising import levels and increased Government spending. The Government of Gabon recognized the need to diversify export earnings away from the reliance on oil revenues, which had been averaging about 85% of total income in the early 1980's. An austerity program was implemented in February 1986, and an updated economic recovery plan, in concert with the receipt of an International Monetary Fund credit of $120 million,[2] was announced in December by the President of Gabon. Gabon stopped payments on its estimated $1.8 billion foreign debt in September as part of the medium-range economic recovery strategy.

The main stimulus to the announced reform programs was the fall in oil prices. The average cost for a barrel of Gabonese crude oil was $13 in 1986, a 50% drop from that of 1985. That loss of revenue, along with a reduction in oil production of almost 4% and the drop in value of the U.S. dollar, meant a substantial decrease in the trade surplus Gabon had enjoyed in the previous few years. In 1985, for example, Gabon's trade surplus was $1.1 billion. France continued to be Gabon's main trading partner in 1986, providing 46% of the country's imports and receiving 53% of Gabonese exports. The United States remained in second place, receiving $225 million worth of goods from Gabon, most of which was crude oil. Gabon continued its efforts to diversify its trading partners, seeking markets for manganese, oil, and uranium in the

Far East and in Northern and Eastern Europe.

Total manganese ore production increased about 7% in 1986, following the rising trend begun in 1981. Production of battery-grade manganese ore increased almost 20% over 1985 levels. Exports of manganese ore increased to 2.48 million tons, a 12% increase over that of 1985. Of that total, 58,000 tons was battery-grade ore.

Production and exports of uranium decreased in 1986, owing to poor market conditions that may have occurred in response to cutbacks in global nuclear energy programs. Exports totaled about 800 tons, with almost 70% going to France and the remainder going to Belgium and Japan.

Table 1.—Gabon: Production of mineral commodities[1]

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
Cement, hydraulic metric tons	175,103	120,000	207,916	244,768	[3] [4]210,858
Diamond, gem and industrial[e] carats	550	550	550	550	500
Gas, natural:					
Gross million cubic feet	66,275	66,300	74,484	[e]75,000	75,000
Marketed do	2,304	4,800	4,800	[e]4,800	4,800
Gold, mine output, metal content troy ounces	550	550	1,325	1,608	2,000
Manganese:					
Ore, gross weight (50% to 53% Mn) metric tons	[r]1,406,400	1,761,752	2,037,760	2,281,000	2,440,000
Pellets, battery- and chemical-grade, gross weight (82% to 85% MnO_2) do	[r]105,500	94,834	81,102	59,000	70,000
Total do	[r]1,511,900	1,856,586	2,118,862	2,340,000	[3]2,510,000
Petroleum:					
Crude thousand 42-gallon barrels	56,453	56,815	61,582	62,307	[3]60,000
Refinery products:					
Gasoline do	502	613	490	523	[3]480
Jet fuel and kerosene do	721	721	703	776	[3]530
Distillate fuel oil do	2,246	1,566	1,465	1,690	[3]1,380
Residual fuel oil do	3,583	2,705	1,285	2,912	[3]1,130
Other do	717	66	129	[e]135	100
Refinery fuel and losses do	282	193	148	[e]200	130
Total do	8,051	5,864	4,220	6,236	3,750
Uranium oxide (U_3O_8), content of concentrate metric tons	976	1,006	1,000	1,225	1,100

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 20, 1987.
[2]In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone) is also produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.
[3]Reported figure.
[4]Of the cement produced, 202,198 tons was from domestic clinker.

COMMODITY REVIEW

METALS

Iron Ore.—Despite the promising agreements reached between the Government of Gabon, the Government of the Congo, and a consortium of French and West German mining agencies in 1985, development of the Haut-Ivindo iron ore deposit remained on hold in 1986. Although much of the financing for the project had already been obtained, the Government of Gabon postponed construction of the 230-kilometer railway extension needed to link the iron ore mine at Belinga to the Trans-Gabon Railroad terminal at Booué, and thus to the port at Owendo. Feasibility studies showed that the ore port at Owendo would also have to be enlarged to accommodate the anticipated 10-million-ton-per-year iron ore production. These additional expenditures, in the light of the depressed iron ore market, the loss of oil revenue, and with the possibility of competition from proposed iron ore developments in Brazil and nearby Guinea, influenced the Government of Gabon to suspend the project until further investment could be obtained and market conditions improved.

Manganese.—In December 1986, the final leg of the Trans-Gabon Railroad, linking the city of Franceville and the nearby manganese mine at Moanda with the planned port complex at Owendo, was completed. The $3 billion, 650-kilometer railway

was officially inaugurated on December 30 in ceremonies headed by the President of Gabon. The finalization of the railway project, along with completion of the port facilities for manganese export at Owendo, will create capacity for an output of up to 4 million tons of manganese ore per year.

Although agreements had been reached early in 1986 for a consortium of engineering firms to begin work on the port complex and preparatory groundwork had already started, work was suspended because of changes in the project's financial stability resulting from the drop in both manganese and oil prices. The engineering consortium, headed by Raymond International Inc. of Houston, Texas, and including Perini Corp. (United States), Dumez Travaux Publiques (France), and Salini Costruttori S.p.A. (Italy), awaited word on when they could resume construction.

In December, control of the harbor project was given to Compagnie Minière de l'Ogooué S.A. (COMILOG), the consortium working the Moanda manganese mine. COMILOG was to operate and maintain the ore terminal after raising money for its construction from chosen private investors. These investors were to receive a portion of the profits for each ton of manganese ore exported as reimbursement for the capital investment. When the ore terminal was originally planned, the cost was set at about $170 million. Under COMILOG's management, the ore terminal will be built solely for manganese export and the estimated cost reduced to about $60 million.[3]

Manganese ore continued to travel along the aerial tramway to Mbinda in the Congo, and from there by railway to Pointe Noire on the Congolese coast where the ore was loaded for shipping. COMILOG, a consortium of companies headed by USX Corp. of the United States, had worked the open pit mine at Moanda since 1962 and still had the third largest manganese reserves in the world, estimated at well over 400 million tons of recoverable ore.

INDUSTRIAL MINERALS

Plans for development of the Dourakiki barite deposits in the southernmost region of Gabon were scaled down because of the establishment of a barite operation in neighboring Cameroon. What had at first been envisioned as a 50,000-ton-per-year, $16 million operation was replanned for production of 30,000 tons per year at a cost of $11 million and was aimed at a market composed of Angola, the Congo, and Gabon. Compagnie des Mines de la Nyanga (CODEMIN), composed of the Government of Gabon, Bureau de Recherches Géologiques et Minières, Société Auxiliare du Manganese de Franceville, COMILOG, Essence et Lubrificants de France-Gabon Oil Co. (ELF-Gabon), and representative bodies from Angola and the Congo, continued to oversee the project.

The major problem that faced CODEMIN remained the location of the barite deposits in the Dourakiki Mountains, a heavily forested, unpopulated area. The only outlet was 40 kilometers of jungle trails leading to the national highway linking the city of Tchibanga with the port of Mayumba. As of 1986, Mayumba had no deepwater loading facilities, so potential markets would have to lie within range of shallow water haulage equipment.

MINERAL FUELS

Petroleum.—In July, a joint venture composed of Shell-Gabon Oil, 50%; ELF-Gabon, 30%; and Société Nationale Elf Aquitaine, 20%, made an onshore oil strike at the Kounga 1 well on the Ogooué Sette Cama permit. The well lay 170 kilometers south of Port Gentil and produced 3,100 barrels per day (bbl/d) of oil at a depth of 1,100 meters. Further testing by the group confirmed that the strike was in the same oilfield as the 1985 Rabi strike, 7 kilometers to the south. Reserves were estimated at over 500 million barrels, which would practically double Gabon's reserves, formerly estimated at 520 million barrels. Production could reach 200,000 bbl/d when the field was brought to full capacity, a figure that would heavily overrun the Gabonese production quota of 150,000 bbl/d set by the Organization of Petroleum Exporting Countries. Unfortunately, access to the strikes was difficult because the concession covered an area of marshland and equatorial forest. Initial plans were to run a pipeline 175 kilometers to Gamba, where there were export facilities. Full production was unlikely to begin until 1988.

There was also a wildcat strike at a concession owned solely by ELF-Gabon on the Grand Anguille Dauphin Marine tract 12 kilometers south of Port Gentil. The well flowed 2,800 bbl/d of 30.2° gravity oil. Several reservoirs were also discovered at depths of about 3,000 meters. ELF-Gabon raised its oil production above 1985 levels by bringing the Gonelle Extension and Grand Anguille Fields on-stream in midyear. Tenneco Oil Co. of Gabon Inc. contracted with several

Louisiana businesses for $18 million of production equipment to be used on its 250,000-acre offshore block on which oil was discovered in 1985. Production of light oil was scheduled to begin in 1987.

The Ministry of Mines and Hydrocarbons signed exploration contracts with two groups in 1986. In February, Triton Energy Corp. of Dallas, Texas, attained the exploration rights to 685,000 acres on the Tchibobo Marine permit, the southernmost permit in Gabon. A consortium consisting of three U.S. organizations, Sun-Gabon Oil Co., 55%; CSX Oil and Gas Corp., 25%; and Hamilton Oil Corp., 20%, signed an agreement for a 3-year exploration program on the 516,000-acre Oyan Marin block. Bids were expected to be received on 11 exploration permits in 1987.

Uranium.—Compagnie des Mines d'Uranium de Franceville, a principally state-owned enterprise, continued to mine uranium at four sites in Gabon. Prospecting for new deposits in the Haut-Ogooué region began in 1986 as part of the Government's push to locate new mineral reserves to lessen Gabon's dependence on oil.

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[1]Physical scientists, Division of International Minerals.

[2]Where necessary, values have been converted from Communauté Financière Africaine francs (CFAF) to U.S. dollars at the rate of CFAF346=US$1.00. The official CFAF exchange rate was maintained at CFAF50 per French franc and was freely convertible.

[3]Industrial Minerals (London). Manganese Ore Terminal for Comilog. No. 233, Feb. 1987, p. 8.

The Mineral Industry of the German Democratic Republic

By George A. Rabchevsky[1]

The German Democratic Republic (GDR) started its new 5-year plan (1986-90), following one of its most economically successful years in 1985. The new plan set a target of 4.4% to 4.7% annual growth for the next 5 years, a rate which the GDR had usually managed to meet previously. In 1986, value of the gross domestic product rose by $4.7 billion,[2] or 4.3%. The growth was attributed to a rise in industrial productivity.[3] Almost 80% of the GDR's economic growth continued to come from the industrial sector. Produced national income also reportedly expanded by 4% during the first 5 months of 1986 and once again was above the average for Council for Mutual Economic Assistance (CMEA)[4] countries. In terms of national product per capita, the GDR had the highest standard of living within this group of states, but still lagged behind the expectations of the Government planners. In the mining sector, coal was the most significant contributor to the economy, followed by potash and rock salt. In nuclear power generation and the use of inferior lignite, environmental considerations tended to hold back a more rapid development of the energy sector.

The new 5-year plan called for a continuation of the GDR's economic strategy of "intensive" growth. The GDR intends to rely on further gains in efficiency, the introduction of new advanced technologies, and the modernization of existing plants to carry forward its pattern of economic growth. The mineral industry is expected to increase production by 3.5% to 5%. Lowering production costs and conserving energy will remain the GDR's most important policy goals.

In 1985, according to the latest official figures, there were a total of 3,526 industrial enterprises, of which 260 were in the chemical, 49 in the energy, and 43 in the metallurgical sectors. Of the 3,261,852 industrial employees, 343,734 were working for the chemical sector, 225,300 in energy, and 139,295 in the metallurgical sector.

PRODUCTION

Productivity reportedly rose in all sectors of the GDR's industry. Overall production grew by 4.3% to $3.9 billion, slightly less than it grew in 1985. The output of minerals and metals, however, remained more or less at the 1985 level. Increases were achieved only in the steel and coal sectors.

In the face of insufficient reserves of domestic raw materials, the Ministry of Geology conducted research and exploration for new deposits. Work was concentrated, however, on the improved extraction, production, and utilization of the already available commodities—such as brown coal, geothermal resources, ground water, and natural gas.

Secondary raw materials continued to play a vital role in the production of ferrous and nonferrous metals, and the Government continued to promote the use of domestic scrap in order to cut down imports. The quota for scrap use has increased, and in 1986 the plan was to increase it by about 30 million tons.

The East German Government has for years attempted to increase the produc-

tivity of its industries. In 1970, for example, there were no industrial robots, while in 1986 there were reportedly 60,000 of them. Fifty-three percent of the industrial functions were automated. Since 1970, industry has introduced almost 16,000 new products, and productivity was to have increased by 350%. In the materials sector, research was conducted on the production of microcrystalline and amorphous metals, powder metallurgical products, high-purity compounds, and plastics. Ilmavit, a new glass ceramic material, was being produced using domestic raw materials. According to the current 5-year plan, 1,000 tons of ilmavit are to be produced by the year 1990.[5]

Table 1.—German Democratic Republic: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum:					
Alumina:					
For metallurgical use	46,085	42,156	43,239	46,695	45,000
For other use[e]	20,000	20,000	20,000	20,000	20,000
Metal:[e]					
Primary	58,000	57,000	58,000	r60,000	60,000
Secondary	50,000	52,000	52,000	52,000	52,000
Total	108,000	109,000	110,000	r112,000	112,000
Cadmium metal, primary[e]	16	15	15	15	15
Copper:					
Mine output, Cu content[e]	13,000	12,000	12,000	r12,000	10,000
Metal:					
Smelter, primary	17,000	17,000	14,000	14,000	12,000
Refined:[e]					
Primary	r35,000	r35,000	r35,000	r35,000	35,000
Secondary	r25,000	r33,000	r30,000	r28,000	28,000
Total	r60,000	r68,000	r65,000	r63,000	63,000
Iron and steel:					
Iron ore and concentrate thousand tons	r41	40	36	30	25
Fe content do	20	20	20	15	15
Metal:					
Pig iron do	2,149	2,207	2,357	2,578	2,600
Ferroalloys, electric furnace do	125	128	124	124	124
Steel, crude do	7,169	7,219	7,573	7,853	7,926
Semimanufactures (hot-rolled only) do	4,959	5,084	5,386	5,637	5,700
Lead:[e]					
Smelter, primary	20,000	20,000	22,000	20,000	20,000
Refined, all sources	38,000	36,000	35,000	r55,000	50,000
Nickel:					
Mine output, Ni content, recoverable	2,500	2,200	2,000	2,000	1,500
Metal, refined[e]	3,000	3,000	3,000	3,000	3,000
Silver, mine output, Ag content, recoverable thousand troy ounces	1,450	1,380	1,290	r e1,250	1,200
Tin:[e]					
Mine output, Sn content, recoverable	1,700	1,800	r2,500	r2,800	2,500
Metal, smelter output including secondary	2,000	2,000	r3,000	r3,300	3,100
Zinc metal including secondary	17,000	16,500	17,000	17,000	16,000
INDUSTRIAL MINERALS					
Barite[e]	35,000	35,000	35,000	34,000	34,000
Boron materials: Processed borax, $Na_2B_4O_7 \cdot 10H_2O$ content[e]	4,200	4,000	4,000	4,000	4,000
Cement, hydraulic thousand tons	11,721	11,782	11,555	11,608	11,650
Chalk[e] do	50	40	40	40	40
Clays, kaolin:[e]					
Crude do	420	400	350	350	330
Marketable do	210	200	175	175	165
Fluorspar[e] do	100	100	100	100	100
Gypsum and anhydrite:					
Crude[e] do	360	360	360	360	340
Calcined do	310	297	302	312	300
Lime and dead-burned dolomite do	3,510	3,458	3,597	3,567	3,500
Nitrogen: N content of ammonia do	r1,163	r1,206	1,203	1,206	1,200
Potash, marketable, K_2O equivalent do	3,434	3,431	3,465	3,465	3,450
Pyrite, gross weight[e] do	20	20	--	--	--

See footnotes at end of table.

Table 1.—German Democratic Republic: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
INDUSTRIAL MINERALS —Continued					
Salt:					
Marine thousand tons	55	56	58	58	57
Rock do	3,060	3,070	3,075	3,080	3,075
Total do	3,115	3,126	3,133	3,138	3,132
Sodium compounds, n.e.s.:					
Caustic soda do	695	687	694	667	660
Sodium carbonate do	882	887	890	884	[3]882
Sodium sulfate do	142	152	164	172	170
Stone, sand and gravel:					
Crushed stone[e] do	15,000	16,000	14,500	15,000	15,000
Sand and gravel do	8,566	8,628	8,599	8,437	8,500
Sulfur:					
Byproduct:[e]					
Elemental do	90	90	80	80	75
Other forms do	270	270	270	250	240
Sulfuric acid do	920	926	885	883	880
MINERAL FUELS AND RELATED MATERIALS					
Coal, brown coal (lignite) do	276,038	277,968	296,341	312,000	315,000
Coke:					
From anthracite and bituminous coal[e] do	1,226	1,200	1,150	--	--
From brown coal:					
High-temperature do	2,592	2,510	2,463	2,497	2,500
Low-temperature do	2,919	3,210	3,327	3,185	3,200
Total do	6,737	6,920	6,940	5,682	5,700
Fuel briquets (from lignite) do	50,005	50,047	50,270	50,666	51,000
Gas:					
Manufactured million cubic feet	224,173	255,320	272,695	274,743	275,000
Natural, marketed production[e] do	286,000	353,000	459,000	459,000	[3]459,000
Petroleum:					
Crude thousand 42-gallon barrels	422	383	430	[e]430	360
Refinery products:					
Gasoline do	33,071	33,618	35,190	36,567	36,600
Kerosene, jet fuel, distillate fuel oil do	[r]47,601	46,915	47,525	49,216	49,210
Residual fuel oil do	56,610	56,610	59,940	[r e]60,000	60,000
Lubricants do	3,058	3,238	3,231	3,346	3,400
Total[4] do	[r]140,340	140,381	145,886	149,129	149,210

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

[1]Table includes data available through Aug. 1987.

[2]In addition to the commodities listed, magnesium, peat, and a variety of construction materials were produced, but output was not reported, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Total of listed products only.

TRADE

As a small industrial country with limited natural resources, the GDR placed considerable emphasis on foreign trade. Exports appear to have amounted to about 40% of the GDR's gross national product. Nearly two-thirds of the GDR's trade was with CMEA countries. The U.S.S.R. remained the GDR's main trading partner, accounting for almost 39% of the country's total foreign trade, about the same as in 1970. The U.S.S.R. supplied the major part of the GDR's energy, raw material, and iron and steel requirements. Shipments of petroleum and natural gas made up more than one-half of the U.S.S.R.'s exports to the GDR, with raw materials accounting for most of the rest. An agreement on trade with the U.S.S.R. set an annual growth rate of 6% during the current 5-year plan. The Federal Republic of Germany (FRG) was the GDR's biggest European market economy trading partner.

The GDR's imports rose in 1985, following a decline in 1984; the increase was mainly

the result of greater demand for machinery and electric engineering products. Stricter controls, however, were imposed on trade with market economy countries, indicating that modernization through imports might not be a major pursuit during the new 5-year plan.

U.S. exports to the GDR have continued to decline in the 1980's, limited by a variety of economic and political factors.

Table 2.—German Democratic Republic: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS				
Alkaline-earth metals	--	323	--	All to Italy.
Aluminum:				
Ash and residue containing aluminum	1,787	2,425	--	All to Netherlands.
Metal including alloys:				
Scrap	3,539	6,133	--	Netherlands 2,679; Belgium-Luxembourg 1,530; Denmark 1,100.
Unwrought	30,593	25,007	--	West Germany 18,004; Poland 5,043; Japan 1,421.
Semimanufactures	22,187	21,827	6	West Germany 16,571; Hungary 1,729; Sweden 896.
Cadmium: Metal including alloys, all forms	--	55	--	All to West Germany.
Chromium: Oxides and hydroxides	161	NA		
Copper:				
Matte and speiss including cement copper	--	300	--	All to Greece.
Sulfate	--	18	18	
Metal including alloys:				
Scrap	498	460	--	All to Belgium-Luxembourg.
Unwrought	12,624	11,202	--	West Germany 5,843; Netherlands 3,322; France 1,635.
Semimanufactures	44,132	48,297	78	West Germany 46,098; Hong Kong 740; Sweden 601.
Gold: Metal including alloys, unwrought and partly wrought value, thousands	--	$2,417	--	All to Italy.
Iron and steel: Metal:				
Scrap	36,708	42,720	--	West Germany 24,148; Thailand 16,533; Italy 1,585.
Pig iron, cast iron, related materials	5,180	248	--	Sweden 103; Denmark 60; Switzerland 40.
Ferroalloys:				
Ferrochromium	100	NA		
Ferromanganese	100	NA		
Ferromolybdenum	--	13	--	All to West Germany.
Ferrosilicon	6,539	5,904	--	Do.
Silicon metal	5	1	--	All to Yugoslavia.
Unspecified	639	363	293	Austria 46; France 24.
Steel, primary forms thousand tons	167	122	1	NA.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	1,583	1,583	5	Egypt 114; Hong Kong 90; unspecified 1,214.
Universals, plates, sheets do	929	847	89	West Germany 132; Portugal 49.
Hoop and strip do	578	588	--	NA.
Rails and accessories do	13	11	--	West Germany 3; unspecified 7.
Wire do	44	45	--	West Germany 18; Belgium-Luxembourg 1; unspecified 25.
Tubes, pipes, fittings do	[2]240	[2]215	--	West Germany 46; France 19; Poland 17.
Castings and forgings, rough do	59	56	(3)	West Germany 24; Switzerland 3; unspecified 22.
Lead:				
Oxides	546	815	--	Yugoslavia 416; Sweden 155; Egypt 121.
Metal including alloys:				
Scrap	--	479	--	Netherlands 300; Austria 179.
Unwrought	50	521	--	All to West Germany.
Semimanufactures	21	2	--	All to United Kingdom.

See footnotes at end of table.

Table 2.—German Democratic Republic: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Manganese: Ore and concentrate, metallurgical-grade	--	19	--	All to Belgium-Luxembourg.
Nickel: Metal including alloys:				
Unwrought	590	415	--	Sweden 372; Italy 35; Netherlands 8.
Semimanufactures	20	37	--	West Germany 35; Netherlands 2.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	--	$2,918	$121	West Germany $2,785; Netherlands $12.
Selenium, elemental	--	[3]	[3]	
Silicon, high-purity	--	1	1	
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$79,919	$62,245	--	United Kingdom $62,006; West Germany $238; Sweden $1.
Tin: Metal including alloys:				
Unwrought	85	40	--	All to Sweden.
Semimanufactures	5	NA		
Zinc:				
Ore and concentrate	--	2,669	--	All to Italy.
Oxides	608	100	--	All to West Germany.
Metal including alloys:				
Unwrought	50	143	--	Jamaica 100; Italy 25; West Germany 18.
Semimanufactures	3	NA		
Other:				
Ores and concentrates	154	20	--	All to West Germany.
Oxides and hydroxides	187	NA		
Ashes and residues	23,791	17,625	--	Austria 10,592; West Germany 4,821; Belgium-Luxembourg 2,212.
Base metals including alloys, all forms	8,277	6,372	3	West Germany 5,893; Poland 458; Sweden 18.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Artificial: Corundum	404	192	--	West Germany 140; Italy 24; Sweden 20.
Dust and powder of precious and semi-precious stones including diamond value, thousands	$3	$3	--	All to Italy.
Grinding and polishing wheels and stones	597	241	--	Italy 88; Greece 58; Yugoslavia 25.
Barite and witherite	1,650	643	--	West Germany 543; Belgium-Luxembourg 100.
Boron materials: Oxides and acids	11	NA		
Bromine	635	1,024	--	West Germany 824; Italy 180; Hungary 20.
Cement thousand tons	[4]1,395	[4]1,557	[3]	West Germany 503; Hungary 200; Egypt 167.
Chalk	[4]27,982	[4]37,730	--	West Germany 5,657; Sweden 80; unspecified 31,933.
Clays, crude:				
Kaolin	[4]147,848	[4]148,704	--	West Germany 84,416; Netherlands 14,403; Hungary 10,857.
Unspecified	23,002	18,340	--	West Germany 11,671; Hungary 5,219; Austria 1,450.
Cryolite and chiolite	200	NA		
Diamond:				
Gem, not set or strung value, thousands	--	$206	$206	
Industrial stones do.	$203	$39	--	All to Belgium-Luxembourg.
Feldspar, fluorspar, related materials:				
Fluorspar	35,014	25,831	--	West Germany 15,679; Austria 5,816; Italy 3,317.
Unspecified	5,559	3,508	--	Sweden 1,859; Yugoslavia 1,202; Denmark 447.
Fertilizer materials: Manufactured:				
Ammonia thousand tons	150	226	--	West Germany 213; Spain 8; Greece 4.
Nitrogenous do.	[4]1,716	[4]1,421	53	West Germany 1,316; United Kingdom 37.
Phosphatic do.	11	8	--	Austria 3; Netherlands 3; United Kingdom 2.
Potassic, K_2O content[4] do.	2,776	2,791	14	Czechoslovakia 422; Brazil 354; India 236.
Unspecified and mixed do.	11	118	--	Austria 106; West Germany 11; Belgium-Luxembourg 1.

See footnotes at end of table.

Table 2.—German Democratic Republic: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Graphite, natural	525	NA		
Gypsum and plaster	[4]88,663	[4]105,498	--	Mainly to Sweden.
Kyanite and related materials	--	20	--	All to Italy.
Lime	--	55	--	All to Sweden.
Magnesium compounds:				
Oxides and hydroxides	6,218	2,180	--	Austria 1,124; Sweden 579; Netherlands 437.
Other	62,370	11,251	--	United Kingdom 5,562; Belgium-Luxembourg 4,911; Netherlands 778.
Nitrates, crude	--	40	--	All to Sweden.
Phosphates, crude	22,025	22,620	--	Bulgaria 22,000; Ireland 595; Netherlands 25.
Pigments, mineral: Iron oxides and hydroxides, processed	403	384	--	Egypt 271; Yugoslavia 66; Spain 21.
Potassium salts, crude	47,158	33,017	--	United Kingdom 13,309; West Germany 9,997; Belgium-Luxembourg 6,799.
Precious and semiprecious stones other than diamond: Natural value, thousands	$29	$74	$12	West Germany $62.
Salt and brine[4] thousand tons	1,501	1,604	--	West Germany 139; Sweden 70; unspecified 1,395.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	[4]368,700	[4]327,100	18	Czechoslovakia 80,000; Sweden 45,802; West Germany 44,359.
Sulfate, manufactured	21,504	18,343	--	West Germany 17,046; Thailand 1,297.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	29	29	--	All to West Germany.
Worked do	34	29	--	West Germany 28.
Gravel and crushed rock do	[4]262	[4]339	--	All to West Germany.
Limestone other than dimension do	55	58	--	Do.
Sand other than metal-bearing do	32	44	--	Hungary 24; Austria 17; Yugoslavia 2.
Sand and gravel[4] do	2,368	2,246	--	All to West Germany.
Sulfur:				
Elemental:				
Crude including native and byproduct	13,020	426	--	West Germany 421; Sweden 5.
Colloidal, precipitated, sublimed	335	2	--	All to Yugoslavia.
Sulfuric acid	[4]26,500	[4]22,965	--	Mainly to West Germany.
Talc, steatite, soapstone, pyrophyllite	24	38	--	Italy 24; Belgium-Luxembourg 14.
Other:				
Crude	49,505	92,778	--	Denmark 57,175; France 28,817; Indonesia 2,500.
Slag and dross, not metal-bearing	29	23,825	--	West Germany 22,716; France 674; United Kingdom 435.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	31	NA		
Carbon black	4,120	3,351	--	Poland 990; United Kingdom 644; Bulgaria 567.
Coal:				
Anthracite and bituminous thousand tons	69	335	--	Poland 290; United Kingdom 33; Ireland 10.
Briquets of anthracite and bituminous coal do	556	13	--	United Kingdom 7; Netherlands 5; Switzerland 1.
Lignite including briquets[4] do	3,971	3,313	--	Czechoslovakia 720; West Germany 628; Austria 566.
Coke and semicoke do	277	422	--	West Germany 180; United Kingdom 112; Austria 55.
Gas, manufactured[4] million cubic feet	498	484	--	NA.
Peat including briquets and litter	1,020	2,594	--	West Germany 1,271; United Kingdom 1,220; Denmark 61.

See footnotes at end of table.

Table 2.—German Democratic Republic: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	608	720	--	West Germany 601; Netherlands 57; Italy 49.
Gasoline do	[4]5,967	[4]6,178	--	West Germany 2,712; Sweden 1,649; unspecified 1,771.
Mineral jelly and wax do	82	90	16	West Germany 24; Netherlands 16.
Kerosene and jet fuel do	116	97	--	All to Hungary.
Distillate fuel oil do	[4]6,108	[4]4,550	--	Mainly to Sweden.
Lubricants do	[2]124	[2]94	--	Mainly to West Germany.
Residual fuel oil do	[2]32,634	[2]29,138	--	West Germany 11,608; Denmark 1,931; Sweden 1,232.
Bitumen and other residues do	579	523	--	West Germany 522.
Bituminous mixtures do	(3)	(3)	--	All to Austria.

[p]Preliminary. NA Not available.

[1]Table prepared by Jozef Plachy. Owing to a lack of official trade data published by the German Democratic Republic, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the trading partner countries.

[2]Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

[3]Less than 1/2 unit.

[4]Official Trade Statistics of the German Democratic Republic.

Table 3.—German Democratic Republic: Apparent imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	[2]170,600	[2]208,400	--	Hungary 141,382; Yugoslavia 5,103; unspecified 61,186.
Oxides and hydroxides	103,820	70,677	--	West Germany 70,657; France 12; Netherlands 7.
Metal including alloys:				
Unwrought	55,024	42,583	--	Yugoslavia 31,291; Hungary 8,089; West Germany 3,185.
Semimanufactures	26,054	25,449	--	West Germany 9,807; Hungary 9,202; Yugoslavia 5,987.
Antimony: Oxides	224	NA		
Cadmium: Metal including alloys, all forms	141	38	--	All from Netherlands.
Chromium: Ore and concentrate, Cr_2O_3 content[2]	39,800	52,300	--	NA.
Cobalt: Oxides and hydroxides	6	1	--	All from Netherlands.
Copper:				
Ore and concentrate	13,809	10,660	--	Morocco 5,480; Sweden 5,180.
Metal including alloys:				
Scrap	1,519	1,873	--	Switzerland 709; Netherlands 703; Belgium-Luxembourg 239.
Unwrought	56,027	41,360	--	West Germany 35,855; Poland 3,655; Yugoslavia 1,781.
Semimanufactures	8,610	13,253	--	West Germany 11,579; Yugoslavia 1,131; Italy 180.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	209	457	--	All from West Germany.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite, Fe content[2] thousand tons	1,971	2,681	--	U.S.S.R. 1,471; India 474; Sweden 349.

See footnotes at end of table.

Table 3.—German Democratic Republic: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal:				
Scrap ------ thousand tons--	1,035	886	--	U.S.S.R. 247; West Germany 225; United Kingdom 207.
Pig iron, cast iron, related materials --------do----	877	1,103	--	NA.
Ferroalloys:				
Ferrochromium -------	241	321	--	All from West Germany.
Ferromanganese -------	62,000	75,000	--	NA.
Ferromolybdenum ------	--	4	--	All from United Kingdom.
Ferrosilicomanganese ----	70	NA	--	All from Netherlands.
Ferrosilicon ----------	342	77	--	All from West Germany.
Unspecified ----------	15,930	12,598	--	Yugoslavia 4,153; France 40; unspecified 8,380.
Steel, primary forms thousand tons--	172	111	--	Yugoslavia 83; unspecified 22.
Semimanufactures:				
Bars, rods, angles, shapes, sections -------do----	974	599	--	Hungary 16; Yugoslavia 13; unspecified 554.
Universals, plates, sheets do----	2,614	3,083	--	Austria 86; Czechoslovakia 32; unspecified 2,928.
Hoop and strip do----	142	152	--	Austria 20; unspecified 131.
Rails and accessories do----	160	180	--	NA.
Wire ---------do----	29	28	--	West Germany 8; Sweden 2; unspecified 14.
Tubes, pipes, fittings do----	330	330	--	West Germany 57; Czechoslovakia 25; unspecified 200.
Castings and forgings, rough do----	8	6	--	NA.
Lead:				
Ore and concentrate ----------	6,800	NA		
Oxides ----------	2	18	--	West Germany 13; Netherlands 5.
Metal including alloys:				
Scrap ----------	4,635	7,307	--	Netherlands 3,166; Denmark 2,342; Belgium-Luxembourg 1,613.
Unwrought ----------	4,100	7,179	--	West Germany 3,357; Italy 1,646; Belgium-Luxembourg 1,012.
Magnesium: Metal including alloys, unwrought ----------	34	149	--	All from Italy.
Manganese:				
Ore and concentrate, metallurgical-grade, Mn content ----------	[2]21,800	[2]19,500	--	Mainly from U.S.S.R.
Metal including alloys, all forms ---	17	NA		
Mercury ------- 76-pound flasks--	9,666	1,044	--	Spain 986; Netherlands 58.
Molybdenum: Ore and concentrate ----	62	31	--	All from Netherlands.
Nickel:				
Matte and speiss, Ni content ------	668	631	--	Cuba 610; United Kingdom 21.
Oxides and hydroxides ---------	680	1,028	--	All from Cuba.
Ash and residue containing nickel --	--	330	--	All from Belgium-Luxembourg.
Metal including alloys:				
Unwrought ----------	64	NA		
Semimanufactures ---------	55	132	--	West Germany 124; Austria 3; Netherlands 3.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands--	$6,539	$13,290	--	West Germany $13,146; United Kingdom $144.
Rare-earth metals including alloys, all forms ----------	1	NA		
Silver:				
Waste and sweepings value, thousands--	$38	NA		
Metal including alloys, unwrought and partly wrought -----do----	$120,683	$102,818	--	West Germany $102,662; United Kingdom $114; Yugoslavia $35.
Tellurium, elemental and arsenic -----	5	NA		
Tin:				
Oxides ----------	--	4,313	--	All from West Germany.
Metal including alloys:				
Scrap ----------	210	NA		
Semimanufactures ---------	10	59	--	All from West Germany.
Titanium:				
Ore and concentrate ----------	5,454	1,840	--	All from Netherlands.
Oxides ----------	16,772	13,556	--	Yugoslavia 10,466; Finland 3,090.
Metal including alloys, all forms ---	1	NA		

See footnotes at end of table.

Table 3.—German Democratic Republic: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Tungsten: Ore and concentrate	189	114	--	All from Netherlands.
Zinc:				
Ore and concentrate	40,981	85,571	--	West Germany 83,171; Sweden 2,400.
Oxides	171	110	--	West Germany 85; France 25.
Blue powder	--	79	--	West Germany 60; United Kingdom 19.
Ash and residue containing zinc	--	6,810	--	All from Spain.
Metal including alloys:				
Scrap	25	206	--	Belgium-Luxembourg 49; West Germany 46; Netherlands 1.
Unwrought	14,593	21,998	--	West Germany 15,818; Yugoslavia 4,042; Italy 1,638.
Semimanufactures	1,853	1,352	--	West Germany 1,347; Austria 3; Belgium-Luxembourg 2.
Zirconium: Ore and concentrate	--	21	--	All from Netherlands.
Other:				
Ores and concentrates	28	96	--	Belgium-Luxembourg 49; West Germany 46; Netherlands 1.
Oxides and hydroxides	424	63	--	West Germany 50; United Kingdom 13.
Ashes and residues	10,792	10,484	--	West Germany 9,068; Italy 1,213; Belgium-Luxembourg 203.
Base metals including alloys, all forms	21,030	19,935	--	West Germany 19,815; Japan 104; Sweden 15.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	331	71	--	Japan 36; Italy 25.
Artificial: Corundum	2,867	3,502	--	West Germany 3,499; Japan 3.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$354	$219	$5	Switzerland $168; Netherlands $46.
Grinding and polishing wheels and stones	151	358	--	West Germany 214; Austria 127; France 8.
Asbestos, crude[2]	53,800	54,600	--	NA.
Barite and witherite	2,192	3,240	--	All from West Germany.
Boron materials:				
Crude natural borates	5,569	180	--	All from Belgium-Luxembourg.
Oxides and acids	4,092	2,943	--	All from France.
Cement[3]	6,700	10,400	--	NA.
Chalk	174	633	--	West Germany 384; France 249.
Clays, crude:				
Bentonite	8,032	5,267	--	Hungary 5,195; West Germany 72.
Chamotte earth	--	123	--	All from Italy.
Fire clay	534	NA		
Fuller's earth	--	736	--	All from West Germany.
Kaolin	[2]3,100	[2]1,400	--	Czechoslovakia 1,000; United Kingdom 25.
Unspecified	1,085	2,568	--	All from West Germany.
Diamond:				
Gem, not set or strung value, thousands	$56	$72	--	All from Belgium-Luxembourg.
Industrial stones do	$1,736	$2,207	--	Belgium-Luxembourg $2,036; Switzerland $171.
Diatomite and other infusorial earth	1,534	1,082	--	All from France.
Feldspar, fluorspar, related materials	18,751	3,886	--	Sweden 3,000; Yugoslavia 886.
Fertilizer materials:				
Crude, n.e.s	--	10	--	All from France.
Manufactured:				
Ammonia	--	17,590	--	West Germany 11,333; Netherlands 6,257.
Nitrogenous, N_2 content	3,624	[3]7,000	--	West Germany 2,802; Poland 2,460; Switzerland 151.
Phosphatic, P_2O_5 content	[2]9,200	1,162	--	All from West Germany.
Unspecified and mixed	204,813	4,081	--	All from Sweden.
Graphite, natural	[2]5,712	[2]6,634	--	West Germany 727; unspecified 5,907.
Gypsum and plaster	228	58	--	All from West Germany.
Magnesium compounds	63,151	56,864	--	Czechoslovakia 53,000; Austria 3,859; Italy 5.
Mica, all forms[2]	1,042	1,124	--	India 716.
Phosphates, crude, P_2O_5 content[2] thousand tons	425	424	--	U.S.S.R. 359; Morocco 39.
Pigments, mineral:				
Natural, crude	73	73	--	Austria 70; United Kingdom 3.
Iron oxides and hydroxides, processed	--	21	10	Belgium-Luxembourg 11.

See footnotes at end of table.

Table 3.—German Democratic Republic: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Precious and semiprecious stones other than diamond:				
Natural ____ value, thousands	$35	$60	--	All from West Germany.
Synthetic ____ do	$104	$56	--	West Germany $53; Austria $3.
Sodium compounds, n.e.s.: Carbonate, manufactured	6	NA		
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	5,026	140	--	All from West Germany.
Worked	15,093	324	--	Yugoslavia 272; Italy 51; Denmark 1.
Dolomite, chiefly refractory-grade	23	NA		
Gravel and crushed rock	314	305	--	Yugoslavia 302; Austria 3.
Quartz and quartzite	1,688	8,160	--	West Germany 8,134; Netherlands 26.
Sand other than metal-bearing	8,329	179	--	Italy 131; France 38; Sweden 9.
Sulfur:				
Elemental, crude including native and byproduct	135,040	139,000	--	Poland 135,000; West Germany 4,000.
Dioxide	3,210	3,981	--	All from West Germany.
Sulfuric acid	[3]2,200	[3]1,400	--	Do.
Talc, steatite, soapstone, pyrophyllite	1,625	3,168	36	West Germany 1,535; Austria 963; Egypt 630.
Other:				
Crude	16,605	16,422	--	Hungary 16,111; West Germany 231; United Kingdom 59.
Slag and dross, not metal-bearing	89,355	12,963	--	Sweden 12,851; West Germany 91; Italy 21.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	6	584	--	All from West Germany.
Carbon black	43,141	44,805	--	West Germany 25,036; U.S.S.R. 19,543; United Kingdom 225.
Coal:				
Anthracite and bituminous[2] thousand tons	3,619	5,098	--	U.S.S.R. 3,025; Czechoslovakia 689; Poland 614.
Lignite including briquets do	--	203	--	Poland 200; Yugoslavia 3.
Coke and semicoke[2] do	1,828	1,730	33	U.S.S.R. 1,115; Czechoslovakia 436; Poland 146.
Gas, natural: Gaseous[2] million cubic feet	217,892	218,985	--	All from U.S.S.R.
Peat including briquets and litter	674	75	--	West Germany 52; Sweden 23.
Petroleum:				
Crude[2] thousand 42-gallon barrels	170,476	167,308	--	U.S.S.R. 125,501.
Refinery products:				
Liquefied petroleum gas do	73	142	--	All from West Germany.
Gasoline do	150	110	--	United Kingdom 108; West Germany 1.
Mineral jelly and wax do	(4)	4	--	West Germany 3.
Kerosene and jet fuel do	7	59	--	United Kingdom 54; Yugoslavia 5.
Distillate fuel oil do	175	538	--	West Germany 533; Sweden 5.
Lubricants[3] do	141	[3]139	(4)	West Germany 47; United Kingdom 3; unspecified 87.
Residual fuel oil[3] do	178	[3]167	--	All from France.
Bitumen and other residues do	3	75	--	Yugoslavia 74.
Bituminous mixtures do	(4)	(4)	--	All from Sweden.
Petroleum coke do	130	148	--	West Germany 147.
Unspecified[3] do	1,309	6	--	All from West Germany.

[p]Preliminary. NA Not available.

[1]Table prepared by Jozef Plachy. Owing to a lack of official trade data published by the German Democratic Republic, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the trading partner countries.

[2]Official Trade Statistics of the German Democratic Republic.

[3]Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

[4]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Secondary materials and scrap contributed over 12% of all metal production. The GDR's metallurgical industry processed more than 5 million tons of ferrous and nonferrous scrap. Nonferrous and precious metals, electronic scrap, and coated and laminated metals were recycled into reusable raw materials. Scrap input for metal production accounted for 68% of steel, 50% of lead, and 33% of copper production. According to the Deputy Minister of Materials Management, by 1990 about 15% of the raw material demand in the national economy will be met by secondary raw materials and industrial waste. There were 165 plants processing secondary materials, headed by the VEB Kombinat Metallaufbereitung.

Aluminum and copper metal output has remained more or less stable for over a decade. All bauxite for alumina production was imported, as was over one-half of the aluminum metal. Mine capacity for copper remained at only 13,000 tons. The smelter and refinery at Eisleben had a 25,000- and 65,000-ton-per-year capacity, respectively. Reportedly, a copper mine was being developed by the VEB Wilhelm Pieck Combine in Mansfeld. The GDR's copper deposits consist mainly of shale of Zechstein Age, approximately 200 million years old. The cupriferous shale beds range from 0.35- to 0.40-meter in thickness and contain various sulfide minerals such as bornite, chalcocite, chalcopyrite, galena, and sphalerite.

The GDR was conducting research and promoting the use of powder metallurgy. Powder metals products were utilized in the following categories: bearings and frictional materials made of sintered iron; hard metal-cutting tools; mining tools; preformed parts manufactured of sintered refractory metals, molybdenum, titanium, and tungsten; products formed from nonferrous metal powders; and superfine powders for microelectronics. The VEB Eisen- und Hüttenwerke Thale was the largest manufacturer of iron powder and sintered iron preformed parts.[6] The VEB Mansfeld Kombinat Wilhelm Pieck's subsidiary, VEB Berliner Metallhutte und Halbzeugwerke, manufactured products from nonferrous metal powders.

Metallurgiehandel, Volkseigener Aussen- and Binnenhandels betrieb der GDR marketed most of the GDR's metallurgical products, including steel, nonferrous metals, and refractory materials.

Domestic reserves of iron ore were being depleted, and the ore grade was declining. Most of the iron ore consumed was imported from the U.S.S.R. and other countries. The GDR was negotiating with Brazil's Cia. Vale do Rio Doce (CVRD) for 3 million tons of iron ore during the 1986-88 period. Previous contracts with CVRD were on an annual basis and amounted to only 650,000 tons. CVRD was to be paid for the ore in the GDR manufactures, including precision instruments.

Production of pig iron and steel continued to rise consistently, according to the plan. Almost 43% of the steel was still produced in open hearth furnaces, 31% in electric furnaces, and 25% in oxygen furnaces. The GDR was the 12th largest exporter of steel in the world and ranked 7th in imports, which amounted to about 65% of domestic production; about 51% of steel production was exported. Continuously cast steel output was steadily increasing, amounting to about 2.9 million tons, or 36% of total crude steel output in 1986.

The steel tube mill in Riesta, VEB Stahl- und Walzwerk Riesta, started production of precision seamless tubes. The new continuous cold-rolling process was developed jointly by the GDR and the U.S.S.R. The mill accounted for 80% of national production of seamless tubes. The production will reportedly double in 2 years. Keulabutte, part of GDR's Armaturenkombinat Magdeburg, began production of cast iron using a cupola fired by natural gas. The process and equipment were developed by the FRG's Korf Engineering Co. of Dusseldorf. Apart from dispensing with the need for coke, another advantage claimed for the process was that melting only has to be stopped once a week for inspection purposes, while with the conventional system one out of three furnaces operating was taken out of service each day.[7]

INDUSTRIAL MINERALS

The production of most industrial minerals has not changed, especially in the last decade. The production of cement, however, has almost doubled in the last 20 years, with exports increasing gradually while imports declined. In 1986, the country was introducing new products and conducted research on the more efficient processing of lower grade materials. VEB Ceramic Work Combine in Hermsdorf was processing aluminum oxide with clays for the production of a variety of ceramic and glass products.

There were over 20 factories and research institutions working on ceramics, including the VEB Fine Ceramics Combine in Kahlo and the Freiberg Mining Academy.[8] The Ministry of Glass and Ceramic Industry was administering 17 enterprises with 8,500 employees in the production of improved glass products. The VEB Flat Glass Combine in Torgall managed the glass research and development program for the Ministry. Indigenous silicate deposits provided 85% of the necessary raw materials for the glass and ceramic production.[9]

The potash industry was a significant contributor to the East German economy. The industry celebrated its 125th year; the first mining of carnallite took place in 1861.[10] Production has increased by about 54% since 1966 but has remained almost the same for the last 6 years (since 1980). Production remained almost the same, while exports registered only minor increases in 1986. Exports decreased to countries in Western Europe, which usually accounted for 24% of GDR's potash exports; only 20%, or a drop of 105,000 tons of potash, was exported to them in 1986. The United Kingdom was the GDR's major customer for potash. Shipments to the United States, at 71,000 tons, were three times the level exported in 1985. India was also an important importer of the GDR's potash.[11]

Mining continued for a second year at the Bleicherode carnallite deposit and at the Merkers Mines. A 50-kilometer-long conveyor belt was operating at the Ernst Schneller Mine at Zielitz in the Magdeburg area. New radiometric control devices were installed along the belt system to automatically assess the quality and quantity of mined potash.

MINERAL FUELS

Consumption of mineral fuels and power was reduced as part of a drive to improve the efficiency of energy usage. In line with this policy, the annual consumption of oil was cut to 70 million barrels in 1985, compared with 100 million barrels in 1980, more than compensating for a reduction in deliveries from the U.S.S.R. A 5-year contract with the U.S.S.R made provisions for annual deliveries of about 126 million barrels of oil and 307 billion cubic feet of gas during the 1986-90 period. In contrast, output of indigenous lignite accounted for about 70% of primary energy consumption. Coal was planned to play a significantly higher role, and to this effect, a new lignite briquet plant was planned at the gas complex VEB Gaskombinat Schwarze Pumpe.

Most of the country's electricity was generated by lignite-fired powerplants, but because of the resulting pollution and the fact that mining conditions were growing more difficult, the Government was expanding the use of nuclear power. A reactor was planned at Stendal, about 50 kilometers from the West German border, and another at Nord, to become operational in 1991. The share of nuclear energy in electricity production was planned to be raised to 15% by that time, from just over 11% in 1986. Bruno Leuschner was the only presently operating nuclear plant in the GDR.

Coal.—The GDR was the world's largest producer of lignite, accounting for about 30% of world output, exclusively mined by opencast methods. Coal contributed about 70% to 72% of primary energy requirements. Environmental pollution, however, has increasingly become a source of local and international concern. The Davy Corp. of the United Kingdom was awarded a contract in 1986 to build a desulfurization unit at the Rummelsberg powerplant in East Berlin.[12] The calorific value of the GDR's lignite coal was 7,500 to 9,600 kilojoules per kilogram, with a moisture content of 55% to 60%, and an ash content of 8% to 20%. To make use of the extensive lignite reserves, Schwarze Pumpe developed a technique for producing synthetic gas from coal with a high salt content. The capacity of the gas generators was 35,000 cubic meters of gas per hour under normal operating procedures. Schwarze Pumpe also produced about 6.5 million tons of briquets from lignite per year.

VEB Schwermaschinenbau-Kombinat Takraf was perhaps the largest manufacturer in the world of surface coal mining and transporting equipment. The company employed about 40,000 workers, in 24 manufacturing centers throughout the country. The maximum capacity of the GDR's bucket-wheel excavators and other equipment was 300,000 cubic meters per day, and the equipment was exported to many countries.

Natural Gas.—The production of natural gas along the northern coast of the GDR proceeded at a slow but steady pace. Not much change was expected during the 1986-90 period, but by the end of that period, 4,060 billion cubic feet of proven natural gas reserves was to be found, and the natural gas condensate deposit of Heringsdorf was

to be exploited.

Petroleum.—The GDR produced an insignificant quantity of petroleum and relied almost totally on the U.S.S.R. for crude imports. Deliveries amounted to about 125 million barrels per year and were expected to continue until 1990. In turn, the GDR was aiding the U.S.S.R. in the development of the Yamburg Oilfield and was building two sections of the Progress pipeline in the Urals and Ukraine.

Crude oil has been processed in the GDR at VEB Petrochemisches Kombinat at Schwedt for over 20 years. A pipeline network more than 1,300 kilometers in length distributes crude oil, gasoline, diesel fuel, and other products throughout the country. The plant was modernized in 1986, with the introduction of catalytic cracking of residues. Research continued in cooperation with the Japanese Toyo Engineering Corp. on thermal and hydrocatalytic cracking of high-metal, high-sulfur primary and secondary heavy oil residues. As a byproduct of acrylonitrile production, hydrogen cyanide was produced as a byproduct, with 98% to 99% purity. Hydrogen cyanide was used in hardening and tempering steel, electroplating, gold and silver leaching, and other applications.[13]

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[1]Physical scientist, Division of International Minerals.

[2]The GDR mark (M) is not convertible, and the official exchange rate cannot be used as a measure of relative values. Foreign trade figures, however, are denoted in valuta marks (VM), which are convertible. The rate of valuta marks converted to U.S. dollars in 1986 was taken as VM2.20 = US$1.00.

[3]Hank, P. German Democratic Republic. Min. Ann. Rev. (London). June 1987, p. 467.

[4]CMEA is an organization of 10 centrally planned economy countries involved in economic cooperation and coordination, comprising the following countries: Bulgaria, Cuba, Czechoslovakia, the German Democratic Republic, Hungary, Mongolia, Poland, Romania, the U.S.S.R., and Vietnam. Yugoslavia has permanent observer status.

[5]Presse-Informationen (East Berlin). No. 87, July 29, 1986, pp. 1-10.

[6]Standardisierung und Qualitat (East Berlin). No. 5, 1986, pp. 126-127.

[7]Metal Bulletin Monthly (London). Mar. 1986, p. 83.

[8]Presse-Information (East Berlin). No. 105, Sept. 9, 1986, pp. 3-4.

[9]Silicattechnik (East Berlin). V. 36, No. 6, 1985, pp. 162-163.

[10]Duchrow, G. 125 Jahre Kallindustrie—Beitrag zur Geschichte eines wichtegen Bergbauzweiges der Deutschen Demokratischen Republic. (125 Years of German Democratic Republic's Potash Industries). Neue Bergbautechnik (Freiberg), v. 11, Nov. 1986, pp. 401-408.

[11]Phosphorus and Potassium (London). No. 149, May-June 1987, p. 8.

[12]Petroleum Economist (London). May 1987, p. 191.

[13]Journal of GDR Foreign Trade (East Berlin). Summer 1987, p. 13.

The Mineral Industry of the Federal Republic of Germany

By George A. Rabchevsky[1]

The economy of the Federal Republic of Germany (FRG) made a steady advance for the fourth consecutive year, following the 1981-82 recession. The average growth in the gross national product was about 2.5%, modest in comparison to past upswings, but a higher growth rate than that of any other large industrial country in 1986, except Italy. Inflation declined somewhat, and prices fell for the first time since the 1950's. Unemployment, however, remained at just below 8%, or 2.2 million workers, but was showing signs of decline. The mining, metals processing, and chemical industries registered only modest advances, with the exception of the construction industry, which recovering from one of the deepest post-World War II building slumps, grew by 1.9%. That also stimulated the consumption of industrial minerals, especially cement and sand and gravel. The chemical industry, which includes some metallic and industrial minerals components, was not as active, even though the labor force rose by more than 10,000 people to 565,000 workers.

There was a noticeable shift in the economy from the traditionally heavy industrial north, especially North Rhine-Westphalia to the south. A third of the population lived in the north, and most of FRG's coal and steel was produced there. On the average, in the past 3 years, about 60% of new companies was set up in south Bavaria, Baden-Württemberg, and the Rhineland-Palatinate. Unemployment in the four northern States was consequently higher than the national average. Unemployment in Hanover, for example, was at 12%, the highest in the nation.[2] Layoffs in the nearby potash and lead and zinc mines also contributed to that. The number of unemployed in Bavaria, on the other hand, fell by 381,000. In order to stimulate economic growth, the Government was promoting the privatization of Government-owned enterprises. One such company was Viag AG, headquartered in Bonn, an aluminum, chemicals, and energy enterprise, which also announced terms of sale of 40% of its basic capital. About 47% of the petroleum and natural gas drilling company Prakta-Seismos AG of Hanover was also to be sold on the stock exchange.

PRODUCTION

The production of steel, iron ore, and most other metals declined. The steel industry, although among the most efficient in Europe, declined owing to lack in demand and price competition from subsidized European Economic Community (EEC) countries. Industrial minerals were, however, following the uptrend of the construction industry. The potash industry, on the other hand, either closed some of its operations or operated on a sporadic schedule. Lead and zinc mining came almost to a standstill, and there remained only one operational iron ore mine in the south. The coal industry was hard hit by the rise of the Deutsche mark, which broadened the gap between international and domestic coal prices to more than double the size of offsetting Government subsidies.

Table 1.—Federal Republic of Germany: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
METALS					
Aluminum:					
Bauxite, gross weight	494	359	343	275	250
Alumina thousand tons	1,510	1,580	1,701	1,657	1,300
Metal:					
Primary do	723	743	777	745	[2]765
Secondary:					
Alloyed do	364	387	402	415	435
Unalloyed do	45	41	44	44	42
Cadmium metal, smelter	1,030	1,094	1,111	1,095	[2]1,185
Cobalt metal, smelter[e]	150	--	--	--	--
Copper:					
Mine output, Cu content	1,303	1,209	1,046	857	[2]834
Metal:					
Smelter:					
Primary	161,800	159,100	148,800	150,000	149,500
Secondary	78,200	94,500	76,700	97,000	96,500
Total	240,000	253,600	225,500	247,000	246,000
Refined including secondary:					
Electrolytic	313,664	[r]332,846	297,854	329,810	330,000
Fire-refined	80,408	87,928	[r]80,752	84,566	95,000
Total	394,072	[r]420,774	[r]378,606	414,376	425,000
Gold:					
Mine output, Au content troy ounces	1,813	[e]1,900	[e]1,500	[e]1,200	1,200
Metal including secondary[e] do	299,000	[r]350,000	[r]350,000	[r]350,000	350,000
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	[r]1,312	976	977	1,034	[2]717
Fe content do	386	279	293	309	[2]212
Metal:					
Pig iron do	27,621	26,598	30,203	31,531	[2]29,018
Blast furnace ferromanganese, spiegeleisen, ferrosilicon do	242	174	309	205	250
Ferroalloys, electric-furnace do	131	119	156	224	210
Steel, crude do	35,880	35,729	39,389	40,497	[2]37,134
Semimanufactures do	25,782	26,061	27,957	28,919	[2]27,540
Lead:					
Mine output, Pb content	23,455	23,523	20,998	20,496	[2]16,736
Metal:					
Smelter:					
Primary	110,749	116,216	102,289	109,674	[2]111,092
Secondary	239,746	236,259	254,944	246,586	254,760
Total	350,495	352,475	357,233	356,260	[2]365,852
Refined:					
Primary	201,600	217,000	191,900	181,000	160,000
Secondary	148,900	135,500	165,300	175,300	200,000
Total	350,500	352,500	357,200	356,300	360,000
Mercury (secondary only) 76-pound flasks	1,537	2,005	--	--	--
Nickel metal including secondary[e] [3]	1,200	1,200	1,000	700	--
Platinum[e] troy ounces	2,420	2,450	2,000	2,200	1,800
Silver:					
Mine output, Ag content thousand troy ounces	1,279	1,167	1,225	1,090	965
Metal including secondary[e] do	21,000	[r]18,600	21,500	20,500	20,000
Tin metal including secondary	608	417	[e]417	[e]400	350
Zinc:					
Mine output:					
Zn content	105,800	113,500	[r]113,100	117,600	[2]102,000
Zn content, recoverable	86,920	92,562	92,467	95,505	84,786
Metal, unwrought, unalloyed:					
Primary	303,373	328,689	325,567	339,876	344,660
Secondary	31,578	27,848	30,825	27,887	26,620
Total	334,951	356,537	356,392	367,763	371,280

See footnotes at end of table.

Table 1.—Federal Republic of Germany: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
INDUSTRIAL MINERALS					
Abrasives: Artificial corundum	80,385	74,201	88,962	91,506	92,000
Barite	165,661	163,965	166,568	171,269	195,000
Bromine	3,073	3,136	3,306	3,077	2,500
Cement and clinker:					
Cement (excluding clinker) thousand tons	30,078	30,466	28,909	25,758	26,500
Clinker do	959	702	742	599	500
Clays:					
Fire clay excluding klebsand do	5,594	5,792	[e]5,800	5,384	5,400
Kaolin, marketable do	454	407	360	410	395
Bleaching do	700	601	628	1,595	800
Other (schieferton) do	86	75	69	75	75
Diatomite and similar earth, marketable	42,695	44,195	49,009	48,427	45,000
Feldspar, marketable	331,430	330,000	297,850	322,000	305,000
Fluorspar, marketable:					
Acid-grade[e]	70,779	[r]69,646	[2]72,098	[r]74,824	75,700
Metallurgical-grade[e]	7,860	[r]11,064	[r]11,170	[r]8,314	8,500
Total	78,639	[r]80,710	[2]83,268	[2]83,138	84,200
Graphite:					
Crude	23,305	19,754	18,756	20,958	15,000
Marketable[4]	[r]10,606	[r]12,012	[r]12,356	12,798	8,000
Gypsum and anhydrite, marketable thousand tons	1,721	2,485	2,262	2,367	1,900
Lime (hydrated), quicklime, dead-burned dolomite do	6,898	6,871	6,941	6,845	7,090
Nitrogen: N content of ammonia do	1,570	1,703	1,963	1,908	1,600
Phosphates: Thomas slag-based fertilizer, P_2O_5 content do	130	93	62	67	65
Pigments, mineral, natural	18,589	19,886	16,178	15,764	16,000
Potash, K_2O equivalent:					
Crude, marketable thousand tons	75	87	92	88	75
Chemically processed do	1,981	2,332	[r]2,553	2,495	2,200
Total do	2,056	2,419	[r]2,645	2,583	2,275
Pumice:					
Crude and washed do	745	645	1,013	690	900
Marketable do	220	200	355	207	315
Pyrites, marketable concentrate, gross weight do	508	554	514	512	500
Quartz, quartzite, glass sand:					
Quartzite do	326	331	362	346	305
Quartz sand, ground do	378	337	316	304	310
Quartz sand, unground and glass sand do	7,320	7,391	7,195	7,021	7,100
Salt, marketable:					
Rock do	7,034	6,265	7,110	9,654	7,200
Marine and other do	[r]4,715	[r]4,603	5,102	3,426	4,000
Sodium compounds:					
Carbonate do	1,105	1,218	1,364	1,412	1,415
Sulfate, synthetic do	214	125	128	139	155
Stone, sand and gravel:					
Dimension stone[5] thousand cubic meters	254	237	291	254	250
Limestone, industrial thousand tons	42,935	44,371	43,505	40,403	40,000
Crushed and broken stone do	93,286	91,445	97,439	94,072	94,000
Slate do	53	62	23	28	25
Basalt lava and lava sand do	7,010	6,350	7,482	7,544	7,500
Calcite do	3	4	3	2	2
Grinding stone[e] cubic meters	40	40	42	40	40
Sand and gravel thousand tons	150,016	146,414	143,278	131,014	132,000
Sulfur:					
S content of pyrites do	229	--	--	--	--
Byproduct:					
Of metallurgy[e] do	400	400	350	320	300
Of natural gas do	872	632	851	964	950
Of petroleum[e] do	220	195	190	200	190
Unspecified[e] do	100	95	90	85	85
Total do	1,821	1,322	1,481	1,569	1,525
Talc including talc schist do	15	14	17	21	18

See footnotes at end of table.

Table 1.—Federal Republic of Germany: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	348,037	362,125	382,420	387,134	400,000
Coal:					
Anthracite and bituminous thousand tons	89,014	82,202	79,426	82,396	80,200
Lignite do	127,307	124,281	126,739	120,667	114,500
Total do	216,321	206,483	206,165	203,063	194,700
Coke, metallurgical do	26,275	22,427	20,586	22,331	21,000
Fuel briquets:					
Of anthracite and bituminous coal do	1,285	1,244	1,437	1,511	1,500
Of lignite do	3,951	3,568	3,818	4,068	3,600
Gas:					
Manufactured (excluding that from petroleum refineries):[6]					
Blast furnace million cubic feet	153,545	145,917	174,345	176,641	165,000
Coke oven do	214,144	185,858	174,345	187,588	175,000
Natural, gross do	568,909	622,339	563,258	510,605	550,000
Peat:					
Agricultural use thousand tons	1,842	1,868	1,429	1,516	1,700
Fuel use do	253	259	277	284	265
Petroleum:					
Crude thousand 42-gallon barrels	30,734	29,730	29,289	29,650	29,000
Refinery products:					
Gasoline, motor do	171,599	170,885	170,629	173,290	205,000
Jet fuel (including aviation gasoline) do	11,099	11,231	13,318	13,797	13,000
Kerosene do	388	356	295	196	180
Distillate fuel oil do	264,823	252,029	260,018	256,691	265,000
Residual fuel oil do	127,852	104,649	92,701	81,272	75,000
Lubricants do	9,229	8,687	11,205	10,656	10,200
Liquefied petroleum gas do	26,262	23,942	24,511	25,462	25,000
Bitumen do	17,676	19,460	18,514	17,076	16,500
Unspecified do	38,205	45,809	42,665	40,315	39,000
Refinery fuel and losses do	52,255	50,169	48,769	46,557	45,000
Total do	719,388	687,217	682,625	665,312	693,880

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

[1]Table includes data available through May 1987.

[2]Reported figure.

[3]Primary nickel and nickel contained in ferronickel, Monel metal, and nickel oxide directly used by the steel industry.

[4]Includes imported stock.

[5]Incomplete data.

[6]Other types of manufactured gas may be produced but production data are not reported, and available information is inadequate to make reliable estimates. Estimates presented in previous editions of this yearbook are considered unreliable.

TRADE

FRG's trade surplus was the highest in years, at $50.1 billion,[3] even though the volume of exports, on the basis of 1980 average unit values, dropped 2.7%, while the corresponding volume of imports contracted 11.1%. Trade with the United States declined, both in exports and imports, although the decline was much sharper, at 19%, on the import side. South FRG's State of Bavaria was the highest, at 14.7% of the total, importer of U.S. goods. The African countries continued to be the major suppliers of raw materials. In the minerals sector, 52.5% of manganese, 49.5% of bauxite, and 41.8% of crude oil came from Africa in 1985. The FRG's major African trading partners were Nigeria, Libya, Algeria, the Republic of South Africa, and Egypt, in that order.[4] The Republic of South Africa supplied 12 of the 30 important minerals and was FRG's most important source of the key industrial materials. In 1984, about 61% of platinum, an estimated 60% of vanadium, 50% of all chromium, 47% of industrial diamonds,

47% of manganese, 34% of gem-quality diamonds, 26% of palladium, and 21% of gold imported by FRG orginated in the Republic of South Africa. Almost 89% of vermiculite used in the construction and steel industries was also imported from the Republic of South Africa. Other important suppliers of raw materials were Australia, Canada, the Soviet Union, and the United States. Of the 30 or so minerals studied for total dependence, only fluorspar, lead, and zinc were in sufficient supply domestically.[5]

Table 2.—Federal Republic of Germany: Exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	NA	13,541	NA	NA.
Alkaline-earth metals	38	82	2	Belgium-Luxembourg 32; France 18; Spain 10.
Aluminum:				
Ore and concentrate	43,426	42,212	--	Belgium-Luxembourg 18,293; France 7,966; Austria 4,415.
Oxides and hydroxides	629,064	668,347	14,557	Canada 189,114; Austria 95,865; East Germany 70,657.
Ash and residue containing aluminum	10,683	13,061	--	France 4,853; Netherlands 4,248; Italy 1,306.
Metal including alloys:				
Scrap	88,175	89,691	207	Italy 31,434; Netherlands 17,071; Belgium-Luxembourg 12,676.
Unwrought	293,939	281,694	3,929	Italy 66,445; France 62,133; Austria 40,433.
Semimanufactures	538,235	551,623	33,032	United Kingdom 81,002; France 75,561; Italy 53,216.
Antimony:				
Oxides	755	592	74	Switzerland 69; United Kingdom 47.
Metal including alloys, all forms	119	104	(2)	Italy 31; Turkey 30; Austria 11.
Arsenic: Oxides and acids	238	367	--	United Kingdom 229; Italy 52.
Beryllium:				
Oxides and hydroxides	(2)	(2)	--	Mainly to United Kingdom.
Metal including alloys, all forms	1	(2)	--	Do.
Bismuth: Metal including alloys, all forms	427	251	18	Yugoslavia 83; United Kingdom 46.
Cadmium:				
Oxides and hydroxides	51	38	NA	NA.
Metal including alloys, all forms	324	296	--	Iran 15; Hungary 10; unspecified 268.
Cesium and rubidium: Metal including alloys, all forms	(2)	(2)	--	Mainly to Singapore.
Chromium:				
Ore and concentrate	8,877	8,909	--	France 3,463; Denmark 1,202; Switzerland 862.
Metal including alloys, all forms	253	126	6	Belgium-Luxembourg 44; United Kingdom 30; France 27.
Cobalt:				
Ore and concentrate	--	(2)	--	All to Spain.
Oxides and hydroxides	112	87	--	Italy 32; France 17; Spain 12.
Metal including alloys, all forms	1,270	913	7	United Kingdom 114; Austria 30; unspecified 601.
Columbium and tantalum:				
Ore and concentrate	1,347	1,895	NA	NA.
Ash and residue containing columbium or tantalum	334	2	--	All to United Kingdom.
Metal including alloys, all forms:				
Columbium (niobium)	93	82	2	Japan 1; unspecified 79.
Tantalum	112	118	1	United Kingdom 1; unspecified 113.
Copper:				
Ore and concentrate	11	47	--	France 45.
Matte and speiss including cement copper	1,124	627	--	Spain 479; Netherlands 148.
Oxides and hydroxides	2,774	2,379	127	Denmark 471; Spain 210; Netherlands 181.
Sulfate	2,120	1,533	NA	NA.
Ash and residue containing copper	15,784	17,713	--	Austria 6,562; Belgium-Luxembourg 3,236; India 2,092.

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Copper —Continued				
Metal including alloys:				
Scrap	78,064	77,294	47	Italy 25,206; Netherlands 17,296; Belgium-Luxembourg 12,752.
Unwrought	79,043	105,582	25	East Germany 35,855; United Kingdom 14,076; Belgium-Luxembourg 10,088.
Semimanufactures	475,945	475,007	43,305	France 56,204; Italy 50,750; Netherlands 44,141.
Gallium: Metal including alloys, all forms	12	9	1	Japan 4; Netherlands 1.
Germanium: Metal including alloys, all forms	(2)	1	(2)	Mainly to United Kingdom.
Gold:				
Ash and residue containing gold value, thousands	$951	$1,592	NA	United Kingdom $1,056; Netherlands $434; Italy $97.
Waste and sweepings do	$3,974	$9,390	NA	Spain $8,847; Switzerland $245; United Kingdom $132.
Metal including alloys, unwrought and partly wrought thousand troy ounces	1,572	1,496	39	Singapore 494; United Kingdom 157; Switzerland 136.
Hafnium: Metal including alloys, all forms	(2)	(2)	--	All to France.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	3,022	2,576	--	Austria 1,014; Netherlands 516; France 313.
Pyrite, roasted	32,478	16,930	--	Belgium-Luxembourg 10,219; France 4,791; Austria 1,920.
Metal:				
Scrap thousand tons	3,268	3,632	(2)	Italy 1,894; Belgium-Luxembourg 552; Netherlands 261.
Pig iron, cast iron, related materials do	554	722	1	France 430; Italy 92; Switzerland 40.
Ferroalloys:				
Ferrochromium	60,977	58,445	6,230	France 20,970; Belgium-Luxembourg 7,694.
Ferromanganese	94,182	65,808	7,477	Italy 6,884; France 6,588.
Ferromolybdenum	819	503	15	Netherlands 108; Sweden 86; Yugoslavia 58.
Ferronickel	1,034	2,023	--	Italy 1,452; Belgium-Luxembourg 563.
Ferrosilicochromium	4,184	3,021	--	Belgium-Luxembourg 1,864; Italy 557; France 469.
Ferrosilicomanganese	4,380	3,682	--	Switzerland 1,069; Italy 679; Greece 612.
Ferrosilicon	79,226	69,445	1,928	France 14,259; Belgium-Luxembourg 12,835; unspecified 19,689.
Silicon metal	6,441	9,606	841	Netherlands 2,433; Austria 1,458; France 1,141.
Unspecified	13,720	14,046	1,152	France 2,385; Austria 1,530.
Steel, primary forms thousand tons	4,279	5,207	733	East Germany 599; Italy 499.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	2,839	3,336	216	France 586; Netherlands 440; China 391.
Universals, plates, sheets do	5,940	5,997	726	U.S.S.R. 1,008; France 534.
Hoop and strip do	1,418	1,382	49	France 193; Netherlands 144; Switzerland 133.
Rails and accessories do	188	259	61	Italy 49; Iraq 33.
Wire do	389	322	30	France 65; Netherlands 51; Belgium-Luxembourg 46.
Tubes, pipes, fittings do	4,069	4,371	279	U.S.S.R. 1,509; Netherlands 456; China 377.
Castings and forgings, rough do	r146	159	9	France 19; Belgium-Luxembourg 18; Austria 17.

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Lead:				
Ore and concentrate	3	9,991	--	France 9,361; Sweden 529; Austria 100.
Oxides	13,788	9,656	68	Sweden 2,041; Netherlands 4,792; U.S.S.R. 800.
Ash and residue containing lead	13,157	18,937	19	Belgium-Luxembourg 9,097; France 2,098; Italy 1,109.
Metal including alloys:				
Scrap	15,756	14,558	--	Netherlands 11,645; Austria 1,013; Belgium-Luxembourg 648.
Unwrought	105,742	106,992	811	Italy 34,610; Austria 19,734; Denmark 8,553.
Semimanufactures	17,497	16,888	120	Denmark 3,893; France 1,728; Switzerland 1,433.
Lithium:				
Oxides and hydroxides	692	761	--	France 206; Italy 164; United Kingdom 139.
Metal including alloys, all forms	59	71	--	Switzerland 45; France 11; Japan 8.
Magnesium: Metal including alloys:				
Scrap	1,471	1,665	402	Italy 460; Netherlands 386.
Unwrought	375	504	--	Austria 168; Belgium-Luxembourg 163; France 62.
Semimanufactures	1,240	1,296	6	Belgium-Luxembourg 409; India 122; Netherlands 94.
Manganese:				
Ore and concentrate, metallurgical-grade	757	1,144	--	Yugoslavia 609; France 325; Austria 54.
Oxides	536	972	--	Belgium-Luxembourg 501; France 156; Netherlands 129.
Metal including alloys, all forms	131	118	(2)	France 33; Belgium-Luxembourg 30; Spain 7.
Mercury 76-pound flasks	5,279	4,350	87	Switzerland 580; Netherlands 406; India 261.
Molybdenum:				
Ore and concentrate	5,291	3,526	--	Netherlands 1,504; Austria 1,402; U.S.S.R. 69.
Metal including alloys:				
Unwrought and scrap	637	603	NA	NA.
Semimanufactures	43	46	6	Brazil 10; Austria 6; Japan 6.
Nickel:				
Ore and concentrate	(2)	1	--	All to Japan.
Matte and speiss	1,786	1,491	--	Belgium-Luxembourg 1,020; Italy 176; France 81.
Oxides and hydroxides	76	58	NA	Belgium-Luxembourg 23; Sweden 9; Yugoslavia 8.
Ash and residue containing nickel	4,549	4,363	--	France 1,111; Austria 1,004; Belgium-Luxembourg 914.
Metal including alloys:				
Scrap	9,404	10,032	96	Sweden 7,676; Netherlands 1,310; France 211.
Unwrought	10,343	6,630	(2)	France 3,768; Netherlands 1,283; Austria 1,099.
Semimanufactures	11,441	14,099	3,932	United Kingdom 2,051; Belgium-Luxembourg 1,416.
Platinum-group metals:				
Ash and residue containing platinum value, thousands	--	$623	NA	Belgium-Luxembourg $453; United Kingdom $165.
Waste and sweepings do.	$575	$1,368	NA	Spain $710; United Kingdom $315; Netherlands $266.
Metals including alloys, unwrought and partly wrought:				
Palladium troy ounces	162,578	187,215	64,977	Switzerland 43,436; Netherlands 17,458.
Platinum do.	292,938	278,148	28,325	Switzerland 83,110; France 31,379; East Germany 28,525.
Unspecified do.	132,744	161,672	6,553	United Kingdom 22,248; Japan 22,152; Netherlands 22,023.
Rare-earth metals including alloys, all forms	22	34	NA	NA.
Rhenium: Metal including alloys, all forms	(2)	(2)	--	Mainly to France.

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Silver:				
Ash and residue containing silver value, thousands	$1,535	$845	NA	United Kingdom $409; Belgium-Luxembourg $313; France $59.
Waste and sweepings do	$1,886	$1,805	NA	Spain $1,130; United Kingdom $291; Belgium-Luxembourg $240.
Metal including alloys, unwrought and partly wrought thousand troy ounces	29,211	47,772	341	East Germany 15,525; United Kingdom 4,870; Austria 3,246.
Tellurium, elemental and arsenic	13	17	3	Turkey 6; Austria 2.
Tin:				
Ore and concentrate	8	110	--	Mexico 57; Netherlands 53.
Ash and residue containing tin	3,764	2,306	--	United Kingdom 2,224; Netherlands 82.
Metal including alloys:				
Scrap	144	87	--	Netherlands 72; Belgium-Luxembourg 6; Italy 5.
Unwrought	4,211	3,788	1,156	Netherlands 806; United Kingdom 457.
Semimanufactures	1,144	1,519	19	Netherlands 396; Austria 206; unspecified 344.
Titanium:				
Ore and concentrate	8,338	15,076	--	United Kingdom 6,611; Hungary 3,388; Bulgaria 1,789.
Oxides	59,954	71,021	16,389	Italy 6,057; East Germany 4,313.
Metal including alloys:				
Scrap	906	811	91	United Kingdom 468; Italy 87.
Unwrought	59	56	--	Austria 29; United Kingdom 13; France 10.
Semimanufactures	1,351	1,003	7	France 293; Italy 110; United Kingdom 110.
Tungsten:				
Ore and concentrate	--	2	--	India 1; Turkey 1.
Ash and residue containing tungsten	136	251	--	Austria 197; Sweden 45; United Kingdom 8.
Metal including alloys:				
Scrap	571	542	NA	NA.
Unwrought	378	581	NA	NA.
Semimanufactures	179	199	8	Romania 73; Italy 14; Brazil 11.
Uranium and thorium:				
Ore and concentrate	--	(2)	--	All to Norway.
Oxides and other compounds	407	833	(2)	NA.
Metal including alloys, all forms:				
Uranium	963	2	--	All to Canada.
Thorium	--	(2)	--	All to Yugoslavia.
Vanadium:				
Ash and residue containing vanadium	2,005	4,296	--	Belgium-Luxembourg 3,328; Italy 647; Hungary 184.
Metal including alloys:				
Unwrought	196	393	5	United Kingdom 128; Japan 113; France 109.
Semimanufactures	(2)	(2)	--	All to Belgium-Luxembourg and France.
Zinc:				
Ore and concentrate	116,591	203,876	--	East Germany 83,171; Belgium-Luxembourg 51,042; France 34,355.
Oxides	17,931	17,128	NA	NA.
Blue powder	6,442	8,050	71	Netherlands 1,765; United Kingdom 1,324; Switzerland 904.
Matte	10,216	12,657	--	Italy 4,245; Netherlands 3,851; France 1,688.
Ash and residue containing zinc	97,381	81,577	--	Sweden 29,243; France 16,254; Belgium-Luxembourg 14,975.
Metal including alloys:				
Scrap	17,523	16,181	--	Netherlands 5,333; Belgium-Luxembourg 4,166; Italy 2,096.
Unwrought	121,256	133,156	2,826	Italy 27,565; France 19,372; East Germany 15,818.
Semimanufactures	19,530	22,511	53	East Germany 1,347; France 423; unspecified 20,056.

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Zirconium:				
Ore and concentrate	18,885	15,051	--	France 2,494; Czechoslovakia 2,209; Yugoslavia 1,722.
Metal including alloys:				
Scrap	61	42	15	France 23; Sweden 1.
Unwrought	21	25	2	France 6; United Kingdom 5; Spain 3.
Semimanufactures	20	21	(2)	Canada 19; France 1.
Other:				
Ores and concentrates	1	47	--	East Germany 46.
Oxides and hydroxides	34,500	6,801	8	Italy 184; Spain 115; Czechoslovakia 101.
Ashes and residues	105,284	147,027	29	France 81,849; Belgium-Luxembourg 45,044; East Germany 9,068.
Base metals including alloys, all forms	--	19,993	15	East Germany 19,815; United Kingdom 67; France 34.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	354,131	364,412	73	Netherlands 349,379; Switzerland 7,524; Belgium-Luxembourg 4,826.
Artificial:				
Corundum	51,670	58,757	3,509	Italy 7,140; United Kingdom 6,103; Netherlands 5,555.
Silicon carbide	28,875	33,373	NA	NA.
Dust and powder of precious and semi-precious stones including diamond kilograms	3,102	1,944	283	Austria 368; Greece 285.
Grinding and polishing wheels and stones	16,146	17,334	1,257	France 1,948; Netherlands 1,331; United Kingdom 1,255.
Asbestos, crude	14,928	3,065	--	Tunisia 943; Nigeria 601; France 460.
Barite and witherite	43,836	55,988	252	France 23,223; Belgium-Luxembourg 7,115; Sweden 5,230.
Boron materials:				
Crude natural borates	4,175	5,895	--	Sweden 5,141; Belgium-Luxembourg 696; United Kingdom 18.
Elemental	15	11	6	France 3; Sweden 1.
Oxides and acids	700	794	129	Venezuela 114; Switzerland 72.
Bromine	28	6	--	Bulgaria 1; Portugal 1; Switzerland 1.
Cement thousand tons	2,281	2,189	1	Netherlands 1,498; Nigeria 142; Belgium-Luxembourg 122.
Chalk	61,046	88,270	460	Finland 40,509; Netherlands 27,071; Sweden 7,850.
Clays, crude:				
Bentonite thousand tons	34	34	(2)	Belgium-Luxembourg 13; France 7; Netherlands 3.
Ceramic do	1,050	1,171	NA	Italy 674; Netherlands 184; France 160.
Chamotte earth do	31	28	--	Netherlands 10; France 5; Italy 4.
Fire clay do	403	183	NA	Netherlands 77; Italy 60; Austria 17.
Kaolin do	92	104	(2)	Italy 27; Netherlands 20; Switzerland 15.
Unspecified do	r265	266	(2)	Netherlands 141; Belgium-Luxembourg 81; France 21.
Cryolite and chiolite	128	298	--	Italy 252; Denmark 22; Venezuela 15.
Diamond:				
Gem, not set or strung carats	128,435	127,319	8,917	Belgium-Luxembourg 40,537; United Kingdom 21,927; Panama 14,237.
Industrial stones do	431,563	452,387	43,729	Ireland 103,680; United Kingdom 88,452; Greece 75,446.
Diatomite and other infusorial earth	1,766	1,510	11	Belgium-Luxembourg 251; Nigeria 221; Libya 200.
Feldspar, fluorspar, related materials:				
Feldspar	16,570	20,313	12	France 9,565; Switzerland 2,972; Netherlands 2,864.
Fluorspar	16,518	15,833	18	Netherlands 5,247; Austria 4,377; France 1,512.
Unspecified	1,205	1,190	--	Belgium-Luxembourg 1,151; Netherlands 17; Norway 10.
Fertilizer materials:				
Crude, n.e.s	97,090	110,774	--	Netherlands 87,573; Saudi Arabia 9,955; Switzerland 3,709.
Manufactured:				
Ammonia thousand tons	358	334	--	Denmark 179; France 39; Sweden 24.
Nitrogenous do	1,486	1,541	11	Belgium-Luxembourg 516; Netherlands 160; France 141.

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Fertilizer materials —Continued				
Manufactured —Continued				
Phosphatic thousand tons	72	114	--	East Germany 31; Netherlands 25; Austria 22.
Potassic do	2,638	2,333	40	Belgium-Luxembourg 611; India 247; Ireland 205.
Unspecified and mixed do	1,052	862	(2)	Belgium-Luxembourg 253; France 155; Italy 76.
Graphite, natural	11,069	11,522	815	Italy 1,483; Bulgaria 1,178; Austria 1,112.
Gypsum and plaster	265,377	274,615	1	Netherlands 106,470; Belgium-Luxembourg 56,137; Switzerland 34,529.
Iodine	74	64	(2)	Italy 27; Netherlands 6; United Kingdom 4.
Kyanite and related materials	8,699	8,013	318	Austria 2,432; Italy 1,572; France 939.
Lime	357,711	421,442	19	Netherlands 265,727; France 73,637; Switzerland 37,154.
Magnesium compounds:				
Magnesite	133	24	1	Switzerland 7; France 6; Belgium-Luxembourg 5.
Oxides and hydroxides	24,614	30,271	596	France 14,379; Italy 2,491; Netherlands 2,053.
Other	440,076	444,732	11,932	France 72,942; Norway 64,239; Singapore 56,393.
Mica:				
Crude including splittings and waste	1,254	1,447	18	Netherlands 461; Spain 229; Austria 147.
Worked including agglomerated splittings	203	220	2	Italy 62; United Kingdom 50; Hungary 17.
Phosphates, crude	2,446	9,824	--	Norway 5,955; Switzerland 1,983; Netherlands 1,441.
Phosphorus, elemental	--	2,299	--	All to East Germany.
Pigments, mineral:				
Natural, crude	1,380	1,598	483	Algeria 482; Switzerland 409.
Iron oxides and hydroxides, processed	171,261	166,495	14,571	France 23,555; United Kingdom 19,747.
Potassium salts, crude	42,459	50,006	--	Belgium-Luxembourg 25,799; United Kingdom 17,092; East Germany 3,000.
Precious and semiprecious stones other than diamond:				
Natural	393	338	16	Japan 92; China 74; Hong Kong 31.
Synthetic	26	20	(2)	Japan 11; Italy 2; Switzerland 2.
Pyrite, unroasted	1,302	1,217	NA	NA.
Quartz crystal, piezoelectric kilograms	172	183	--	Mainly to Japan.
Salt and brine thousand tons	2,116	2,360	(2)	Belgium-Luxembourg 1,408; Sweden 338; Netherlands 150.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	353,772	407,343	172	Belgium-Luxembourg 158,101; Netherlands 46,409; France 30,559.
Sulfate, manufactured	48,217	73,104	--	Italy 18,601; Netherlands 9,835; France 5,200.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	1,132	691	(2)	Netherlands 592; Switzerland 38; France 32.
Worked do	40	41	1	Austria 10; Netherlands 7; Switzerland 7.
Dolomite, chiefly refractory-grade do	161	112	(2)	Netherlands 44; Belgium-Luxembourg 26; France 17.
Gravel and crushed rock do	9,975	8,965	(2)	Netherlands 6,875; Switzerland 1,266; Belgium-Luxembourg 444.
Limestone other than dimension do	57	86	--	Netherlands 72; Belgium-Luxembourg 8; Austria 1.
Quartz and quartzite do	111	90	(2)	Belgium-Luxembourg 31; Netherlands 17; Austria 11.
Sand other than metal-bearing do	7,142	6,358	(2)	Netherlands 4,678; Belgium-Luxembourg 960; Switzerland 392.

See footnotes at end of table.

Table 2.—Federal Republic of Germany: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Sulfur:				
Elemental:				
Crude including native and byproduct	509,636	671,952	--	Netherlands 305,778; Denmark 79,826; United Kingdom 67,331.
Colloidal, precipitated, sublimed	450	502	29	Belgium-Luxembourg 271; France 38; Netherlands 37.
Dioxide	23,326	27,899	18	Austria 9,562; Netherlands 6,791; Belgium-Luxembourg 4,729.
Sulfuric acid	569,648	660,988	7,665	Netherlands 280,480; Belgium-Luxembourg 183,886; France 100,076.
Talc, steatite, soapstone, pyrophyllite	4,377	8,534	--	Netherlands 4,515; East Germany 1,535; Yugoslavia 347.
Vermiculite, perlite, chlorite	5,312	6,885	--	Belgium-Luxembourg 3,763; Netherlands 1,727; Switzerland 646.
Other:				
Crude thousand tons	2,215	2,115	13	Netherlands 1,423; Belgium-Luxembourg 419; France 131.
Slag and dross, not metal-bearing do	3,730	3,593	1	Netherlands 2,345; France 1,053; Belgium-Luxembourg 86.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	4,996	6,228	--	Austria 3,092; Belgium-Luxembourg 1,015; East Germany 584.
Carbon:				
Carbon black	8,086	31,211	332	East Germany 25,036; Austria 1,135; France 806.
Gas carbon	120,760	126,934	1,736	France 33,404; Austria 14,119; Netherlands 13,909.
Coal:				
Anthracite and bituminous thousand tons	10,489	8,957	--	France 2,971; Belgium-Luxembourg 1,989; Italy 1,625.
Briquets of anthracite and bituminous coal do	627	668	--	United Kingdom 363; Belgium-Luxembourg 115; France 114.
Lignite including briquets do	860	1,074	--	Belgium-Luxembourg 373; Austria 215; France 154.
Coke and semicoke do	6,590	5,504	--	Belgium-Luxembourg 1,802; France 1,301; Austria 551.
Gas, natural: Gaseous million cubic feet	337,846	256,358	NA	NA.
Peat including briquets and litter thousand tons	894	1,066	(2)	Netherlands 601; France 152; Switzerland 77.
Petroleum:				
Crude thousand 42-gallon barrels	36	8,805	(2)	East Germany 8,795; Netherlands 5.
Refinery products:				
Liquefied petroleum gas do	5,940	5,655	(2)	Netherlands 2,485; Italy 1,023; Belgium-Luxembourg 631.
Gasoline do	11,981	12,240	436	Switzerland 4,450; Netherlands 2,182; Austria 1,776.
Mineral jelly and wax do	1,282	1,385	(2)	Netherlands 172; Republic of South Africa 113; Finland 72.
Kerosene and jet fuel do	9,088	10,674	1	Switzerland 1,089; Netherlands 159; bunkers 9,186.
Distillate fuel oil do	8,418	8,760	2	Switzerland 4,160; Austria 1,007; France 900.
Lubricants do	3,633	3,873	239	Belgium-Luxembourg 577; United Kingdom 383; Netherlands 343.
Residual fuel oil do	21,230	15,640	(2)	United Kingdom 2,694; Belgium-Luxembourg 2,365; bunkers 4,891.
Bitumen and other residues do	2,272	2,760	(2)	Austria 872; Switzerland 698; Denmark 434.
Bituminous mixtures do	113	126	(2)	Netherlands 36; Switzerland 24; Austria 13.
Petroleum coke do	1,974	2,157	--	France 492; Netherlands 487; Austria 340.
Unspecified do	--	6	--	All to East Germany.

[r]Revised. NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.

Table 3.—Federal Republic of Germany: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	4	1,374	4	France 121; unspecified 1,224.
Alkaline-earth metals	377	547	(2)	France 272; Belgium-Luxembourg 124; China 61.
Aluminum:				
Ore and concentrate thousand tons	4,056	4,034	--	Australia 1,368; Guinea 1,328; Sierra Leone 697.
Oxides and hydroxides	701,868	664,738	2,970	Australia 256,631; Italy 192,360; Guinea 83,621.
Ash and residue containing aluminum	52,267	74,629	--	U.S.S.R. 28,654; Netherlands 11,904; Belgium-Luxembourg 8,310.
Metal including alloys:				
Scrap	208,892	202,882	5,561	Netherlands 50,714; United Kingdom 46,009; France 21,034.
Unwrought	722,773	721,618	2,808	Norway 232,296; United Kingdom 64,648; Netherlands 59,633.
Semimanufactures	307,536	331,329	2,021	France 75,559; Belgium-Luxembourg 47,788; Netherlands 44,905.
Antimony:				
Ore and concentrate	2,131	1,630	--	China 1,550; Bolivia 80.
Oxides	5,536	4,806	22	France 1,416; Belgium-Luxembourg 1,117; United Kingdom 870.
Metal including alloys, all forms	582	783	40	China 295; Belgium-Luxembourg 235; Turkey 166.
Arsenic: Oxides and acids	384	328	--	Belgium-Luxembourg 134; France 93.
Beryllium:				
Oxides and hydroxides	(2)	(2)	(2)	Mainly from Romania.
Metal including alloys, all forms	(2)	2	2	NA.
Bismuth: Metal including alloys, all forms	350	385	3	United Kingdom 97; Peru 46; Belgium-Luxembourg 25.
Cadmium:				
Oxides and hydroxides	571	532	NA	Belgium-Luxembourg 490; France 39.
Metal including alloys, all forms	734	546	41	Netherlands 111; Belgium-Luxembourg 109; France 59.
Cesium and rubidium: Metal including alloys, all forms	(2)	(2)	(2)	
Chromium:				
Ore and concentrate	337,907	384,473	12,090	Republic of South Africa 185,051; Albania 84,236; Turkey 62,924.
Oxides and hydroxides	1,914	1,893	7	China 823; Italy 305; Poland 285.
Metal including alloys, all forms	1,294	1,460	37	United Kingdom 604; France 334; Japan 264.
Cobalt:				
Ore and concentrate	17	5	--	Canada 3; Switzerland 2.
Oxides and hydroxides	448	441	--	Belgium-Luxembourg 209; Finland 98; Netherlands 51.
Metal including alloys, all forms	2,678	2,122	54	Zaire 1,041; Zambia 252; Norway 136.
Columbium and tantalum:				
Ore and concentrate	641	506	NA	NA.
Ash and residue containing columbium and/or tantalum	2,422	3,998	122	Thailand 594; Nigeria 353; Singapore 252.
Metal including alloys, all forms:				
Columbium (niobium)	32	34	30	Brazil 3; United Kingdom 1.
Tantalum	157	173	113	France 21; Austria 10.
Copper:				
Ore and concentrate	550,531	549,081	(2)	Papua New Guinea 179,308; Mexico 106,045; Poland 65,801.
Matte and speiss including cement copper	2,724	7,086	--	Australia 3,926; France 2,020; Cyprus 688.
Oxides and hydroxides	1,139	1,310	69	Belgium-Luxembourg 745; Italy 439.
Sulfate	11,495	10,215	--	Czechoslovakia 2,491; Belgium-Luxembourg 2,234; Poland 1,152.
Ash and residue containing copper	17,763	25,141	3,064	Netherlands 3,974; Italy 3,959.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Copper —Continued				
Metal including alloys:				
Scrap	211,756	269,855	34,451	France 47,413; United Kingdom 42,362; Netherlands 39,187.
Unwrought	592,722	562,045	4,746	Chile 127,659; Zaire 87,105; Republic of South Africa 70,181.
Semimanufactures	298,568	300,088	1,211	Belgium-Luxembourg 97,625; France 63,498; East Germany 46,098.
Gallium: Metal including alloys, all forms	11	17	4	Belgium-Luxembourg 4; Netherlands 3.
Germanium: Metal including alloys, all forms	5	6	(2)	Belgium-Luxembourg 3; United Kingdom 3.
Gold:				
Ash and residue containing gold value, thousands	$3,717	$13,349	$8,732	Sweden $1,052; Canada $706.
Waste and sweepings do	$95,047	$26,744	--	Canada $5,032; Sweden $4,044; Philippines $3,327.
Metal including alloys, unwrought and partly wrought thousand troy ounces	2,352	2,673	54	United Kingdom 529; Switzerland 500; Papua New Guinea 405.
Hafnium: Metal including alloys, all forms	(2)	(2)	(2)	
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	42,568	45,007	--	Brazil 16,500; Australia 6,959; Canada 6,670.
Pyrite, roasted do	89	76	--	Norway 31; Sweden 23; Belgium-Luxembourg 22.
Metal:				
Scrap do	1,785	1,836	25	Netherlands 515; France 250; East Germany 225.
Pig iron, cast iron, related materials	266,525	268,929	77	Brazil 71,531; France 30,112; U.S.S.R. 27,506.
Ferroalloys:				
Ferrochromium	244,644	287,300	1,271	Republic of South Africa 149,831; Zimbabwe 33,976; Finland 8,932.
Ferromanganese	87,111	129,854	152	Norway 61,609; France 43,086; Belgium-Luxembourg 8,341.
Ferromolybdenum	5,401	5,795	139	United Kingdom 2,002; Belgium-Luxembourg 1,972; Austria 695.
Ferronickel	99,327	101,491	1,481	Greece 44,310; New Caledonia 28,286; Dominican Republic 9,507.
Ferrosilicochromium	12,520	17,793	--	Zimbabwe 14,491; Sweden 1,829; Italy 49.
Ferrosilicomanganese	122,635	123,253	--	Norway 51,969; Portugal 23,963; Republic of South Africa 14,379.
Ferrosilicon	241,655	220,079	244	Norway 121,239; France 23,433; U.S.S.R. 9,387.
Silicon metal	75,557	68,842	--	Norway 32,105; France 11,353; Republic of South Africa 5,223.
Unspecified	15,827	18,957	265	France 6,462; Belgium-Luxembourg 2,867; Brazil 2,786.
Steel, primary forms thousand tons	2,000	2,403	1	Belgium-Luxembourg 630; East Germany 439; Netherlands 304.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	r4,162	4,019	1	Belgium-Luxembourg 781; Italy 693; France 527.
Universals, plates, sheets do	3,652	3,895	4	Belgium-Luxembourg 978; France 676; Austria 343.
Hoop and strip do	602	663	1	Belgium-Luxembourg 253; France 156; Austria 59.
Rails and accessories do	12	17	(2)	Netherlands 5; Poland 4; East Germany 3.
Wire do	299	311	(2)	Belgium-Luxembourg 91; France 59; Italy 29.
Tubes, pipes, fittings do	990	976	2	Italy 230; France 125; Netherlands 107.
Castings and forgings, rough do	r63	72	(2)	East Germany 24; France 7; Netherlands 6.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Lead:				
Ore and concentrate	206,723	236,490	--	Canada 46,302; Australia 37,299; Sweden 27,324.
Oxides	9,847	9,212	58	Belgium-Luxembourg 3,780; France 737; unspecified 4,376.
Ash and residue containing lead	23,534	45,133	5,480	Australia 21,175; France 9,672.
Metal including alloys:				
Scrap	69,865	45,905	161	United Kingdom 19,290; Netherlands 9,340; France 5,726.
Unwrought	144,682	135,139	867	United Kingdom 49,978; France 22,025; Belgium-Luxembourg 19,349.
Semimanufactures	3,695	3,705	8	Belgium-Luxembourg 1,926; Netherlands 693; United Kingdom 539.
Lithium:				
Oxides and hydroxides	674	687	235	China 252; Romania 73.
Metal including alloys, all forms	21	22	(2)	United Kingdom 17; Hungary 4; France 1.
Magnesium: Metal including alloys:				
Scrap	3,194	3,901	162	Netherlands 479; Sweden 411; Italy 383.
Unwrought	28,560	26,944	3,814	Norway 15,627; France 2,511.
Semimanufactures	1,013	1,634	19	Austria 1,033; France 239; Belgium-Luxembourg 137.
Manganese:				
Ore and concentrate, metallurgical-grade	535,843	377,795	--	Republic of South Africa 152,901; Australia 128,162; Ghana 31,461.
Oxides	4,467	5,601	3	Belgium-Luxembourg 3,278; Japan 1,156; Greece 586.
Metal including alloys, all forms	6,102	6,225	433	Republic of South Africa 3,507; France 758; Belgium-Luxembourg 662.
Mercury 76-pound flasks	12,360	11,687	87	Algeria 5,423; Spain 3,045; Turkey 667.
Molybdenum:				
Ore and concentrate	18,597	17,600	4,752	Chile 3,792; Belgium-Luxembourg 2,521.
Oxides and hydroxides	192	174	1	United Kingdom 80; Netherlands 74; Belgium-Luxembourg 15.
Metal including alloys:				
Scrap	504	472	20	Austria 388; France 24; Netherlands 22.
Unwrought	130	270	45	Sweden 115; Belgium-Luxembourg 40.
Semimanufactures	330	403	101	Austria 246; United Kingdom 25.
Nickel:				
Ore and concentrate	74	24	--	All from U.S.S.R.
Matte and speiss	12,239	12,583	--	Australia 9,584; Canada 2,497; Indonesia 257.
Oxides and hydroxides	383	234	(2)	Canada 153; Netherlands 33; Czechoslovakia 30.
Ash and residue containing nickel	3,262	2,099	139	Netherlands 535; France 228; United Kingdom 224.
Metal including alloys:				
Scrap	8,389	7,561	1,594	France 2,246; Belgium-Luxembourg 836.
Unwrought	44,284	42,368	2,668	U.S.S.R. 11,663; Canada 5,419; Australia 4,900.
Semimanufactures	7,042	8,766	688	France 3,663; United Kingdom 1,453; Austria 1,039.
Platinum-group metals:				
Ash and residue containing platinum value, thousands	$9,765	$7,927	$1,888	United Kingdom $3,029; Italy $892.
Waste and sweepings do	$38,267	$31,684	$1,668	Netherlands $4,913; Belgium-Luxembourg $3,378; Hungary $3,377.
Metals including alloys, unwrought and partly wrought:				
Palladium troy ounces	567,661	621,575	127,543	U.S.S.R. 218,562; United Kingdom 111,564.
Platinum do	551,194	621,222	108,092	Switzerland 145,483; United Kingdom 122,174.
Unspecified do	270,366	155,632	62,952	Republic of South Africa 38,356; United Kingdom 20,544.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Rare-earth metals including alloys, all forms	135	107	NA	NA.
Rhenium: Metal including alloys, all forms	(2)	(2)	(2)	
Selenium, elemental and phosphorus	28,214	28,468	NA	NA.
Silicon, high-purity	30	44	2	United Kingdom 19; France 7; Sweden 7.
Silver:				
Ash and residue containing silver value, thousands	$46,548	$62,604	$46,860	United Kingdom $6,229; Switzerland $2,015.
Waste and sweepings ——do——	$15,245	$30,315	$2,605	Portugal $11,054; Mexico $5,883; United Kingdom $3,303.
Metal including alloys, unwrought and partly wrought thousand troy ounces	33,652	35,442	1,324	France 6,240; Sweden 5,475; Poland 5,058.
Tellurium, elemental and arsenic	89	74	--	Sweden 25; Netherlands 17; Belgium-Luxembourg 15.
Tin:				
Ore and concentrate	1,365	2,351	--	Bolivia 1,582; Burma 356; China 313.
Oxides	77	42	1	United Kingdom 29; Italy 8; Netherlands 3.
Ash and residue containing tin	8,138	8,247	2,710	Netherlands 1,949; Brazil 1,188.
Metal including alloys:				
Scrap	284	224	--	Netherlands 56; Austria 33; Switzerland 30.
Unwrought	18,819	19,138	10	Malaysia 3,395; Thailand 3,189; Indonesia 3,049.
Semimanufactures	243	194	1	Belgium-Luxembourg 104; United Kingdom 30; Netherlands 18.
Titanium:				
Ore and concentrate	455,686	486,362	4,846	Norway 272,532; Canada 115,436; Sri Lanka 45,857.
Oxides	20,045	16,980	1,197	Belgium-Luxembourg 6,150; France 5,392; United Kingdom 2,323.
Metal including alloys:				
Scrap	738	886	148	United Kingdom 167; France 159; Japan 150.
Unwrought	2,125	2,269	362	Japan 1,457; U.S.S.R. 327.
Semimanufactures	1,360	836	126	Japan 339; United Kingdom 222.
Tungsten:				
Ore and concentrate	7,296	3,843	24	China 1,128; Canada 695; Thailand 354.
Oxides and hydroxides	1	3	(2)	China 1; Japan 1; United Kingdom 1.
Ash and residue containing tungsten	272	803	162	France 146; Sweden 141.
Metal including alloys:				
Scrap	519	483	10	France 158; United Kingdom 69; Austria 57.
Unwrought	620	728	14	Austria 429; United Kingdom 185; France 46.
Semimanufactures	102	103	26	Austria 38; United Kingdom 12.
Uranium and/or thorium:				
Ore and concentrate	6	--		
Oxides and other compounds	24	3	--	India 2.
Metal including alloys, all forms:				
Uranium	r1	(2)	(2)	
Thorium	(2)	(2)	(2)	
Vanadium:				
Ore and concentrate	2	--		
Oxides and hydroxides	1,715	1,870	(2)	Finland 1,549; China 315.
Ash and residue containing vanadium	35,611	31,635	171	Italy 1,890; Israel 214; unspecified 26,810.
Metal including alloys, all forms	3	267	256	Belgium-Luxembourg 11.
Zinc:				
Ore and concentrate	594,352	592,709	3,815	Canada 180,743; Australia 106,061; Peru 69,121.
Oxides	14,940	13,986	14	Netherlands 3,617; France 2,991; Italy 2,335.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Zinc —Continued				
Blue powder	10,490	12,394	--	Belgium-Luxembourg 9,109; France 2,112; Norway 939.
Matte	10,660	9,668	391	Netherlands 3,697; Belgium-Luxembourg 1,947; France 938.
Ash and residue containing zinc	60,649	58,981	2,300	Netherlands 7,260; Belgium-Luxembourg 7,217; United Kingdom 6,372.
Metal including alloys:				
Scrap	18,875	19,823	4	Netherlands 4,222; United Kingdom 3,990; Italy 3,107.
Unwrought	179,454	167,813	10	Belgium-Luxembourg 60,331; Netherlands 34,150; France 24,479.
Semimanufactures	23,169	23,653	10	France 15,194; Yugoslavia 3,577; Netherlands 3,163.
Zirconium:				
Ore and concentrate	75,486	78,929	1,724	Republic of South Africa 38,248; Australia 31,511; Netherlands 4,610.
Metal including alloys:				
Scrap	21	20	15	United Kingdom 3; France 1.
Unwrought	16	6	1	Sweden 3; France 2.
Semimanufactures	290	463	140	France 265; Sweden 45.
Other:				
Ores and concentrates	10,186	20	--	All from East Germany.
Oxides and hydroxides	511	504	15	United Kingdom 256; France 217.
Ashes and residues	r222,694	250,860	754	Canada 165,640; East Germany 4,821; unspecified 78,243.
Base metals including alloys, all forms	7,893	7,297	718	East Germany 5,893; Belgium-Luxembourg 126.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	82,078	46,504	797	Greece 39,169; Italy 4,333.
Artificial:				
Corundum	27,258	30,644	474	U.S.S.R. 4,980; Austria 4,558; Yugoslavia 4,089.
Silicon carbide	76,431	80,915	(2)	Norway 19,242; U.S.S.R. 4,936; Italy 2,627.
Dust and powder of precious and semi-precious stones including diamond	302	433	430	Ireland 2.
Grinding and polishing wheels and stones	9,943	9,981	67	Austria 2,668; Italy 2,184; France 1,720.
Asbestos, crude	74,438	63,171	187	Canada 31,340; Italy 16,839; U.S.S.R. 6,909.
Barite and witherite	209,419	221,624	--	France 94,330; China 32,201; Spain 19,482.
Boron materials:				
Crude natural borates	118,175	58,664	3,907	Turkey 53,852; Netherlands 718.
Elemental kilograms	(2)	(2)	(2)	
Oxides and acids	21,310	22,063	64	France 8,864; Turkey 6,200; Italy 4,986.
Bromine	5,865	7,443	--	Israel 5,766; East Germany 824; United Kingdom 582.
Cement thousand tons	1,867	1,775	(2)	East Germany 504; Belgium-Luxembourg 457; France 330.
Chalk	263,684	242,897	2	France 206,368; Belgium-Luxembourg 20,390; Italy 6,339.
Clays, crude:				
Bentonite	82,612	114,610	10,136	Greece 55,598; Turkey 14,000; Morocco 13,776.
Ceramic	76,084	69,508	123	France 22,049; Czechoslovakia 14,792; United Kingdom 12,935.
Chamotte earth	53,049	26,172	637	France 13,971; Czechoslovakia 6,804; Republic of South Africa 3,467.
Fire clay	92,846	100,369	5,262	Czechoslovakia 43,277; France 32,480; China 6,829.
Kaolin	910,815	871,793	100,744	United Kingdom 401,672; Czechoslovakia 136,357.
Unspecified	r131,281	126,846	8,860	Netherlands 54,883; Czechoslovakia 31,725; France 11,765.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Cryolite and chiolite	1,686	1,744	7	Greenland 1,737.
Diamond:				
Gem, not set or strung thousand carats	471	422	5	Belgium-Luxembourg 161; India 79; U.S.S.R. 79.
Industrial stones do	1,083	1,167	13	Belgium-Luxembourg 425; Republic of South Africa 336; United Kingdom 141.
Diatomite and other infusorial earth	37,363	39,161	1,013	Denmark 22,206; France 10,679; Iceland 1,423.
Feldspar, fluorspar, related materials:				
Feldspar	51,164	46,213	8	Norway 17,501; Italy 15,983; Finland 7,637.
Fluorspar	194,558	233,280	655	Republic of South Africa 64,648; China 33,377; Spain 18,271.
Unspecified	62,034	64,473	--	Norway 52,030; Netherlands 11,998.
Fertilizer materials:				
Crude, n.e.s	29,422	31,199	605	Netherlands 22,479; Belgium-Luxembourg 2,311; Israel 1,317.
Manufactured:				
Ammonia thousand tons	199	497	--	East Germany 213; Netherlands 172; France 65.
Nitrogenous do	2,168	3,208	1	East Germany 1,316; Netherlands 704; Belgium-Luxembourg 355.
Phosphatic do	821	711	9	Belgium-Luxembourg 537; France 79; Netherlands 34.
Potassic do	80	76	(2)	France 69; Belgium-Luxembourg 7.
Unspecified and mixed do	1,520	1,472	130	France 190; Austria 181; Netherlands 167.
Graphite, natural	31,983	33,998	157	China 8,369; Austria 4,064; Madagascar 2,526.
Gypsum and plaster	822,324	876,859	75	France 676,960; Austria 139,066; East Germany 28,593.
Iodine	961	1,880	67	Japan 906; Chile 837.
Kyanite and related materials	88,902	110,172	56,627	Republic of South Africa 41,448; France 7,076.
Lime	332,255	356,393	--	France 235,096; Poland 47,228; Belgium-Luxembourg 38,392.
Magnesium compounds:				
Magnesite	5,779	6,242	--	Netherlands 2,851; Spain 1,370; Greece 1,224.
Oxides and hydroxides	397,224	394,558	900	Greece 67,226; China 50,056; Netherlands 47,875.
Other	--	2	--	All from Sweden.
Mica:				
Crude including splittings and waste	10,842	11,946	224	India 4,896; China 3,420; France 1,621.
Worked including agglomerated splittings	609	645	15	Belgium-Luxembourg 261; France 200; Austria 64.
Nitrates, crude	1,601	2,346	--	All from Chile.
Phosphates, crude thousand tons	1,933	1,943	847	Republic of South Africa 200; Israel 175.
Pigments, mineral:				
Natural, crude	2,666	296	--	France 139; Cyprus 137; Netherlands 14.
Iron oxides and hydroxides, processed	26,326	32,765	22,363	Belgium-Luxembourg 2,931; Netherlands 2,063.
Potassium salts, crude	26,933	10,086	--	East Germany 9,997; Belgium-Luxembourg 89.
Precious and semiprecious stones other than diamond:				
Natural	1,465	841	50	Brazil 470; Republic of South Africa 99.
Synthetic	29	30	9	Switzerland 11; Bulgaria 5.
Pyrite, unroasted	149,274	187,042	--	Yugoslavia 87,907; Finland 72,511; U.S.S.R. 14,960.
Quartz crystal, piezoelectric kilograms	60	50	NA	NA.
Salt and brine	765,110	826,942	30	Netherlands 501,671; East Germany 138,815; France 130,602.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	162,896	151,084	28	Netherlands 48,067; East Germany 44,359; Switzerland 10,475.
Sulfate, manufactured	80,055	91,290	--	Spain 29,040; Austria 20,894; East Germany 17,046.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	600	772	1	Norway 157; Sweden 133; Austria 106.
Worked do	893	858	(2)	Italy 428; Portugal 183; Austria 52.
Dolomite, chiefly refractory-grade do	430	332	--	Belgium-Luxembourg 293; Norway 13; Austria 12.
Gravel and crushed rock do	9,997	8,417	(2)	France 4,903; Denmark 862; Norway 680.
Limestone other than dimension do	1,493	1,418	(2)	Austria 558; France 469; East Germany 58.
Quartz and quartzite do	58	69	3	Netherlands 20; Yugoslavia 10; Italy 7.
Sand other than metal-bearing do	3,994	2,873	1	France 1,809; Netherlands 542; Belgium-Luxembourg 187.
Sand and gravel do	2,925	2,411	--	All from East Germany.
Sulfur:				
Elemental:				
Crude including native and byproduct	328,091	252,801	25,621	Canada 166,984; Poland 44,213.
Colloidal, precipitated, sublimed	929	733	2	France 603; Netherlands 125; Italy 3.
Dioxide	4,171	7,254	--	Poland 3,404; Sweden 2,240; Switzerland 1,042.
Sulfuric acid	106,109	177,213	--	Netherlands 88,848; East Germany 46,940; Belgium-Luxembourg 19,017.
Talc, steatite, soapstone, pyrophyllite	143,494	139,082	568	Austria 54,707; France 31,498; Italy 12,986.
Vermiculite, perlite, chlorite	101,638	97,641	--	Greece 73,691; Republic of South Africa 10,685; Hungary 7,706.
Other:				
Crude thousand tons	1,351	1,505	10	Norway 655; Austria 198; France 126.
Slag and dross, not metal-bearing do	1,769	1,556	8	Belgium-Luxembourg 591; France 560; Austria 92.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	23,763	20,275	7,347	Trinidad and Tobago 12,603; Denmark 224.
Carbon:				
Carbon black	1,846	3,680	39	Netherlands 2,238; France 700; United Kingdom 277.
Gas carbon	54,769	60,159	1,595	France 25,485; Netherlands 18,601; United Kingdom 3,263.
Coal:				
Anthracite thousand tons	28	33	1	Republic of South Africa 17; Norway 6; Italy 3.
Bituminous do	8,818	9,828	789	Republic of South Africa 3,178; Poland 2,791; France 435.
Briquets of anthracite and bituminous coal do	(2)	1	--	Mainly from Netherlands.
Lignite including briquets do	4,666	4,023	(2)	Czechoslovakia 2,461; East Germany 1,553; Austria 8.
Coke and semicoke do	771	1,012	10	Belgium-Luxembourg 231; France 222; East Germany 180.
Gas, natural: Gaseous million cubic feet	1,846,883	1,873,310	NA	NA.
Peat including briquets and litter	97,212	103,948	--	Netherlands 60,309; U.S.S.R. 38,337; France 1,855.

See footnotes at end of table.

Table 3.—Federal Republic of Germany: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum:				
Crude thousand 42-gallon barrels	490,617	491,422	(2)	United Kingdom 125,330; Nigeria 72,780; Libya 72,037.
Refinery products:				
Liquefied petroleum gas do	7,424	10,316	1	Netherlands 2,814; United Kingdom 1,955; U.S.S.R. 1,166.
Gasoline do	93,978	96,025	163	Netherlands 36,999; U.S.S.R. 19,267; United Kingdom 7,419.
Mineral jelly and wax do	1,597	1,594	4	France 217; Netherlands 171; unspecified 734.
Kerosene and jet fuel do	16,036	16,754	85	Netherlands 11,963; Belgium-Luxembourg 2,120; France 679.
Distillate fuel oil do	118,838	158,783	489	Netherlands 74,394; U.S.S.R. 17,499; United Kingdom 9,259.
Lubricants do	2,650	2,516	143	United Kingdom 612; France 515; Italy 304.
Residual fuel oil do	57,947	59,763	407	Netherlands 18,448; U.S.S.R. 11,830; Spain 4,876.
Bitumen and other residues do	2,447	2,126	(2)	Netherlands 597; East Germany 523; Belgium-Luxembourg 373.
Bituminous mixtures do	130	118	2	Netherlands 56; Hungary 21; France 20.
Petroleum coke do	7,268	6,883	6,087	Netherlands 232; United Kingdom 222.
Unspecified do	829	397	--	All from East Germany.

rRevised. NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—The FRG's aluminum production increased, despite rising energy and raw material costs, placing it first among the EEC countries. The largest operating state-owned company, Vereinigte Aluminium-Werke AG (VAW), accounted for over 55%, or 420,000 tons, of total output of primary metal. The company was also a major alumina producer, processing imported bauxite. Other smelters included Schweizerisches Aluminium AG (Alusuisse), with two production units: Leichtmetallgesellschaft AG at Essen, with a 126,000-ton-per-year primary metal capacity and a 170,000-ton-per-year foundry capacity; and Aluminiumhuette Rhinefelden GmbH at Rhinefelden, with an 80,000-ton-per-year capacity. Kaiser Aluminium Europe Inc. operated a 73,000-ton-per-year smelter at Voerde, and Alcan Aluminiumwerke GmbH worked a 44,000-ton-per-year smelter at Ludwigshafen. About 35% of VAW's production was exported. VAW had holdings in Australia, New Guinea, and the United States. The company was installing a new extrusion press and heat treatment furnace at Hanover and modernizing its carbon and graphite products facilities and rolling mill as well as adding a new smelting furnace at Grevenbroich. A new foil plant at Grevenbroich was to raise capacity from 50,000 tons to 90,000 tons per year, for a total of 210,000 tons per year of capacity in all its plants. VAW's state-owned parent company, Vereinigte Industrieunternehmungen AG, sold 40% of its shares to the public in June, as part of the Government's privatization program.

Alcan Aluminiumwerke at Ludwigshafen employed 340 workers and produced about 7% of the country's aluminum ingots. The total capacity of 44,000 tons per year was being cut by one-half, with 150 possible layoffs in its work force.

Chromium.—Bayer AG of Leverkusen, a producer of chromium chemicals and other specialty metals, acquired 90% interest in Hermann C. Starck Berlin KG, a Düsseldorf-based chemical and metallurgical manufacturer. Bayer owned chromium mines in Brazil and the Republic of South Africa. Electrowerk Weisweiler GmbH was another West German chromium products producer.

Iron and Steel.—FRG operated only one iron ore mine, the Leonie Mine, at Auerbach in northern Bavaria. The ore grade

was poor, and the working conditions in the mine were extremely difficult because of high water seepage. The higher grade ores were imported mainly from Brazil, Canada, and Liberia.

Of the 50 top steel producers in the world, 7 were West German companies. The FRG's steel industry was the third largest in the Western World, employing about 203,000 workers. Thyssen AG was the largest FRG producer, and ranked sixth in the world. Klöckner AG, Krupp-Stahl AG, Hoesch AG, Peine-Salzgitter AG, Mannesmann AG, and Arbed Saarstahl GmbH followed, in declining order of production; Saarstahl ranked 43d in the world.

Production declined slightly, and some producers were anticipating closures and labor reductions because of low exports, low demand, the slack steel market, and alleged subsidies to other European producers. Thyssen was to close two blast furnaces at Hattingen, cutting the work force by 2,900 to about 1,800. The 4.2-meter heavy plate mill at the Henrichshütte, Hattingen, plant was also to shut down, with only the 3.7-meter plate mill remaining at Duisburg.

Klöckner-Werke AG registered a loss in its steel operations, and was planning restructuring measures, plant closures, and layoffs in order to return to profitability. The company, which employed about 14,000 workers, reorganized its steelmaking and associated activities into a new Klöckner Stahl AG company. The new firm incorporated three former steelworks at Bremen, Georgs-Marienhütte, and Mannstaed-Werke, as well as holdings in Maxhötte, Schmiedewerke Krupp-Klöckner, Klöckner Draht, and the joint venture technology company Klöckner CRA Technologie Ltd. of Australia. Similar measures were being taken by Hoesch Stahl AG, which employed 16,500 workers. The company added a third 2-million-ton-per-year continuous slab caster, a new 800,000-ton-per-year continuous annealing line, and a new galvanizing line. Peine-Salzgitter was also down, with cutbacks in capacity and reorganization being implemented in its work force of about 10,000 people.

The West German Government did not guarantee state aid for its steel industry. Between 1983 and 1985, however, $2.3 billion worth of state aid was granted toward restructuring. Klöckner AG's subsidiary, Eisenwerk-Gesellshaft Maximilianshütte mbH, has received $82 million and Saarstahl $1.6 billion in subsidies in the last 3 years. FRG, on the other hand, also imported about 40% of various steels from subsidized EEC markets. Thyssen, Krupp, Hoesch, and Klöckner AG, unlike their European competitors, are in the private sector and are not nearly as highly subsidized.

Lead and Zinc.—Preussag AG mined lead and zinc in the Harz Mountains, and Metallgesellschaft AG (MG) mined mostly zinc at its Meggen Mine, east of Bonn in Lennestadt. Preussag was the larger ore producer. Mining at the Rammelsberg Mine in Goslar was declining because of ore depletion.[6] In situ leaching of sulfide ore residues continued.[7] Preussag's lead and zinc mine at Bad Grund closed for about 4 months because of poor market conditions, and plans were initiated to cut one-third of the 583 jobs. Production fell to 300,000 tons from the 1985 total of 440,000 tons, reducing the mine's expected lifetime to 5 years. MG was the largest operator of nonferrous smelters and refineries, based mostly on imported materials. Operating units included Ruhr-Zink GmbH (RZ), which operated a 130,000-ton-per-year electrolytic zinc plant at Datteln; Berzelius Metallhütte GmbH, which operated an Imperial smelter at Duisburg at 85,000 tons of zinc per year and 35,000 tons of lead per year, and a lead smelter and refinery at Binsfeldhammer with a 90,000-ton-per-year capacity; and Blei-und Silberhütte Braubach GmbH, which operated a 45,000-ton-per-year secondary lead plant at Braubach. Norddeutsche Affinerie AG, 40% owned by MG, operated a 50,000-ton-per-year lead smelter and refinery at Hamburg. MG was developing the Queneau-Schumann-Lurgi (QSL) lead process at its Binsfeldhammer plant, with a precommercial production of 30,000 tons of lead. RZ at Datteln produced about 129,000 tons of its capacity of 135,000 tons of zinc because of damage to one of four transformer rectifier units. RZ imported concentrates from about 15 mines, with Australia and Canada being the main sources.

Preussag's smelters and refineries included Preussag-Weser-Zinc GmbH at Nordenham with a 120,000-ton-per-year electrolytic zinc output; Preussag-Boliden-Blei GmbH, 50% owned by Preussag, operated a lead refinery at Nordenham, where smelter lead capacity was about 100,000 tons per year and lead refinery capacity was 135,000 tons per year; it also operated a wholly owned 70,000-ton-per-year secondary lead plant near Goslar.[8]

Precious Metals.—West German smelters produced about 20% and 70% of its

gold and silver demand, respectively, the rest being reclaimed from imported copper and lead and zinc concentrates, precious metal scrap, and primary materials. Degussa AG, the largest recycler of precious metals in the FRG, refined about 50 million troy ounces of silver, 4 million troy ounces of gold, and 500,000 troy ounces of platinum-group metals. Degussa also held a 7.5% share of the Ok Tedi gold and copper mine in Papua New Guinea. In the United States, Degussa operated a precious metals refinery in South Plainfield, New Jersey.

W. C. Heraeous GmbH began in the late 1820's by melting and processing special metals such as columbium, tantalum, and titanium, and then founded the precious metals division. The company produces precious metal alloys and precious metal ingots for the dental and jewelry industries.[9]

Tantalum.—Bayer became essentially the sole owner of the NRC Inc. tantalum processing plant in Newton, Massachusetts, by purchasing 50% of Samin Corp.'s equity in the company. The other 50% was held by Starck, itself a majority-owned subsidiary of Bayer. Starck is world renowned in the tantalum market. W. C. Heraeous was another major producer of tantalum products in Europe.

Tin.—Of the three tinplate producers in the FRG, Rasselstein AG was the largest, with an installed capacity of 940,000 tons per year; it was also perhaps the largest in the world. Hoesch Werke AG and Ewald Giebel AG were other producers. The FRG exported much of its production, and ranked fourth in the world in tinplate exports.

INDUSTRIAL MINERALS

A yearbook was published by the West German Federal Institute for Earth Sciences and Natural Resources specifically on industrial mineral deposits, production, and consumption.[10] According to the report, the official production statistics are extremely poor and very often misleading, because the figures included only the production of companies with more than 10 or 20 employees. Production figures for 1982, the latest available, are as follows for selected minerals: 310 million tons of sand and gravel; 125 million tons of crushed stone; 76 million tons of carbonate rock (road metal excluded); 28.5 million tons of clay and mudstone (includes 5.5 million tons of ball clay and refractory clay); 14.6 million tons of silica sand, quartz, and pure quartzite; 7.1 million tons of scoria; 4.5 million tons of gypsum and anhydrite; 3.4 million tons of pumice; 1.1 million tons of dimension stone; 610,000 tons of bentonite; 450,000 tons of kaolin; and 440,000 tons of feldspar and feldspathic rock. About 90% of all industrial minerals mined was consumed by the construction industry.

Advanced Ceramics.—The West German Government continued to support research in advanced ceramics; several private companies were also actively involved in research and development. BASF AG, Degussa, Didier-Werke AG, ESK AG, Feldmühle Aktiengesellschaft AG, Friedrichsfeld AG, Hoesch, and Hutschenreuther AG were the leading production companies, Feldmühle being the largest. Advanced ceramics sales accounted for 12% of Feldmühle's total sales in 1985; production was from the plants in Plochingen and Wesseling, which employed 1,000 and 650 workers, respectively. Hoesch acquired interests in several advanced ceramics producers in order to enter the field.[11]

Bayer entered the advanced ceramics field by purchasing interests in established companies specializing in ceramic-coated, heat-treated fixed alumina and engineering ceramics products.

Bentonite and Kaolin.—Bentonite deposits occur and are mined mostly in Bavaria, extracted at about 40 locations, from Oligocene to Miocene marine and freshwater molasse sediments. Landshut, Mainburg, and Moosburg were the most productive areas. Annual production was about 600,000 tons, with some imports from Wyoming. Süd-Chemie AG in Moosburg was the largest bentonite producer in Western Europe, at about 120,000 tons of acid-activated clay per year. The second largest company was Erbsloeh-Geisenheim GmbH, in Geisenheim, which produced about 140,000 tons of crude bentonite. Over 30% of the production was exported and eventually used by the drilling, construction, foundry, agricultural, and water purification industries. Kaolin was also mined by the company at Lohrheim and Oberwinter, at 60,000 tons and 20,000 tons of capacity, respectively. The Geisenheim location was closed because of ore depletion.

About 75% of West German kaolin was mined in Bavaria, followed by the States of Rhineland-Palatinate, North Rhine-Westphalia, and Hesse. The country imported two-thirds of its domestic consumption, even though it was the second largest producer of kaolin in Western Europe after the United Kingdom. Amberger Kaolinwerke GmbH was the largest producer at about 140,000 tons, with mines in Hirschau-Schnaittenbach in Bavaria. The second largest producer at 130,000 tons, Edward

Kick GmbH, was also in the same area, and the third largest, at 100,000 tons, Gebruder Dorfner OHG, worked mines in the Hirschau region.

Carbon Black.—Degussa manufactured carbon black from natural gas at Kalscheuren and Dortmund, with 150,000 and 90,000 tons per year of capacity, respectively. The product was used mostly in the manufacture of automobile tires and other rubber goods. The company was also expanding by acquiring interest in other companies.

Fused Magnesia.—The FRG was Western Europe's largest consumer of refractory magnesia, and, because there were no domestic sources, depended on about 13 European and Asian countries for supplies, thus being a major importing country. Dynamit Nobel AG was FRG's only producer of fused magnesia, at its electrofurnace plant in Luelsdorf. The company also manufactured a white magnesia-alumina spinel for use in refractories.

Graphite.—Most of FRG's graphite deposits were in southern Bavaria. The region was the only producer of crystalline flake graphite, mined by Graphitwerk Kropfmühl AG in the Kropfmühl area. The underground mine and a processing plant were worked by about 180 people, at the rate of up to 8,000 tons per year of crystalline graphite and 17,000 tons of crude graphite. The company also had interests in foreign graphite-producing companies.

Gypsum.—Most of FRG's gypsum deposits were in Lower Saxony, Baden-Württemberg, the upper Weser area, the Egge Region, the Teutoburger Forest, and Franconia. The country was one of the world's major producers of gypsum and anhydrite. The deposits were concentrated in the Zechstein, Middle Muschelkalk, and Keuper geological horizons. At 3 million tons, Gebr. Knauf Westdeutsche Gipswerke GmbH at Iphofen was the largest producer of crude gypsum, with 11 underground and surface mines. Rigips Baustoffwerke GmbH in Baden-Württemberg, Portland-Zementwerke Heidelberg AG with a mine in Obrigheim, Gewerkschaft Ruhr-Waldeck GmbH in the Ruhr, Roddewig GmbH in Lower Saxony, and some others were the major producers.

Potash.—Kali und Salz AG, the sole producer of potash, accounted for 8% of world output, even though the K_2O content of its ore was only 11%. In order to extract over 30 million tons of raw salts, all drilling and loading equipment is mechanized. Because of a weak market, the company operated on an intermittent schedule and short work hours.

Talc.—Talc and steatite schists were mined only in the Fichtel Mountains in Bavaria. Rosenthal Technik AG operated a mill at Johanneszeche, and Scheruhn Talkum-Bergbau operated one at Fichtel Mountains in the Schwarzenbach-Saale area, each with about 10,000 tons per year of capacity. Talc was also imported from Austria, France, and Italy.

MINERAL FUELS

At yearend, the Government updated its energy policy, first established in 1981. The program reaffirmed the country's commitment to promote rationalization of energy use, to further diversify energy supply sources for increased security, and to continue the utilization and expansion of nuclear power. The Federal Government also continued to stress the preservation of natural environment and abatement of pollution. The Government relied mainly on free market mechanisms to achieve its energy policy objectives, with the exception of subsidies to the domestic hard coal industry.

Primary energy consumption was 385 million metric tons of coal equivalent (mtce), the same as that of 1985. It was the first year in which there was no growth in primary energy consumption since 1981. The record-high consumption of 408.2 mtce was in 1979.

Coal.—Lignite played a major role in the production of electricity. Lignite accounted for 8.6% and hard coal for 20% of FRG's primary energy consumption, essentially unchanged from that of 1985. Domestic coal accounted for 87% of the FRG's coal requirements. The Government was attempting to decrease production and to phase out export subsidies. From 1983 to 1986, about $9 billion was granted as subsidies to the coal production industry. The industry was especially heavily subsidized for the development of new mining technology. The Bottrop Mine in the Ruhr, for example, installed a new inclined mining shaft, replacing the conventional vertical and horizontal tunnels. The new structure, 3,653 meters wide and 780 meters deep, replaced 20 kilometers of old underground tunnels and four open pits. The project took 2 years to complete. Ruhrkohle AG, the operator of the mine, was a major coal-producing company.

The industry initiated a "Jahrhundertvertrag," a long-term agreement between coal producers and the electrical generating industry whereby the utilities would be required to generate most of their output using domestic coal. In 1985, electric utilities purchased 45.4 million tons of domestic

coal, while consuming 6.6 million tons of imported coal. The steel industry was the second largest consumer of domestic coal.

The hard coal mining industry employed about 160,000 workers, compared with 204,000 in 1973, or about 0.7% of the total labor force.

An average of 4.5 tons of hard coal was produced per miner per shift in 1986 in the FRG, more than in any other European country, and 13% more than in 1985. Because of low demand and prices, the drop in the value of the U.S. dollar, and the lag in steel production, however, the unsold coal was stockpiled. With cutbacks in production, the 1986 surplus amounted to about 13 million tons, triggering new subsidies to the producers. It was estimated that about $3 billion in subsidies was needed for operations, about $709 million more than in 1985.

Natural Gas.—Domestic production accounted for about 30% of demand, and natural gas accounted for 15% of primary energy consumption, thus being the third largest primary energy source. In 1985, about 35% of imported gas came from the Netherlands, 25% from the Soviet Union, 13% from Norway, and 1% from Denmark. Gas was also imported from Algeria and Libya. FRG's natural gas imports decreased slightly in 1986, with the cost decreasing by $1.91 billion to $4.73 billion.

Nuclear Power.—Nuclear power accounted for 10.1% of the FRG's primary energy consumption. It was the fastest growing source of electricity generation in the FRG, accounting for about 34% of total electricity production, compared with 36% in 1985. Three-quarters of Bavaria's electricity was provided by Bayerwerk AG, one-half of which was from nuclear plants. In the State of Hesse, north of Bavaria, the Government refused permission for the first time for the construction of a plant at Borken. There were 17 operating nuclear generating units with an aggregated power of 18,304 megawatts, including the new unit at Brokdorf, which started in late December. The total electricity generated by nuclear powerplants dropped by 6% to 119,658 billion kilowatt hours. The new Mulheim-Karlich nuclear power station stopped operation because of a court order. In addition, two experimental facilities and a prototype thorium high-temperature reactor plant supplied power to the electrical system.

Exxon Corp. sold its Exxon Nuclear Corp. (ENC) subsidiary at Lingen to Kraftwerk Union AG (KU). ENC designed, manufactured, and marketed pressurized and boiling water reactor fuels and provided related services for electrical utilities. KU, a wholly owned affiliate of Siemens AG and based in Muelheim, supplied fuels and services for fossil fuel and nuclear powerplants.

Petroleum.—Petroleum accounted for 43.3% of primary energy consumption. Veba AG was the largest West German oil company. Over 40% of FRG's crude oil requirements was imported. Crude oil imports increased 3.7% (to 66.6 million tons), as did the percentage imported from member countries of the Organization of Petroleum Exporting Countries (OPEC). The North Sea accounted for about 32.5% of supplies, OPEC for 54.1%, Soviet Union for 6%, and others for 7.4%. Since 1979, West German imports of crude petroleum have fallen by over 37%.

FRG's primary refinery capacity was further reduced from the peak year of 1979. Since 1979, the number of operating refineries had fallen from 31 to 19. Further capacity reductions were announced in 1986. Imports of refined products increased by 16% to about 51 million tons.

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[1]Physical scientist, Division of International Minerals.
[2]Financial Times (London). Apr. 3, 1987, p. 25.
[3]Where necessary, values have been converted from the Deutsche mark (DM) to U.S. dollars at the rate of DM2.2=US$1.00 for 1986.
[4]German Information Center (New York). Sept. 5, 1986, p. 6.
[5]———. Jan. 8, 1987, p. 6.
[6]Klossel, E. Erzmetall (Weinheim). V. 39, No. 12, 1986, pp. 591-604.
[7]Brauckmann, B. M. Erzmetall (Weinheim). V. 39, No. 12, 1986, pp. 613-617.
[8]Engineering and Mining Journal (New York). Dec. 1986, pp. 39-40.
[9]Metal Bulletin Monthly (London). Oct. 1986, pp. 93-99.
[10]Egger, P., J. A. Hubener, J. Priem, V. Stein, K. Vossen, and E. Wettig. Steine and Erden in der Bundesrepublik Deutschland-Lagerstatten, Production und Verbrauch. Bundesanstalt fur Geowissenschaften und Rohstoffe (Hanover). Geologisches Jahrbuch, Reiche D. Heft 82. 1986, 879 pp.
[11]Industrial Minerals (London). Dec. 1985, pp. 45-47.

The Mineral Industry of Ghana

By George A. Morgan and David J. Ellis[1]

The Government of Ghana continued efforts to revitalize and update the mining and transportation sectors in 1986 with the aid of funding from the International Monetary Fund (IMF), the International Bank for Reconstruction and Development (World Bank), and from several donor countries. As Ghana entered the third successive year of increasing average per capita income growth, interest in the mining sector increased. The Economic Recovery Program instituted by the Government of Ghana showed enough success, including a reduction of inflation to about 23% compared with 123% in 1984, to merit a promise of continuing loans and credit from the IMF and the World Bank.

The rehabilitation of the gold mining industry got under way, and although gold production dropped slightly, sources in the industry were confident that it would increase throughout the rest of the 5-year program initiated in 1984. Several consortiums of mining companies looked into the possibility of reopening old mines as joint ventures with the Government of Ghana. Bauxite and aluminum production increased dramatically in response to a steady supply of power from the hydroelectric power generators, whose reservoirs were filled as a result of increased rainfall. Droughts in 1983 and 1984 had caused massive power shortages that affected production through 1985. The U.S.S.R. continued to investigate the possibility of mining the bauxite deposits at Kibi in 1986.

Manganese production stayed fairly steady while new markets were pursued in expectation of higher production once the upgrading of the transportation system was completed. Production of diamonds decreased slightly because illegal winning and smuggling continued to plague the industry. Two oil exploration companies began projects onshore in the quest to make Ghana less dependent on imported oil.

PRODUCTION AND TRADE

Production of gold decreased slightly because of the focus on rehabilitation of existing mines. Exports of gold continued to be the primary source of foreign exchange among mineral commodities with exports earning $105 million.[2] This 14% increase from that of 1985 was due to higher gold prices. Production and exports of bauxite and aluminum increased by about 60% and 155%, respectively, because of the stable power supply from the hydroelectric plants supplying the aluminum smelter at Tema.

Manganese production increased, but exports decreased slightly, as improvements to the mine and to the rail system linking the mine at Nsuta to the port at Takoradi continued slowly. Exports totaled 258,000 tons compared with 264,000 tons in 1985. Belgium, the Federal Republic of Germany, Japan, Norway, Romania, and Spain were the principal importers of manganese ore. Production of diamonds decreased more than 5% because mining switched to a new development at Birim following the near depletion of the former workings at nearby Akwatia in the Eastern Region of Ghana.

In September, the exchange rate for the Ghanaian cedi, which had fluctuated widely in 1985 and stabilized as a set rate during the first three-quarters of 1986, was set by means of a foreign exchange auction. Companies holding import licenses were asked

to submit sealed bids for allocations of foreign exchange. Transactions involving essential commodities, such as crude oil and pharmaceuticals, were originally given a more favorable exchange rate, but a new system was subsequently developed using the minimum rate from the previous auction as the official rate the following week. This procedure produced a fairly effective devaluation of the previously overinflated cedi and provided importing agencies with an economic buffer from the effects of minimum wage increases in 1985 and 1986.

Table 1.—Ghana: Production of mineral commodities[1]

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
Aluminum:					
Bauxite, gross weight ____ metric tons	63,500	70,200	44,000	125,000	200,000
Metal, smelter, primary ____ do	174,246	42,453	NA	48,550	[3]124,570
Cement, hydraulic ____ thousand metric tons	292	290	299	342	250
Diamond:					
Gem[e] ____ thousand carats	68	34	35	[r]60	60
Industrial stone[e] ____ do	616	306	311	[r]572	540
Total ____ do	684	340	346	632	600
Gold ____ thousand troy ounces	331	276	287	299	287
Iron and steel: Steel, crude[e] ____ metric tons	5,400	5,400	5,400	5,400	5,000
Manganese:					
Ore and concentrate, gross weight ____ do	159,900	173,000	268,700	[r e]290,000	300,000
Mn content ____ do	63,960	69,216	107,480	[r e]116,000	120,000
Petroleum:					
Crude[e] ____ thousand 42-gallon barrels	730	730	730	NA	NA
Refinery products:					
Gasoline ____ do	2,070	2,150	1,460		
Jet fuel ____ do	224	248	224		
Kerosene ____ do	992	597	666		
Distillate fuel oil ____ do	2,178	1,220	1,270	NA	NA
Residual fuel oil ____ do	1,805	2,630	2,120		
Other ____ do	81	81	81		
Refinery fuel and losses ____ do	273	257	216		
Total ____ do	7,623	7,183	6,037	NA	NA
Salt[e] ____ metric tons	50,000	50,000	50,000	50,000	50,000
Silver, mine output, Ag content thousand troy ounces	[3]17	14	14	14	14

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Table includes data available through July 28, 1987.
[2]In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone) are produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.
[3]Reported figure.

COMMODITY REVIEW

METALS

Aluminum.—Aluminum production was back at capacity as increased rainfall raised the level of the Volta River, thus ensuring that the aluminum smelter at Tema received an adequate supply of power from the hydroelectric stations at Akosombo and Kpong. Volta Aluminium Co. Ltd., the Ghanaian subsidiary of Kaiser Aluminum & Chemical Corp. (90%) and Reynolds Metals Co. (10%) of the United States, added a fourth potline in midyear, which would raise annual capacity at the smelter to 160,000 tons. Improvement and rehabilitation of the road and rail links to the port of Takoradi in the Western Region continued with financing provided by the World Bank. These improvements would allow greater productivity once more markets were found for the bauxite. An eight-member team from the U.S.S.R. arrived to conduct a feasibility study on the exploitation of the Kibi bauxite deposits in the Atewa Hills northwest of Accra. The Soviet Union would mine the bauxite and construct an alumina plant for processing the ore if the project proved to be economically viable.

Gold.—The gold mining industry in Ghana endured a transitional year in 1986, while much needed rehabilitative work was begun on both the Ashanti Goldfields Corp. (Ghana) Ltd. (AGC) and the State Gold Mining Corp. (SGMC) mines. In addition,

several investigations into the possibility of reopening old mines were begun, and more comprehensive exploratory work was started as part of the effort to discover new deposits for development. Although the 5-year plan for the restoration of the Ghanaian gold mining industry was drawn up in 1985, no real concrete steps toward the achievement of higher productivity were taken until near the end of 1986. It had been hoped that the effects of the 5-year plan would show up in increased gold output in 1986, but production actually declined slightly from 1985 values. This slight drop occurred mainly because of deterioration in the three operating mines and the dredging facility that was so advanced that the management teams were forced to decrease gold production in the effort to renovate and repair certain equipment and to lay out a comprehensive plan of future action.

AGC embarked on a $160 million mine expansion and refurbishment project in 1986. Financing for the project came in the form of a loan of $55 million from the International Finance Corp. (the commercial loan affiliate of the World Bank) and a $32.5 million loan from a consortium of Western European banks headed by Standard Chartered Merchant Bank of London. The balance of the financing was to be in retained profits of the AGC.

A $3.5 million contract for the commissioning of a gold treatment plant was awarded to Davy McKee (London) Ltd., a British engineering and construction firm. The plant will have the capacity to treat 3,000 tons of leached ore per day, as well as 3,000 tons of gold tailings per day, using a carbon-in-pulp adsorption process rather than the former zinc-based system. An up-to-date low-profile raised drill was ordered from Robbins Co. of the United States for low headroom usage. Other planned projects included the sinking of a new shaft to enable exploitation in the southern area of the mine and the replacement of much obsolete and broken machinery.

Production was halted at Obuasi for 10 days in April when the mine workers went on strike in a successful attempt to gain a wage increase. This work stoppage, along with the time and labor spent on the rehabilitative work, contributed to the AGC's production drop of a little over 6%.

At the SGMC mines situated near the towns of Prestea and Tarkwa, which lie in the southern part of the Western Region, the Canada Ghana Mining Group (CGMG) management team hired in 1985 to manage the state-owned gold mines, evaluated the mines in order to draw up a work schedule for 1987. The SGMC received a $35 million loan for the mine rehabilitation from the International Development Agency, the low-interest loan affiliate of the World Bank. Of that loan, $8 million was a partial payment of the $13.3 million paid to the CGMG management team. At the Tarkwa Mine, preliminary plans were for a production increase from about 20,000 troy ounces in 1986 to 60,000 troy ounces in 1990. This increase was to result from rehabilitation of the underconveyor system, the underground pumping system, the mill, and the maintenance workshop. In addition, a feasibility study was planned in an effort to identify alternative shaft systems.

A similar program of rehabilitation was instigated at the Prestea Mine area to raise annual production from less than 20,000 troy ounces in 1986 to 55,000 troy ounces by 1990. At the Dunkwa dredging operation, the CGMG subcontracted the renovation work to Osborne and Chappel Inc. of Malaysia in deference to their expertise in dredging programs. Annual output from the Dunkwa operation had slipped to less than 3,000 troy ounces in 1985 and 1986 after averaging over 50,000 troy ounces in the 1960's. The management team hoped that renovation and the import of much-needed spare parts would boost production to 18,000 ounces by 1990. There were reserves estimated at over 1.5 million ounces of gold in alluvial deposits in and around the Ofin River and its tributary streams. An essential part of the contract with the CGMG management team was that they train Ghanaian staff to use the new machinery and procedures efficiently so that they could take over operation of the mines at the conclusion of the 5-year program.

The Ghanaian gold industry was also stimulated by new investment incentives produced by the Government of Ghana. These incentives included a 75% tax write-off for the first year of a gold mining venture, and a writeoff of 50% of the balance of capital investment in subsequent years. Companies were also given the opportunity to open offshore accounts for loan servicing and payment of expatriate personnel. In return, the Government reserved the right to a minimum 10% share in the investment should it turn out to be commercially viable. In an effort to ensure that

foreign loans were serviced, the Government also raised from 20% to 45% the level of foreign exchange earnings to be kept in Ghana. These new incentives, along with others passed as part of a modification of the existing Minerals and Mining Law, and in concert with the creation by law of a Minerals Commission to advise the Secretary for Lands and Natural Resources on all matters relating to minerals in Ghana, resulted in a dramatic increase in applications for prospecting licenses in 1986.

The most advanced of the new enterprises was a joint venture between the SGMC (30%) and Northern Queensland Co. Ltd. of Australia (70%) known as Southern Cross Mining Ltd. A mining lease for an area northeast of Lake Bosumtwi, including the previously worked Obenemase and Kononogo Mines, was granted, and production was expected to begin in 1987. Another joint venture under the name of Teberebie Goldfields Ltd.—composed of the Pioneer Group of the United States, Glencar Explorations PLC. of Ireland, and the SGMC—were granted a 26-square-kilometer concession south of Tarkwa. SGMC data indicated possible reserves of 10 to 20 million tons of ore in the form of auriferous conglomerates on the site.

A Canadian joint venture between Denison Mines Ltd. and Sikamen Gold Resources Corp. gained the rights to exploration of the Bogosu Concession just north of Prestea. The concession covered about 100 square kilometers, most of which was part of a previously worked concession that closed in 1955. Reserves were estimated in excess of 1.7 million troy ounces, and plans were made for a $4 million exploration program to begin in 1987.

Illegal gold winning and smuggling, known as galamsey, was a continued problem in Ghana because there was no system for licensing of the artisanal gold industry. A study was commissioned and a report was produced on the regularization of mining and purchasing laws, as well as on improvements in mining and processing methods by a team composed of members of the newly formed Minerals Commission and representatives of Mackay and Schnellmann Ltd. It was recommended that an internal agency be set up to license the working of small holdings and to purchase gold from the workers of such holdings.

Manganese.—Modernization of the manganese mine and plant at Nsuta continued as Ghana sought to return to the annual production rate of 500,000 tons that was achieved in the early 1970's. The rail link between the mine and the port at Takoradi continued to be rehabilitated.

INDUSTRIAL MINERALS

Cement.—Shortages of cement led to the importation of 250,000 tons of clinker from the German Democratic Republic to the Ghana Cement Works. Lack of foreign exchange to buy more clinker was blamed for a decrease of almost 30% in cement production.

Diamond.—Production of diamonds from the Birim Valley Complex commenced in January because deposits at nearby Akwatia were almost exhausted. With the replacement of obsolete mining and milling equipment, and the restocking of spare parts, Ghana Consolidated Diamonds Ltd. (GCDL) hoped to achieve production of 1 million carats by 1987. There were also attempts made to reduce losses from illegal diamond winning and smuggling, which probably amounted to one-half of the annual production. GCDL expected a profit of $3.5 million from operations in 1986.

MINERAL FUELS

Primary Fuels Inc. of the United States shut down the Saltpond offshore field, the only producing field in Ghana, because of yields of less than 1,000 barrels per day. A consortium led by Royal Dutch/Shell Oil Co. were reportedly negotiating to take over the Saltpond concession, as well as additional acreage. Diamond Shamrock International Petroleum Co. (DSIPC), a subsidiary of Diamond Shamrock Corp. of the United States, planned to spud a wildcat on their 650,00-acre Keta Basin onshore concession, which extended from the eastern border of Ghana across the Volta River to the coastal town of Ada. DSIPC had a 55% share in the venture, with Ghana National Petroleum Corp. (GNPC) controlling the other 45%. Petro-Canada International Assistance Corp. (PCIAC), based in Ottawa, Canada, began a $6 million onshore exploration program in the Tano Basin on the western coast of Ghana at Half Assini. PCIAC was following up on two oil and gas strikes at wells in the Half Assini area that had been drilled in 1984 and 1985. The first of 18 planned wells was drilled in December. PCIAC's agreement with GNPC called for a 2-year program on about 400 square kilometers, which included the processing and interpretation of seismic data and the provision of a Canadian adviser to the GNPC.

Imports of oil cost Ghana almost one-half of its export earnings in 1986. Much of the financing for oil exploration agreements came from World Bank grants aimed at assisting developing countries in developing internal sources of oil to reduce their dependence on foreign exchange.

[1]Physical scientists, Division of International Minerals.
[2]Where necessary, values have been converted from Ghanaian cedis (C) to U.S. dollars at the rate of C1=US$0.0112.

The Mineral Industry of Greece

By Walter G. Steblez[1]

Greece's mineral industry maintained its position in 1986 as a leading world producer of bentonite, magnesite, and perlite, as well as an important European producer of bauxite, cement, emery, marble, and a variety of other industrial minerals, ferroalloys, and nonferrous metals. The Government's National Statistical Service indicated a 1.8% increase in mine production and a 0.3% increase in industrial production compared with that of 1985. The estimated gross value output of mining, quarrying, and processing sectors for industrial minerals and metals was about 20% of total industrial production at current prices and about 4% of the gross domestic product (GDP). Overall economic performance in 1986 showed some improvement over that of 1985; inflation declined to 16.9% from 25%, and the economy, in terms of GDP, grew by about 1.3%. Also, the balance of payments deficit was reduced by 46.4%. The major events in the mineral industry during the year included the strike and production downturn at Larco S.A., Greece's ferronickel producer; continued feasibility studies for the construction of a stainless steel plant; and a new round of negotiations with the U.S.S.R. and Bulgaria concerning the construction of a 600,000-ton-per-year alumina plant at Itea. In the energy sector, there was, reportedly, a discovery of a large-scale lignite deposit at Diavolorema.

Government Policies and Programs.—The Government maintained the dual policy of seeking to attract foreign investment while, at the same time, attempting to gain control of the country's mineral sector through nationalization. This policy continued to depress the mineral industry's private sector, and the performance of formerly private companies such as Larco and the Scalistiris Group continued to deteriorate.[2] Although the Government's 2-year stabilization program legislated at yearend 1985 to reduce public sector borrowing, the current account deficit, and inflation was moderately successful in 1986, other policies dampened the mineral industry's performance during the year. These included efforts to abolish private marble quarrying, and the drafting of a new mining code that relegated the status of mineowners to that of contractors, and which, in effect, would have redefined mines and mineral deposits as state property. There was also an attempt to reclassify industrial minerals that would allow for their nationalization.

PRODUCTION

The mineral industry's performance during the year was negatively influenced by the decline in the value of the U.S. dollar and by strong competition in the world market, especially in the cement and magnesite sectors. There was also a decline in production of some commodities such as nickel ore and ferronickel. Reduced efficiency owing to overstaffing continued to have a negative impact on the the country's industry, largely in the state-controlled public sector.

The Government continued to play a major if not dominant role in Greece's mineral industry. The Ministry of Industry, Energy, and Technology and its National Committee of Geological, Metallurgical, and Mining Policy were the chief Government

agencies responsible for exploration and mining, metallurgical, and energy development. Government-controlled mining and processing operations were conducted largely under the auspices of the Hellenic Industrial Development Bank (ETVA), the National Bank of Greece, and the National Bank for Industrial Development (ETEBA). Commercial mineral operations controlled by ETVA included the Asbestos Mines of Northern Greece S.A. (MABE); the Project Studies and Mining Development Corp. S.A. (GEMEE), which was responsible for research and the production of marble and quartz through its respective affiliates Hellenic Marbles S.A. and Hellenic Industrial Minerals (ELVIOR); and the Aegean Metallurgical Industries S.A. (METBA), which was responsible for the development of deposits for the production of gold, lead, silver, and zinc, as well as sulfuric and phosphoric acids. Other ETVA-owned interests were Hellenic Alumina S.A., charged with the construction of the Itea alumina plant with Soviet cooperation, and Porcel, a subsidiary for the development and subsequent operation of the Drama feldspar deposit and a high-grade 30,000-ton-per-year potassium feldspar processing plant. ETVA also held a 40% interest in the Hellenic Industrial Mining & Investment Co. (HIMIC), and the balance was owned by the National Bank of Greece and the National Mortgage Bank of Greece. HIMIC operated Hellenic Ferroalloys S.A. (ELSI), the country's sole producer of ferroalloys and chief chromite mining concern, as well as the Messolonghi Saltworks.

The planned near-term reorganization of HIMIC would make it an independent state agency with increased activity in the mineral industry that would include the operation of Larco, the country's nickel producer, and the former Scalistiris Fimisco/Elbaumin Group, which produced bauxite, chromite, magnesite, manganese, and refractories, and developed phosphate rock mining in the western region of the country. ETEBA, a joint venture of the National Bank of Greece and an international consortium of financial institutions, owned a majority interest in Mevior S.A., a producer of feldspar and quartz, and a minority interest in Skaris Marble S.A. ETEBA was also involved in the development of silica, perlite, and wollastonite deposits. The National Bank of Greece controlled Heracles General Cement Co. S.A., the country's largest cement producer. In the energy field, the Public Power Corp. (PPC) mined lignite and generated electricity, and the Public Petroleum Corp. (DEP) was in charge of petroleum exploration and production.

Greece's major private companies were Aluminium de Gréce S.A. (AG), a subsidiary of Pechiney of France, the Bodossakis Group (mixed sulfides and lead and zinc concentrates), the Eliopoulos Kyriacopoulos Group (barite, bauxite, bentonite, and perlite), Magnomin General Mining Co. S.A. (magnesite and dead-burned magnesite), and Titan Cement Co. S.A.

Table 1.—Greece: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum:					
Bauxite, gross weight ----- thousand tons	2,846	2,455	2,296	2,453	2,500
Alumina, gross weight ----------do----	404	410	482	380	400
Metal:					
Primary ----------	e135,000	136,181	136,244	125,222	130,000
Secondary[e] ----------	7,000	r7,000	r7,000	r7,000	7,000
Chromium: Chromite:					
Run-of-mine ore ----------	59,483	83,202	123,186	214,031	220,000
Marketable products:					
Direct-shipping ore[e] ----------	6,000	7,000	11,000	r15,000	15,000
Concentrate ----------	23,238	20,517	50,364	58,948	65,000
Iron and steel:					
Iron ore and concentrate, nickeliferous:[3]					
Gross weight ------- thousand tons	516	1,343	1,929	2,245	2,200
Fe content ----------do----	221	572	810	920	900
Metal:					
Pig iron ----------do----	110	138	138	e140	160
Ferrochromium ----------	--	e18,000	32,974	34,436	35,000
Ferronickel[e] ----------	51,000	50,000	53,000	r63,800	40,000
Steel, crude ------- thousand tons	933	858	895	985	890

See footnotes at end of table.

Table 1.—Greece: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS —Continued					
Lead:					
Mine output, Pb content[e]	19,000	20,000	22,000	20,000	21,000
Metal, refined:[e 4]					
Primary	3,200	--	--	15,000	16,000
Secondary	1,000	--	--	--	--
Manganese:					
Ore, crude:					
Gross weight	51,150	40,140	28,170	29,820	31,000
Mn content	15,345	12,042	8,451	8,946	9,000
Concentrate:					
Gross weight	5,600	4,636	5,447	5,085	5,200
Mn conent	2,744	2,272	2,669	2,478	2,548
Nickel:					
Ni content of nickeliferous iron ore[e 5]	5,000	13,000	16,700	[r]22,000	21,000
Ni content of alloys	[e]4,500	12,858	15,829	15,952	16,000
Silver: Mine output, Ag content thousand troy ounces	1,582	1,797	[e]1,800	[e]1,700	1,700
Tin metal, secondary[e]	40	40	40	40	40
Zinc:					
Mine output, Zn content[e]	20,400	21,300	[r]22,500	[r]21,500	22,500
INDUSTRIAL MINERALS					
Abrasives, natural: Emery	--	7,007	8,100	7,729	8,000
Asbestos:					
Ore thousand tons	1,562	2,490	3,766	3,705	3,800
Processed	17,016	31,811	45,376	46,811	47,000
Barite:					
Crude ore	119,747	90,187	24,822	[r e]26,000	24,000
Concentrate	39,101	30,262	2,423	3,283	2,500
Cement, hydraulic thousand tons	12,860	14,196	13,521	13,669	13,500
Clays:					
Bentonite:					
Crude	[e]312,000	688,941	778,722	886,972	900,000
Processed	265,577	214,193	260,941	239,861	240,000
Kaolin:					
Crude	44,736	60,749	92,407	87,623	88,000
Processed	5,260	6,032	10,376	7,449	7,500
Fluorspar, grade unspecified[e]	300	300	300	300	300
Gypsum and anhydrite	685,883	[r]645,431	690,000	[e]690,000	650,000
Magnesite:					
Crude thousand tons	967	891	1,064	846	900
Dead-burned	285,572	251,692	316,119	239,837	240,000
Caustic-calcined	80,930	113,026	121,227	94,866	100,000
Nitrogen: N content of ammonia	223,605	227,247	[r e]230,000	[r e]230,000	230,000
Perlite:					
Crude	245,000	206,882	274,360	239,768	245,000
Screened	151,271	151,601	177,571	161,161	170,000
Pozzolan (Santorin earth) thousand tons	[r]1,177	[r]880	908	938	950
Pumice	641,804	500,460	626,971	620,328	625,000
Pyrites, gross weight	115,976	143,518	164,949	173,262	170,000
Salt, all types thousand tons	116	159	133	150	150
Silica (probably silica sand)[e]	28,000	[3]1,908	[3]38,892	38,000	38,000
Sodium compounds:[e]					
Carbonate	1,000	1,000	1,000	1,000	1,000
Sulfate	[e]7,408	[e]7,173	9,000	9,000	9,000
Stone: Marble[e] cubic meters	[r]150,000	[e]138,492	[e]132,332	[r]150,000	150,000
Sulfur:					
S content of pyrites thousand tons	55	67	78	[e]78	75
Byproduct of petroleum do.	8	5	5	[e]5	5
Natural gas[e] do.	97	115	120	120	120
Total do.	160	187	203	[e]203	200
Talc and steatite	2,697	2,166	1,712	1,725	1,800
MINERAL FUELS AND RELATED MATERIALS					
Coal including briquets:					
Lignite thousand tons	26,843	30,580	31,576	35,962	37,000
Lignite briquets do.	[r]64	52	[e]120	[e]120	110
Coke:[e]					
Coke oven do.	[e]306	300	300	300	305
Gashouse do.	[e]16	15	15	15	16
Gas:					
Manufactured, gasworks[e] million cubic feet	12	15	15	15	15
Natural do.	4,416	[e]5,000	3,224	2,195	2,200

See footnotes at end of table.

Table 1.—Greece: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum:					
Crude ------ thousand 42-gallon barrels	7,618	[e]10,000	9,688	9,655	9,500
Refinery products:					
Gasoline ------ do	14,952	[e]14,500	14,136	16,592	15,000
Jet fuel ------ do	13,504	[e]13,000	11,696	10,984	11,000
Kerosene ------ do	332	[e]300	217	302	300
Distillate fuel oil ------ do	29,479	[e]29,000	28,378	24,521	25,000
Residual fuel oil ------ do	41,878	[e]35,000	29,417	27,279	28,000
Lubricants ------ do	687	[e]650	630	822	800
Other ------ do	3,349	[e]3,400	3,852	3,461	3,500
Refinery fuel and losses ------ do	4,969	[e]4,500	3,521	3,899	4,000
Total ------ do	109,150	[e]100,350	91,847	87,860	87,600

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

[1]Table includes data available through June 1987.

[2]In addition to the commodities listed, a variety of other crude construction materials (clays, sand and gravel, and stone) is produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels. Cobalt is also produced and is included with "Nickel."

[3]Ni content is also reported under "Nickel."

[4]Includes antimonial lead and hard lead.

[5]Also includes Co content.

[6]Reported figure.

TRADE

At yearend, Greece's balance of payments showed marginal improvement. There was a slight decline in total imports and a modest increase in exports. The country's outstanding foreign debt was $17.13 billion compared with $15.22 billion in 1985. This increase was, in part, attributable to the devaluation of the U.S. dollar. Mineral commodities such as cement and magnesite were subject to strong competition during the year, which resulted in a decrease in export earnings.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate thousand tons	1,374	1,333	--	U.S.S.R. 550; Romania 411.
Oxides and hydroxides	208,500	187,400	--	Netherlands 112,600; Yugoslavia 49,800; Iran 25,000.
Ash and residue containing aluminum	77	610	--	West Germany 235; Italy 200.
Metal including alloys:				
Scrap	1,253	1,114	--	Belgium-Luxembourg 400; Netherlands 286; Italy 202.
Unwrought	48,451	43,198	--	Italy 24,964; France 12,128; Lebanon 3,975.
Semimanufactures	48,287	49,549	5,572	Saudi Arabia 16,655; West Germany 7,667.
Antimony: Ore and concentrate	60	120	--	All to France.
Chromium:				
Ore and concentrate	8,625	8,830	--	West Germany 5,500; United Kingdom 2,050.
Metal including alloys, all forms	821	209	--	All to Netherlands.
Columbium and tantalum: Metal including alloys, all forms, columbium (niobium)	20	--		

See footnote at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Copper:				
Matte and speiss including cement copper	836	950	--	All to Belgium-Luxembourg.
Ash and residue containing copper	452	1,117	--	West Germany 660; Spain 397.
Metal including alloys:				
Scrap	503	900	--	Belgium-Luxembourg 718; Spain 85.
Unwrought	221	22	--	All to Belgium-Luxembourg.
Semimanufactures	15,938	14,481	179	Italy 3,596; West Germany 2,942.
Gold: Metal including alloys, unwrought and partly wrought value, thousands	--	$218	--	Switzerland $207.
Iron and steel: Metal:				
Scrap	1,450	1,102	--	Italy 662; Belgium-Luxembourg 179.
Ferroalloys:				
Ferrochromium	29,411	23,070	1,600	Sweden 4,350; West Germany 4,000; Spain 3,300.
Ferronickel	77,149	89,542	--	West Germany 51,976; France 10,543; United Kingdom 8,964.
Steel, primary forms	148,202	145,609	--	Turkey 61,828; Italy 61,801; Lebanon 14,071.
Semimanufactures:				
Bars, rods, angles, shapes, sections	159,596	246,678	540	China 112,529; Syria 27,433.
Universals, plates, sheets	232,048	154,802	43,239	Turkey 34,738; United Kingdom 20,517.
Hoop and strip	25,586	53,548	38,170	Syria 8,487; West Germany 1,852.
Rails and accessories	--	9	--	Cyprus 6.
Wire	561	1,474	--	Saudi Arabia 834; Lebanon 351.
Tubes, pipes, fittings	138,929	106,032	53,546	U.S.S.R. 19,208; Sudan 8,784; Libya 8,268.
Castings and forgings, rough	201	252	--	Libya 110; West Germany 98.
Lead:				
Ore and concentrate	33,706	23,000	--	Belgium-Luxembourg 12,500; U.S.S.R. 10,500.
Ash and residue containing lead	84	982	--	Spain 857; West Germany 66.
Metal including alloys:				
Scrap	179	--		
Unwrought	2,000	2,167	--	Yugoslavia 2,000.
Semimanufactures	37	23	--	West Germany 21.
Magnesium: Metal including alloys, scrap	9	30	--	West Germany 23.
Manganese:				
Ore and concentrate, metallurgical-grade	361	--		
Metal including alloys, all forms	1,057	--		
Nickel:				
Ash and residue containing nickel	--	39,121	24,146	Italy 11,655; Egypt 2,760.
Metal including alloys:				
Scrap	21	18	--	All to United Kingdom.
Semimanufactures	763	873	--	All to Netherlands.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$404	$782	--	All to France.
Rare-earth metals including alloys, all forms	3	1	--	NA.
Selenium, elemental	1	--		
Silver:				
Waste and sweepings[2] value, thousands	$82	--		
Metal including alloys, unwrought and partly wrought do.	$2,798	$4,004	$1	Belgium-Luxembourg $3,146; United Kingdom $850.
Tin:				
Ash and residue containing tin	179	22	--	All to United Kingdom.
Metal including alloys:				
Scrap	3	6	--	All to Italy.
Unwrought	1	1	--	Do.
Semimanufactures	2	(3)	--	All to Libya.
Tungsten: Metal including alloys, semimanufactures	--	2	--	All to Italy.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Ore and concentrate	39,450	43,300	--	France 25,500; Italy 7,750; Japan 5,000.
Matte	280	431	--	All to West Germany.
Ash and residue containing zinc	1,583	1,322	--	Italy 607; West Germany 308; Japan 300.
Metal including alloys:				
Scrap	359	373	--	Italy 257; West Germany 116.
Unwrought	183	69	--	West Germany 46; Italy 22.
Semimanufactures	2	2	--	All to Saudi Arabia.
Other:				
Ores and concentrates	65,350	143,390	1,500	Sweden 68,350; Belgium-Luxembourg 53,290.
Ashes and residues	30,090	21,371	--	Bahrain 7,368; Malta 6,740; United Arab Emirates 5,000.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	454,948	373,588	223,622	United Kingdom 69,521; West Germany 39,344.
Dust and powder of precious and semi-precious stones including diamond value, thousands	$446	$399	$290	West Germany $109.
Grinding and polishing wheels and stones	69	37	(3)	Switzerland 20.
Asbestos, crude	34,740	29,387	--	Turkey 4,905; Japan 4,672; Thailand 2,024.
Barite and witherite	16,000	14,000	--	All to Kuwait.
Cement thousand tons	7,025	7,286	601	Egypt 2,638; Saudi Arabia 1,643; Algeria 1,291.
Chalk	3,083	1,652	(3)	Saudi Arabia 1,482.
Clays, crude:				
Bentonite	380,246	453,714	--	Sweden 70,806; Canada 64,900; West Germany 56,680.
Chamotte earth	29	1	--	NA.
Kaolin	18,576	15,341	--	Yugoslavia 14,990.
Unspecified	103	187	--	Cyprus 179.
Diatomite and other infusorial earth	--	15	--	All to Cyprus.
Fertilizer materials:				
Crude, n.e.s	580	365	--	Saudi Arabia 322.
Manufactured:				
Ammonia	(3)	--		
Nitrogenous	6,875	11,282	--	Netherlands 5,800; Cyprus 4,397.
Phosphatic	38	--		
Potassic	22,739	33,110	--	China 31,500.
Unspecified and mixed	34,861	74,399	--	China 49,500; Cyprus 16,804.
Gypsum and plaster	392	61	--	Egypt 20; Jordan 20.
Lime	580	500	--	All to Israel.
Magnesium compounds:				
Magnesite, crude	24,931	10,447	--	Italy 6,675; United Kingdom 2,900.
Oxides and hydroxides	402,391	332,618	55,439	West Germany 60,704; Italy 40,461; United Kingdom 40,428.
Mica: Worked including agglomerated splittings	15	1	NA	NA.
Pyrite, unroasted	--	110	--	All to Cyprus.
Salt and brine	10	11	--	All to bunkers.
Sodium compounds, n.e.s.: Carbonate, manufactured	5	80	--	Saudi Arabia 50; Cyprus 30.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	42,667	53,053	262	Saudi Arabia 16,107; Italy 8,919; West Germany 6,698.
Worked	90,181	140,206	4,629	Saudi Arabia 75,250; Tunisia 22,800.
Dolomite, chiefly refractory-grade	671	1,300	--	All to Italy.
Gravel and crushed rock	59,191	9,535	--	Libya 8,940.
Quartz and quartzite	15,820	2,900	--	All to Norway.
Sand other than metal-bearing	71	26	--	All to bunkers.
Sulfur:				
Elemental, crude including native and byproduct	10,187	13,571	--	Algeria 5,000; Italy 4,400; Turkey 3,000.
Dioxide	153	168	--	Cyprus 161.
Sulfuric acid	19,361	4,708	--	Yugoslavia 3,001; Lebanon 830.
Talc, steatite, soapstone, pyrophyllite	174	109	--	Cyprus 95.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Vermiculite, perlite, chlorite	191,951	200,764	42,018	West Germany 79,732; United Kingdom 23,750.
Other:				
Crude	7,869	6,585	--	Jordan 2,500; France 1,694.
Slag and dross, not metal-bearing	18,963	10,855	--	France 7,009; Saudi Arabia 1,241.
MINERAL FUELS AND RELATED MATERIALS				
Carbon: Carbon black	20	--	--	
Coal: Bituminous thousand tons	--	49,000	--	Lebanon 44,000.
Petroleum:				
Crude thousand 42-gallon barrels	2,527	2,728	--	France 2,363.
Refinery products:				
Liquefied petroleum gas do	670	401	--	Cyprus 130; Syria 125.
Gasoline do	3,838	4,866	1,287	France 846; Italy 697.
Kerosene and jet fuel do	3,442	3,458	1,577	Iran 744; India 706.
Distillate fuel oil do	842	1,505	1,357	Lebanon 42; Cyprus 30.
Lubricants do	662	697	139	Egypt 213; Italy 179.
Residual fuel oil do	4,451	5,744	215	United Kingdom 1,837; Italy 1,433.
Bitumen and other residues do	3	1	--	Mainly to Cyprus.

NA Not available.
[1]Table prepared by Jozef Plachy.
[2]May include other precious metals.
[3]Less than 1/2 unit.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	6,197	2,029	--	West Germany 1,146; France 593; Belgium-Luxembourg 235.
Alkaline-earth metals	9	21	--	All from France.
Aluminum:				
Ore and concentrate	5,689	1,406	--	China 986; Italy 399.
Oxides and hydroxides	496	332	72	United Kingdom 136; West Germany 93.
Metal including alloys:				
Scrap	--	50	26	Bulgaria 23.
Unwrought	6,474	3,644	51	Egypt 1,087; Spain 659; Norway 408.
Semimanufactures	5,300	4,627	43	West Germany 1,849; United Kingdom 1,011.
Antimony:				
Oxides	--	11	--	United Kingdom 10.
Metal including alloys, all forms	12	71	--	China 31; Belgium-Luxembourg 30.
Arsenic: Oxides and acids	78	74	--	France 62.
Beryllium: Metal including alloys, all forms	20	--		
Bismuth: Metal including alloys, all forms	2	1	--	Mainly from United Kingdom.
Cadmium: Metal including alloys, all forms	1	1	--	NA.
Chromium:				
Ore and concentrate	26,815	35,980	--	Republic of South Africa 20,704; Albania 14,703.
Oxides and hydroxides	92	208	--	United Kingdom 131; U.S.S.R. 30.
Cobalt:				
Oxides and hydroxides	(3)	(3)	--	Mainly from West Germany.
Metal including alloys, all forms	5	5	(3)	Belgium-Luxembourg 3.
Columbium and tantalum: Metal including alloys, all forms:				
Columbium (niobium)	--	(3)	--	All from Italy.
Tantalum	(3)	(3)	--	All from Netherlands.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Copper:				
Matte and speiss including cement copper	13,367	9,959	--	Zambia 2,601; Chile 2,229; Belgium-Luxembourg 2,068.
Oxides	65	92	--	Norway 51; Netherlands 22.
Sulfate	2,533	1,373	63	Yugoslavia 937; West Germany 350.
Metal including alloys:				
Scrap	447	(2)	--	Mainly from West Germany.
Unwrought	20,313	22,780	--	Chile 10,624; Zambia 4,037; Zaire 1,873.
Semimanufactures	3,469	8,539	13	Belgium-Luxembourg 3,242; France 2,750.
Germanium: Metal including alloys, all forms	12	--		
Gold: Metal including alloys, unwrought and partly wrought value, thousands	$17,616	$25,872	$18	Switzerland $22,879.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	21	339	--	All from Sweden.
Pyrite, roasted	--	14,950	--	All from Senegal.
Metal:				
Scrap	327,570	313,312	116,886	U.S.S.R. 107,018; United Kingdom 47,827.
Pig iron, cast iron, related materials	7,133	8,589	--	U.S.S.R. 7,052; Italy 730.
Ferroalloys:				
Ferrochromium	35	43	--	West Germany 38.
Ferromanganese	2,751	6,115	--	Portugal 5,254; West Germany 409.
Ferromolybdenum	9	6	--	West Germany 5.
Ferrosilicomanganese	5,924	6,642	--	Portugal 4,015; Norway 1,673.
Ferrosilicon	2,812	2,807	--	Norway 1,254; West Germany 844.
Silicon metal	423	311	--	France 305.
Unspecified	278	424	--	France 373.
Steel, primary forms	830,075	943,412	--	Netherlands 243,882; United Kingdom 159,757; France 116,123.
Semimanufactures:				
Bars, rods, angles, shapes, sections	157,277	169,753	3	Italy 30,183; Czechoslovakia 24,420; France 20,482.
Universals, plates, sheets	207,375	212,826	4	France 39,900; West Germany 38,496; United Kingdom 20,839.
Hoop and strip	22,193	22,363	--	West Germany 11,307; Bulgaria 3,441.
Rails and accessories	1,761	1,104	(2)	West Germany 285; France 224; Italy 203.
Wire	13,043	10,874	--	Italy 2,197; West Germany 1,752; Belgium-Luxembourg 1,554.
Tubes, pipes, fittings	30,293	29,664	35	West Germany 7,719; United Kingdom 5,162; France 3,976.
Castings and forgings, rough	1,961	985	(2)	Belgium-Luxembourg 515; France 260.
Lead:				
Ore and concentrate	8,531	9,783	--	Belgium-Luxembourg 5,050; Morocco 2,103; Peru 1,161.
Oxides	134	82	--	France 32; United Kingdom 22.
Ash and residue containing lead	--	2	--	All from Denmark.
Metal including alloys:				
Scrap	101	12	--	United Kingdom 11.
Unwrought	13,881	9,752	52	Morocco 2,991; West Germany 1,091; Australia 1,045.
Semimanufactures	17	22	--	Italy 8; United Kingdom 5.
Lithium: Oxides and hydroxides	--	3	--	All from West Germany.
Magnesium: Metal including alloys:				
Scrap	14	--		
Unwrought	675	382	22	France 240; Norway 117.
Semimanufactures	27	18	--	West Germany 12; France 4.
Manganese:				
Ore and concentrate, metallurgical-grade	--	10,852	--	Gabon 7,861; Republic of South Africa 2,628.
Oxides	24	5	--	All from West Germany.
Metal including alloys, all forms	50	119	--	France 91.
Mercury 76-pound flasks	58	58	--	West Germany 29.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Molybdenum: Metal including alloys:				
Unwrought	8	3	--	Ivory Coast 2.
Semimanufactures	(2)	11	(2)	West Germany 10.
Nickel:				
Ore and concentrate	20	--		
Matte and speiss	159	207	18	Republic of South Africa 130; United Kingdom 40.
Oxides and hydroxides	3	4	--	All from Norway.
Metal including alloys:				
Unwrought	72	134	(2)	Republic of South Africa 85; Norway 20.
Semimanufactures	39	34	(2)	West Germany 10; Italy 7.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$1,585	$1,421	$288	Switzerland $580; West Germany $470.
Selenium, elemental	1	(2)	--	All from West Germany.
Silicon, high-purity	89	213	--	France 193.
Silver:				
Waste and sweepings value, thousands	--	$1	--	All from West Germany.
Metal including alloys, unwrought and partly wrought do.	$3,547	$4,786	$11	Netherlands $1,983; Switzerland $1,318; West Germany $1,214.
Tin:				
Oxides	4	5	--	United Kingdom 4.
Metal including alloys:				
Scrap	(2)	1	--	All from Netherlands.
Unwrought	266	417	--	Malaysia 224; Bolivia 94; United Kingdom 44.
Semimanufactures	18	26	2	West Germany 15.
Titanium:				
Ore and concentrate	--	299	--	All from Australia.
Oxides	444	357	--	West Germany 139; France 109; Spain 64.
Metal including alloys, semimanufactures	5	(2)	--	Mainly from Italy.
Tungsten: Metal including alloys, all forms:				
Unwrought	3	1	(2)	Mainly from West Germany.
Semimanufactures	1	(2)	(2)	Do.
Uranium and thorium:				
Ore and concentrate value, thousands	$7	$2	--	All from West Germany.
Metal including alloys, all forms, uranium	3	--		
Vanadium: Ore and concentrate	2	--		
Zinc:				
Oxides	521	472	--	West Germany 127; France 115; Netherlands 84.
Blue powder	9	8	--	West Germany 5.
Metal including alloys:				
Scrap	2	40	--	Zambia 25; Netherlands 15.
Unwrought	13,409	17,344	--	Belgium-Luxembourg 6,854; Netherlands 2,504; Zambia 2,284.
Semimanufactures	138	112	(2)	Netherlands 37; Yugoslavia 30; West Germany 20.
Zirconium:				
Ore and concentrate	67	216	--	United Kingdom 119; West Germany 54.
Metal including alloys, semimanufactures	--	(2)	--	All from Italy.
Other:				
Ores and concentrates	5,702	3,562	--	Italy 3,337; Australia 146.
Oxides and hydroxides	22	14	--	United Kingdom 10.
Base metals including alloys, all forms	1	--		

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	62	40	4	Yugoslavia 20; Italy 14.
Artificial:				
Corundum	325	272	--	West Germany 99; France 96; Italy 56.
Silicon carbide	511	961	--	West Germany 759; Italy 183.
Dust and powder of precious and semi-precious stones including diamond value, thousands	$4,137	$3,446	$10	West Germany $2,623; Belgium-Luxembourg $592.
Grinding and polishing wheels and stones	438	668	3	Italy 390; West Germany 78.
Asbestos, crude	3,954	4,653	108	Republic of South Africa 2,856; Canada 1,238.
Barite and witherite	40	2,590	--	France 1,470; Austria 1,000.
Boron materials:				
Crude natural borates	100	--		
Elemental	15	--		
Oxides and acids	125	59	--	Belgium-Luxembourg 40.
Cement	614	784	--	Spain 185; Italy 152; Netherlands 100.
Chalk	165	90	--	Spain 50; France 20; Yugoslavia 10.
Clays, crude:				
Bentonite	1,658	359	4	West Germany 133; Netherlands 107.
Chamotte earth	166	3,076	--	Israel 2,424; Czechoslovakia 402.
Kaolin	43,763	41,180	428	United Kingdom 32,638; Bulgaria 2,968.
Unspecified	7,406	10,929	61	United Kingdom 5,329; Italy 2,521; Norway 1,140.
Cryolite and chiolite	11	2	--	All from Italy.
Diamond:				
Gem, not set or strung value, thousands	$175	$187	--	Belgium-Luxembourg $162.
Industrial stones do	$348	$420	--	West Germany $230; Belgium-Luxembourg $190.
Diatomite and infusorial earth	1,886	1,693	513	United Kingdom 432; Poland 367.
Feldspar, fluorspar, related materials:				
Feldspar	2,228	1,530	--	Norway 1,269; Italy 91.
Fluorspar	4,986	9,642	--	Kenya 8,147; France 1,469.
Unspecified	5,222	3,097	--	Norway 2,477; Italy 502.
Fertilizer materials:				
Crude, n.e.s	129	--		
Manufactured:				
Ammonia	168,794	129,174	--	U.S.S.R. 24,433; United Kingdom 17,459; Italy 15,326.
Nitrogenous	220,508	159,718	(2)	Italy 36,992; Bulgaria 26,042; Netherlands 25,015.
Phosphatic	--	18	--	All from Israel.
Potassic	44,817	57,802	--	West Germany 26,616; Italy 19,279.
Unspecified and mixed	9,374	12,221	43	West Germany 7,620; Tunisia 2,960.
Graphite, natural	272	765	--	West Germany 451; Austria 120.
Gypsum and plaster	796	914	--	Italy 663; West Germany 235.
Iodine	1	1	--	Mainly from France.
Kyanite and related materials	1,713	201	16	United Kingdom 133; Czechoslovakia 20.
Lime	1,841	62	--	All from West Germany.
Magnesium compounds:				
Magnesite, crude	18	--		
Oxides and hydroxides	10,018	27,024	3	Turkey 26,677.
Other	--	38	--	Italy 20; West Germany 18.
Mica:				
Crude including splittings and waste	263	474	--	Austria 426.
Worked including agglomerated splittings	6	5	--	Spain 2.
Nitrates, crude	--	40	--	All from Chile.
Phosphates, crude	379,041	202,830	--	Austria 61,484; Jordan 46,977; Morocco 37,440.
Phosphorus, elemental	1	6	--	West Germany 3; Sweden 2.
Pigments, mineral:				
Natural, crude	44	85	--	Denmark 63.
Iron oxides and hydroxides, processed	1,381	1,265	--	West Germany 882; Italy 145.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Precious and semiprecious stones other than diamond:				
Natural ____ value, thousands__	$186	$172	$1	Belgium-Luxembourg $63; Thailand $44.
Synthetic ____do____	$24	$22	__	Thailand $8; West Germany $6.
Pyrite, unroasted____	76,044	41,354	__	Spain 20,327; Austria 12,258; West Germany 8,769.
Salt and brine____	35,681	48,873	__	Italy 41,647; France 5,506.
Sodium compounds, n.e.s.: Carbonate, manufactured ____	27,995	35,009	__	Turkey 11,201; Italy 10,993; West Germany 4,184.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked ____	1,177	1,808	__	Pakistan 641; Turkey 322; Bulgaria 289.
Worked____	254	320	__	Italy 190; Yugoslavia 74.
Dolomite, chiefly refractory-grade __	830	473	__	Italy 256; United Kingdom 126.
Gravel and crushed rock ____	613	1,039	__	Spain 565; France 216.
Limestone other than dimension ___	__	(2)	__	All from West Germany.
Quartz and quartzite____	361	123	__	United Kingdom 72; West Germany 34.
Sand other than metal-bearing ____	62,128	75,897	__	Belgium-Luxembourg 34,415; Bulgaria 16,231; Portugal 10,807.
Sulfur:				
Elemental:				
Crude including native and by-product____	82,617	46,749	__	Poland 23,895; France 22,854.
Colloidal, precipitated, sublimed_	48	43	__	West Germany 33.
Dioxide____	1	1	__	All from Netherlands.
Sulfuric acid____	48,009	34,258	(2)	Italy 26,806; Switzerland 3,732.
Talc, steatite, soapstone, pyrophyllite __	2,067	2,036	37	Austria 386; Finland 359; Belgium-Luxembourg 256.
Vermiculite, perlite, chlorite____	__	248	__	Republic of South Africa 140; Belgium-Luxembourg 108.
Other:				
Crude____	722	643	(2)	Belgium-Luxembourg 216; Netherlands 163; Italy 133.
Slag and dross, not metal-bearing ___	338,175	209,443	__	Italy 170,639; Spain 35,385.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural ____	12	3	__	All from United Kingdom.
Carbon:				
Carbon black ____	5,938	4,447	13	Italy 3,736; United Kingdom 300.
Gas carbon ____	NA	1,133	__	Italy 978.
Coal:				
Anthracite____ thousand tons__	__	(2)	__	All from Czechoslovakia.
Bituminous ____do____	1,111	1,550	684	Australia 529; Republic of South Africa 141.
Lignite including briquets __do____	(2)	(2)	__	Mainly from West Germany.
Coke and semicoke____do____	73	84	__	Australia 26; Italy 19; Republic of South Africa 14.
Peat including briquets and litter____	8,236	10,262	__	U.S.S.R. 6,991; Netherlands 1,474.
Petroleum:				
Crude_ thousand 42-gallon barrels__	74,507	91,409	__	Saudi Arabia 29,690; Libya 19,983; U.S.S.R. 16,296.
Refinery products:				
Liquefied petroleum gas do____	24	26	__	Italy 15; France 8.
Gasoline ____do____	595	1,165	__	Romania 742; Netherlands 180.
Mineral jelly and wax __do____	20	29	(2)	West Germany 16; Hungary 7.
Kerosene and jet fuel___do____	237	154	__	Italy 113.
Distillate fuel oil ____do____	1,386	839	__	Romania 334; Bulgaria 228.
Lubricants ____do____	623	633	4	Italy 266; Netherlands 219.
Residual fuel oil____do____	3,329	5,978	__	Iraq 3,102; Egypt 948; U.S.S.R. 872.
Bitumen and other residues do____	210	454	(2)	Yugoslavia 414.
Bituminous mixtures___do____	1	7	(2)	United Kingdom 6.
Petroleum coke ____do____	349	344	251	U.S.S.R. 87.

NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—Greece was the largest producer of bauxite in the European Economic Community (EEC), accounting for 3% to 4% of world production. The country's bauxite reserves were measured at 600 million tons, and probable reserves were estimated at over 760 million tons, with an aluminum oxide content ranging from 50% to 59%. In 1986, the output of both aluminum and bauxite remained at the level of 1985. Most production remained privately owned and operated. The Bauxites Parnasse Mining Co. S.A., a subsidiary of the Eliopoulos Kyriacopoulos Group, was the country's largest bauxite producer with a production capacity of about 2 million tons per year. The company owned mines at Euboea, Ghiona, Itea, and Parnassos; processing and shipping facilities were at Itea. Bauxites Parnasse planned to expand its mining capacity to eventually supply about two-thirds of the planned 1.2-million-ton-per-year feed requirement for the proposed Greek-Soviet alumina facility at Itea. Other major producers of bauxite were Fimisco/Elbaumin (formerly a Scalistiris operation, now a subsidiary of HIMIC), with mines at Eleusis, Euboea, Itea, and Lamia; Helikon Bauxites-G. Barlos S.A., with mines in the Elikon Mountains; and the AG subsidiaries Delphi-Distomon S.A., Hellenic Bauxites of Distomon S.A., and Delphi Bauxites S.A., with mines at Itea and Distomon.

The status of the proposed alumina project remained the central issue in the industry during the year. In early 1986, Greek and Bulgarian Government representatives concluded an agreement that provided for annual exports of 200,000 tons of alumina to Bulgaria, thereby removing the last obstacle to the Greek-Soviet project. One-half of Bulgaria's annual payments were to have been in foreign exchange and the balance in Bulgarian products. The Soviet Union agreed to purchase 380,000 to 400,000 tons of alumina per year over a 10-year period. The main concern of the Greek Government was to establish an assured market. However, later in 1986, Bulgaria gradually withdrew from the agreement owing to shortages of hard currency and marketing arrangement problems. At yearend, the Soviet Union indicated a willingness to purchase the additional 200,000 tons of alumina, but the terms of the offer were not provided. Construction of the 600,000-ton-per-year alumina plant was to have started in January 1987. A collateral issue that arose during the year involved objections to the alumina project by environmental interests claiming that the proximity of the site to the historic and archaeologically important Delphi complex would result in the corrosion of ancient marbles by sulfurous stack emissions.

Chromite.—Greece was the EEC's only integrated ferrochromium producer with a 45,000-ton-per-year high-carbon ferrochromium plant at Tsigeli. This operation, along with four mines in the Vourinos area near Kozani, was controlled and operated by ELSI. The largest chromite mine was at Skoumtsa, also the site of the concentrator. Chromite reserves in the region were determined to be about 30 million tons. Fimisco/Elbaumin was the country's only other producer with an output of 11,000 tons of refractory grade material per year. During the year, ELSI concluded trade agreements with Japan and several North American companies. The two contracts signed with the North American companies were worth $5 million and provided for deliveries of Greek ferrochromium. Reportedly, increased ferrochromium output by ELSI could stimulate sales to reach $20 million annually to North America. The contract with Japan called for deliveries of 20,000 tons of ferrochromium over a 5-year period.

Iron and Steel.—After ETVA completed a marketing feasibility study in 1985 for the construction of the country's first stainless steel works, Krupp Stahltechnik, a subsidiary of Friedrich Krupp Hüttenwerke AG of the Federal Republic of Germany, had undertaken a detailed analysis of the project. The proposed project would incorporate a 160,000-ton-per-year smelting shop and an 80,000-ton-per-year cold-strip mill. Part of the feed requirement for the plant would be met by supplies of ferroalloys produced domestically by the ETVA subsidiaries Larco and ELSI. The project's estimated cost of $170 million was considered to be the main obstacle to construction startup.

Hellenic Steel S.A. announced the sale of 26% of its shares to Klöckner Stahl AG of the Federal Republic of Germany. Hellenic Steel operated facilities at Thessaloniki,

which produced cold-rolled and galvanized sheet and tinplate. Klöckner AG indicated that it would invest $8 million for unspecified facility expansion at Hellenic Steel and would also supply it with hot coil that was previously purchased from French and Italian manufacturers. After the sale, Hellenic Steel's other major owners were ETVA, 38%, and C. Itoh & Co. Ltd. of Japan, 28%.

Lead and Zinc.—During the year, METBA announced plans to proceed with a three-phase plan for lead and zinc development in Greece. The first phase included the construction of a $400 million lead and zinc metallurgical complex near Amphipolis in northern Greece, which would initially consist of a 120,000-ton-per-year pyrite treatment plant to extract up to 96,000 troy ounces of gold and 129,000 troy ounces of silver per year from mined and stockpiled material from the Olympus Mine. The Olympus Mine, part of the Kassandra Mines at Khalkidiki, was owned and operated by the Bodossakis Group through its subsidiary Hellenic Chemical Products and Fertilizers Co. Ltd. Construction was to begin in 1987 and initial operation in 1989. A U.S. company, Fluor Mining & Metals Inc. of California, completed the technical study for this unit. The proposed technology would be chosen from about seven processes used in Australia, Canada, and the United States. The second phase would be the development of the new lead and zinc deposit at Molai in the Peloponnesus.

In 1986, the Institute of Geological and Mineral Research of Greece (IGME) carried out further exploration in the Molai area and expanded its original estimate of 2.8 million tons of ore to 5.5 million, grading 1.6% lead, 9% zinc, and 50 grams of silver per ton (1.46 troy ounces per short ton). IGME planned additional exploration and survey work in the area for 1986 and 1987. Startup of mining operations at Molai was planned for 1989. The third phase was the construction of a lead-zinc smelter near Molai that would begin in mid-1988.

Nickel.—Larco, the country's only nickel producer, underwent another crisis in 1986 as nickel prices fell, and the workers went on strike at the company's mines and ferronickel smelter because of disputes over labor cutbacks. The strike lasted for 2 months and resulted in considerable production losses. In December, workers and company management resolved their differences, and full operations were resumed. Part of the settlement was the reduction in the labor force by 200 employees, as well as extended Government credit to the company on the condition that it produce at least 18,000 tons of ferronickel per year.

INDUSTRIAL MINERALS

Greece remained a significant world producer of a number of industrial minerals. The country was the second largest world producer of bentonite, ranking 15th in cement output. Greece was also the second largest producer of emery and perlite and accounted for 7% of world magnesite production. Greece was also among the largest world producers of pumice. Other commercially produced industrial minerals included asbestos, barite, feldspar, gypsum, kaolin, limestone, marble, quartz, sulfur, and talc.

Cement.—A decline in cement demand in the Middle East, together with increased production and local exports by several countries in that area resulted in a loss of business by Greek producers in their traditional Near East markets and a shift towards U.S. and British markets. The Government's sustained regulation of domestic prices also added pressure on the country's cement producers to find new markets to maintain profits. At yearend, British cement producers lobbied for setting limits on imports of subsidized Greek cement. The matter was referred to the EEC's European Commission, which instructed Greece, an EEC member, to restrict its subsidies to agreed-upon limits over the next 4 years or face sanctions.

Feldspar.—Both ETVA and ETEBA were involved in bringing new feldspar facilities on-stream during the year. ETEBA's subsidiary, Mevior, was building a soda feldspar plant at Assiros, near Thessalonika, which would include crushing, washing, and fine grinding. The initial output of 20,000 tons per year would be earmarked for the country's ceramics and glass industries. ETVA's project involved the development of the Paranesti feldspar deposit and processing facilities to produce 46,000 tons of potassium feldspar products per year. Upon completion, the operation would be managed by Porcel, an ETVA subsidiary.

Marble.—Early in the year, the Federation of Greece Industries accused the Government of attempting to undermine private enterprise. The accusation resulted from a proposed bill in Parliament to nationalize the Greek marble industry without compensation. The Greek marble indus-

try producers pointed out that their output had doubled over the preceding 10 years, while the only Government-owned operation filed for bankruptcy during the same period.

MINERAL FUELS

Coal.—The output of lignite increased by about 2% in 1986 compared with that of 1985, and its use for electric power generation increased slightly. The major event in the industry in 1986 was the discovery of 400 million tons of lignite at Diavolorema in the Ptolemais area of northern Greece. The survey and exploration program was conducted by the PPC, and according to industry representatives, the discovery would restore the lignite reserve levels in the Ptolemais Basin to 1956 levels. At midyear, the United States expressed interest in participating in a coal gasification project at PPC's power station in Ptolemais. General Electric Co. and Conoco Inc. expressed interest in conducting a feasibility study of the project. The cost of the study would be shared with the U.S. Government.

Petroleum and Natural Gas.—The major event in the industry was the announced intention by the Government of Greece to take over the majority of the shares of the consortium operating the Prinos deposit in the Aegean. The Government offered the Denison Co. of Canada $26 million for its stake in the venture. After Denison's refusal, the Government began to draft legislation that would allow it to nationalize private interests in the Prinos consortium. The respective Governments of the private consortium members protested the Government of Greece's decision during the year.

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[1]Foreign mineral specialist, Division of International Minerals.

[2]Metal Bulletin. Dec. 30, 1986, p. 7.

The Mineral Industry of Guinea

By Michael D. Fenton[1]

The Republic of Guinea continued its policy of privatizing the commercial sector and reducing the influence of Government on the economy that began with the change in Government in 1984. The Government's commitment to economic reform brought significant foreign aid from the International Monetary Fund, the International Bank for Reconstruction and Development (World Bank), France, the Federal Republic of Germany, Italy, Japan, Saudi Arabia, and the United States. The Government planned to become less dependent on mining by increasing agricultural development to reduce food imports, and to reduce its dependence on bauxite revenues by diversifying into diamond, gold, and iron ore mining.

PRODUCTION AND TRADE

Economic readjustment was difficult because foreign exchange earnings from mineral resources, primarily bauxite and alumina, were needed to make the restructuring of the economy a success. Guinea depended on bauxite and alumina for 87% of its export revenues, and the depressed markets for these commodities were viewed with concern. New petroleum, mineral, and investment codes were promulgated, and the money and banking system was also reorganized; all of which were expected by the Government to promote the development of Guinea's mineral wealth by simplifying investment and providing guarantees to foreign investors.

The Government's new policy resulted in greater economic growth and expanding commercial opportunities. France was the primary trader with Guinea. Imports from the United States, which peaked at $51 million[2] (revised) in 1985, fell to $24.3 million in 1986, in part owing to the cessation of shipments of refined oil products. The value of U.S. imports from Guinea, primarily bauxite, was $112.7 million. Guinea's largest import expense during 1986 was $107 million for petroleum products.

Table 1.—Guinea: Production of mineral commodities[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985	1986
Aluminum:					
Bauxite:					
Mine production:					
Wet basis thousand tons	11,827	12,421	14,156	13,100	14,780
Dry basis do.	r10,750	11,600	12,740	11,790	13,300
Shipments (dry basis):					
Metallurgical-grade bauxite do.	9,701	r10,380	11,310	10,830	9,550
Calcined bauxite do.	98	100	120	100	122
Alumina:					
Production do.	r535	r573	578	572	556
Shipments do.	r535	r573	578	572	556
Diamond:					
Gem thousand carats	e10	e23	44	123	190
Industrial do.	e23	e17	3	9	14
Total do.	33	40	47	132	204

eEstimated. rRevised.

[1]Includes data available through Aug. 21, 1987.

[2]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, stone, and sand and gravel) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

COMMODITY REVIEW

METALS

Bauxite and Alumina.—Guinea had the world's largest bauxite reserves, amounting to 5.9 billion tons or 26.2% of the world total, and it was the world's second largest exporter after Australia. Compagnie des Bauxites de Guinée (CBG), a joint venture company owned by the Government and Pittsburgh-based Halco Mining Inc. (Halco), completed its 14th year of operation at the Sangaredi Mine in northwestern Guinea by producing nearly 9 million tons of the national output of 13.3 million tons of dry bauxite. Ninety percent of production went to North American and Western European consortium members of Halco, while the remainder was sold to Norway and Czechoslovakia by the Government. Possible reserves in the Sangaredi region were estimated at over 1 billion tons, and proven reserves were 250 million tons. The average alumina content of 60% was about one-third higher than that in other areas in Guinea, and the cutoff grade was 45%. CBG planned to open a new mine in 1991 on the Bidi-Kom plateau near Sangaredi and across the Pora River. This 60- to 90-million-ton reserve contained about 55% alumina.

A second bauxite mine, Kindia, owned by the Office des Bauxites de Kindia, a Guinean-Soviet joint venture, was operated with technical assistance from the U.S.S.R. Ninety percent of the 2.7-million-ton-per-year dry production was shipped to the U.S.S.R. under a barter contract, 56% of which was used to repay a $400 million debt, and the remaining 270,000 tons was shipped to Eastern Europe.

About 2.2 million tons of bauxite was refined in 1986 into nearly 556,000 tons of alumina at the third bauxite mine, Fria, but financial losses were incurred in both 1985 and 1986. Kaiser Engineers Co. of the United States was appointed to review the Fria alumina plant in an effort to make it more competitive in an increasingly difficult world market, and the Government and other shareholders agreed to restructure the company financially with the help of a $4.3 million loan from France's Central Fund for Economic Cooperation.

Negotiations between the Government and Halco on bauxite pricing and the export levy led to a draft agreement in November that was expected to result in a sharp cut in Government revenue beginning January 1, 1988. Prices of bauxite from the Sangaredi Mine would be more closely matched to prevailing world market levels, and the controversial export levy of $13.13 per ton that was tied to tonnages rather than profits would be included in the overall pricing formula. The Government's 65% share of overall profits would be raised, and the base price would be increased to partially compensate for the removal of the export levy.

Halco bought 90% of Sangaredi bauxite for about $35 per ton, and the new formula was expected to reduce the amount Halco would pay in the future. Revenue to the Government could drop by as much as one-third from the guaranteed level of $151 million for 1987. Guinea's other bauxite mining contracts were expected by all parties to be similarly revised.

Gold.—Société Auriferè de Guinée, a joint venture company owned by Chevaning Mining and Exploration Co. of New York and the Government, signed a $12 million loan with a group of international banks for the development of two placer gold deposits in the Siguiri region of northeastern Guinea that may produce as much as 80,000 troy ounces of gold annually. Wright Engineers Ltd. of Toronto, Canada, was to do the engineering, procurement, and construction that was scheduled to start early in 1987. Production was scheduled to begin in late 1987. The Koron deposit, 4 million cubic meters containing 0.08 troy ounce of gold per cubic meter of gravel, would be mined first at a rate of 875,000 cubic meters of gravel per year. The Didi deposit, 3.5 million cubic meters averaging 0.04 troy ounce of gold per cubic meter, would be mined later. These deposits were 2 of more than 10 deposits discovered during a 5-year exploration program.

The Bureau de Recherches Géologiques et Minières of France, the Saudi Arabian company Al Baraka, the Harry Winston Group of New York, and the Government of Guinea cooperated as the Niandan Mining Co. in the exploration and possible development of a gold mine in Guinea's Kouroussa region.

The operators of the Aredor diamond mine at Banankoro made plans to install five Knelson concentrators to recover plus-150 micrometer-size gold from the minus-2 millimeter-size tailings from the diamond recovery plant. The capital cost for the plant was expected to be $400,000, and planned production would be 10,000 troy ounces of gold per year beginning in September 1987.

Iron Ore.—The World Bank continued to study the feasibility of the development of the Mifergui-Nimba iron ore deposit on the Liberia-Guinea border by a joint venture company that would include the Government and the Liberian-American-Swedish Minerals Co. Major difficulties appeared to be securing both long-term contracts from steel producers, primarily in Western Europe, and at least $210 million for capital investment. The latest plan was to produce annually 10 million tons of ore containing 60% to 65% iron from the Le Chateau deposit and later from the Pierre Richaud deposit that would be mixed with 2 million tons of processed ore from the Tokadeh Mine in Liberia.

INDUSTRIAL MINERALS

Diamond production at the Aredor diamond mine continued to increase throughout the year, as it has since first production in March 1984. Production reached 203,788 carats, compared with a target of 172,000 carats, and the operator of Aredor, Bridge Oil Ltd. of Australia, predicted that 1987 production would exceed the budgeted target of 180,000 carats. Recovery at the mine in 1986 was 94%, which represented 99% of the value of the material mined. These diamonds were of the highest gem quality, and the Aredor Mine was characterized by the number of large stones recovered. In July, a gem diamond of 121.1 carats was found. On the basis of value per carat, the Aredor Mine was the richest in the world, with over 93% of its 1986 output classified as high-grade gem quality. Aredor Mine gem-quality production was 1.5% of the world's gem diamond output. Average prices of Aredor Mine diamonds sold in Antwerp by the Industrial Diamond Corp. of London, England, were considerably higher than prices of all other stones from other mines.

Initial prospecting had outlined a proven reserve of nearly 2.1 million carats, but improved sampling procedures and data evaluation techniques resulted in lower estimates of proven reserves of 0.4 to 0.5 million carats, and probable reserves of 1 million carats. The average stone size was estimated at 0.53 carat. As a result of improved mining and processing methods developed since March 1984, throughput rose from 35,000 tons per month to 110,000 tons per month, and cash operating costs were reduced from $260 per carat to $85 to $90 per carat.

Bridge Oil was also a 39.6% equity holder, while the Government had a 50% interest and the Industrial Diamond Co. and various banks held the remaining interest. Bridge Oil reported that the mining operation and the prices realized for the diamonds exceeded the expectations of the original feasibility study conducted for the project.

MINERAL FUELS

Mobil Oil Co. of the United States continued to compile geophysical data collected since exploration began in 1968, and investors for a drilling program were to be sought in mid-1987.

[1]Physical scientist, Division of International Minerals.
[2]Where necessary, values have been converted from French francs (F) to U.S. dollars at the average rate of F6.93=US$1.00.

The Mineral Industry of Hungary

By Walter G. Steblez[1]

The production of most mineral commodities in Hungary continued to show slight declines in 1986. The country closed its only iron ore mine at Rudabanya at yearend 1985, and its lead and zinc mining operations at Gyöngyösoroszi were closed down in 1986, owing to increasing financial losses. However, the bauxite-alumina operations showed an increase in production compared with that of 1985. Bauxite and alumina remained the only mineral commodities that Hungary produced of world significance, together with byproduct gallium. The country's centrally planned economy grew at a pace below the planned level for 1986. National income increased by 0.5% and industrial production by 1.8% compared with growth achieved in 1985; these were about 2% and 0.45%, respectively, below the planned levels for the year.[2]

Investment projects during the year included the yearend startup of a new coking unit at the Dunaujvaros (Danube) iron and steel works as well as the startup of the third reactor block at the Paks nuclear powerplant. Construction work also began in October on the Hungarian side of the U.S.S.R.'s Unity gas pipeline project.

At yearend 1985, Hungary celebrated the 250th anniversary of the Selmec Mining School. The Selmec Mining School was founded in 1735 under the authority of Charles III, Holy Roman Emperor and King of Hungary. Its distinguished faculty in the past included Alessandro Volta from Italy and Christian Doppler from England. In 1949, the Selmec Mining School was renamed the Technical University for Heavy Industry and was relocated from Sopron to Miscolc. In 1986, the school had about 3,700 students and continued to train mining engineers, metallurgists, and geologists for Hungary's minerals industry.

Government Policies and Programs.—The Government policy of industrial modernization and the gradual linkage of industrial production to the demands of the world market was to continue in 1987 despite economic setbacks in 1985 and 1986. National income was planned to grow by about 2.0% and industrial production by between 2.0% and 2.5% compared with 1986 figures. Planned production of pig iron, alumina, and aluminum was set at about the levels of 1986 output. Net coal production would also remain at the 1986 level. The production of crude and semimanufactured steel would be below the output levels of 1986 as would the output of petroleum and natural gas. At the same time, metallurgical production would be of a higher quality and value. Uneconomic mining activity would be halted as well as unprofitable activities in the iron and steel industry. In October 1986, the National Mine Engineering Inspectorate reportedly began a comprehensive safety review at the country's mines. Increased production at the expense of safety regulations during slower and more difficult winter months would no longer be permitted.

PRODUCTION

With the exception of bauxite mining and aluminum smelting, the production of most minerals, metals, and fuels continued to decline in 1986, owing to shutdowns of uneconomic mining and processing operations as well as to Government efforts to

streamline and rationalize heavy industry to meet the demands of the world market. The outflow of workers from the mineral sector continued. Reportedly 10,000 workers left state-owned industries in 1986.

Table 1.—Hungary: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985	1986[p]
METALS					
Aluminum:					
Bauxite, gross weight ----- thousand tons	2,627	2,917	2,994	2,815	3,022
Alumina, gross weight ----------do----	710	836	811	798	856
Metal, primary ----------	74,221	74,039	74,202	73,859	73,877
Copper:					
Metal:[e]					
Smelter, secondary ----------	100	100	100	100	100
Refined including secondary ----------	12,200	12,500	12,800	12,800	12,800
Gallium, metal[e] ---------- kilograms	2,000	2,100	2,400	2,800	3,300
Gold, mine output, Au content[e] thousand troy ounces	50	30	20	20	20
Iron and steel:					
Iron ore:					
Gross weight ------- thousand tons	467	441	383	311	--
Fe content ----------do----	112	106	92	75	--
Metal:					
Pig iron:					
For steel industry ----------do----	2,065	1,966	2,029	2,007	1,987
For foundry use ----------do----	116	81	68	88	67
Total ----------do----	2,181	2,047	2,097	2,095	2,054
Ferroalloys:[e]					
Ferrosilicon ----------	10,500	10,000	9,000	9,000	9,000
Silicon metal ----------	2,000	2,000	2,000	2,000	2,000
Other ----------	2,500	2,000	2,000	2,000	2,000
Total ----------	15,000	14,000	13,000	13,000	13,000
Steel, crude ---------thousand tons	3,702	3,616	3,750	3,647	3,715
Semimanufactures, rolled only --do----	2,853	2,815	2,953	2,863	2,903
Lead:[e]					
Mine output, Pb content ----------	600	700	700	700	--
Metal, refined, secondary ----------	100	100	100	100	100
Manganese ore:					
Run of mine:[3]					
Gross weight ----------	150,035	103,580	115,885	115,334	106,009
Mn content ----------	28,500	20,000	22,000	22,000	20,000
Concentrate:					
Gross weight ----------	83,000	59,000	67,000	65,700	[e]60,000
Mn content ----------	24,900	17,700	20,100	19,700	18,000
Vanadium, metal[e] ----------	250	250	275	300	300
Zinc:[e]					
Mine output, Zn content ----------	1,500	2,400	2,300	2,200	--
Metal, smelter, secondary ----------	600	600	600	600	600
INDUSTRIAL MINERALS					
Cement, hydraulic ---------- thousand tons	4,369	4,243	4,145	3,678	3,846
Clays:					
Bentonite:					
Raw ----------	84,934	79,807	64,158	59,853	79,888
Processed ----------	54,014	56,850	45,759	44,431	47,504
Kaolin:					
Raw ----------	45,131	37,375	38,869	29,038	29,837
Processed ----------	7,109	7,874	8,303	6,485	6,032
Lime, calcined ---------- thousand tons	845	822	823	798	787
Nitrogen: N content of ammonia -------do----	792	813	814	791	[e]800
Perlite ----------	89,975	93,503	94,360	94,460	109,360
Pyrites, gross weight[e] ----------	7,000	7,000	7,000	7,000	7,000
Refractory materials, n.e.s.:					
Chamotte products ------ thousand tons	158	166	164	153	[e]60
Chrome magnesite products -------do----	40	48	38	39	[e]40
Sand and gravel:					
Gravel ---------thousand cubic meters	11,219	10,665	10,317	8,529	[e]9,000
Sand:					
Common[e] ----------do----	400	400	400	400	400
Foundry ---------- thousand tons	585	579	591	560	519
Sodium compounds:					
Hydroxide (caustic soda) ----------	177,895	191,646	193,693	193,719	201,684
Sulfate[e] ----------	11,000	11,000	10,000	10,000	10,000
Stone:					
Dimension, all types ------ thousand tons	7,967	7,060	5,874	5,718	[e]6,000
Dolomite ----------do----	1,324	1,167	1,205	1,158	[e]1,200
Limestone ----------do----	8,367	8,081	7,695	7,418	[e]7,500
Quartzite ----------do----	26	14	22	37	[e]35

See footnotes at end of table.

Table 1.—Hungary: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985	1986[p]
INDUSTRIAL MINERALS —Continued					
Sulfur:					
From pyrite[e]	3,000	3,000	2,000	2,000	1,000
Byproduct, elemental, all sources[e]	9,200	9,200	9,000	9,000	10,000
Total[e]	12,200	12,200	11,000	11,000	11,000
Sulfuric acid	571,339	605,659	549,159	520,338	542,760
Talc[e]	17,000	17,000	17,500	17,000	16,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[e]	5,000	5,000	5,000	5,000	5,000
Coal:					
Bituminous thousand tons	3,039	2,827	2,573	2,639	2,324
Brown do	14,754	14,406	14,448	14,016	13,821
Lignite do	8,286	7,980	8,026	7,387	6,983
Total do	26,079	25,213	25,047	24,042	23,128
Coke:					
Coke oven:					
Metallurgical do	618	564	546	492	546
Other[e] do	170	170	160	160	150
Total do	788	734	706	652	696
Gashouse[e] do	180	170	160	160	160
Total coke do	968	904	866	812	856
Fuel briquets do	1,472	1,533	1,549	1,722	2,006
Gas:					
Manufactured million cubic feet	17,834	15,362	14,232	11,830	[e]12,000
Natural, marketed do	234,524	229,899	244,060	263,306	250,663
Natural gas liquids:[e]					
Natural gasoline thousand 42-gallon barrels	3,700	3,800	3,900	3,800	3,700
Liquefied petroleum gas do	3,500	3,500	3,500	3,500	3,400
Peat, agricultural use[e] thousand tons	70	70	70	70	75
Petroleum:					
Crude:					
As reported do	2,027	2,004	2,007	2,012	2,005
Converted thousand 42-gallon barrels	13,743	13,587	13,607	13,641	13,594
Refinery products:[4]					
Gasoline including naphtha do	20,068	20,153	21,479	22,644	22,500
Kerosene and other light distillates[e 5] do	7,000	7,000	7,000	7,000	7,000
Distillate fuel oil do	25,185	23,454	25,909	24,506	[e]24,500
Residual fuel oil do	17,329	16,836	16,960	16,970	[e]17,000
Lubricants[e] do	1,000	1,000	1,000	1,000	1,000
Liquefied petroleum gas[e] do	1,000	1,000	1,000	1,000	1,000
Asphalt and bitumen[e] do	3,900	3,800	3,800	3,800	3,600
Paraffin and petrolatum[e] do	250	250	250	250	250
Total do	75,732	73,493	77,398	77,170	76,850

[e]Estimated. [p]Preliminary.

[1]Table includes data available through June 6, 1987.

[2]In addition to the commodities listed, diatomite, gypsum, and a variety of other crude construction materials such as common clays are produced, but available information is inadequate to make reliable estimates of output levels.

[3]18% to 20% Mn.

[4]Excludes refinery fuel and losses.

[5]Data derived by subtracting reported motor gasoline and white spirit data from reported light refinery products total.

TRADE

Hungary's total imports increased slightly and total exports decreased slightly compared with those of 1985. Hungary's trade with member states of the Council for Mutual Economic Assistance (CMEA) accounted for about 58% of its total trade turnover.

The U.S.S.R. remained Hungary's most significant source of raw materials and fuels, accounting for more than one-half of the country's import needs. The commercial agreement reached with the U.S.S.R. during the year on trade in 1987 included

continued Soviet exports of petroleum, natural gas, steel, and nonferrous metals in exchange for Hungarian exports of electronic goods and producer durables. Overall exports to market economy countries declined by 4% in 1986, while imports rose slightly. In part, the unfavorable trade returns were a result of a decline in prices for Hungarian petroleum products and agricultural goods.

Table 2.—Hungary: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate[2]	430,587	382,335	--	Czechoslovakia 220,509; East Germany 141,382; Poland 20,440.
Oxides and hydroxides[2]	650,921	599,352	--	U.S.S.R. 315,691; Austria 118,669; Poland 103,823.
Ash and residue containing aluminum	739	1,373	--	West Germany 1,181; Italy 192.
Metal including alloys:[2]				
Scrap	8,226	6,928	--	Austria 4,170; Italy 1,947; West Germany 784.
Unwrought	72,511	50,528	--	East Germany 8,089; Poland 7,228; Bulgaria 4,996.
Semimanufactures	45,802	52,826	5,052	East Germany 9,202; West Germany 5,616.
Antimony: Metal including alloys, all forms	--	40	--	All to Yugoslavia.
Chromium:				
Ore and concentrate	4,138	NA		
Oxides and hydroxides	46	125	--	Sweden 65; Italy 38; West Germany 21.
Cobalt:				
Oxides and hydroxides	4	NA		
Metal including alloys, all forms	--	2	--	All to West Germany.
Columbium and tantalum: Metal including alloys, all forms, tantalum	--	1	--	All to United Kingdom.
Copper:				
Sulfate	553	565	--	Austria 291; Belgium-Luxembourg 154; West Germany 120.
Ash and residue containing copper	21	NA		
Metal including alloys:				
Scrap	5,926	4,709	--	Austria 3,395; West Germany 992; Sweden 239.
Unwrought	5,138	5,246	--	West Germany 4,781; Belgium-Luxembourg 424; Austria 41.
Semimanufactures	5,732	5,783	737	West Germany 2,606; Austria 1,294.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	874	NA		
Iron and steel: Metal:				
Scrap	79,000	40,270	--	Italy 18,227; Austria 10,899; West Germany 7,615.
Pig iron, cast iron, related materials	[3]20,900	1	--	All to Italy.
Steel, primary forms[2]	45,899	37,719	--	Yugoslavia 14,578; Turkey 12,191; Austria 5,892.
Semimanufactures:				
Bars, rods, angles, shapes, sections[2]	792,348	721,646	--	U.S.S.R. 126,703; Iran 121,819; Bulgaria 96,673.
Universals, plates, sheets[2]	376,622	320,329	--	Iran 98,837; Austria 56,728; Yugoslavia 32,403.
Hoop and strip[2]	20,701	17,184	--	Yugoslavia 6,569; U.S.S.R. 2,291; Czechoslovakia 2,096.
Rails and accessories	97	27	--	All to West Germany.
Wire[2]	12,252	19,516	--	Iran 7,600; Yugoslavia 5,462; Egypt 1,998.
Tubes, pipes, fittings[2]	84,756	81,102	--	U.S.S.R. 20,433; Austria 17,886; Yugoslavia 6,569.
Castings and forgings, rough[2]	13,070	15,385	100	Poland 3,857; West Germany 3,082; Sweden 1,287.
Lead:				
Ash and residue containing lead	1,121	793	--	All to West Germany.
Metal including alloys:				
Scrap	2,068	2,168	--	West Germany 1,314; Austria 854.
Unwrought	351	NA		
Semimanufactures	4	4	--	All to Yugoslavia.
Lithium: Metal including alloys, all forms	--	4	--	All to West Germany.
Magnesium: Metal including alloys, semimanufactures	17	NA		
Manganese: Ore and concentrate, metallurgical-grade[2]	11,657	11,417	--	All to Czechoslovakia.

See footnotes at end of table.

Table 2.—Hungary: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Molybdenum: Metal including alloys, all forms	16	3	--	Yugoslavia 2; United Kingdom 1.
Nickel:				
Matte and speiss	--	35	--	All to Austria.
Ash and residue containing nickel	21	NA		
Metal including alloys:				
Scrap	100	333	--	West Germany 254; Austria 79.
Unwrought	317	NA		
Semimanufactures	89	156	--	West Germany 100; Sweden 25; Portugal 13.
Platinum-group metals:				
Waste and sweepings value, thousands	$3,380	$3,432	--	All to West Germany.
Metals including alloys, unwrought and partly wrought ---do---	--	$38	--	Do.
Silver:				
Waste and sweepings ---do---	$303	$191	--	West Germany $177; United Kingdom $14.
Metal including alloys, unwrought and partly wrought ---do---	$778	$518	--	West Germany $385; Austria $133.
Tin:				
Ash and residue containing tin	57	20	--	All to Belgium-Luxembourg.
Metal including alloys:				
Scrap	--	16	--	All to Austria.
Unwrought	56	20	--	All to Belgium-Luxembourg.
Semimanufactures	40	1	--	All to West Germany.
Tungsten:				
Ore and concentrate	--	32	--	Do.
Metal including alloys, all forms	16	22	--	West Germany 7; United Kingdom 6; Austria 4.
Zinc:				
Matte	173	416	--	West Germany 373; Italy 43.
Ash and residue containing zinc	3,378	4,166	--	All to West Germany.
Metal including alloys:				
Scrap	738	636	--	Do.
Unwrought	16	20	--	All to Italy.
Other:				
Oxides and hydroxides	4	NA		
Ashes and residues	28,206	30,042	--	Austria 22,218; Italy 7,371; Sweden 101.
Base metals including alloys, all forms	31	29	16	Austria 6; Sweden 5.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	992	500	456	West Germany 44.
Artificial: Corundum[2]	15,438	18,750	560	Austria 3,895; West Germany 3,867; Romania 2,373.
Grinding and polishing wheels and stones[2] value, thousands	$2,996	$1,368	$121	Romania $409; East Germany $309; Poland $256.
Asbestos, crude	3,203	NA		
Cement[2]	180,011	49,319	--	Yugoslavia 28,347; U.S.S.R. 19,390; Czechoslovakia 893.
Chalk	50	NA		
Clays, crude:				
Bentonite[2]	12,920	10,338	--	East Germany 5,195; Poland 5,020.
Kaolin[2]	6,603	8,098	--	Czechoslovakia 6,609; West Germany 1,489.
Unspecified	200	704	--	Austria 703; United Kingdom 1.
Cryolite and chiolite	200	NA		
Diamond:				
Gem, not set or strung value, thousands	$91	$16	--	All to Austria.
Industrial stones ---do---	$660	$239	--	Belgium-Luxembourg $142; Austria $96; Sweden $1.
Diatomite and other infusorial earth	3,178	2,805	--	Austria 2,667; Greece 138.
Feldspar, fluorspar, related materials	971	977	--	All to Switzerland.
Fertilizer materials:				
Crude, n.e.s	400	441	--	All to Austria.
Manufactured:				
Ammonia[2] thousand tons	66	44	--	Yugoslavia 36; Austria 6; Italy 1.
Nitrogenous ---do---	[2]1,519	[2]1,592	--	Yugoslavia 125; West Germany 81; unspecified 1,321.
Phosphatic, P_2O_5 content[3] ---do---	12	--		
Unspecified and mixed	178	147	--	West Germany 117; Austria 24; Sweden 3.

See footnotes at end of table.

Table 2.—Hungary: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS — Continued				
Gypsum and plaster	120	NA		
Kyanite and related materials	--	103	--	West Germany 84; United Kingdom 19.
Lime	29	NA		
Magnesium compounds	27	90	--	Italy 60; West Germany 20; Austria 10.
Mica: Crude including splittings and waste	40	8	--	All to Austria.
Pigments, mineral: Iron oxides and hydroxides, processed	1	NA		
Precious and semiprecious stones other than diamond:				
Natural value, thousands	--	$4	--	All to Italy.
Synthetic do.	$29	$45	--	All to United Kingdom.
Salt and brine	--	2	--	All to Cyprus.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	49	NA		
Sulfate, manufactured	--	170	--	All to United Kingdom.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked[2]	16,756	14,181	--	U.S.S.R. 8,544; East Germany 3,019; Czechoslovakia 1,226.
Worked	105	37	--	Austria 35; West Germany 2.
Dolomite, chiefly refractory-grade	18,194	NA		
Gravel and crushed rock	29,586	11,963	--	Poland 11,956; Sweden 7.
Quartz and quartzite	19,956	16,815	--	All to Austria.
Sand other than metal-bearing	31,047	32,136	--	Yugoslavia 20,446; Austria 7,050; Czechoslovakia 3,430.
Sulfur:				
Elemental: Crude including native and byproduct	12,101	16,768	--	Austria 16,368; West Germany 340; Yugoslavia 60.
Sulfuric acid[2]	47,867	62,365	--	Yugoslavia 50,079; Romania 7,052; Austria 4,842.
Talc, steatite, soapstone, pyrophyllite	--	15	--	All to Austria.
Vermiculite, perlite, chlorite	--	7,706	--	All to West Germany.
Other:				
Crude[2]	75,800	76,039	--	Austria 23,089; East Germany 16,111; Poland 11,904.
Slag and dross, not metal-bearing	328	1,271	--	All to Austria.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	9,636	6,747	--	Pakistan 6,725; Austria 22.
Carbon black	59	678	--	West Germany 481; Italy 197.
Coal:				
Anthracite and bituminous[3] thousand tons	533	483	--	NA.
Briquets of anthracite and bituminous coal do.	1	--		
Lignite including briquets[2] do.	17	294	--	Brazil 277; U.S.S.R. 17.
Gas, natural: Gaseous million cubic feet	368	735	--	All to U.S.S.R.
Peat including briquets and litter[2]	5,294	6,299	--	Austria 3,739; Yugoslavia 2,171; Italy 370.
Petroleum refinery products:				
Liquefied petroleum gas[2] thousand 42-gallon barrels	500	461	--	Austria 182; Italy 170; Yugoslavia 102.
Gasoline do.	1,071	1,269	--	Austria 756; West Germany 380; Switzerland 117.
Mineral jelly and wax[2] do.	311	315	6	West Germany 77; Morocco 43; Italy 42.
Kerosene and jet fuel do.	490	876	--	Austria 616; West Germany 155; Switzerland 66.
Distillate fuel oil do.	4,468	3,253	--	Switzerland 1,453; Austria 1,326; West Germany 454.
Lubricants[2] do.	411	485	--	Austria 223; Yugoslavia 129; Switzerland 43.
Residual fuel oil do.	864	14	--	All to Austria.
Bitumen and other residues[2] do.	622	458	--	West Germany 151; Austria 113; Pakistan 74.
Bituminous mixtures do.	(4)	23	--	West Germany 22.

[p]Preliminary. NA Not available.

[1]Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Hungary, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data were compiled from United Nations information and data published by the partner trade countries.

[2]Official Trade Statistics of Hungary.

[3]Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

[4]Less than 1/2 unit.

Table 3.—Hungary: Apparent imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	1,496	1,026	--	West Germany 1,003; Greece 23.
Oxides and hydroxides	111	130	--	West Germany 127; Denmark 2; Belgium-Luxembourg 1.
Metal including alloys:[2]				
Unwrought	163,320	165,294	--	U.S.S.R. 162,698; Romania 2,420; Yugoslavia 166.
Semimanufactures	4,529	3,176	1	East Germany 1,729; Czechoslovakia 478; Austria 410.
Antimony: Metal including alloys, all forms	5	48	--	Austria 32; West Germany 16.
Chromium:				
Ore and concentrate	17,000	15,000	--	All from U.S.S.R.
Oxides and hydroxides	280	302	--	All from United Kingdom.
Cobalt: Metal including alloys, all forms	2	1	--	All from West Germany.
Copper:				
Sulfate[2]	3,569	3,550	--	All from U.S.S.R.
Metal including alloys:				
Scrap	6,285	5,540	--	West Germany 1,987; Switzerland 1,885; Belgium-Luxembourg 1,349.
Unwrought[2]	30,112	28,129	--	U.S.S.R. 13,429; Poland 5,031; Austria 1,246.
Semimanufactures	[2]12,803	[2]11,477	9	West Germany 1,748; Italy 290; unspecified 8,991.
Gold: Metal including alloys, unwrought and partly wrought, troy ounces	3,858	1,125	--	West Germany 836; Switzerland 289.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite[2] thousand tons	4,170	2,382	--	U.S.S.R. 1,919; Canada 233; Sweden 109.
Pyrite, roasted, do	28	44	--	All from Yugoslavia.
Metal:				
Scrap	20,000	14,000	--	Yugoslavia 5,051; Austria 1,865; unspecified 7,082.
Pig iron, cast iron, related materials[2]	293,562	272,413	--	U.S.S.R. 249,666; Yugoslavia 9,989; Algeria 9,835.
Ferroalloys:				
Ferrochromium[2]	8,801	10,390	--	U.S.S.R. 5,955; Yugoslavia 1,725; West Germany 680.
Ferromanganese[2]	37,794	44,951	--	U.S.S.R. 27,537; Spain 8,100; Norway 3,740.
Ferrosilicon[2]	6,373	6,742	--	U.S.S.R. 6,585; France 118; West Germany 39.
Silicon metal	1,860	1,005	--	All from Italy.
Unspecified	12,819	15,060	--	U.S.S.R. 10,266; Czechoslovakia 1,358; West Germany 968.
Steel, primary forms[2]	418,780	479,115	--	U.S.S.R. 409,250; Czechoslovakia 35,346; Bulgaria 31,411.
Semimanufactures:				
Bars, rods, angles, shapes, sections[2]	182,968	187,499	3	U.S.S.R. 155,640; Czechoslovakia 8,337; Italy 2,773.
Universals, plates, sheets[2]	337,646	340,130	--	U.S.S.R. 237,928; Spain 20,842; Italy 15,890.
Hoop and strip[2]	11,009	8,395	--	West Germany 3,236; France 1,180; Czechoslovakia 1,134.
Rails and accessories	2,000	308	--	West Germany 303; Sweden 3.
Wire[2]	34,159	34,776	--	Czechoslovakia 13,461; West Germany 4,115; U.S.S.R. 3,010.
Tubes, pipes, fittings[2]	74,089	77,160	--	Czechoslovakia 19,408; Romania 19,144; East Germany 14,819.
Castings and forgings, rough[2]	15,376	14,053	--	Poland 9,069; Yugoslavia 1,847; Italy 1,208.
Lead:				
Ore and concentrate	--	1,800	--	All from Italy.
Oxides	792	542	--	West Germany 527; Italy 15.
Ash and residue containing lead	--	25	--	All from United Kingdom.
Metal including alloys:				
Unwrought[2]	9,343	7,454	--	U.S.S.R. 5,175; West Germany 58.
Semimanufactures	15	13	--	West Germany 10; United Kingdom 2; Yugoslavia 1.
Magnesium: Metal including alloys:				
Scrap	--	5	--	All from Belgium-Luxembourg.
Unwrought	160	475	--	All from Italy.
Semimanufactures	15	22	--	All from West Germany.

See footnotes at end of table.

Table 3.—Hungary: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Manganese: Ore and concentrate, metallurgical-grade[2]	340	480	--	All from Netherlands.
Mercury 76-pound flasks	1,740	NA		
Molybdenum:				
Ore and concentrate	18	NA		
Metal including alloys, all forms	11	15	--	All from Japan.
Nickel:				
Matte and speiss, Ni content	687	202	--	All from Cuba.
Metal including alloys:				
Unwrought	56	3	--	West Germany 1; Japan 1; United Kingdom 1.
Semimanufactures	109	113	--	United Kingdom 44; West Germany 33; Sweden 15.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$4,251	$4,171	--	West Germany $3,745; Italy $325; United Kingdom $98.
Silver: Metal including alloys, unwrought and partly wrought do	$5,414	$4,565	--	West Germany $4,288; Sweden $201; Austria $46.
Tin: Metal including alloys:				
Scrap	5	NA		
Unwrought[2]	1,654	1,277	--	West Germany 90; Vietnam 16; unspecified 1,162.
Semimanufactures	16	20	--	West Germany 14; United Kingdom 6.
Titanium:				
Ore and concentrate	2,719	3,308	--	All from West Germany.
Oxides	1,889	1,401	2	Belgium-Luxembourg 657; United Kingdom 517; West Germany 198.
Tungsten:				
Ore and concentrate	50	58	--	All from Portugal.
Metal including alloys, all forms	12	1	--	All from West Germany.
Zinc:				
Oxides	3,162	1,342	--	Yugoslavia 550; Austria 500; Italy 252.
Metal including alloys:				
Unwrought[2]	27,995	20,543	--	Poland 6,517; U.S.S.R. 4,087; United Kingdom 1,499.
Semimanufactures	[2]5,796	[2]5,857	--	West Germany 665; Belgium-Luxembourg 275; unspecified 4,839.
Zirconium: Ore and concentrate	4,343	4,498	--	Italy 4,127; West Germany 371.
Other:				
Ores and concentrates[2]	9,996	9,506	2	Cuba 6,671; Austria 1,469; Australia 1,005.
Oxides and hydroxides	1,979	11	--	All from United Kingdom.
Ashes and residues	32	184	--	All from West Germany.
Base metals including alloys, all forms	27	49	--	Austria 44; West Germany 5.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	30	63	--	Italy 62; West Germany 1.
Artificial:				
Corundum[2]	1,627	1,434	--	Italy 939; West Germany 180; Switzerland 130.
Silicon carbide	873	932	--	All from Italy.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$47	$156	$35	Belgium-Luxembourg $112; United Kingdom $9.
Grinding and polishing wheels and stones[2] do	$10,732	$4,812	--	U.S.S.R. $1,508; West Germany $978; Austria $973.
Asbestos, crude[2]	35,097	33,596	38	U.S.S.R. 31,190; Botswana 2,047; Italy 130.
Barite and witherite	16,269	16,172	--	Yugoslavia 11,862; West Germany 4,268; United Kingdom 42.
Boron materials:				
Crude natural borates	1,030	NA		
Elemental	40	NA		
Oxides and acids	3,222	10,379	--	Italy 9,579; U.S.S.R. 800.
Bromine[2]	630	649	--	Israel 450; U.S.S.R. 179; East Germany 20.

See footnotes at end of table.

Table 3.—Hungary: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Cement[2]	845,438	719,956	--	U.S.S.R. 301,692; East Germany 199,886; Czechoslovakia 140,984.
Chalk	1,705	1,315	--	All from Austria.
Clays, crude:				
Chamotte earth[2]	72,822	65,269	798	Czechoslovakia 60,150; Israel 2,001; Poland 1,214.
Kaolin[2]	60,843	59,451	231	Czechoslovakia 11,792; East Germany 10,857; Bulgaria 5,907.
Unspecified[2]	88,695	74,558	69	Czechoslovakia 51,885; Poland 12,596; East Germany 5,219.
Diamond:				
Gem, not set or strung value, thousands	$354	$129	--	Switzerland $51; Belgium-Luxembourg $36; United Kingdom $28.
Industrial stones do	$878	$1,430	--	Belgium-Luxembourg $1,320; Austria $60; West Germany $42.
Diatomite and other infusorial earth	2,477	2,121	--	Iceland 1,839; Austria 194; Italy 88.
Feldspar, fluorspar, related materials	2,039	2,067	--	West Germany 1,106; Yugoslavia 581; Sweden 220.
Fertilizer materials: Manufactured:				
Ammonia	737	3,032	--	All from Yugoslavia.
Nitrogenous, Ne content[2]	322,371	309,810	--	All from U.S.S.R.
Phosphatic, P_2O_5 content[2]	156,599	96,696	--	U.S.S.R. 26,752; Yugoslavia 22,374; Austria 16,786.
Potassic, K_2O content[2]	509,066	514,576	--	U.S.S.R. 395,440; East Germany 117,136; West Germany 2,000.
Unspecified and mixed[2]	115,632	124,092	17,454	Yugoslavia 66,460; U.S.S.R. 40,168.
Graphite, natural	608	368	--	Austria 200; West Germany 82; United Kingdom 57.
Gypsum and plaster[2]	87,973	82,133	--	East Germany 69,394; Romania 12,225; West Germany 479.
Iodine[2]	35	45	--	U.S.S.R. 31; Japan 13; West Germany 1.
Lime[2]	41,221	39,041	--	Czechoslovakia 20,370; Yugoslavia 18,636; Austria 20.
Magnesium compounds[2]	91,467	94,990	--	Czechoslovakia 70,636; Austria 9,746; U.S.S.R. 7,323.
Mica:				
Crude including splittings and waste	137	104	--	All from United Kingdom.
Worked including agglomerated splittings	38	44	--	Switzerland 20; West Germany 17; Austria 7.
Phosphates, crude[2]	645,820	575,883	--	U.S.S.R. 402,222; Morocco 115,597; Algeria 58,064.
Pigments, mineral: Iron oxides and hydroxides, processed	3,223	3,500	--	West Germany 3,230; Italy 230; Belgium-Luxembourg 32.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$62	$91	--	Switzerland $82; West Germany $9.
Synthetic do	$267	$176	--	West Germany $67; Belgium-Luxembourg $60; Switzerland $46.
Pyrite, unroasted[2]	4,174	37,568	--	Czechoslovakia 20,776; Yugoslavia 9,451; Albania 6,738.
Salt and brine[2]	578,011	672,310	--	Romania 449,733; U.S.S.R. 149,250; Poland 52,463.
Sodium compounds, n.e.s.: Carbonate, manufactured[2]	197,834	186,423	--	Bulgaria 101,778; Romania 41,535; East Germany 15,157.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked[2]	17,119	17,748	--	Romania 5,706; Bulgaria 5,536; Cuba 3,263.
Worked	1,242	1,539	--	Italy 928; West Germany 320; Yugoslavia 161.
Dolomite, chiefly refractory-grade	81	17	--	All from West Germany.
Gravel and crushed rock	12,562	10,395	--	Austria 5,817; Italy 4,272; West Germany 226.
Limestone other than dimension	--	73	--	All from Austria.
Quartz and quartzite	2,232	2,524	--	West Germany 2,430; Belgium-Luxembourg 78; Italy 16.
Sand other than metal-bearing[2]	125,790	120,168	10	Czechoslovakia 88,922; East Germany 24,381; Australia 4,429.

See footnotes at end of table.

Table 3.—Hungary: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Sulfur:				
Elemental:				
Crude including native and byproduct[2]	168,066	171,503	--	Poland 140,708; U.S.S.R. 30,763.
Colloidal, precipitated, sublimed	3	NA		
Dioxide	--	275	--	All from West Germany.
Sulfuric acid	147	208	--	West Germany 58; Italy 48.
Talc, steatite, soapstone, pyrophyllite	1,743	1,532	--	Austria 1,266; Italy 266.
Other: Crude	69,020	1,153	--	West Germany 764; Austria 195; Belgium-Luxembourg 194.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	74	46	--	West Germany 34; Austria 12.
Carbon:[2]				
Carbon black	2,461	243	--	East Germany 163; U.S.S.R. 80.
Gas carbon	21,076	23,754	--	U.S.S.R. 23,562; West Germany 172.
Coal:				
Anthracite and bituminous[2] thousand tons	1,610	2,518	63	U.S.S.R. 937; Poland 534; Czechoslovakia 401.
Briquets of anthracite and bituminous coal[2] do	589	676	--	East Germany 566; Poland 65; Czechoslovakia 36.
Lignite including briquets do	7	208	--	Yugoslavia 199; West Germany 9.
Coke and semicoke[2] do	831	949	--	Yugoslavia 453; Poland 164; Czechoslovakia 163.
Gas, natural: Gaseous[2] million cubic feet	134,847	141,568	--	All from U.S.S.R.
Petroleum:				
Crude[2] thousand 42-gallon barrels	65,116	53,370	--	U.S.S.R. 49,219; Iran 1,901; Libya 1,672.
Refinery products:				
Liquefied petroleum gas[2] do	209	259	--	U.S.S.R. 247; Austria 10; Czechoslovakia 2.
Gasoline[2] do	3,640	3,265	--	U.S.S.R. 2,982; Yugoslavia 238; Albania 43.
Mineral jelly and wax[2] do	11	10	--	U.S.S.R. 9.
Kerosene and jet fuel[2] do	1,240	1,214	--	U.S.S.R. 928; East Germany 97; Bulgaria 25.
Distillate fuel oil[2] do	5,645	5,696	--	U.S.S.R. 5,619; United Kingdom 77.
Lubricants[2] do	151	120	(3)	U.S.S.R. 88; Belgium-Luxembourg 8; Austria 7.
Residual fuel oil[2] do	1,559	3,679	--	Austria 2,274; U.S.S.R. 1,325; United Kingdom 80.
Bitumen and other residues do	(3)	2	--	Yugoslavia 1.
Bituminous mixtures do	1	1	--	Mainly from Sweden.
Petroleum coke do	55	8	--	All from West Germany.

[p]Preliminary. NA Not available.

[1]Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Hungary, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data were compiled from United Nations information and data published by the partner trade countries.

[2]Official Trade Statistics of Hungary.

[3]Less than 1/2 unit.

COMMODITY REVIEW

METALS

The Hungarian metal mining and processing industry has been in a state of transition from a strictly centrally planned basis to more decentralized and flexible operations. Uneconomic mining operations have ceased, and by 1986, the country no longer produced copper, iron, and lead and zinc ores; only bauxite, manganese, and uranium deposits were being exploited. Hungary's reserves and resources of copper, lead, zinc, and gold at Recsk, however, were significant. Situated in the Matra Mountains in the north-central part of the country, near the old Recsk copper-gold mine,

the deposit, a porphyritic chalcopyrite ore body, was determined to be 1 of the 20 largest copper deposits in the world. Analysis of the ore body indicated 700 million tons of ore, graded at between 0.4% and 0.8% copper, with important molybdenum and zinc values, as well as lead, silver, and gold. Associated zinc was found to grade up to 7.0%. Because the top of the ore body was measured 600 feet below the surface, perspective mining would be underground on a large scale. Hungary's limited financial resources as well as a depressed copper market have precluded early development of this resource. Exploratory shafts, connecting roadways, and surface facilities, however, were reportedly maintained at operational readiness.

Aluminum and Bauxite.—The production of bauxite, alumina, and aluminum showed some recovery in 1986 compared with 1985 output levels. Owing to expected modest increases in world aluminum prices, the Hungarian Aluminum Trust (Hungalu), the country's vertically integrated corporation for bauxite mining and alumina and aluminum production and marketing, indicated that investment for the renovation of old aluminum production facilities and storage units for clay residues generated by alumina production, might not be adequate in the near future.[3]

Hungary continued to be a large-scale producer of bauxite and alumina in 1986, with a bauxite output of about 2% of the world total. Annual production has been about 3 million tons of bauxite per year. The country's largest producing mine was the Halimba III underground mine, with an output of approximately 30% of the total bauxite production. The mine, a part of the Bakony Bauxite Mines subsidiary of Hungalu, north of Lake Balaton, was fully automated with four work areas on four separate levels. The ore was transported by conveyor to the surface and trucked to the nearby Ajka alumina plant for processing. Under the 1986-90 5-year plan, bauxite production would reach 3.6 million tons per year, and total sales of aluminum products in domestic and foreign markets would exceed 300,000 tons annually. To achieve this goal, new mines were reportedly planned to open during this period and new smelting capacities were to be added.

Gallium.—Gallium was produced at Hungary's Ajka alumina refinery in the Bakony region near lake Balaton. Reportedly, the production of gallium was about 3,300 kilograms in 1986, an 18% increase over that of 1985. Hungalu announced plans to build a new $2.2 million gallium recovery unit at Ajka that would increase output to 8,000 kilograms per year in 1988. During 1986, the country's output of gallium reportedly accounted for 6% to 8% of total world production.

Iron and Steel.—The output of pig iron and crude steel had mixed results during the year. Pig iron production showed a slight decline and that of crude steel a slight increase compared with those of 1985. The chief events in the industry included the planned installations of two Korf energy optimizing furnaces at the Ozd steelworks by 1987. The new furnaces would cost $40 to $50 million and would replace nine old and less efficient open-hearth furnaces. Although the new furnaces would reduce crude steel capacity at Ozd from 1.4 million tons to 900,000 tons per year, the impact of reduced capacity on the Ozd steelworks would be negligible since only 1 million tons per year of sections, wire rods, and bars have been produced at this facility. At the Dunaujvaros iron and steel works, the No. 3 coking unit with a design capacity of 1 million tons per year was put into operation at yearend. The new coking plant would reduce annual coke imports by between 400,000 to 500,000 tons annually.

Manganese.—Manganese oxide ore mining continued in the Urkut region, north of Lake Balaton. Less economic carbonate deposits were near Eger in the Bukk Mountains in the northeast part of the country. Hungary's manganese reserves were reported to consist of 100 million tons of carbonate ore, containing 11% to 20% manganese and about 28 million tons of oxide material with a 37% to 40% manganese content. Over 115,000 tons of oxide ore was produced in 1986, largely for export.

INDUSTRIAL MINERALS

Hungary's National Ore and Mineral Co. produced about 4 million tons of industrial minerals during the year. The production of bentonite, kaolin, perlite, and zeolite was sufficient to meet most domestic needs as well as for export. In aggregate, Hungary's reported reserves of industrial minerals would last nearly 100 years at present mining rates. The Palhaza perlite mine was reportedly the fifth largest perlite producer in the world with an annual output rate of 100,000 tons. Both raw and expanded Hungarian perlite was competitive in the world market.

MINERAL FUELS

Coal.—Coal production continued to decline in 1986 owing to both adverse weather conditions and worsening geological conditions. Other problems in the industry included fewer workers in the mines as well as the need for large-scale investments to modernize existing mines and to open new mining areas for exploitation. The coal requirement in 1986 for electric power stations was met but at the expense of railways and other consumers. Reportedly, major production delays occurred at the Dorog, Mecsek, and Tatabanya coal mines during the year.

Natural Gas and Petroleum.—The planned output of petroleum and natural gas for 1986 was met. The major event in the industry was the reported start of construction on the Hungarian section of the Soviet Unity gas pipeline at Beregdaroc near the Soviet frontier. The planned completion of the 5,000 kilometer pipeline was set for September 1987.

To help assure supplies of Soviet petroleum and natural gas, Hungary and the U.S.S.R. reached a cooperative agreement that would send 1,000 Hungarian workers and specialists to the Soviet Republic of Kazakhstan to help develop the Tengiz Oilfield, northeast of the Caspian Sea. Also, Hungary sold the U.S.S.R. gas injection equipment valued at about $95 million for low-temperature operations in the West Siberian oilfields.

Nuclear Power.—At yearend, a third Soviet 440-megawatt reactor was put into operation at the Paks nuclear powerplant. The Paks facility would supply about one-third of Hungary's requirements for electricity and thereby alleviate production shortfalls of fossil fuels. Hungary continued to mine uranium ore in the Mecsek Mountains in the Transdanubian area. The material, after processing in the U.S.S.R., was used to fuel the Paks reactors.

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[1]Foreign mineral specialist, Division of International Minerals.
[2]Nepszabadsag. Jan. 31, 1987, pp. 1-3.
[3]Otlet. No. 14, Apr. 3, 1986, p. 15.

The Mineral Industry of Iceland

By Richard H. Singleton[1]

Little change occurred in Iceland's metals and minerals industries in 1986. The Government continued to promote further development of its energy-intensive metals industries, aluminum and ferrosilicon, as well as a new silicon metal plant, in order to utilize Iceland's large hydroelectric power potential. World industry was reluctant to invest in the construction of these new plants because of low world prices for the products as well as increasing costs of Iceland's labor and hydroelectric power. Further development of the country's hydropower was delayed or slowed as a result of this lack of progress.

The Icelandic economy experienced its best growth in many years because of lower prices for imported oil, higher prices for seafood, its major export, and the lower U.S. dollar, coupled with lower interest rates on its foreign debt, more than one-half of which was in U.S. currency. The percentage increase in the gross domestic product (GDP) returned to late 1970's levels. The GDP increased by 6% in 1986 to about $3.6 billion.[2] At the same time, the current account deficit was eliminated for the first time since 1978, and the net external debt was lowered to 51% of GDP. The increase in the cost-of-living index during 1986 decreased to about 13%, the lowest since 1971. The Government adopted a policy at the beginning of the year of allowing market forces to determine wages and prices.

PRODUCTION

Production of ferrosilicon increased somewhat. Production of diatomite, all for export, decreased significantly. Salt production decreased.

Table 1.—Iceland: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
Aluminum metal, primary[2]	75,200	76,077	80,359	73,403	75,929
Cement, hydraulic[3] thousand tons	124	115	118	114	111
Diatomite	24,965	25,501	27,265	29,388	22,897
Iron and steel: Ferrosilicon	41,545	[r]50,313	60,976	60,328	66,787
Nitrogen: N content of ammonia	7,000	[e]7,000	[e]7,000	7,532	7,980
Pumice and related volcanic material:					
Pumice	18,700	45,000	55,000	56,000	52,500
Scoria thousand cubic meters	--	[e]10	[r]10	6	[e]6
Salt	100	500	950	1,350	704
Sand:					
Basaltic cubic meters	5,300	5,500	4,000	5,500	[e]5,000
Calcareous, shell thousand cubic meters	120	125	115	100	129
Sand and gravel do	NA	NA	4,700	4,150	4,088
Silica dust[3 4]	4,200	8,326	7,221	7,873	8,339
Stone, crushed:					
Basaltic thousand tons	NA	NA	90	80	77
Rhyolite	20,500	20,400	20,000	25,755	23,114

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Table includes data available through June 30, 1987.
[2]Ingot and rolling billet production.
[3]Sales.
[4]Byproduct of ferrosilicon.

TRADE

In 1986, exports of aluminum ingot and billet increased 10% to about 78,000 tons, near the 1984 level. Exports of ferrosilicon increased 11% to a record high 63,000 tons; however, no significant value increase occurred because of sharply reduced world market prices. Diatomite exports decreased 15% to about 23,000 tons.

Total exports, $1.1 billion, increased to within 2% of total imports. Approximately 22% of exports was to the United States, compared with 27% in 1985. The United States continued to be Iceland's largest single foreign market and to supply 7% of Iceland's total imports.

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

(Metric tons)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
Abrasives, n.e.s.: Natural: Corundum, emery, pumice, etc	56,533	50,013	327	Finland 14,583; Norway 12,749; Denmark 9,917.
Aluminum: Metal including alloys, unwrought	79,928	70,600	--	Switzerland 20,519; West Germany 12,934; United Kingdom 11,992.
Diatomite and other infusorial earth	26,486	27,123	--	West Germany 6,649; Denmark 3,048; Italy 2,657.
Iron and steel: Metal:				
Scrap	9,784	6,237	--	Netherlands 4,145; Spain 2,079.
Ferroalloys: Ferrosilicon	57,252	56,845	9,103	Japan 23,210; West Germany 17,661.
Stone, sand and gravel: Dimension stone, crude and partly worked	7,154	7,955	398	Canada 7,483; Denmark 73.
Other: Base metals including alloys, scrap	471	898	--	Netherlands 759; Denmark 73; United Kingdom 26.

[1]Table prepared by Jozef Plachy.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	147,509	197,130	--	Australia 197,125; United Kingdom 4.
Metal including alloys:				
Scrap	--	10	--	All from United Kingdom.
Unwrought	31	112	--	Netherlands 78; United Kingdom 33.
Semimanufactures	1,107	932	12	West Germany 290; Norway 136; Switzerland 105.
Chromium: Oxides and hydroxides	2	2	--	All from West Germany.
Cobalt: Oxides and hydroxides	(2)	(2)	NA	NA.
Copper: Metal including alloys:				
Scrap	280	--		
Unwrought	3	4	--	Denmark 3; Norway 1.
Semimanufactures	213	198	9	West Germany 74; Sweden 52; Netherlands 15.
Gold: Metal including alloys, unwrought and partly wrought value, thousands	$126	$111	$32	Switzerland $24; Sweden $13; Republic of South Africa $13.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	15,647	23,410	--	All from Norway.
Metal:				
Scrap	3	--		
Pig iron, cast iron, related materials	286	395	23	Norway 256; France 50; Denmark 23.
Ferroalloys:				
Ferrosilicon	(2)	2	--	All from Sweden.
Unspecified	--	10	10	
Steel, primary forms	904	744	--	Netherlands 299; Spain 241; Norway 156.
Semimanufactures:				
Bars, rods, angles, shapes, sections	20,168	17,232	438	Norway 6,344; Belgium-Luxembourg 2,577; Netherlands 2,140.
Universals, plates, sheets	12,274	12,219	(2)	West Germany 3,082; Belgium-Luxembourg 2,520; Sweden 1,807.
Hoop and strip	647	612	3	Denmark 210; Belgium-Luxembourg 90; West Germany 73.
Rails and accessories	68	31	--	Norway 21; Italy 5; West Germany 4.
Wire	191	245	(2)	Belgium-Luxembourg 131; Australia 55; Denmark 17.
Tubes, pipes, fittings	6,696	7,599	2	West Germany 3,140; Netherlands 1,815; United Kingdom 589.
Castings and forgings, rough	88	113	(2)	West Germany 70; Denmark 33; Italy 6.
Lead:				
Oxides	16	13	--	West Germany 12; Netherlands 1.
Metal including alloys:				
Unwrought	46	103	--	Denmark 102; United Kingdom 1.
Semimanufactures	15	21	--	West Germany 11; Italy 4; Belgium-Luxembourg 3.
Magnesium: Metal including alloys:				
Unwrought	10	88	--	Norway 78; Netherlands 10.
Semimanufactures	--	(2)	--	All from Denmark.
Manganese: Oxides	--	2	--	All from United Kingdom.
Mercury, 76-pound flasks	3	3	--	NA.
Molybdenum: Ore and concentrate	--	(2)	--	All from United Kingdom.
Nickel: Metal including alloys, semimanufactures	1	1	(2)	Mainly from United Kingdom.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$143	$125	$5	Switzerland $78; Netherlands $30; West Germany $10.
Silver: Metal including alloys, unwrought and partly wrought, do.	$117	$124	$3	Sweden $75; United Kingdom $16; West Germany $15.
Tin: Metal including alloys:				
Scrap	--	1	--	All from Belgium-Luxembourg.
Unwrought	(2)	(2)	--	NA.
Semimanufactures	8	8	--	Denmark 6; Belgium-Luxembourg 1; United Kingdom 1.
Titanium: Oxides	724	793	--	United Kingdom 402; West Germany 210; Norway 114.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Tungsten: Metal including alloys, all forms	(2)	(2)	--	All from Sweden.
Zinc:				
Oxides	6	10	2	United Kingdom 4; Norway 3.
Blue powder	--	6	--	All from Norway.
Metal including alloys:				
Unwrought	63	75	--	West Germany 36; Norway 29; Belgium-Luxembourg 9.
Semimanufactures	41	36	--	France 20; Belgium-Luxembourg 6; Netherlands 4.
Other:				
Ores and concentrates	3	(2)	--	All from Denmark.
Base metals including alloys, all forms	10	10	(2)	Netherlands 10.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	21	26	--	Norway 11; Italy 10; Netherlands 4.
Artificial:				
Corundum	(2)	(2)	--	All from West Germany.
Silicon carbide	170	168	--	All from Norway.
Grinding and polishing wheels and stones	30	30	1	West Germany 9; Sweden 7; Finland 3.
Asbestos, crude	2	--		
Barite and witherite	144	121	--	West Germany 111; Denmark 10.
Boron materials:				
Crude natural borates	5	10	--	All from Denmark.
Oxides and acids	1	(2)	--	All from West Germany.
Cement	209	4,149	2	Denmark 4,058; Belgium-Luxembourg 46; United Kingdom 32.
Chalk	363	359	--	Norway 127; France 92; United Kingdom 80.
Clays, crude	447	330	23	United Kingdom 206; Netherlands 76; Denmark 21.
Cryolite and chiolite	1,450	15	--	Norway 10; United Kingdom 5.
Diamond:				
Gem, not set or strung value, thousands	$37	$39	--	Belgium-Luxembourg $33; West Germany $2; Netherlands $2.
Industrial stones do	$3	$11	--	United Kingdom $10.
Diatomite and other infusorial earth	(2)	76	(2)	Denmark 75; West Germany 1.
Feldspar, fluorspar, related materials	1	(2)	NA	NA.
Fertilizer materials:				
Crude, n.e.s	(2)	--		
Manufactured:				
Ammonia	6,843	5,029	--	Norway 5,009; West Germany 12; Netherlands 6.
Nitrogenous	84	143	--	Norway 100; Denmark 25; West Germany 15.
Phosphatic	1,902	1,800	--	All from Sweden.
Potassic	10,360	9,997	--	All from East Germany.
Unspecified and mixed	25,883	11,627	1	Netherlands 11,043; West Germany 500; Sweden 42.
Graphite, natural	15	11	--	United Kingdom 10.
Gypsum and plaster	5,173	7,135	1	Sweden 7,058; Norway 27; Netherlands 18.
Lime	521	564	--	United Kingdom 270; West Germany 157; Denmark 136.
Magnesium compounds: Magnesite, all forms	(2)	2	--	All from West Germany.
Mica:				
Crude including splittings and waste	12	14	--	All from Norway.
Worked including agglomerated splittings	(2)	(2)	--	Do.
Nitrates, crude	--	5	--	All from West Germany.
Phosphates, crude	--	9	--	Norway 8.
Pigments, mineral: Iron oxides and hydroxides, processed	34	45	--	Denmark 23; West Germany 8; Norway 5.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$3	$6	--	West Germany $3; Belgium-Luxembourg $1; Brazil $1.
Synthetic do	$5	$3	--	Belgium-Luxembourg $2; West Germany $1.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Pyrite, unroasted	--	(2)	(2)	
Salt and brine	48,797	71,521	(2)	Spain 65,292; West Germany 3,535; Denmark 1,652.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	1,656	1,427	--	Poland 875; East Germany 200; West Germany 163.
Sulfate, manufactured	96	109	--	Sweden 46; West Germany 40; Denmark 22.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	600	1,097	--	Norway 894; India 74; China 47.
Worked	424	988	NA	Portugal 383; Denmark 327; Italy 245.
Dolomite, chiefly refractory-grade	263	607	--	Norway 589; Sweden 18.
Gravel and crushed rock	282	8,615	(2)	Sweden 8,556; Norway 31; Denmark 24.
Limestone other than dimension	176	250	--	Denmark 247.
Quartz and quartzite	103,247	138,670	57	Norway 108,839; Spain 8,626; East Germany 3,201.
Sand other than metal-bearing	374	365	--	Netherlands 102; Belgium-Luxembourg 76; United Kingdom 73.
Sulfur:				
Elemental:				
Crude including native and by-product	20	(2)	NA	NA.
Colloidal, precipitated, sublimed	2	11	--	All from Denmark.
Dioxide	(2)	12	--	United Kingdom 8; West Germany 3.
Sulfuric acid	381	361	--	Norway 304; Denmark 44; Netherlands 10.
Talc, steatite, soapstone, pyrophyllite	118	117	--	Norway 111; Denmark 3; Sweden 1.
Other:				
Crude	9	5	--	United Kingdom 4; Denmark 1.
Slag and dross, not metal-bearing	--	1	NA	NA.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	18	42	(2)	West Germany 40; Denmark 2.
Carbon black	1	22	--	Norway 21; West Germany 1.
Coal:				
Anthracite	37,670	48,684	42,149	West Germany 2,810; Colombia 1,876.
Bituminous	17,152	19,934	--	United Kingdom 16,049; Australia 3,882.
Briquets of anthracite and bituminous coal	(2)	--		
Coke and semicoke	40,878	33,698	--	Norway 32,392; United Kingdom 1,276; France 29.
Peat including briquets and litter	177	166	--	Sweden 75; Finland 70; Denmark 21.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	12	11	--	Netherlands 9; Denmark 2.
Gasoline do	829	805	--	U.S.S.R. 511; Portugal 252; Netherlands 25.
Mineral jelly and wax do	3	3	(2)	United Kingdom 2.
Kerosene and jet fuel do	450	515	(2)	Netherlands 358; Norway 79; Belgium-Luxembourg 62.
Distillate fuel oil do	1,532	1,905	135	U.S.S.R. 973; Netherlands 542; Portugal 194.
Lubricants do	48	45	(2)	Netherlands 13; United Kingdom 12; Belgium-Luxembourg 9.
Residual fuel oil do	773	666	--	All from U.S.S.R.
Bitumen and other residues do	74	86	(2)	United Kingdom 64; Sweden 21.
Bituminous mixtures do	3	3	(2)	Norway 1; Sweden 1.
Petroleum coke do	(2)	2	--	All from United Kingdom.

NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—Aluminum production was curtailed in 1985 and the first half of 1986 by about 10%, in line with that of other Western European producers, in an overall endeavor to combat weakened prices. Icelandic Aluminium Co. Ltd., Iceland's only aluminum producer, continued to operate at a loss. The Government of Iceland continued its attempt to encourage world aluminum producers to build new aluminum production capacity in Iceland, where relatively low cost hydroelectric power was available. However, Swiss Aluminium Ltd., Icelandic Aluminium's parent, announced it would not contribute to any expansion of the plant, in support of its planned divestiture of aluminum production capacity worldwide.

Ferrosilicon.—Despite record-high production and sales and lower production costs, Iceland's ferrosilicon plant operated at a loss because of low world market prices. Discussions continued between the Government and Rio Tinto Zinc Corp. PLC regarding possible establishment of a ferrosilicon and/or silicon plant at Reydharfjorhur in eastern Iceland.

INDUSTRIAL MINERALS

Nitrogen.—Prices for imported ammonia were lower than those for the domestic product because of higher costs for the electrical energy used locally to manufacture hydrogen for ammonia production and lower costs for petroleum used in the manufacture of imported ammonia. The State Fertilizer Plant approached the National Power Co. regarding a possible lowering of hydroelectrical power prices.

Production of mixed fertilizers remained at approximately 60,000 tons per year. The State Fertilizer Plant made a small profit, compared with a significant loss in 1985, because of the lowered inflation rate and cost cutting measures, including a 15% reduction in staff to 170 employees.

Pumice.—Two producers, B. M. Vall Ltd. and Eldberg Ltd., continued to mine and beneficiate pumice from the area of the Hekla Volcano in south-central Iceland. The reserve appears to be practically unlimited. The product was shipped to Western Europe and North America, where it was used to manufacture lightweight, thermally insulating concrete blocks and cast shapes, mainly for the construction industry. Vall also mined limited amounts of scoria, and significant tonnages had been shipped in recent years to Canada and the United States, primarily for landscaping and construction of barbecue grills.

Silica.—Fine silica particles continued to be collected from the ferrosilicon industry as bag dust. Approximately 8,000 tons per year of this material was sold to Iceland's cement industry, where it was used to improve the strength and resistance to alkaline reactions of concretes used for road construction. Other uses for the silica were being sought.

MINERAL FUELS

Installed electrical energy capacity, nearly all hydropower, remained at nearly 800 megawatts (MW); approximately 5% was geothermal. The Blanda hydroelectric plant, with a capacity of 150 MW, was under construction in northern Iceland with a projected 1991 starting date. Detailed construction plans existed for about 600 MW of additional hydroelectric power at five locations, mostly in south-central and eastern Iceland. Development of these facilities awaited construction of energy-intensive plants, specifically aluminum and ferroalloy production facilities. Foreign participation in these plant developments continued to be actively sought by Government-controlled entities.

Iceland remained dependent on foreign sources for its mineral fuels. Its principal sources of coal and coke were Norway, the United Kingdom, and the United States. The U.S.S.R. remained its principal source of petroleum products.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Icelandic krona (IKr) to U.S. dollars at the rate of IKr41.0=US$1.00.

The Mineral Industry of India

By Gordon L. Kinney[1]

The mineral industry of India produced 52 minerals on a commercial scale during 1986. Their value accounted for 3.4% of the gross national product (GNP). India was the world's leading producer of sheet mica and ranked 3d in kyanite, 4th in chromite and nitrogen fertilizer, 5th in iron ore and talc minerals, 6th in barite and cement, 7th in manganese, and 10th in bauxite. The first phase of the National Aluminium Co. Ltd.'s (NALCO) production complex came on-line at the end of fiscal year[2] (FY) 1986. The 800,000-ton-per-year alumina plant at Damanjodi thus became the largest in Asia and reportedly the third largest in the world. The commissioning of NALCO's 218,000-ton-per-year Angul smelter brought India's installed aluminum capacity to 580,000 tons, or about seventh in the world.

Both the cement and fertilizer industries continued to add capacity at an impressive rate. Nitrogen fertilizer was about to see an even further increase as the first of a series of six large natural-gas-based plants was scheduled for completion early in 1987 and the remaining five during the next few years, adding about 3 million nutrient tons per year of capacity. The first section of the country's largest natural gas pipeline was completed just at the end of FY 1986. The pipeline was designed to supply the six fertilizer plants with feedstock and three large thermal-electric powerplants with fuel. Much of the natural gas for these industries, originating in offshore fields west of Bombay, has been flared in the past, an expensive waste considering India's large petroleum import bill.

Several Government agencies conducted mineral surveying, evaluation, and development work throughout India. Mineral Exploration Corp. Ltd. (MEC) was incorporated in the public sector in 1972 to undertake mineral exploration with the objective of bridging the gap between discovery of a resource and its exploitation as a mine or quarry. Much of its work was with Coal India Ltd. (CIL), its largest client. MEC was headquartered at Nagpur with additional offices in Calcutta, Hyderabad, Jaipur, and Ranchi. During 1986, MEC completed 200,000 meters of drilling and 5,000 meters of exploratory tunneling, most of it in high-priority coal and lignite. Copper-lead-zinc, gold, tin, and tungsten were also given preferential attention. Twenty-five exploration reports were submitted to the Department of Mines, upgrading and establishing 1.3 billion tons of mineral reserves, mostly coal.

Work under way by MEC included exploration for the following: (1) Gold in Buddini and Gadag in Karnataka, Chigargunta in Andhra Pradesh, and Kunderkocha in Bihar; (2) copper at Malanjkhand in Madhya Pradesh and Basantgarh, Chandmari, Banwas, and Akwali in Rajasthan; (3) tin at Tosham, Haryana; and (4) tungsten at Balda, Rajasthan, and Khobna, Maharashtra.

The Geological Survey of India (GSI) has a systematic mapping program of India under way at a scale of 1:63,360 (1 inch to the mile). GSI was scheduled to complete about 140,000 square kilometers of these map sheets in 1986. In the field of mineral investigation, 3,100 square kilometers of large-scale mapping and 104,000 meters of drilling were carried out on schedule in the first three quarters of FY 1986. During 1986, GSI identified new coal reserves of 2.3 billion tons in the major coal States. Lead and zinc ore of moderate grade was found in Ghugra and Ganeshpur blocks, Ajmir District of Rajasthan. Additional copper mineralization was discovered in Taregaon near the Malajkhand Mine. In the Tosham area of Haryana, work with MEC has revealed an 18-million-ton tin deposit grading 0.15%

tin. The search for tungsten continued on a priority basis in four States. The best new prospect to date was mineralization grading 0.10% to 0.47% tungsten in the Kolari-Bhaonri area of Nagpur District, Maharashtra.

Continuing exploration over the last two decades has placed total recoverable manganese ore reserves at 138 million tons. Exploration at Subbarayanahalli and Ramgad in Bellary District, Karnataka, established 19 million tons of 35% manganese ore with 0.01% phosphorus. The low phosphorus content was particularly desirable for blending, as most of India's manganese has relatively high phosphorus content. About 15 million tons of new chromite reserves was established at Damsal Nala in Orissa in 1986.

GSI improved its exploration and mapping capability by commissioning a twin-engine Otter aircraft from Canada equipped with sophisticated multisensor geophysical equipment. The plane will gather data for processing at a new geophysical mapping center recently commissioned in Bangalore, Karnataka.[3]

India's new Mine and Minerals (Regulation and Development) Amendment Act-1986 became law. It includes prospecting an area and preparation of mining plans as preconditions for granting a mining lease and premature termination of prospecting licenses and mining leases on ecological and other grounds. It also simplified some of the paperwork involved in granting prospecting licenses and mining leases. There was also a provision for increasing the penalties for illegal mining activities.[4]

India's real GNP grew 5% in FY 1986 to $212 billion[5] in current dollars. The growth in industrial output was much higher, with the manufacturing component growing by 11%. India's 770 million population grew at a 2.2% annual rate, equivalent to adding the population of Peru or North Korea each year. There has been a significant increase in medical and child care facilities in India, which may result in a further increase in the growth rate. One-half of the population was 15 years old or younger, and population pressure would continue to be an economic factor at least until the middle of the next century.

The output of a number of basic industries including cement, fertilizers, and steel increased significantly. Railroad freight traffic increased 16% in 1985-86. Coal production was up 9%, and the crucial output from thermal powerplants was up 13% in 1986.

Despite impressive gains, lack of infrastructure in most areas was a serious obstacle to the development of India, particularly its mineral development. The railroad and road systems were overburdened, and each improvement was usually more than matched by increased use. Electric power was the most significant constraint. Electricity demand responds rapidly to rising income, and official estimates were that, despite an overall 10.3% increase in output in FY 1986, the gap between supply and demand widened to 9.7% from 8.3% in FY 1985.[6] Faced with intolerable power cuts, many industries have resorted to installation of captive power generators, adding to their costs. Notwithstanding ambitious plans to increase power production, electric power is to remain a major bottleneck for industry and agriculture through the end of the century.

PRODUCTION

The value of mineral production in India was reported as $7.18 billion during 1986, an increase of 7.6% over that of 1985. Because of a change in the rupee-to-dollar conversion rate, however, the dollar increase was minimal. At $3.5 billion and $2.6 billion, crude oil and coal, respectively, were by far the most valuable mineral commodities. Iron ore at $218 million was the next most valuable, followed by limestone at $148 million. In the latest available figures, 11 metallic minerals, 39 industrial minerals, and coal and lignite were mined in 4,179 mines.

Production of the most important mineral-based products, nitrogen fertilizer and portland cement, continued to grow, outstripping much of the rest of the mineral industry's performance. The estimated value of each of these two commodities surpassed the value of any other mineral commodity except crude oil and coal. The output of nitrogen fertilizer increased partly because of new capacity, but also because of a large increase in plant capacity utilization. The upward trend in nitrogen fertilizer production should continue strongly as a number of large new gas-based plants now under construction should come into service in the next 3 years. Both the Indian public

and private sectors contributed to the growth in cement production. Installed capacity surpassed 50 million tons during 1986, and at least an additional 5 million tons was under construction.

Production of natural gas increased every year of this decade, but much of the increase has been as a coproduct of offshore crude oil. Far more gas was produced than could be marketed, resulting in one-half being flared. The trend is expected to change when the new fertilizer plants begin operating.

Table 1.—India: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985	1986[p]
METALS					
Aluminum:					
Bauxite, gross weight thousand tons	1,854	1,923	1,994	2,121	2,322
Alumina, gross weight[e] do	500	450	560	560	600
Metal, primary do	216,679	203,559	268,520	260,010	257,096
Cadmium metal	131	131	148	194	[e]160
Chromium: Chromite, gross weight	[r]364,204	[r]359,932	423,000	560,000	616,000
Copper:					
Mine output, Cu content	24,000	37,774	44,132	45,892	48,103
Metal, primary:					
Smelter	32,585	[3]35,469	40,536	32,460	39,074
Refinery:					
Electrolytic (cathode)	25,632	28,368	32,580	28,020	[e]37,000
Fire refined	1,153	[e]1,000	[e]1,000	[e]1,000	[e]1,000
Total	26,785	29,368	33,580	29,020	[e]38,000
Gold metal, smelter troy ounces	71,935	70,158	65,234	58,771	60,250
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	40,902	38,800	41,026	42,545	47,800
Iron content do	25,605	24,289	25,682	26,633	29,923
Metal:					
Pig iron do	9,600	9,086	9,382	9,835	10,509
Ferroalloys:					
Ferrochromium (including charge chrome)	41,625	[r]35,790	[3]55,578	66,497	84,000
Ferromanganese	157,884	[r]150,880	[3]121,829	163,438	179,132
Ferrosilicochromium	4,527	[r]1,675	[3]3,892	12,499	[e]10,000
Ferrosilicon	40,253	[r]49,044	[3]50,802	39,478	50,096
Other	[e]10,400	[r]53	[r]284	[e]500	[e]500
Steel, crude:					
Steel ingots thousand tons	10,628	10,216	[3]10,261	10,962	11,332
Steel castings do	87	89	[3]84	92	95
Total do	10,715	10,305	[3]10,345	11,054	11,427
Semimanufactures[3 4] do	6,565	6,511	6,967	7,841	7,753
Lead:					
Mine output, Pb content	16,640	25,700	24,839	27,085	37,578
Metal, refined:					
Primary	14,413	14,960	15,246	15,567	19,933
Secondary	8,780	6,596	[e]10,000	[e]10,000	11,300
Total	23,193	21,556	[3]25,246	[3]25,567	31,233
Manganese:					
Ore and concentrate, gross weight thousand tons	1,490	[r]1,281	[r]1,130	1,240	1,213
Mn content	547,575	480,811	420,812	461,776	455,287
Rare-earth metals: Monazite concentrate, gross weight[e]	4,000	4,000	4,000	4,000	4,000
Selenium kilograms	5,351	3,684	[e]4,000	[e]4,000	[e]4,000
Silver, mine and smelter output thousand troy ounces	463	469	862	816	1,048
Titanium concentrates, gross weight:					
Ilmenite	[3]152,938	[3]134,476	[e]140,000	[3]143,000	[e]140,000
Rutile	[3]5,782	[3]5,500	[e]6,000	[3]6,800	[e]7,000
Tungsten, mine output, W content	25	15	21	28	23

See footnotes at end of table.

Table 1.—India: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985	1986[p]
METALS —Continued					
Zinc:					
Mine output, concentrate:					
Gross weight	52,839	77,594	85,260	87,082	94,597
Zn content	29,060	40,350	44,335	45,283	49,190
Metal:					
Primary	52,571	53,268	55,753	70,947	72,000
Secondary[e]	200	200	200	200	200
Total	52,771	53,468	55,953	71,147	[e]72,200
Zirconium concentrate: Zircon, gross weight	10,483	11,395	[e]12,000	14,800	[e]16,000
INDUSTRIAL MINERALS					
Abrasives, natural, n.e.s.:					
Corundum, natural	1,355	714	442	498	968
Garnet	5,429	3,349	[e]3,000	5,917	5,366
Jasper	2,139	5,418	[e]5,000	5,078	[e]5,000
Asbestos	26,761	24,873	25,450	30,183	25,236
Barite	325,368	323,000	446,000	579,742	344,000
Bromine, elemental[e]	350	350	350	350	350
Cement, hydraulic thousand tons	22,498	[r]25,356	29,030	33,050	[3]36,400
Chalk	87,057	91,146	[e]80,000	114,964	106,708
Clays:					
Ball clay	114,782	137,917	[e]135,000	236,625	277,460
Diaspore	5,802	6,361	[e]6,000	9,605	11,580
Fire clay	769,495	657,000	602,000	592,047	583,000
Kaolin:					
Direct salable, crude thousand tons	531	553	504	585	733
Processed do.	[e]100	[e]100	116	[e]110	[e]100
Total do.	[e]631	[e]653	620	[e]695	[e]833
Other[e] do.	[e]80	[e]80	[e]80	100	[e]100
Diamond:					
Gem[e] thousand carats	11	12	13	14	13
Industrial[e] do.	2	2	2	2	2
Total do.	13	14	15	16	15
Feldspar	44,854	41,837	39,943	46,101	46,288
Fluorspar:					
Concentrates:					
Acid-grade	12,407	[e]11,000	[e]12,000	11,107	[e]11,000
Metallurgical-grade	5,710	4,590	[e]5,000	[e]5,000	[e]5,000
Total	18,117	[e]15,590	[e]17,000	[e]16,107	[e]16,000
Other fluorspar materials, graded	6,785	6,993	4,232	[e]4,000	[e]4,000
Gem stones excluding diamond:					
Agate including chalcedony pebble	1,062	502	[e]1,000	750	[e]800
Garnet kilograms	2,249	735	[e]2,000	2,399	5,021
Graphite[5]	52,376	39,567	38,986	27,337	38,412
Gypsum	970,365	1,039,000	1,378,000	1,260,369	1,549,000
Kyanite and related materials:					
Andalusite	536	2,573	2,700	504	[e]500
Kyanite	33,951	38,307	37,024	30,472	27,468
Sillimanite	13,066	7,928	13,377	17,095	14,905
Lime[e]	400,000	400,000	500,000	500,000	600,000
Magnesite	407,071	434,072	414,029	417,412	422,000
Mica:[e 6]					
Exports:					
Block	1,100	1,100	1,100	1,200	1,200
Film and book for mica cuttings	200	200	200	250	250
Splittings	4,000	3,000	3,000	4,000	4,000
Scrap	8,000	7,000	7,000	11,000	11,000
Powder	5,000	4,000	4,000	4,700	4,700
Manufactured	300	500	500	1,000	1,000
Total	18,600	15,800	15,800	22,150	22,150
Domestic use, all forms	3,000	3,000	3,000	3,500	3,500
Total mica	21,600	18,800	18,800	25,650	25,650
Nitrogen: N content of ammonia[3] thousand tons	3,469	3,565	3,975	4,324	5,410
Phosphate rock including apatite	631,082	687,907	892,000	929,098	[e]640,000

See footnotes at end of table.

Table 1.—India: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985	1986[p]
INDUSTRIAL MINERALS —Continued					
Pigments, mineral, natural: Ocher	84,789	88,633	107,852	108,549	85,312
Pyrites, gross weight	55,853	63,621	44,238	17,744	20,773
Salt:					
Rock salt thousand tons	4	4	5	4	2
Other do	7,308	7,008	7,723	9,875	10,116
Total do	7,312	7,012	7,728	9,879	10,118
Sodium carbonate	586,800	744,329	830,863	813,600	873,600
Stone, sand and gravel:[7]					
Calcite	19,101	[e]20,000	[e]20,000	26,049	26,318
Dolomite thousand tons	2,133	2,264	2,277	2,217	2,139
Limestone do	33,462	36,965	45,483	48,070	52,562
Quartz and quartzite do	332	[e]300	[e]300	259	274
Sand:					
Calcareous do	669	598	570	706	571
Other do	1,254	1,018	[e]1,200	2,349	1,113
Slate	4,770	3,461	[e]5,000	5,529	6,483
Sulfur:					
Content of pyrites	22,341	25,448	17,695	7,098	8,309
Byproduct:					
From metallurgical plants[e]	100,000	110,000	115,000	120,000	120,000
From oil refineries	5,189	3,906	[e]5,000	305	[e]1,000
Total[e]	127,530	139,354	137,695	127,403	129,309
Talc and related materials:					
Pyrophyllite	43,602	59,042	84,159	53,741	53,005
Steatite (soapstone)	300,338	294,000	333,576	329,192	343,000
Vermiculite	2,068	2,411	1,953	1,805	6,681
Wollastonite	20,725	16,557	[e]20,000	26,040	23,770
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Bituminous thousand tons	128,225	136,261	145,800	149,259	162,800
Lignite do	6,675	7,342	7,500	7,774	7,900
Total do	134,900	143,603	153,300	157,033	170,700
Coke:[e]					
Coke oven and beehive do	12,000	12,000	12,000	13,000	13,000
Gashouse do	100	100	100	100	100
Other, soft do	50	50	50	100	200
Total do	12,150	12,150	12,150	13,200	13,300
Gas, natural:					
Gross million cubic feet	140,000	210,550	255,700	287,200	[e]360,000
Marketable[8] do	85,180	100,860	114,420	133,561	232,090
Petroleum:					
Crude thousand 42-gallon barrels	149,811	184,440	204,943	219,132	228,416
Refinery products:					
Gasoline do	[e]24,000	27,100	[e]26,000	[e]29,000	[e]42,000
Kerosene and jet fuel do	[e]25,000	27,900	[e]27,000	[e]30,000	[e]45,000
Distillate fuel oil do	[e]80,000	87,200	[e]84,000	[e]88,000	[e]110,000
Residual fuel oil do	[e]49,000	53,600	[e]51,000	[e]52,000	[e]58,000
Lubricants do	[e]3,000	3,200	[e]3,000	[e]3,000	[e]3,000
Other do	[e]43,000	43,600	[e]42,000	[e]44,000	[e]55,000
Refinery fuel and losses do	[e]16,000	20,200	[e]19,000	[e]20,580	[e]22,167
Total do	[e]240,000	262,800	[e]252,000	266,580	335,167

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

[1]Table includes data available through Sept. 17, 1987.

[2]In addition to the commodities listed, other clays (bentonite, common clay, and fuller's earth), other gem stones (aquamarine, ruby, and spinel), and uranium are also produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels. In 1975, production of 6,514 metric tons of uranium ore containing about 3 metric tons of U_3O_8 was reported from two mines, which was only a part of total national production. Reported production of sand and gravel and stone are clearly only partial figures and exclude a number of types of stone; the amounts reported are inadequate to provide sufficient aggregate for production of concrete from domestically produced and consumed cement, nor do they provide for other supplies of aggregate for road metal and other construction uses.

[3]Data are for fiscal year beginning Apr. 1 of that stated.

[4]Excludes production from steel miniplants.

[5]India marketable production is 10% to 20% of mine production.

[6]Data supplied here (exports plus domestic use) are provided in lieu of officially reported production because the latter figures are evidently incomplete. Officially reported production figures are as follows, in metric tons: 1982—12,961; 1983—7,364; 1984—7,171; 1985—6,965; and 1986—4,684.

[7]Partial figures; for details, see footnote 2.

[8]Includes reinjected gas.

TRADE

Cut and polished diamonds continued to be the predominant mineral-based export, accounting for $1.53 billion during FY 1986, 45% more than in FY 1985. India imported 39.3 million carats of rough diamonds in 1986 and exported 7.5 million carats of polished diamonds. India, therefore, retained its position as the world's largest processor of rough diamonds and largest exporter of polished stones in carat terms. The United States ($670 million), Japan ($229 million), Hong Kong ($227 million), and Belgium ($206 million) were the major importers of the cut and polished diamonds.

India was a major world exporter of iron ore and was actively soliciting additional buyers for both lump and fine ore, Kudremukh concentrate, and pellets from the new Mangalore pellet plant. NALCO began looking for markets for its surplus alumina capacity. The first sale would reportedly go to Norway late in 1987.

In a change of policy, the Government banned imports of hot-rolled coil, cold-rolled sheets, and tinplate by private industry in favor of returning to controlled imports by the Government's Minerals and Metals Trading Corp. (MMTC). Imports of fertilizer raw materials increased 7% to $296 million; there was a drop in imports of finished fertilizers because of greater domestic availability.

India's trade deficit, which increased dramatically in FY 1985 to $7.17 billion, decreased to $6.24 billion in FY 1986. Imports rose slightly, moderated by reduced crude oil prices in the world market, lower edible oil prices, and diminished fertilizer imports. Exports increased 13%, led by gem stones.

India's oil import bill was to rise in the coming years as no major fields have been discovered recently while oil consumption has continued to climb. Exports of crude oil have stopped because India's oil refineries have been modified, allowing them to refine all Bombay High offshore oil.

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—The installed capacity for aluminum at yearend was 362,000 tons per year. When the NALCO complex goes into full production it will rise to 580,000 tons per year, and following the planned expansion of 30,000 tons per year at Hindustan Aluminium Co. (HINDALCO), India's aggregate capacity will be 610,000 tons per year. The capacity utilization of India's four aluminum companies ranged from 22% to 103% for the first 9 months of 1986, reflecting the varying supply of electric power.

Bharat Aluminium Co. (BALCO), a public company, increased its capacity utilization and production during the last 4 years as the electric power availability situation in the Korba area has improved. Despite the favorable production record, BALCO suffered heavy losses in 1984, 1985, and apparently again in 1986. The cause was an increase in the cost of electric power from $0.036 to $0.059 per kilowatt-hour. BALCO management stated that without an increase in its retention prices, the losses would continue.

BALCO was also having a problem with long-term raw materials supply. The company's mines at Amarkantak and Phutkapahar in Madhya Pradesh have been depleting and will be exhausted in a few years. In 1982, the Government sanctioned the development of the Gandhamardan bauxite deposit in Orissa. It was to have a capacity of 600,000 tons per year, cost about $30 million, and be operating in 1985. The Gandhamardan deposit straddles the Sambalpur and Bolangir Districts and is the second largest bauxite deposit in India with reserves of 213 million tons. The ore grades 44.7% alumina and 3.2% silica and has an average thickness of 15 meters with 6 meters of overburden. Progress at the Gandhamardan Mine has been slow. By mid-1986, about $20 million had been spent, and development was more than 2 years behind schedule. The main problems have been acquiring the surface rights and obtaining environmental plan approval. To settle the matter, a high-level Government committee was formed to study the environmental impact of the mine. The committee reportedly submitted a favorable report at yearend, and development of the mine would probably continue in 1987.

Construction of BALCO's 270-megawatt captive thermal powerplant at Korba continued with completion scheduled for late in 1987. The cost of the plant has escalated over 40% since the project was sanctioned in 1984. The increase was reportedly due to changes in the rupee-pound sterling rate

and an increase in the customs import duty on powerplant equipment. The United Kingdom was funding a major part of the powerplant cost.

Construction of the NALCO mine-smelter complex continued during the year. By the end of FY 1986, at least the first phase of each component of the complex had been commissioned. The 2.4-million-ton-per-year bauxite mine at Panchpatmali was fully operational, reportedly making India the 10th largest bauxite producer in the world. Test runs on the 800,000-ton-per-year alumina plant at Damanjodi were under way at yearend. It was the largest alumina plant in Asia and the third largest in the world.[7] The first two 120-megawatt units of the 600-megawatt captive thermal powerplant at Angul were operating, and the first of two potlines had been charged. The company expected that full capacity of 218,000 tons of aluminum per year would be reached by yearend 1987. When full capacity is reached, the NALCO complex will be the largest integrated aluminum plant in Asia.

Indian Aluminium Co. Ltd. (INDAL) had such severe power shortages that its plants at Hirakud, Orissa, and Alupuram, Kerala, were forced to shut down completely for several months in 1986 and were under at least 60% reductions for most of the remainder of the year. Power to the Belgaum, Karnataka, plant was cut 85% for most of the summer months. As could be expected of any electricity-dependent industry with that type of power restriction, INDAL's production record was a shambles for 1986. INDAL's production through three quarters of FY 1986 was at an annualized rate of 25,000 tons. INDAL's 1984 production had been 52,000 tons when electric power supplies were more favorable. INDAL estimated that during the last 5 years its production loss owing to power cuts was more than the quantity of aluminum imported by the country during that period.

INDAL was making plans for new facilities during 1986. One was the expansion of its sheet-rolling facilities at Taloja by 20,000 tons per year at a cost of $15 million. INDAL also submitted proposals to relocate it's 2,400-ton-per-year extrusion plant from Nasik to Alupuram and set up a 20,000-ton-per-year caustic soda-chlorine plant at Haldia at a cost of $23 million. INDAL also incorporated a new joint sector company called Orissa Extrusion Ltd. The $13 million plant is to manufacture 5,000 tons of specialty extrusions per year. Both INDAL and Madras Aluminium Co. were examining the economics of installing captive electric power facilities.

In an effort to make aluminum's price more competitive and encourage greater domestic use, the Government announced plans to reduce the excise duty on primary metal from 44% to 13% and the rate of tax on downstream products from 44% to 25%.[8]

Plans for a bauxite mine and alumina plant at Visakhapatnam in Andhra Pradesh have been discussed with the U.S.S.R. for a number of years. Problems of arranging financing and a softening of the world alumina market have contributed to the long delay of the project. Now, according to a Soviet progress report, the 2.3-million-ton-per-year bauxite mine is to be constructed, and the bulk of the output is to be exported to the U.S.S.R. The alumina plant is apparently going to be built at a later time and the mine then expanded to 4 million tons to accommodate the increased bauxite requirements.[9]

Chromite.—Orissa Mining Corp. Ltd. (OMC) of India operated its new charge chrome plant smoothly during 1986 after its startup in November 1985. The plant management planned to inaugurate a rotary kiln chrome ore preheater at the end of FY 1986. The company planned to produce 30,000 tons of charge chrome from the 50,000-ton-per-year-capacity plant during 1987. All chrome shipments from the plant went to Japan in 1986, but OMC would not rule out the Western European market if the demand appeared.

OMC planned to build India's third chromite beneficiation plant and a chromite briquetting plant. The beneficiation plant would upgrade low-grade chrome ore to 63,000 tons containing 51% chromic oxide (Cr_2O_3) and 21,000 tons containing 54% Cr_2O_3 per year. The briquetting plant would briquet high-grade ore containing over 50% Cr_2O_3.[10] Plant capacity was planned to be 50,000 tons and could also supply Indian Metals and Ferroalloys Ltd. and Ferroalloys Corp. Ltd., if needed.

Copper.—The Hindustan Copper Ltd.'s (HCL) Khetri Copper Complex (KCC) in Khetrinagar, Rajasthan, dedicated the startup of two gas-turbine-powered generator sets of 10 megawatts each in May 1986. That raised the total captive power generating capacity at Khetri to 46 megawatts, reportedly enough to operate the essential parts of the complex when necessary. During the last decade, persistent power

shortages have been the major factor in lost copper production.

Production at Khetri of blister and refined copper during FY 1986 was reportedly up 25% and 40%, respectively. This was partly because of an increase in ore production made possible by a change in the mining method at the Khetri and Kolihan Mines and partly from better electric power availability.

HCL began a program to modernize and debottleneck the smelter and refinery at Khetri to achieve and stabilize the production level at the designed capacity of 31,000 tons per year. The modernization of the smelter was being done mostly by HCL with some outside engineering services. The refinery work was awarded to Mitsubishi Metal Corp. for execution on a turnkey basis.

A similar program was also begun at the Indian Copper Complex (ICC) at Ghatsila in Singhbhum District, Bihar. In addition to the modernization of both the smelter and refinery, the refinery capacity was being increased to match the 16,500-ton capacity of the smelter.

The Government approved a plan by HCL to expand the byproduct recovery plant at ICC to handle the increased slime that would become available as a result of the modernization at both of the copper complexes.

In addition to the above work at KCC, HCL planned to install a new type of smelter with a capacity for treating 20,000 tons of reverts and slag concentrates per year to produce more than 5,000 tons of anode copper. The new technology was to come from Humbold Wedag AG of the Federal Republic of Germany. These low-sulfur-content slags had been toll smelted abroad.

Hopes for significantly increasing copper production were resting in the Malanjkhand deposit in Madhya Pradesh and in the Singhbhum copper belt in Bihar. The continuing drilling program at Malanjkhand resulted in frequent updates and changes in the reserves. The latest published figures state 292 million tons of ore with an average metal content of 1.36% copper. This would be far more economically attractive than reserve figures quoted in 1985 of 526 million to 790 million tons at 0.83% copper. Further detailed exploration was to be undertaken with the intention of increasing output of the mine to 100,000 tons of copper per year. A feasibility study was still to be commissioned to make recommendations on the proposed large expansion of the mine and construction of a smelter at the site. The present output of concentrate was trucked 900 kilometers to Khetri or toll smelted overseas.

The other potential for increased copper production was from further exploration in the Singhbhum copper belt. In 1986, only about 20 kilometers of the 200-kilometer belt was being worked in four mines, Kendadih, Mosaboni, Pathargora, and Surda. The relatively underdeveloped copper belt was believed to contain 38% of India's copper resources. The Department of Mines approved $2.7 million for a feasibility study of the Singhbhum development.

Gold.—Gold was being explored in several areas of the country with various degrees of success. GSI located 530,000 tons of ore grading 0.064 to 0.257 troy ounce of gold per ton in the Wandalli block of Karnataka and a deposit of 540,000 tons grading 0.064 to 0.180 troy ounce of gold per ton in the Kappata Gubba areas of the Gadag Goldfield in Karnataka. The discovery came after a preliminary survey of the long-closed Hosur Mine. MEC took over the detailed exploration work on the site from GSI.

GSI and MEC were also exploring for gold in the Munger, Ranchi, and Singhbhum Districts of Bihar. To date, the best prospects were in Karmatia in the Munger District and Karkari in the Ranchi District. Trenching and ore drilling have found gold traces over a 0.6-square-kilometer area. The gold occurs in association with sulfur compounds of iron, arsenic, and copper. These efforts formed part of a national gold exploration program.

A committee set up by the Department of Mines to examine the operation of Bharat Gold Mines Ltd. (BGM) recommended that the company diversify into gold jewelry manufacture for export to make its operations more economic. If gold were to be sold by BGM to jewelers, it was feared that the price would fall and the demand would increase without preventing smuggling. The Indian market price of gold was nearly double the London Metal Exchange price. Gold's cost of production was well above the Indian market price, making the recommendation to manufacture gold jewelry logical. BGM was mining ore from three mines in the Kolar Goldfields—the Champion Reef, Mysore, and Nundydroog. The Yeppamana Mine across the border in Andhra

Pradesh was being mined in a very small-scale operation, which produced less than one-tenth the Kolar Goldfield output.

Two major rockbursts in the Kolar mines during 1986 adversely affected ore production. Other factors hindering production included shaft renovation at the Nundydroog Mine, drought, lack of personnel, and frequent electric power interruptions.[11]

Iron Ore and Pellets.—National Mineral Development Corp. Ltd. (NMDC) was developing the Bailadila No. 11/C deposit to supplement and eventually replace the Bailadila No. 14 Mine, whose production would be tapering off as the ore was depleted and operational constraints increased. Bailadila No. 14 has been operating since 1968. The No. 11/C Mine, scheduled to begin operating in June 1989, had a capital cost of $23 million and was designed for a capacity of 2.8 million tons of lump and fines per year. The output is to be exported or shipped to the Visakhapatnam steel plant when completed.

Fine ore handling, reclaiming, and loading facilities were being updated in a $24 million project at the Bailadila No. 5 Mine. The main civil and construction work and erection of equipment were completed in December. The first ore train was loaded before yearend FY 1986. The completely independent fine ore reclamation system was expected to be ready early in 1987.

The development of a new mine in the Bailadila No. 11/B deposit may be necessary to meet the future needs for the Visakhapatnam plant and export requirements. Plans for a detailed investigation of the deposit were being prepared. Consultants were being approached for preparation of a prefeasibility report.

To improve environmental conditions, tailing dams were being modified or constructed at Donimalai and two of the Bailadila mines. In addition, reforestation of the area and construction of check dams wherever necessary to prevent silting of the streams was under way.

Future projects under consideration by NMDC were developing the Bailadila No. 14 Mine to a deeper level and constructing a specular hematite mining and handling scheme and a fine ore handling system at the Bailadila No. 14 and No. 11/C Mines.

The Meghataburu mining complex on the border of Bihar and Orissa was scheduled for startup during 1987 after experiencing a series of construction delays since its inception in 1978. The main problems were slow deliveries of equipment and the mine's location in rough terrain 900 meters above sea level. The mine was designed to meet the increasing ore requirements of the Bokaro steelworks. In 1986, Bokaro was fed by ore from the Kiriburu Mine located 2 kilometers from Meghataburu. Meghataburu was to produce 5 million tons of run-of-mine ore, which, after washing and screening, should yield 1.3 million tons of lump ore and 3.0 million tons of fines. The 800-meter-long open pit contained reserves of 120 million tons of 63% iron content ore. The deposit is to be mined on 12-meter benches to a depth of 120 meters. Total cost of the project was $90 million, more than twice the original estimate.

The 3-million-ton-per-year pellet plant of Kudremukh Iron Ore Co. Ltd. in Mangalore began operating early in the year and shipped its first load of 25,000 tons to Hungary in September. The plant was built to convert the fine-grained high-grade Kudremukh concentrate into a more marketable product. Iran was originally to be the recipient of the ore but backed out of the arrangement when there was a change in the Government of Iran. Samples of the Kudremukh pellets have been sent to China, Czechoslovakia, and Poland in hopes of developing a substantial market.

The Kudremukh Mine produced a record high 3.4 million tons of ore during FY 1986, which represented a near doubling of its FY 1985 production.

Iron and Steel.—The Government was encouraging private investment in the direct-reduction (DR), electric arc furnace (EAF) sector of the steel industry. Recognizing both the shortage of public investment funds and the efficiency of the private sector steel minimills, Indian policy has encouraged the installation of 150 privately owned mills with a capacity of 4.5 million tons, accounting for 25% of salable steel production.

To encourage production by minimills, which frequently have idle capacity of 40% to 50%, the following concessions have been offered by the Government: (1) EAF units that have run at 80% of their licensed capacity the last 2 years would be allowed to expand capacity by up to 100%, (2) existing units were permitted to diversify into production of all grades of alloy or stainless steels up to their licensed capacity, (3) existing units were permitted to install captive rolling mills to encourage formation of composite units, and (4) EAF units were

allowed to install new facilities such as continuous casters. Further indirect encouragement was seen in the Government's vigorous efforts to reduce chronic electric power shortages. The availability of adequate electricity was often the main factor affecting minimill production.

Sponge Iron India Ltd. (SIIL) put a 30,000-ton-per-year DR iron plant into operation in 1980 at Paloncha, Kothagudem, in Andhra Pradesh. The purpose of the plant was to determine the technical and economic feasibility of using lump iron ore and noncoking coal for production of electric-furnace-grade DR iron. The project was successful, and SIIL commissioned a second 30,000-ton-per-year unit at Poloncha in June 1985. The DR product has found a good market in the EAF steel miniplants. SIIL was conducting a research and development program to examine various coal and ore feed proportions and coal and lignite types. As a result, productivity improved 10% and coal consumption was lowered by 0.15 ton per ton of DR iron. Bulk-scale testing of raw materials was under way for Vietnam and several other countries as part of the facility's original research and development function. Research also began on the briquetting of minus 3-millimeter-size fines from the operation. Currently, 10% of the DR iron is minus 3 millimeters and is not marketable.

SIIL was contemplating a 100,000-ton-per-year commercial-scale DR plant in the Bellary-Hospet region of Karnataka. The project would be jointly owned by SIIL, Karnataka State Industrial Investment and Development Corp., and private owners.

Ipitata Sponge Iron Ltd. (IPITATA), a joint venture between Tata Iron and Steel Co. Ltd. and the Industrial Promotion and Investment Corp. of Orissa, started commercial operation of its IPITATA DR iron plant at Joda in Keonjhar District early in 1986. The plant was the first to use an Indian-designed DR process.[12] The plant was designed to produce 90,000 tons per year of 81% to 84% metal lumps with total iron content of 90% to 92%. The plant design allowed for the doubling of capacity with the construction of a second kiln. A third-phase development was the possible addition of a Korf energy-optimizing furnace, continuous caster, and wire rod mill. If the plan were to be executed, IPITATA would be the first integrated steelmaker in India using the DR-EAF process.[13]

Steel consumption in India in FY 1985 was 11.5 million tons, 19% higher than that of FY 1984. The demand for steel was still growing in FY 1986 but at a slower rate because of rising prices. Indian steel production did not meet this demand, and over 1 million tons was imported to fill the gap. Owing to a rather inflexible product mix, India had a surplus of some steel products and had to import to meet a shortage of other steel products.

The major problems faced by the Indian steel industry were a chronic instability in domestic steel demand; inability of the main producers to adjust the product quickly in response to demand changes; old technology, outdated equipment, and high energy consumption; and poor quality of raw materials, particularly coal, which raises the cost and lowers the quality of steel production.

The seventh 5-year plan (1986-90) placed priority on the modernization of the older integrated steel plants. Total funds allocated for the steel sector in the seventh plan were $5 billion against a requirement of $11 billion. Because of the shortage of domestic investment funds, India was trying to obtain foreign assistance for modernizing its steel industry.

The seventh plan called for no new integrated plants, but the capacity expansion, which was a carryover from the sixth plan, was to add about 5 million tons of capacity. The largest allocation in the plan was for the Visakhapatnam steel plant.[14] The steel plant was designed for a 3.4-million-ton-per-year capacity of molten steel. However, because of long delays in construction and high cost increases, a revised project concept has been adopted for implementation of the project at a lower capital cost and within a shorter time frame to improve its economic viability. The first phase of the project was rescheduled for commissioning in December 1988, and plant completion by June 1990. By December 1986, essentially all of the concrete, structural fabrication, equipment ordering, and refractory erection had been completed. Work on the railroad lines both within the plant area and connecting with the raw materials suppliers was well under way. The Yeleru water supply project for supplying 73 million gallons per day was on schedule. Electric power facilities to supply 78% of the 280 megawatts needed by the plant were in various stages of construction. The Andhra Pradesh State Electricity Board was to supply the remaining needs of the plant.

The Government's Public Investment

Board approved only a small part of the $950 million master plan of the planned Dugapur steel plant modernization. These were improvements at the Bolani iron ore mines, the limestone plant, and the ladle repair shop. Negotiations for the consultancy work with British Steel Corp. (Overseas Services) reportedly had come to no decision as of yearend 1986. The captive two-unit 120-megawatt powerplant was already funded and scheduled to go into operation in 1987.

At Rourkela steel plant, the cold-rolling lines for the $13 million silicon steel unit were ready for trials, and production was to begin early in 1987. The first of two 60-megawatt captive power generators began operating in December. The second unit was scheduled for startup in October 1987. Negotiations for modernization and the 500,000-ton-per-year capacity increase at Rourkela were under way with the International Bank for Reconstruction and Development (World Bank) and the Federal Republic of Germany.

The captive power program at Bokaro steel plant was set back by a fire in the No. 1 60-megawatt unit, which had only been in operation 7 months. Recommissioning was scheduled for April 1987. The No. 2 and No. 3 units were due on-line later in 1987 or in 1988. The fire came at a particularly poor time. Electric power to Bokaro had been severely cut during the first part of the fiscal year, causing a virtual shutdown in production. The power situation did not improve until October.

Most of the work toward bringing the Bokaro plant's capacity to 4 million tons per year has been completed or was under way. One of the main new facilities was the $480 million cold-rolling mill No. II. This was a complex of 3 mills and 14 processing lines. The units were scheduled to be commissioned in stages starting in April 1987.

The Tata Iron and Steel Co. Ltd. (TISCO) complex in Jamshedpur, Bihar, was the only privately owned integrated steel plant in India. It was in the middle of its phase-2 modernization program, which was proceeding well. The most important unit, the 300,000-ton-per-year bar and rod mill, was to be commissioned at the end of FY 1986 at a capital cost of $60 million. A sophisticated waste gas recycling plant was completed and a $53 million high-technology coke oven battery was scheduled for completion in January 1988. The second sinter plant, with a capacity of 1.4 million tons per year, was to be commissioned at yearend 1988 at a cost of $69 million. The plant was designed to handle a variety of feed, including the high-grade but difficult-to-handle blue dust ore. The installation of two 30-megawatt generating sets to augment the captive power requirements has been delayed by the equipment manufacturer.

Lead and Zinc.—The public sector Hindustan Zinc Ltd. (HZL) anticipated record-high production of ore, concentrate, and lead and zinc metal for FY 1986, owing mainly to an increased availability of electric power to the company's Rajasthan units. At the Zawar group of mines in Rajasthan, the Mochia Mine began stoping operations below the seventh level in 1985 and continued during 1986. The purpose of lower level development was to control high ground stresses that had been building in the upper levels. The release of stress in the western end of the mine was completed in October 1986 with a controlled blast of 40 tons of explosive to remove the pillars left above the sixth level. The blast accomplished its purpose and released 130,000 tons of ore for production. It was the largest underground blast in HZL's history and was believed to have been the largest ever in India. The company was considering applying the technique to the remainder of the Mochia and Balaria Mines.

Production from the Zawarmala Mine was increased from 600 tons to 700 tons per day during 1986, and plans were under way to gradually step up production to 1,000 tons per day.

The Rajpura-Dariba Mine operators have been working to overcome unexpectedly poor ground conditions and have managed to stabilize the mine. The current cut-and-fill mining method was to be changed to a safer and more productive vertical retreat method of mining.

The Debari zinc smelter improved its output and efficiency with the operation of its new leach residue treatment plant. The new silver flotation and recovery plant also came on-stream, bringing silver production at Debari to a record-high level.

Plans for the development of the Rampura Agucha deposits and Chanderiya smelter in Chittorgarh District were firming up during the year after 5 years of delay. The smelter is to have an annual capacity of 70,000 tons of zinc, 35,000 tons of lead, 235 tons of cadmium, 1,607,537 troy ounces of silver, and 160,000 tons of byproduct sulfuric acid.

The Government sanctioned $17 million for preparation of an environment management plan for the mine, preparation of basic engineering data and firm cost estimates, and the start of work on the Gosunda water supply dam. A test excavation was under way at the deposit for finalizing the design parameters of the ore beneficiation plant. The United Kingdom has offered $118 million in financial aid toward the $177 million cost of the smelter. On completion, the Chanderiya smelter capacity would comprise 47% of India's primary zinc smelter capacity. Construction contracts were to be signed in early 1987 for the smelter furnace and the cadmium recovery section. Other contracts should follow soon afterward.

Manganese.—Manganese Ore India Ltd. (MOIL), the Government-owned company, has been stockpiling manganese ore fines for several years. To utilize the fines, MOIL proposed building a 6,000-ton-per-year ferromanganese facility employing the sophisticated plasma smelting technology. The plan would produce a lower price ferromanganese by saving considerably on energy costs. The plant would not aggravate an overcapacity problem in Indian ferromanganese because of its small size and because it would use raw materials not usable by the other manufacturers. It was also believed that ferromanganese demand would improve by the time the plant was completed in 1989. Other development programs related to mechanization of ore sorting and grading operations were being done manually. In particular, MOIL was seeking a viable separation based on phosphorus, manganese, iron, and silica content.

Deepening of the Holmes shaft at the Balaghat Mine was completed. MOIL also planned to sink a vertical shaft at the Chikla Mine and a main hoisting shaft at the Ukwa Mine.

INDUSTRIAL MINERALS

Cement.—The Indian cement industry closed the year with an installed capacity of 51 million tons per year. Of that total, 2.7 million tons was accounted for by the cement miniplants in the more remote areas of India. The small plants compete economically where transportation costs and poorly developed infrastructure increase delivery expenses from the distant major cement complexes. An additional 35 miniplants with a capacity of about 1.0 million tons were under construction.

The rapid growth of the miniplants did not hinder the work of expanding the overall cement industry. The 3,200-ton-per-day plant for Jaypee Rewa Cement Ltd. in Rewa District of Madhya Pradesh was commissioned during 1986. An 1,800-ton-per-day unit was completed at Ambujanagar in Gujarat for Ambuja Cements Pvt. Ltd. Gwalior Rayon Corp. Ltd. commissioned a second production line at its Vicram cement plant 150 kilometers northwest of Indor in Madhya Pradesh. This was an 1,800-ton-per-day unit with dry-process technology designed to use low-grade local Indian coal. Priyadarshini Cement Ltd. began production at its 1,500-ton-per-day plant in Nalgonda District, Andhra Pradesh. Modi Cement Ltd. commissioned a 3,000-ton-per-day plant at Bhatapara in Madhya Pradesh. Cement Corp. of India completed a 3,000-ton-per-day plant at Tandur in Andhra Pradesh. Vasavdatta Cement Co.'s 1,800-ton-per-day plant in Gulbarga District of Karnataka was completed by yearend. Two plant expansions were completed, a 3,200-ton-per-day expansion for Avarpur Cement Ltd. in Chanda and Raymond Cement Works Ltd.'s plant in Bilaspur, from 1,500 tons per day to 3,850 tons.

The following companies had plants under construction during the year: Chettinad Cement Corp. in Karur, Tamil Nadu; J. K. Cement Ltd. in Nimbahera, Rajasthan; Dalmia Cement Ltd. in Dalmiapuram, Tamil Nadu, and Rajgangpur, Orissa; Birla cement works in Chittorgarh, Rajasthan; Andhra Cement Co. in Durga, Andhra Pradesh; Madras Cement Co. in Jayanthipuram, Tamil Nadu; Cement Corp. of Gujarat in Morasa, Gujarat; and Udaipur cement works in Udaipur, Rajasthan.[15]

Several other expansions or modernizations were also under way, which are to continue the rapid growth of the cement industry through the end of the decade.

Dolomite and Limestone.—NMDC has been given the task of developing a dolomite deposit to supply blast-furnace-grade material to the Visakhapatnam steel plant. The government of Madhya Pradesh rejected NMDC's application for a mining lease for the Machkot dolomite deposit in Bastar District. A suitable alternative dolomite deposit was identified by NMDC at Kotmi-Sonar in Bilaspur District of Madhya Pradesh, and a mining lease was granted. Detailed exploration of the deposits was under way, and efforts were being made to develop the deposit so that deliveries could be started by the time the steel plant is

commissioned.

Fertilizer Materials.—The Government attached great importance to the development of the fertilizer industry. The Department of Fertilizers under the Ministry of Agriculture was responsible for this critical segment of industry in a country most of whose population was still directly dependent on subsistence farming or small-farm agriculture for their livelihood.

The fertilizer industry made some excellent progress during the year. Effective nitrogen capacity increased 868,000 tons, and effective phosphorus pentoxide (P_2O_5) capacity increased 367,000 tons. The capacity utilization increased from 72% in 1985 to 79% for nitrogen plants but declined from 87% to 80% for P_2O_5. The nitrogen increase was due to better raw materials availability, improvement in the infrastructure supporting the industry, and a growing sophistication achieved by management and workers in operating and maintaining the high technology equipment inherent in the industry. Many innovations and small improvements were being made, and though small by themselves, were contributing to the overall improvement.

The decline in P_2O_5 capacity utilization was due to changes in market conditions, price discounting for diammonium phosphate (DAP), and a surplus of phosphate imports. If seven nitrogen plants were excluded that were considered by the industry as developmental in nature and whose production had not stabilized, the capacity utilization for nitrogen went up to 89%. Similarly, if two triple-superphosphate plants were excluded that have never gone into commercial production, capacity utilization would improve to 93%. The Government considered the above utilization as quite gratifying for an industry with a capacity of nearly 9 million tons of nutrients, using a variety of feedstocks at diverse locations with many ownership patterns and a wide range of technology and equipment that spanned a quarter of a century.

Specific developments included the start of commercial nitrogen production at Krishak Bharati Cooperative Ltd.'s plant at Hazira in Gujarat State. Thal-Vaishet, which started operating in 1985, and Hazira were the first units of the 10 new nitrogenous plants to be established based on natural gas from the Bombay High and Bassien Fields off the western coast of India. Thal-Vaishet and Hazira each have two complete production lines for ammonia and urea. Of the remaining six plants, three were in advanced stages of construction at Bijaipur, Madhya Pradesh; Aonla, Uttar Pradesh; and Jagdishpur, Uttar Pradesh. They were expected to be completed by December 1987, April 1988, and July 1988, respectively. The remaining three at Sawai Madhopur, Rajasthan; Babrala, Uttar Pradesh; and Shahjahanpur, Uttar Pradesh, were in earlier stages of construction and were scheduled for completion in 1990. Each of the six gas-based plants was to have a capacity of 1,350 tons per day of ammonia and a matching urea capacity. The location of the plants was decided on the basis of a major consumption area for their products. A study of the economics indicated that the cost of transportation of finished fertilizer from coastal plants would be lower with a gas pipeline network.

Paradeep Phosphates Ltd. in Paradeep, Orissa, commissioned a 720,000-ton-per-year DAP plant in February 1986; the sulfuric acid and phosphoric acid units at the new plant were scheduled for completion in 1988. Hindustan Lever Ltd. commissioned a 71,000-ton-per-year single-superphosphate plant at Haldia, West Bengal.

Total installed capacity for nitrogen content of ammonia stood at 6.76 million tons from 42 operating units at the end of FY 1986. Of this, more than 1.30 million tons was contained in plants listed by the Government as chronically inefficient producers. The major inefficient producers were SAIL's Rourkela plant in Orissa, Hindustan Fertilizers Corp. Ltd.'s Barauni plant in Bihar, and Fertilizer Corp. of India Ltd.'s plants at Ramagundam in Andhra Pradesh and Talcher in Orissa. The latter two plants were the country's only coal-based nitrogen fertilizer plants. Neither has worked well from the start. Design deficiencies and equipment breakdowns have plagued the plants constantly. Electric power failures at Talcher exacerbated the already formidable problems. A West German technical consultant surveyed both plants and made recommendations for extensive and expensive additions and replacements, in effect nearly rebuilding the plants.

With the two new phosphate plants, total annual capacity of P_2O_5 from 16 major plants totaled just over 2 million tons. In addition, about 50 small-scale units contributed to the above capacity by producing single superphosphate for consumption in their immediate plant areas. Six new phosphate fertilizer plants were in various

stages of construction at yearend, including the Paradeep phase-2 plant in Paradeep, Orissa; Mangalore Chemicals & Fertilizer Ltd.'s plant expansion in Mangalore, Karnataka; Gujarat State Fertilizer Co. Ltd.'s plant in Sikka, Gujarat; the Godavari plant in Kakinada, Andhra Pradesh; the Tuticorin DAP plant (retrofitting) in Tuticorin, Tamil Nadu; and the Bharuch plant in Bharuch, Gajarat.

The Mussoorie phosphate deposits near Dehradun contained reserves of 45 million tons of 16% to 18% P_2O_5. The phosphate rock was mined, upgraded to 20% to 24% P_2O_5, and then powdered for direct application as a source of P_2O_5 in acidic soils. Production increased from 81,000 tons in 1985 to 102,000 tons in 1986. Plans were under way for the expansion of capacity to 200,000 tons per year.

The public sector National Chemicals and Fertilizer Ltd. in Bombay reported the development of ammonium polyphosphate (APP) in granular form. The APP was formerly available only in a liquid suspension from an overseas producer. The granular form avoids transport and other handling problems. The company claimed the development was solely from indigenous equipment and technology.

The Government's Planning Commission consultants working on the strategy for the eighth 5-year plan period (FY 1990-95) suggested a radical shift in fertilizer procurement policy. Their findings were that the cost of domestically produced fertilizer was much higher than that of imported material and, more importantly, that this cost differential was going to continue because the capital investment requirements and input costs in India were higher than those in other countries. Their recommendations, therefore, were to build no new phosphate fertilizer plants and only four or five 1,350-ton-per-day nitrogenous plants during the eighth plan period. This level of new construction would account for 30% of the projected 5.2-million-ton nitrogen deficit at the end of the eighth plan period. The recommended new construction would be only as a safeguard against world prices shifting up to unreasonable levels. The remaining needs would be satisfied by imports.[16]

Gem Stones.—The country's first diamond exchange was established in Bombay in 1985 by Government-owned MMTC and private diamond traders. MMTC also planned to establish a 100% export-oriented unit for cutting and polishing diamonds.

Domestic production of diamonds from Panna Diamond Mines Ltd. met about 1% of the diamond processors' requirements. The remainder were imported, reaching 34 million carats in FY 1985 and 39 million carats in FY 1986. After cutting and processing, the diamonds were exported—5.4 million carats in FY 1985 and 7.5 million carats in FY 1986. The volume made India the largest processor of rough diamonds in the world and the largest exporter of polished stones in terms of carats.

Strong steps have been taken by Indian entrepreneurs to improve the quality and productivity and to modernize the gem stone and jewelry export production sector. They have set up a number of Indian diamond cutting units equipped to process sawn and sawable varieties of diamonds. Although low-value diamonds continued to form the bulk of India's exports, a steady revamp of the industry has been taking place toward producing stones of better quality, larger size, and more unusual shapes.

All machinery, tools, spare parts, and consumables needed by the gem stone and jewelry industry are now on Open General License and can be imported on very reasonable rates of customs duty. This, combined with policy changes to promote exports of gold and silver jewelry, should enable a larger proportion of precious and semiprecious stones to be mounted in India and exported as much higher value-added finished jewelry. The diamond and jewelry trade was not only good for earning foreign exchange, it was also a significant factor in the local economy of the three major centers of Bombay, Navsari, and Surat, where it employed a total of 400,000 workers.

The sales subsidiary of Australia's Argyle Diamond Sales Ltd. diamond field was considering setting up a sales office in India to secure direct sales to the Indian manufacturers. India has been trying to arrange direct diamond sales with various diamond-producing countries for several years.

Mica.—Mica Trading Corp.'s (MITCO) mica paper plant at Abrakhnagar near Jhumritelaiya in Bihar was inaugurated in June 1986. The plant was built with technical collaboration of Nippon Rika Kogyosho Co. Ltd. of Japan at a cost of $5 million. It is designed to produce 610 tons of mica paper per year by the mechanical disintegration process. The plant was still stabilizing its

production line in October. MITCO was also setting up a second unit for manufacturing mica paper based on thermochemical and calcination processes with technical collaboration from the same firm.

MINERAL FUELS

Coal.—Coal production topped the previous year's output for the ninth consecutive year as the country continued to push the use of its domestically most abundant fuel. Persistent exploration efforts by GSI have added new reserves faster than the present rate of production. The new finds totaled 3.9 billion tons in six States. The largest new find was an estimated 1.6 billion tons in several seams to a depth of 1,200 meters in the Mulag coal belt of the Godavari Coalfield, Andhra Pradesh. A reserve of 475 million tons was reported in the Kulda-Manoharpur-Gopalpur sector of the If River Coalfields, and another 450 million tons in the Chendipada-Bada-Telesingha sector of the Talchir Coalfields in Orissa. Five established coalfields in Madhya Pradesh added a total of 636 million tons, and the Raniganj Fields in West Bengal added 437 million tons.

The reserves' increases came at a time when demand curves were climbing at increasingly steep slopes. Spurred by India's growing electric power needs, coal consumption has been expanding at up to 9% annually. It was forecast by the Government to increase to an annual rate of 12% in the 1990's. Coal provides 65% of the energy consumed by industry and powerplants. Coal used for electric power generation was predicted to triple through the next two decades.

These were a number of development projects being planned, designed, or under way, some by CIL, the Government-owned coal company, and some with foreign technological and financial assistance. These included Australia, Canada, France, the German Democratic Republic, Poland, the U.S.S.R., and the United Kingdom.

CIL was considering adopting Canadian hydraulic mining technology and financing to expand its Rajmajal Mine. The program called for raising the present 4-million-ton-per-year capacity to 10 million tons per year.

The Soviet Union has been providing assistance to India since the 1960's and was involved in about 15 projects with a combined capacity of 75 million tons. One of these projects was the Jhanjra underground mine in Burwan District, West Bengal, where two shafts were being s ak to 280 meters. The planned output was 3.5 million tons per year from nine longwall faces in a coal reserve estimated at 244 million tons. The first two faces were scheduled for an October 1987 startup. India's biggest coal project with a capacity of 14 million tons per year was to be set up at Nigahi in the Singrauli Coalfield straddling the Uttar and Madhya Pradesh border. The U.S.S.R. has been requested to prepare the project report and operational plans. Initial output would be 4.5 million tons per year and be dedicated to the Vindhyachal super thermal powerplant. The U.S.S.R. was also involved in the development of the Sitanla underground mine and open pits at Khadia (10 million tons), Kumari, Mohar (10 million tons), and Makunda. The capacities of the Jitanla, Kimari, and Makunda Mines were not reported.

India reportedly reached an agreement in principle with the United Kingdom on the development of a 2-million-ton-per-year mine at Ghusick in West Bengal.

In addition to bilateral aid, the World Bank was approached for a loan to expand the Gevra open pit in the Korba Coalfield from 5 million to 10 million tons per year and to build the 3-million-ton-per-year Sonepur-Bazari Mine in Raniganj Coalfield.[17]

Lignite.—Expansion of the Neyveli lignite mine in Tamil Nadu continued as work on the second 210-megawatt unit of the second pitside powerplant, Neyveli II, was scheduled for completion by mid-1987. The first unit was commissioned late in 1985. The Neyveli II plant is to have an ultimate capacity of 630 megawatts and use 4.7 million tons of lignite per year. The Neyveli I powerplant has been the major thermal electric powerplant in Tamil Nadu for nearly three decades. The Neyveli Mine is reportedly the largest open pit mine in Asia. To develop the additional lignite mining capacity at the mine, Neyveli Lignite Corp. Ltd. (NLC) ordered four giant new bucket-wheel excavators from Krupp Industrietechnik of Duisburg in the Federal Republic of Germany. Each unit weights 1,500 tons and has a capacity of 1,100 bank cubic meters per hour. Because of pockets of hard sandstone in the overburden, the units were to be especially modified and have very high cutting power. Krupp has already supplied four bucket-wheel excavators, two traveling-boom conveyors, and five boom stackers. Three additional traveling-boom con-

veyors were under construction. Most of the ancillary equipment was also supplied by Krupp.[18]

Several deposits of lignite have been reported in Rajasthan by GSI in the last few years. There was a question of jurisdication over exploiting the deposits. The Union Planning Commission, NLC, and the Tamil Nadu government decided that NLC would be given the mandate to mine a 50-million-ton deposit in the Bikaner District. Plans were made for a 1.5-million-ton-per-year mine that would feed a 220-megawatt pithead thermal powerplant.

Natural Gas.—Construction of the Hazira-Bijaipur-Jagdishpur gas pipeline was progressing well during 1986. By the end of FY 1986, construction was nearly complete to Bijaipur, the first stop on the 1,700-kilometer pipeline network, which was designed to carry 640 million cubic feet per day in its first stage. The pipeline is to service a nitrogen fertilizer plant at Bijaipur and continue into northern India to serve five additional fertilizer plants and thermal powerplants at Anta, Rajasthan; Aurairva, Uttar Pradash; and Kawas, Gujarat. When the complete system is operational, consumption of natural gas in India is to nearly double. More importantly, it will cut down on the high proportion of wasted gas. In 1986, about one-half of the gas was flared.

The Oil & Natural Gas Commission (ONGC) has prepared a plan for the development of the offshore Tapti Gasfield off the west coast. The field would produce 100 million cubic feet per day with a development cost of $470 million.

Exploration in the Tripura Basin in eastern India has discovered gas in three geological structures—the Baramura, Gojalia, and Rokhia Domes. Most recently, a 4-million-cubic-foot-per-day flow was tested in a well 15 kilometers east of Agartala. Commercial development of the Tripura Basin would be of considerable benefit to the economy of this remote area.[19]

Gas discoveries were reported at yearend at Manheratibba and Ghotaru, both in Rajasthan. The discoveries were described in the press as major, but no further details were announced.

Petroleum.—Because of the persistent power shortages throughout much of India, many industries were being compelled to set up diesel generating sets to meet their power requirements. This resulted in an increased demand for petroleum products. Consumption increased an average of 5.3% per year during the 1980-85 plan period. The 1985-90 plan period projected a growth of 6.4%, but current estimates suggest an actual growth of about 7%. This resulted in the Government putting its highest priority on seeking additional reserves of crude oil. These efforts have had limited success, and the new discoveries have yielded more gas than oil.

India's oil industry was Government-controlled through public sector companies. ONGC and Oil India Ltd. (OIL) were engaged in oil and gas exploration and production. Crude oil processing and marketing were done by seven additional, mostly publicly owned, refining companies, two having foreign participation. These were Madras Refineries Ltd., which has 1.7% equity participation by the National Iranian Oil Co., and Cochin Refineries Ltd., with U.S.-based Phillips Petroleum Co. holding 26.43% equity. The Government was considering acquiring Phillips' share following Phillips' recent decision to sell off its holding.

ONGC continued with a vigorous exploration program, covering over 15,000 line-kilometers of onshore and 13,000 line-kilometers of offshore seismic survey in 1986. The company operated 101 drilling rigs and reported 10 oil and gas discoveries.

OIL, the smaller of the two companies, concentrated its exploration in Assam, Arunachal Pradesh, and off the coast of the Andaman Islands. Twenty-four wells were completed in the northeast, and three were drilled off the Andaman Islands. One-half of the onshore wells tested at least some oil.

To accelerate its exploration program, the Government offered 27 offshore exploration blocks to foreign oil companies in 1968 on a production-sharing basis. Despite a slump in the international oil industry, 7 companies, 3 from the United States, submitted initial bids on 9 of the 27 blocks offered. This was considered a very favorable response, considering that the first offer in 1980 elicited one contract and the second offer in 1982 drew no final bids. In November 1986, the Government concluded an agreement with a Soviet group for an integrated onshore exploration program in West Bengal. India was also encouraging its private sector to venture into oil drilling under contract to ONGC or OIL. Four joint venture proposals were approved in 1986.

The most promising discovery of the last few years has been the Gandhar Oilfield in Cambay Basin, 200 kilometers southwest of

Ahmedabad, Gujarat. Oil was struck in November 1983, and 14 additional wells have revealed oil. Reserves of 700 million barrels were estimated so far, and ONGC proposed an expenditure of $266 million to develop the first phase of this field, which is to entail drilling 36 more wells by 1991.

Indian oil companies have completed technological modifications on refineries in Cochin, Madras, and Visakhapatnam that allow all Indian crude oil to be refined domestically. With these changes, India's refining capacity was 337 million barrels per year, or approximately 910,000 barrels per day.

Government long-term projections estimate demand for petroleum products at 518 million barrels per year by 1995 and 651 million barrels per year by the end of the century. Refinery development programs have been advanced that will increase capacity considerably. Whether the new capacity can keep up with demand will depend primarily on funding availability. The program calls for two additional refineries of 6 million tons each, one in Karnal, Haryana, and one in Mangalore, Karnataka. Of the two, only the Karnal project has received final Government approval. Each of the new plants was estimated to cost well over $1 billion and was to have both public and private sector participation. Another refinery of unspecified capacity was also planned for Assam in the joint sector.

Other development projects included the expansion of refineries in Koyali, Gujarat, and Mathura, Uttar Pradesh. Also, Guwahati and Digboi refineries in Assam were slated for modernization and marginal expansion. The Government crude oil storage capacity requirement of 30 days was raised to 45 days. Accordingly, the refining companies were constructing 45 million barrels of additional storage capacity.[20]

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[1]Physical scientist, Division of International Minerals.
[2]The Indian fiscal year begins on Apr. 1 of the year stated.
[3]Government of India, Ministry of Steel and Mines. Annual Report 1986-87: Department of Mines. P. 3.
[4]Mining Journal. V. 308, No. 7908, Mar. 13, 1987, p. 203.
[5]Where necessary, values have been converted from Indian rupees (Rs) to U.S. dollars at the rate of Rs12.611=US$1.00.
[6]U.S. Embassy, New Delhi, India. State Dep. Airgram A-14, Apr. 28, 1987, p. 5.
[7]Engineering and Mining Journal. V. 188, No. 5, May 1987, p. 38.
[8]Metal Bulletin (London). No. 7161, Feb. 17, 1987, p. 13.
[9]U.S. Embassy, New Delhi, India. Telegram 05159, R271241Z, Feb. 1987.
[10]The Tex Report. V. 19, No. 4416, Apr. 13, 1987.
[11]Page 63 of work cited in footnote 3.
[12]Metal Bulletin (London). No. 7126, Nov. 10, 1986, p. 26.
[13]Minerals & Metals Review (Bombay). V. 12, No. 5, May 1986, p. 9.
[14]Page 54 of work cited in footnote 3.
[15]Rock Products. V. 90, No. 4, Apr. 1987, p. 58.
[16]Chemical Industry News. V. 32, No. 2, June 1987, p. 74.
[17]International Mining. V. 3, No. 10, Oct. 1986, p. 60.
[18]Indian Mining and Engineering Journal. V. 25, No. 12, Dec. 1986, p. 51.
[19]U.S. Embassy, New Delhi, India. State Dep. Airgram A-24, June 24, 1984, p. 9.
[20]Page 1 of work cited in footnote 19.

The Mineral Industry of Indonesia

By John C. Wu[1]

Indonesia was the world's largest producer of liquefied natural gas (LNG), the 4th largest producer of tin, the 5th largest producer of nickel, and the 12th largest producer of crude oil. Indonesia remained a significant producer of primary aluminum, bauxite, cement, coal, copper concentrate, and nitrogen fertilizer in the Far East.

Despite a slight increase in the output of crude oil and tin, the sharp decline in values of output and export earnings of oil, gas, and tin caused by the collapse of oil and tin prices in the world markets resulted in a considerable reduction in the contribution of the mineral industry to the Indonesian economy. In an effort to offset the declining contribution of the mineral industry to Indonesia's gross domestic product (GDP) and export earnings, the Government took steps to broaden export-oriented industries by liberalizing imports of raw materials used by the export-oriented industries and promoting non-oil exports by devaluating the Indonesian rupiah. In addition, more attractive fiscal incentives were offered to direct foreign investment, especially in the export-oriented sector.

The mineral fuels sector remained the dominant force in Indonesia's mineral industry. Production of crude petroleum and coal increased slightly while the output of natural gas remained steady. As a result of the sharp drop in the world's oil prices, oil and gas exploration activity, in terms of the area of seismic profiling, the number of exploratory wells drilled, and the amount of exploration expenditures, slowed down further in Indonesia. However, about 19 significant oil and gas deposits were discovered in the Malacca Strait, in offshore East Kalimantan, offshore Irian Jaya, offshore northwestern Java, and in onshore Sumatra. The country's first floating production, storage, and offloading (FPSO) system was brought into production by Marathon Petroleum Indonesia (MPI) of the United States offshore South China Sea. Coal production reached another record-high level but was below the Government target production because of further delays in completing an expansion project at the Bukit Asam Mine in South Sumatra.

In the metallic minerals sector, mining of tin onshore and offshore Bangka Island by the state-owned P.T. Tambang Timah (P.T. Timah) increased because of the Government's effort to reduce production costs. However, tin mining by foreign contractors was cut back substantially because of the drastic decline in tin prices. P.T. Riau Tin Mining ceased tin mining offshore Sumatra. Mining of copper at the Ertsberg Mine by Freeport Indonesia Inc. (FI) of the United States reached another record-high level despite the low prices of copper. The copper ore reserves at the mining area increased to 62.8 million tons from 39.6 million tons in 1985. The average ore grade was estimated at 2.3% copper. Mining of nickel ore in Pomalaa and on Gebe Island by the state-owned P.T. Aneka Tambang (P.T. Antam) and in Soroako by P.T. International Nickel Indonesia (P.T. Inco) rose considerably because of increased exports to Japan. A new gold mine was brought into production by P.T. Lusang Mining of Australia near Bengkulu in South Sumatra. Because of increased gold prices in the world markets, gold exploration and development had intensified in Sumatra and Kalimantan. In 1986, 34 new contracts were awarded by Indonesia to foreign companies from Australia, the United Kingdom, and the United States, and several important discover-

ies were made in Central Kalimantan and North Sumatra.

In the industrial minerals sector, the output of cement increased slightly, but continued expansion of the cement production capacity was postponed because of the slowdown in the construction industry resulting from cutbacks in the Government's expenditures for industrial development projects. Production of fertilizer materials suffered a setback owing to a sharp decline in world prices of urea. Two high-cost old urea plants were scrapped. As a result, the country's urea production capacity was reduced by 145,000 tons per year to 4.37 million tons per year in 1986. However, the third unit of the 200,000-ton-per-year ammonium sulfate plant was brought on-stream by P.T. Petrokimia Gresik in East Java. Exploration for diamonds in Indonesia by foreign companies from Australia and the United Kingdom showed encouraging results from the Cempaka area of southeastern Kalimantan and the Pujon area of Central Kalimantan.

In the mineral processing sector, production of primary aluminum by P.T. Indonesia Asahan Aluminum (IN-ALUM) at Kuala Tanjung in North Sumatra increased. Despite increased sales and exports to Japan, INALUM suffered losses of more than $59 million[2] owing to low prices of aluminum in the world market and increased interest costs of a Japanese yen loan because of the appreciation of the Japanese yen. On the other hand, iron and steel production by state-owned P.T. Krakatau Steel continued its upward trend owing to increased exports resulting from devaluation of the rupiah against the U.S. dollar, which made Indonesian steel products more competitive in the world market. In October, a 300,000-ton-per-year methanol plant, Indonesia's first, was brought on-stream on Bunyu Island in East Kalimantan, and the sixth LNG train at Arun, Aceh, North Sumatra, began production and started delivery of LNG to the Republic of Korea. Indonesia planned to construct two liquefied petroleum gas (LPG) plants in the Bontang area of East Kalimantan and in Arun, Aceh, North Sumatra, to produce LPG for export to Japan at the rate of 1.95 million tons per year for 10 years beginning in July 1988.

Indonesia's economy, as measured by the change in real GDP, was estimated to have a zero growth rate compared with a positive growth of 1.9% in 1985.[3] Slack domestic demand and sharply reduced export earnings from the oil and gas industry were the main cause of stagnation in the Indonesian economy. Indonesia's GDP in current dollars was estimated at $76,174 million in 1986. The inflation rate, as measured by the change in the Consumer Price Index, rose to 9.2% compared with 4.4% in 1985.

Because of a 44% drop in export earnings for oil and gas, Indonesia's export earnings in fiscal year 1986 declined 27% to $13.5 billion while imports declined only slightly to $11.2 billion. In an effort to cut imports and boost exports, Indonesia devaluated its rupiah against the U.S. dollar by 31% in September while abolishing the system of quotas for imports of 165 commodities. However, nontariff protection was retained on 152 items including car components, electronics, foodstuffs, plastic, and steel. Import tariffs were abolished on 59 items, and the rate reduced up to 40% on 94 products for consumption mainly by the export-oriented industries.[4]

PRODUCTION

Despite the lower prices of mineral commodities in the world markets, most of Indonesia's major minerals production increased slightly. However, the sharp drop in the world prices of oil and tin resulted in reduced export earnings of the oil and tin industries, in a cutback of expansion, and in closing down high-cost operating units.

The mineral fuels sector continued to dominate the mineral industry. The output of crude petroleum and coal increased slightly while production of natural gas remained at essentially the same level as that of 1985. The slight increase in crude oil production was due to relaxation of production quota by the Organization of Petroleum Exporting Countries (OPEC) during the first 8 months of 1986. However, coal production was still below the Government target production of 3 million tons. In downstream processing of natural gas, the sixth LNG processing plant in Aceh, North Sumatra, and the country's first methanol processing plant on Bunyu Island, East Kalimantan, were brought on-stream in late 1986. Production of LNG was at full capacity.

In the metallic minerals sector, production of bauxite was at a lower level because of reduced exports to Japan while primary

aluminum production rose to near capacity despite the lower prices of primary aluminum in the world market. Production of copper concentrate from the Ertsberg Mine on Irian Jaya reached a new record-high level while gold production also rose considerably as the new gold mine, operated by P.T. Lusang, came on-stream near Bengkulu in South Sumatra. Because of Government policy, tin production increased slightly despite a drastic decline in tin prices. Production of nickel ore from Pomalaa in South Sulawesi and on Gebe Island increased substantially while production of nickel matte by P.T. Inco from its Soroako complex in South Sulawesi also increased owing to increased shipments to Japan.

In the industrial minerals sector, production of cement increased because of increased exports to Bangladesh. As a result of a slowdown in Indonesia's construction industry, new investments in cement plants and facilities were postponed. Production of fertilizer materials remained at about the same level as that of 1985. However, the annual production capacity of urea had been cut back from 4.52 million tons in 1985 to 4.37 million tons because of the lower world market prices of urea. However, the annual capacity of ammonium sulfate had been raised to 650,000 tons from 450,000 tons in 1985.

Table 1.—Indonesia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
METALS					
Aluminum:					
Bauxite, gross weight ----- thousand tons	700	778	1,003	830	650
Metal, primary ----------	32,532	114,766	198,960	216,820	218,772
Copper, mine output, Cu content ----------	75,116	78,608	82,509	88,724	95,880
Gold, mine output, Au content[2] --- troy ounces	71,878	76,888	78,677	83,688	102,942
Iron and steel:					
Iron sand, dry basis ----------	144,493	132,887	82,997	130,930	153,271
Metal:					
Ferroalloys, ferronickel ----------	21,501	20,708	22,774	23,789	22,554
Steel, crude ----------	500,000	800,000	1,000,000	1,200,000	1,500,000
Manganese ore ----------	17,894	8,318	12,267	33,295	1,424
Nickel:					
Mine output, Ni content[3] ----------	45,882	49,378	47,604	40,336	52,669
Metallurgical products:					
Matte: Ni content ----------	13,748	18,288	22,815	24,946	28,123
Ferronickel: Ni content ----------	5,010	4,855	4,826	4,802	4,518
Silver, mine output, Ag content thousand troy ounces	1,134	1,135	1,121	1,175	1,369
Tin:					
Mine output, Sn content ----------	33,806	26,554	23,223	21,759	24,049
Metal ----------	29,755	28,390	22,467	20,909	22,080
INDUSTRIAL MINERALS					
Asbestos[e] ----------	25,000	25,000	25,000	25,000	25,000
Cement, hydraulic ---------- thousand tons	7,501	8,187	[r]8,907	10,081	10,941
Clays:					
Bentonite ----------	7,798	10,006	12,505	6,659	[e]10,000
Kaolin powder ----------	77,207	59,628	83,414	106,869	124,937
Diamond:[e]					
Industrial stones ------- thousand carats	12	22	22	22	22
Gem ---------- do	3	5	5	5	6
Total ---------- do	15	27	27	27	28
Iodine ---------- kilograms	28,920	25,297	24,970	13,416	5,790
Nitrogen: N content of ammonia ----------	1,027,600	1,150,400	1,658,200	2,054,800	2,100,000
Phosphate rock ----------	5,031	5,573	1,917	525	601
Salt, all types ---------- thousand tons	1,258	618	370	[e]600	[e]600
Stone:					
Granite ---------- do	2,130	2,405	1,583	1,421	1,240
Limestone[4] ---------- do	11,002	12,073	11,314	11,770	12,784
Marble ---------- square meters	28,970	24,374	16,108	9,699	3,530
Quartz ----------	977,289	372,216	541,827	682,125	[e]650,000
Sulfur, elemental[5] ----------	1,144	2,769	4,999	4,023	[e]4,000
MINERAL FUELS AND RELATED MATERIALS					
Asphalt rock, natural ----------	330,842	533,188	471,239	450,633	242,055
Coal ---------- thousand tons	588	648	[r]1,468	1,942	2,405
Gas, natural:					
Gross ---------- million cubic feet	1,111,928	1,186,362	1,521,450	1,580,012	1,628,920
Marketed ---------- do	926,150	1,032,321	1,386,051	1,148,628	1,113,286

See footnotes at end of table.

Table 1.—Indonesia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum:					
Crude including field condensate thousand 42-gallon barrels	488,189	490,483	516,990	483,768	507,228
Refinery products:					
Gasoline do	13,385	12,980	21,879	23,619	28,119
Jet fuel do	8	2,760	4,923	3,845	1,631
Kerosene do	18,947	31,669	39,141	38,383	43,043
Distillate fuel oil do	14,714	37,522	43,935	50,060	73,490
Residual fuel oil do	14,131	66,596	67,160	19,006	30,221
Lubricants do	525	487	93	1,263	1,574
Liquefied petroleum gas do	373	471	674	2,101	2,787
Paraffin wax do	103	76	32	79	116
Naphtha do	465	19,074	14,736	17,148	17,306
Unfinished oils requiring further processing do	26,355	2,405	1,032	25,710	22,621
Unspecified do	5,623	5,657	3,678	24,150	2,533
Refinery fuel and losses do	4,654	5,169	2,251	8,527	10,004
Total do	99,283	184,866	199,534	213,891	233,445

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

[1]Table includes data available through Aug. 4, 1987.

[2]Includes Au content of copper ore and output by Government-controlled operations. Gold output by operators of so-called People's mines is not available but may be as much as 30,000 troy ounces per year.

[3]Includes a small amount of cobalt that is not recovered separately.

[4]Data represent limestone used for cement production. Excludes considerable amounts of limestone produced by enterprises under local jurisdictions for building materials, for crushed rock to be used as aggregate, and to burn for lime.

[5]Sulfur produced by other than the Frasch process.

TRADE

According to Indonesia's Department of Finance, the country's merchandise trade surplus shrank to $2.3 billion in fiscal year 1986 from $6.1 billion in fiscal year 1985. During the 2 fiscal years, total merchandise exports dropped to $13.5 billion from $18.6 billion while imports decreased slightly to $11.2 billion from $12.6 billion. The significant drop in export earnings was due to a 44% decline in export earnings from oil and gas resulting from the sharply reduced world prices of oil and gas in 1986. The percentage share of oil and gas in Indonesia's export earnings dropped to 51% from 67% in fiscal year 1985.

During the year, exports of mineral fuel commodities included 377 million barrels of crude oil and refined petroleum products valued at $5.3 billion, 15.3 million tons of LNG valued at $2.9 billion, and 1 million tons of coal valued at $32 million. Export earnings from bauxite, copper concentrate, granite, nickel ore, tin ore, and other minerals were estimated at $221 million while export earnings from primary aluminum, cement, fertilizer, nickel sulfate matte, and tin were estimated at $655 million. Imports of major industrial materials and capital goods including chemical products, electrical equipment, machinery, and transport equipment were estimated at $5.4 billion, accounting for 48% of total imports. Indonesia also imported about $2.2 billion of crude petroleum and refined petroleum products, and other mineral and metal products. In 1986, Indonesian exports to the United States were valued at $3.3 billion, accounting for 19.5% of Indonesia's total exports, while imports from the United States were valued at $910 million, accounting for 13.3% of Indonesia's total imports.[5]

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	944,332	631,763	--	All to Japan.
Oxides and hydroxides	--	2,803	--	Do.
Metal including alloys:				
Scrap	433	19	--	Do.
Unwrought	135,017	238,708	4	Japan 199,001; China 24,052.
Semimanufactures	2,297	534	--	Singapore 223; Hong Kong 175; United Kingdom 58.
Copper:				
Ore and concentrate	188,428	204,421	--	All to Japan.
Metal including alloys, all forms	473	405	--	Singapore 261; Japan 77; Thailand 37.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	--	12,000	--	All to Japan.
Metal:				
Scrap	962	484	--	All to Singapore.
Pig iron, cast iron, related materials	69,557	86,542	--	India 42,196; Japan 39,345.
Steel, primary forms	20,098	19,921	3,354	Malaysia 8,336; Japan 4,994; Thailand 2,040.
Semimanufactures:				
Bars, rods, angles, shapes, sections	10,365	94,889	16,729	China 45,636; Hong Kong 17,321; Philippines 14,937.
Tubes, pipes, fittings	268	898	--	All to Singapore.
Lead:				
Ore and concentrate	850	485	--	All to Japan.
Metal including alloys, semimanufactures	1,254	442	--	Japan 284; Singapore 84; Taiwan 63.
Manganese: Ore and concentrate[2]	26,260	30,665	--	All to Taiwan.
Nickel:				
Ore and concentrate	579,284	626,745	--	All to Japan.
Matte and speiss	49,848	54,004	--	Japan 43,660; Netherlands 10,344.
Tin:				
Ore and concentrate	2,789	3,240	--	Malaysia 3,182.
Metal including alloys:				
Scrap	70	--		
Unwrought	22,568	21,104	--	Singapore 13,287; Netherlands 3,857.
Semimanufactures	63	50	--	All to Singapore.
Zinc:				
Ore and concentrate	933	1,565	--	All to Japan.
Oxides	35	--		
Metal including alloys:				
Scrap	682	599	--	Singapore 257; Taiwan 175; Japan 166.
Semimanufactures	123	10	--	All to Japan.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1,128	2,802	--	Hong Kong 2,310.
Grinding and polishing wheels and stones	317	79	--	All to Hong Kong.
Barite and witherite	762	3,591	--	New Zealand 2,000; Singapore 1,284.
Cement	389,800	870,931	--	Bangladesh 486,692; Singapore 196,140; Sri Lanka 107,284.
Clays, crude:				
Bentonite	5,184	3,009	--	Brunei 1,200; Singapore 914; Bangladesh 800.
Kaolin	10,921	34,908	--	Taiwan 19,050; Japan 14,786.
Unspecified	210	199	--	Singapore 194.
Fertilizer materials: Manufactured:				
Ammonia	178,555	220,250	--	India 73,920; Philippines 69,862; Taiwan 42,234.
Nitrogenous	217,908	684,504	--	Malaysia 186,405; China 151,911; Philippines 116,398.
Phosphatic	44,401	--		
Gypsum and plaster	--	1,839	--	All to Philippines.
Iodine	28	2	--	All to France.
Phosphates, crude	550	2,200	--	All to Taiwan.
Salt and brine	50	--		
Sodium compounds, n.e.s.: Sulfate, manufactured	11,582	4,800	--	Thailand 2,306; Singapore 1,680.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	1,339	1,115	--	Singapore 1,017.
Worked	125	548	87	Australia 221; Singapore 207.
Gravel and crushed rock	597	314	9	Singapore 305.
Quartz and quartzite	28,200	20,350	--	All to Japan.
Sand other than metal-bearing thousand tons	19,022	59,284	--	All to Singapore.
MINERAL FUELS AND RELATED MATERIALS				
Coal:				
Anthracite	136,420	115,876	--	Malaysia 55,060; Thailand 31,817; Japan 19,500.
Bituminous	745,924	964,862	5,000	Japan 364,661; Malaysia 318,138; Thailand 126,758.
Gas, natural, liquefied thousand tons	14,340	15,264	--	All to Japan.
Petroleum:				
Crude thousand 42-gallon barrels	374,228	293,886	96,055	Japan 120,875; Singapore 24,800.
Refinery products:				
Liquefied petroleum gas do.	8,097	6,089	--	Singapore 2,934; Japan 2,498.
Kerosene and jet fuel do.	9	444	--	Singapore 338; Bangladesh 106.
Distillate fuel oil do.	631	490	--	Australia 245; France 245.
Lubricants do.	13	(3)	--	Mainly to Singapore.
Residual fuel oil do.	39,175	15,856	1,383	Japan 13,304.

[1]Table prepared by Audrey D. Wilkes.
[2]Includes manganiferous iron ore and concentrate.
[3]Less than 1/2 unit.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	177	427	427	
Aluminum:				
Ore and concentrate	164	112	2	Japan 110.
Oxides and hydroxides	398,824	225,864	61	Australia 157,872; Japan 60,665.
Metal including alloys:				
Scrap	4	20	--	Mainly from Singapore.
Unwrought	17,183	11,987	1,299	Australia 4,208; Canada 3,173.
Semimanufactures	20,682	110,947	448	Australia 83,512; Singapore 5,317; Japan 5,057.
Arsenic: Oxides and acids	64	75	(2)	Belgium-Luxembourg 28; Republic of Korea 17; China 15.
Chromium:				
Ore and concentrate	46	237	--	Philippines 218.
Oxides and hydroxides	694	180	23	New Zealand 86; West Germany 32.
Cobalt: Oxides and hydroxides	276	33	9	Japan 13; Belgium-Luxembourg 5.
Copper:				
Ore and concentrate	--	100	100	
Matte and speiss including cement copper	10	16	16	
Sulfate	433	314	(2)	Italy 146; Taiwan 35.
Metal including alloys:				
Scrap	--	250	--	Australia 150; Japan 100.
Unwrought	17,803	16,297	399	Zambia 7,048; Chile 4,282; Philippines 1,589.
Semimanufactures	7,787	7,748	83	Japan 5,159; West Germany 895.
Gold: Metal including alloys, unwrought and partly wrought thousand troy ounces	48	11	--	Switzerland 10.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	198,460	132,850	291	Brazil 71,410; Sweden 60,591.
Pyrite, roasted thousand tons	1,268	1,188	--	Sweden 1,035.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal:				
Scrap	243,121	190,903	2,000	Australia 75,319; Hong Kong 53,302.
Pig iron, cast iron, related materials	95,612	80,604	18,248	Mozambique 13,525; Malaysia 13,016; Singapore 9,563.
Ferroalloys:				
Ferromanganese	20,727	13,465	--	Australia 4,045; Switzerland 3,612; Mozambique 2,523.
Ferromolybdenum kilograms	1,500	--		
Ferrosilicon	7,769	9,650	1,374	Switzerland 2,650; Philippines 1,377; Taiwan 991.
Unspecified	2,108	1,651	(2)	Mozambique 1,221.
Steel, primary forms	[3]81,743	43,474	60	Australia 15,570; Brazil 12,010.
Semimanufactures:				
Bars, rods, angles, shapes, sections	240,275	114,872	1,702	Japan 85,413.
Universals, plates, sheets	[3]171,887	753,639	12,036	Japan 545,416; Republic of Korea 76,471; Australia 29,055.
Hoop and strip	[3]14,029	9,428	45	Republic of Korea 3,171; Japan 2,687; Australia 2,519.
Rails and accessories	NA	5,754	34	Japan 2,146; Australia 1,820.
Wire	NA	14,360	112	Japan 5,121; Taiwan 3,957; Republic of Korea 1,976.
Tubes, pipes, fittings	NA	164,867	13,003	Japan 129,370.
Castings and forgings, rough	12,184	6,458	783	France 1,677; Japan 1,229; Singapore 692.
Lead:				
Oxides	875	814	1	Mexico 292; Australia 171; West Germany 142.
Metal including alloys:				
Scrap	54	84	--	Taiwan 50; Australia 34.
Unwrought	14,410	13,170	18	Australia 11,025.
Magnesium: Metal including alloys:				
Unwrought	142	22	--	All from Norway.
Semimanufactures	35	94	6	Taiwan 35; Singapore 22.
Manganese:				
Ore and concentrate	1,545	1,152	--	Singapore 892; Japan 210.
Oxides	14,317	13,863	(2)	Singapore 8,700; Japan 4,675.
Mercury 76-pound flasks	323	1,173	(2)	Singapore 499; China 272; West Germany 156.
Molybdenum: Metal including alloys, all forms kilograms	312	986	226	Austria 386; Netherlands 244.
Nickel:				
Matte and speiss	170	--		
Metal including alloys:				
Unwrought	7	8	--	All from Japan.
Semimanufactures	1,421	1,544	59	Republic of Korea 742; Japan 291; West Germany 220.
Platinum-group metals: Metals including alloys, unwrought and partly wrought:				
Platinum troy ounces	96	1,125	--	West Germany 932.
Unspecified do	32	--		
Rare-earth metals including alloys, all forms	35	4	--	All from Singapore.
Silver: Metal including alloys, unwrought and partly wrought troy ounces	9,340	675	--	Japan 514.
Tin:				
Oxides	--	3	--	Japan 2.
Metal including alloys, all forms	321	103	2	Japan 95.
Titanium: Oxides	12,076	13,787	3,223	Japan 4,856; Australia 2,022; West Germany 1,762.
Tungsten: Metal including alloys, all forms kilograms	1,933	3,720	131	Netherlands 1,781; West Germany 1,097.
Uranium and thorium:				
Oxides and other compounds	210	109	(2)	France 61; China 30.
Metal including alloys, all forms	24	17	(2)	Taiwan 13.
Vanadium: Oxides and hydroxides	15	24	7	Japan 12.
Zinc:				
Oxides	163	747	--	Republic of Korea 319; China 309.
Metal including alloys:				
Scrap	120	495	--	Canada 299; Singapore 185.
Unwrought	45,080	50,612	21	Australia 41,205; Canada 4,755.
Semimanufactures	875	1,333	32	Australia 859.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Other:				
Ores and concentrates:				
Of base metals	11,796	1,819	5	China 1,000; Australia 450.
Of precious metals	151	--	--	
Ashes and residues	(2)	16	(2)	West Germany 11.
Base metals including alloys, all forms	97	117	--	Hong Kong 48; Taiwan 35; China 30.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	541	212	19	Japan 160.
Artificial:				
Corundum	--	19,613	--	Australia 19,528.
Silicon carbide[4]	145	104	1	Japan 70; West Germany 22.
Grinding and polishing wheels and stones	3,191	2,032	10	China 1,096.
Asbestos, crude	10,963	8,149	508	Canada 3,467; Mozambique 895; Zimbabwe 500.
Barite and witherite	60,457	67,536	466	Thailand 54,459.
Boron materials:				
Crude natural borates	2	448	--	Malaysia 430.
Oxides and acids	725	1,375	1,159	West Germany 78.
Bromine kilograms	9	540	--	All from Singapore.
Cement	70,546	14,905	1,817	Malaysia 7,917; Singapore 3,875.
Chalk	624	534	--	Taiwan 500.
Clays, crude:				
Bentonite	25,542	28,189	19,585	Australia 4,704; India 2,500.
Kaolin	29,956	22,207	9,573	Japan 3,529; Republic of Korea 2,860; Australia 2,758.
Unspecified	1,310	8,683	715	Japan 3,931; China 1,950; Hong Kong 1,209.
Cryolite and chiolite	1,730	2	--	Mainly from U.S.S.R.
Diatomite and other infusorial earth	1,075	637	470	West Germany 59; Singapore 54.
Feldspar, fluorspar, related materials	13,523	6,872	--	China 3,488; Japan 2,167.
Fertilizer materials:				
Crude, n.e.s	392	2,695	91	West Germany 2,000; Belgium-Luxembourg 500.
Manufactured:				
Ammonia	83	21	2	United Kingdom 16.
Nitrogenous	292,210	97,200	37,783	West Germany 20,693; Poland 12,000; Romania 10,500.
Phosphatic	38,196	7,189	409	Australia 2,800; Belgium-Luxembourg 950.
Potassic	276,430	311,674	60	Canada 172,450; Jordan 63,000; West Germany 39,856.
Unspecified and mixed	12,935	13,264	124	West Germany 6,630; Belgium-Luxembourg 4,650.
Graphite, natural	98	150	--	Republic of Korea 50; China 38; Taiwan 35.
Gypsum and plaster	384,301	304,939	41	Australia 193,291; Thailand 102,538.
Iodine	11	36	16	United Kingdom 15.
Kyanite and related materials	4	4	--	All from Japan.
Lime	557	416	95	Singapore 318.
Magnesium compounds:				
Magnesite, crude	r3,524	4,614	--	Japan 2,851; China 1,196.
Oxides and hydroxides	973	3,153	158	West Germany 1,462; Japan 1,082.
Mica:				
Crude including splittings and waste	704	909	31	India 455; China 185.
Worked including agglomerated splittings	83	107	(2)	Taiwan 70; Japan 31.
Nitrates, crude	10,340	9,265	--	Republic of Korea 4,800; Belgium-Luxembourg 4,080.
Phosphates, crude	636,509	817,431	89,785	Jordan 307,991; Morocco 267,768; Tunisia 85,625.
Pigments, mineral:				
Natural, crude	672	222	--	China 200.
Iron oxides and hydroxides, processed	4,251	4,536	528	West Germany 1,701; China 638; Japan 530.
Precious and semiprecious stones other than diamond: Synthetic kilograms	57	13	--	Hong Kong 12; Singapore 1.
Pyrite, unroasted	12	(2)	--	All from Malaysia.
Salt and brine	1,060	26,830	71	Australia 26,536.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	125,365	145,119	82,943	Japan 17,951; France 17,209; Kenya 11,800.
Sulfate, manufactured	5,880	11,229	3,723	Taiwan 2,603; Japan 2,470; China 829.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	2,020	12,283	8	Hungary 9,397; China 1,268.
Worked	3,132	5,870	(2)	Italy 3,354; Taiwan 1,100.
Dolomite, chiefly refractory-grade	6,978	8,155	100	United Kingdom 2,242; Japan 2,224; West Germany 1,896.
Gravel and crushed rock	628	769	2	France 397; New Zealand 121; Japan 104.
Limestone other than dimension	2	2,941	--	Thailand 2,732.
Quartz and quartzite	296	249	12	China 80; United Kingdom 36; Australia 35.
Sand other than metal-bearing	4,400	7,372	5,966	Malaysia 503; Taiwan 361.
Sulfur:				
Elemental:				
Crude including native and byproduct	1,974	2,624	--	Singapore 1,100; Republic of Korea 727.
Colloidal, precipitated, sublimed	212,487	182,619	5,439	Canada 151,421.
Dioxide	14	7	(2)	Mainly from Australia.
Sulfuric acid	7,497	70	2	Singapore 59.
Talc, steatite, soapstone, pyrophyllite	17,291	13,386	49	China 7,435; Republic of Korea 2,191; Taiwan 1,024.
Other:				
Crude	2,061	27,069	13	West Germany 22,547.
Slag and dross, not metal-bearing	3,741	3,169	231	Japan 2,522.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	4,176	4,489	146	Singapore 3,647.
Carbon black	34,572	27,943	459	Australia 12,755; Taiwan 5,755; Thailand 2,545.
Coal:				
Anthracite	81	835	8	Norway 655; Singapore 170.
Bituminous	144	14,553	--	Australia 14,426.
Briquets of anthracite and bituminous coal	55	29,970	--	All from Australia.
Lignite including briquets	278	475	238	United Kingdom 193.
Coke and semicoke	42,899	29,774	--	Japan 15,309; Taiwan 5,143; Australia 4,892.
Peat including briquets and litter	(2)	39	--	All from Australia.
Petroleum:				
Crude thousand 42-gallon barrels	39,648	26,739	--	All from Saudi Arabia.
Partly refined do.	512	147	12	Netherlands 57; Singapore 47.
Refinery products:				
Liquefied petroleum gas do.	1	3	(2)	Mainly from Singapore.
Gasoline do.	603	126	(2)	Do.
Mineral jelly and wax do.	407	86	1	China 48; Taiwan 14.
Kerosene and jet fuel[5] do.	9,949	3,000	1	Singapore 2,998.
Distillate fuel oil do.	4,667	1,111	(2)	Singapore 1,105.
Lubricants do.	284	70	7	Singapore 58.
Nonlubricating oils do.	195	57	33	Japan 23.
Residual fuel oil do.	15,348	4,342	(2)	Singapore 4,326.
Bitumen and other residues do.	1,161	1,422	397	Singapore 752; Taiwan 250.
Bituminous mixtures do.	13	27	1	Singapore 19.
Petroleum coke do.	168	296	290	Singapore 6.

[r]Revised. NA Not available.
[1]Table prepared by Audrey D. Wilkes.
[2]Less than 1/2 unit.
[3]1984 figures are incomplete owing to insufficient data.
[4]Includes boron carbide.
[5]Includes 32,700 barrels of white spirit in 1984 and 3,000 barrels in 1985.

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—Bauxite produced by P.T. Antam from Bintan Island and nearby small islands dropped to 650,000 tons owing to a further cutback in imports of bauxite by Japan. Exports of bauxite to Japan fell 20% from those of 1985 to 600,000 tons. According to an industry source, a 10-year contract was signed between P.T. Antam and Nam Jin Resources Development Co. Ltd. of the Republic of Korea in October. Under the contract, Indonesia was to export bauxite to the Republic of Korea at an

annual rate of 200,000 tons beginning in November 1986.

Production of primary aluminum by IN-ALUM reportedly increased to 219,000 tons. About 75% of the output was exported to Japan, and the remainder was sold to domestic and world markets. Because of low primary aluminum prices on the world market and strengthening of the Japanese yen, IN-ALUM reportedly had incurred losses of about $59 million during 1982-85. Further losses were expected for 1986. In mid-1986, an agreement was reached between the major shareholder of IN-ALUM, Nippon Asahan Aluminium Co., and a Japanese financial syndicate led by the Export-Import Bank of Japan for allowing IN-ALUM to defer repayments of principal according to a new repayment schedule to be determined in 1987.

Despite increased production and sales of primary aluminum, IN-ALUM remained financially trapped by the higher debt burden and lower income stream because the project cost was mostly financed by a Japanese loan based on the yen while sales of aluminum ingots were mostly to Japan but based on the London Metal Exchange price in U.S. dollars. As a result of lower primary aluminum prices and rapid appreciation of the Japanese yen, IN-ALUM suffered severely from reduced revenues while facing increased interest payments and repayment of principal.[6]

Copper.—Copper produced by FI from the Gunung Bijih (Ertsberg) Mine in Irian Jaya reached a new record-high level in 1986. The average ore production rose to 15,565 tons per day compared with 14,270 tons per day in 1985. Production of copper, gold, and silver contained in the 251,000 tons of copper concentrate produced in 1986 was 95,800 tons, 85,000 troy ounces, and 1.2 million troy ounces, respectively. Export earnings of the concentrate amounted to $151.1 million compared with $128.8 million in 1985. Exports of copper were principally to Japan under sales agreements that used the world market prices of the London Metal Exchange.

According to the company's annual report, the average market price dropped to $0.62 per pound in 1986 from $0.64 per pound in 1985. However, FI's net earnings from copper rose sharply to $16.7 million from $8.3 million in 1985, mainly because of further progress in its productivity and cost containment program; increased sales volume of copper, gold, and silver contained in concentrate; and higher prices of gold in 1986. The estimated copper production costs at the Ertsberg operation, including delivery costs, depreciation, and amortization, after gold and silver credits, was $0.50 per pound in 1986 compared with $0.55 per pound in 1985.

As a result of an extensive exploration program conducted by FI in the vicinity of the Ertsberg mining areas, the company reported that an additional 23.2 million tons of proven ore reserves had been ascertained, mostly from a new ore deposit about 800 meters south of the Ertsberg mining area. The estimated proven and probable ore reserves at the Ertsberg and Ertsberg East ore bodies, as of December 31, 1986, increased to 62.8 million tons having an average ore grade of about 2.3% copper. This would prolong the mine life at the Ertsberg Mine until the end of the century at the current rate of production.

As part of its cost-cutting program, in 1986, FI started construction of an underground hydroelectric powerplant to provide 22% of the project's power requirements. The powerplant was scheduled for completion in the third quarter of 1987. An expansion plan to increase throughput of the mill to 20,000 tons per day reportedly was under consideration. The final commitment was expected to be made after evaluation studies are completed in mid-1987.[7]

Gold.—The overall gold production rose significantly and reached a new record-high level in 1986. Gold recovered from copper ore by FI at the Ertsberg Mine in Irian Jaya increased to 85,000 troy ounces from 76,000 troy ounces in 1985. However, gold produced by P.T. Antam from the Cikoto gold mine in South Banten, West Java, dropped 14% to about 65,000 troy ounces. P.T. Lusang, a new gold producer that began gold mining at the Lebong Tandai underground mine, north of Bengkulu, South Sumatra, in late 1985, reportedly produced 11,500 troy ounces in 1986.

Activity of gold exploration in Indonesia intensified further as 34 more new contracts were awarded by the Government to foreign contractors for gold exploration and development mainly in Kalimantan and Sumatra. These new contracts included 27 for 8 Australian companies, 3 for 2 British companies, 3 for a U.S. company, and 1 for a Malaysian company. Most of the exploration contracts were in the form of joint venture projects between foreign companies and P.T. Antam or private Indonesian companies except one that was awarded wholly to a foreign contractor. According to a

Government official, of the 43 concession areas awarded since 1984, only 10 contract areas were expected to strike gold and go into production by 1989.[8]

Under the terms of the newly signed contracts, the foreign companies were expected to pay royalty taxes to the Indonesian Government ranging from 1% to 2% of the sales prices on the production of gold, platinum, and silver from the contract areas. The reference prices for a 1% royalty tax are $400 per troy ounce of gold, $925 per troy ounce of platinum, and $10 per troy ounce of silver. A 2% royalty would be imposed if the prices of gold, platinum, and silver were higher than that of the reference prices.

Pelsart Resources NL of Australia, one of the principal Australian contractors operating in Indonesia, reportedly would begin gold production at an annual rate of 20,000 troy ounces in 1987. The production plan was made in December following a series of bank drillings and test pittings conducted by its partner, Jason Mining Ltd. of Australia, at the Kasongan alluvial deposits in Central Kalimantan. The project was jointly owned by Pelsart Resources and Jason Mining, 42.5% each, and by P.T. Yunawati Perdana of Indonesia, 15%. The mineral rights over the concession area were held by the Indonesian firm.

During 1986, several foreign contractors reportedly struck gold in Kalimantan and Sumatra. The important discoveries included the Seunagan alluvial deposits in northwestern Sumatra by Portman Mining Ltd. of Australia, the Muro gold deposits in Central Kalimantan by Newmont Mining Corp. (through Duval Corp.) of the United States, the Woyla River deposits in North Sumatra by Abaleen Minerals NL and Asia Oil and Minerals Ltd. of Australia, the Kelian deposit in Central Kalimantan by Conzinc Rio Tinto of Australia Ltd. (CRA), and the Ampalit deposit, west of Palangka Raya in Central Kalimantan, also by CRA.

In line with the Government trade policy to encourage exports of non-oil commodities, the Ministry of Trade and Industry issued a ministerial decree allowing exports of gold and silver effective August 9, 1986. Under an earlier ministerial decree issued in 1982, exports of gold and silver were banned.

Iron and Steel.—Iron sands produced by P.T. Antam from the coastal area, east of Cilacap in Central Java, increased slightly in 1986. According to the Ministry of Mining and Energy, domestic consumption of iron sand by the cement industry was 134,575 tons, and exports of iron sand, all to Japan, were 12,500 tons in 1985.

Production of iron and steel by Krakatau Steel continued to increase despite the stagnant domestic demand for steel. Output of direct-reduced iron increased 30% to 1.3 million tons while production of crude steel rose 39% to 1.1 million tons, of which 650,000 tons was slab steel and 450,000 tons was billet steel. Because of a further 31% devaluation of the Indonesian rupiah against the U.S. dollar in September and further strengthening of the Japanese yen against the U.S. dollar, the prices of Krakatau Steel's iron and steel products became more competitive in the world markets. As a result, exports of iron and steel by Krakatau Steel rose to 241,700 tons from 156,400 tons (revised) in 1985 and its export earnings increased to $56 million from $31 million in 1985.

Krakatau Steel, 100% owned by the Government, operated an integrated iron and steel complex at Cilegon, about 120 kilometers west of Jakarta and employed about 6,000 workers. Its iron and steel complex included a 2-million-ton-per-year HYL-process, direct-reduction plant; a 1.1-million-ton-per-year slab plant; a 500,000-ton-per-year billet plant; a 1-million-ton-per-year SMS hot-strip mill; a 200,000-ton-per-year wire rod mill; a 150,000-ton-per-year bar mill; a 45,000-ton-per-year section mill; and an 18,000-ton-per-year wire drawing mill. The auxiliary facilities included a 400-megawatt powerplant, a clean-water plant, and other infrastructure such as company housing and an expanded road system.

Krakatau Steel began its integrated operations in 1983. During the early stage of operations, the company suffered from operating losses owing to poor sales of its iron and steel products in domestic and overseas markets caused by problems of noncompetitive pricing and poor quality of its products as well as heavy debt burden. However, the financial situation of Krakatau Steel began to improve after the company's debt to the Government was converted into equity in 1985 and sale of its products continued to increase, especially in the overseas market, during 1985-86. As a result, the company reported a profit of $34.8 million on sales of $329.2 million in 1986. Between 1979 and 1985, Krakatau Steel reportedly had cumulative losses of more than $700 million. As of 1985, the total assets of Krakatau Steel were estimated at $1.5 billion.

Construction of the $825 million cold-

rolling strip mill with a capacity of 850,000 tons per year of cold-rolled sheet in Cilegon, West Java, was near completion and scheduled to come on-stream in February 1987. P.T. Cold-Rolling Mill Indonesia, the operator of the mill, was a joint venture of Krakatau Steel, 40%; P.T. Kaulin Indah Utama, 20%; and Sestiacier S.A., a French-Spanish joint venture company, 20%. The project was financed by equity capital of $245 million and loans of $580 million from a consortium of 19 international banks. According to the company's plan, the cold-rolling mill was expected to produce 173,000 tons in 1987, 490,000 tons in 1988, and increase to 700,000 tons in 1989. Domestic consumption of cold-rolled sheet, all met by imports, principally from Japan, was between 520,000 tons and 560,000 tons in 1985-86. Beginning in 1987, domestically produced cold-rolled sheet would account for 30% of cold-rolled-sheet consumption. By 1989, Indonesia was expected to have surplus cold-rolled sheet for export.[9]

In December 1986, a joint venture agreement was signed for construction of a $550 million seamless pipe plant in the Cilegon industrial estate in West Java, beginning in 1987 and to be completed in 3 years. According to the agreement, the 300,000-ton-per-year-capacity plant would be operated by a joint venture firm called P.T. Seamless Pipe Indonesia Raya. The joint venture project was 39% owned by P.T. Bakrie Bros., 30% by PERTAMINA, 20% by Asia Pacific Pipe Investment Corp. S.A., 6.1% by P.T. Encona Engineering, and 4.9% by Krakatau Steel. Construction of the plant, a turnkey project, reportedly was under discussion with prospective contractors from the Federal Republic of Germany and Italy.[10]

Nickel.—Despite further decline in the world nickel price, nickel production in Indonesia increased substantially because of increased exports to Japan resulting from devaluation of the Indonesian rupiah. Production of nickel ore by P.T. Antam from its mines at Pomalaa in southeastern Sulawesi and on Gebe Island in North Moluccas rose to 1.5 million tons from 962,000 tons in 1985. Exports of nickel ore to Japan increased to 1.4 million tons from 830,000 tons in 1985. However, production of ferronickel by P.T. Antam from its smelter at Pomalaa dropped slightly owing to decreased exports to Japan in 1986.

P.T. Inco, which signed a contract of work with the Government of Indonesia in July 1968, as the sole contractor, produced 28,123 tons of nickel in nickel-sulfate matte compared with 24,948 tons in 1985. P.T. Inco's integrated nickel operations in the Soroako complex in South Sulawesi had undergone several modifications since 1979 when it first started commercial operation. The latest modification included replacement of the original top-blown Kaldo-type rotary converters by the Pierce-Smith converters to increase efficiency and reliability and reduce operating costs. According to P.T. Inco's annual report, the cash costs of nickel-sulfate matte production had been reduced by 50% from that of 1982. In late 1986, P.T. Inco was operating at 90% capacity or at an annual rate of 32,000 tons of nickel matte with an employment of about 2,400, of whom 32 were expatriate employees. As of December, the proven and probable ore reserves in the Soroako area were estimated at 74.4 million tons, containing 1.4 million tons of nickel, sufficient for more than 25 years of operation.[11]

P.T. Inco was owned 98% by Inco Ltd. of Canada and 2% by a consortium of six Japanese companies. Under the contract-of-work agreement, the Government of Indonesia had the right to acquire up to 20% of P.T. Inco's equity at the rate of 2% per year. The initial 2% offer in 1980 and subsequent annual offers had not been exercised by the Government of Indonesia. Exports of nickel-sulfate matte to Japan were under three separate long-term contract agreements, to expire in the early 1990's. The Japanese importers included Shimura Kako Co. Ltd. and Tokyo Nickel Co. Ltd. Inco Ltd., in turn, has a 34.7% interest in Shimura and a 45% interest in Tokyo Nickel. Despite increased exports to Japan and reduced costs of production, P.T. Inco continued to suffer from losses because of further softening of nickel prices in the world market.

Tin.—Tin mine production rebounded to 24,000 tons from 22,000 tons in 1985 owing to the Government policy to reduce production costs by increased output. Exports of tin metal also rose to 23,300 tons from 21,000 tons in 1985. However, export earnings from tin dropped 43% to $139 million, resulting from a sharp drop of tin prices in the world markets in 1986 following the October tin crisis of 1985.

Of the total tin produced in 1986, about 82% was by P.T. Timah, the state-owned tin mining company, 16% by P.T. Koba Tin, and 2% by P.T. Preussag Kelapa Kampit, a newly established tin-mining company by Preussag AG of the Federal Republic of Germany, which acquired the Kelapa Kam-

pit underground tin mine on Belitung Island from P.T. Broken Hill Pty. Indonesia in May 1985. P.T. Riau Tin stopped production at the end of 1985 because of the low tin price.

According to Indonesia's Department of Mining and Energy, tin production in Indonesia, by company and area, in 1984-85 was as follows, in metric tons:

Company and area	1984	1985
P.T. Tambang Timah:		
Bangka Island	11,333	10,892
Belitung Island	4,044	3,839
Singkep Island	2,200	1,635
Bangkinang, Sumatra	31	--
P.T. Koba Tin: Koba, Bangka Island	4,215	4,056
P.T. Riau Tin Mining: Tujuh Riau Island	927	855
P.T. Broken Hill Pty. Indonesia: Kelapa Kampit, Belitung Island	473	482
Total	23,223	21,759

P.T. Timah, which lost $12 million in 1985, reportedly made a pretax profit of $21 million, despite low prices of tin in the world market. According to a company official, the 31% devaluation of the Indonesian rupiah against the U.S. dollar, the company's cost-cutting measures, and increased sales were the main contributing factors for the turnaround. To reduce production costs, the company implemented an early retirement program, cut back employees' prerequisites, reintroduced panning, and concentrated tin mining at the higher grade mines on Bangka and Singkep Islands. As a result, production costs were reduced to about $2.72 per pound from $4.46 per pound in 1985. In early 1986, the company's employment remained at 29,446 workers.

Koba Tin, 75% owned by Kajuara Mining Corp. of Australia, had shut down its high-cost tin mines on Bangka Island and put 570 of its 1,500 work force on leave at reduced salary because of low tin prices. As a result, tin production by Koba Tin was about 20% less than that of 1985.

P.T. Riau Tin, reportedly had stopped its tin operation offshore Sumatra in the Tujuh Riau Island area and returned its concession to the Government of Indonesia.

P.T. Pelat Timah Nusantara (P.T. Latinusa), the country's first tinplate producer that began full commercial operation in September 1985, reportedly produced at an average monthly rate of 6,500 tons in 1986. P.T. Latinusa purchased its tin requirements from P.T. Timah and its blackplate from Nippon Steel Corp., Nippon Kohan K.K., Kawasaki Steel Corp., and Toyo Kohan Co. Ltd. of Japan. In 1986, the company awarded a technical assistance contract to Kaiser Engineers International of the United States for staff training on production, quality controls, plant maintenance, and marketing of tinplate.

INDUSTRIAL MINERALS

Cement.—Cement production increased slightly over that of 1985 owing mainly to a substantial increase in exports. The cement industry's annual capacity remained at 17.4 million tons. Cement production and consumption were estimated at 11 million tons and 9.5 million tons, respectively. Exports of cement rose sharply to 1,600,000 tons from 870,000 tons in 1985. Most cement exports were to Bangladesh and Singapore.

The industry's plans for expansion and new investments in cement plants were put on hold because of excess capacity and sluggish domestic demand because of a slowdown in the country's construction activities. In late 1985, three Polysius roller mill systems for coal grinding reportedly were installed by P.T. Indocement to its Cibinong cement complex in West Java.

According to an international industry survey, configuration of the operating costs of Indonesia's cement industry for 1985 was capital costs, 37%; energy costs including electricity, coal, and fuel oil, 34%; wages, 10%; raw materials, 5%; and other costs including bagging, maintenance, general management, and subcontracting, 14%.[12]

Indonesia's cement production, by company and location, in 1984-85 was as follows, in thousand metric tons:

Company and area	1984	1985
P.T. Indocement, West Java	[1]3,237	[1]3,710
P.T. Semen Padang, West Sumatra	1,211	1,244
P.T. Semen Gresik, West Java	1,383	1,241
P.T. Semen Cibinong, West Java	995	1,009
P.T. Semen Nusantara, West Java	667	733
P.T. Semen Tonasa, South Sulawesi	445	626
P.T. Semen Andalas Indonesia, North Sumatra	486	455
P.T. Semen Baturaja, South Sumatra	424	399
P.T. Tridaya Manunggal Perkasa Cement, West Java	--	398
P.T. Semen Kupang, Timor Island	49	66
Total	8,897	9,881

[1]Includes production of white cement, 94,250 metric tons for 1984 and 64,044 metric tons in 1985.

Diamond.—Acorn Securities Ltd. of Australia, through its subsidiary, Acorn Diamond Indonesia Pty. Ltd., reportedly was involved in a joint venture project with P.T. Antam and Keymead Ltd. of the United

Kingdom for diamond exploration at the Cempaka swamp-stream area in southeastern Kalimantan. According to preliminary drillings at the Danan Seran area, about 940 gem-quality stones ranging in size from 0.01 to 2.31 carats were recovered from bulk samples by the alluvial sampling plant of the project.

The joint venture project was owned 65% by Acorn Securities, 20% by P.T. Antam, and 15% by Keymead. The project had a 10-cubic-meter-per-hour-capacity alluvial sampling plant, five churn drill rigs, and employed about 150 workers. Further bulk sampling in the downstream area was scheduled for 1987, and a mining consultant, Alluvial Dredges International of the United Kingdom, was hired to conduct feasibility studies for diamond mining.[13]

Pelsart Resources of Australia reportedly was also involved in exploration of diamond in the Pujon area of Central Kalimantan. In October, United Industrial Corp. of Singapore had acquired 10% interest in Pelsart Resources and provided a considerable amount of capital for Pelsart Resources to continue exploration of diamond.

Fertilizer Materials.—Indonesia's fertilizer industry was expected to expand further in the next 2 years. However, the industry reportedly suffered financially from keen competition in the world market and the cutback of Government subsidies in 1986. According to local press reports, P.T. Asean-Aceh Fertilizer had suffered from heavy losses owing to a sharp drop in the world price of urea and reduced urea exports to China. Because of economic reasons, P.T. Pupuk Sriwijaya (PUSRI) had shut down its 100,000-ton-per-year-capacity urea plant, PUSRI I, at Palembang in South Sumatra. P.T. Petrokimia Gresik reportedly also shut down its 45,000-ton-per-year-capacity urea plant at Surabaja in East Java in 1986. As a result, the industry's annual production capacity of urea was reduced to 4.37 million tons from about 4.52 million tons in 1985.

Despite the setback in the urea sector, P.T. Pupuk Kalimantan Timur (Kaltim) continued construction of its third unit, Kaltim III, with a designed annual capacity of 570,000 tons of urea in Bontang, East Kalimantan. The construction was undertaken by Chiyoda Chemical Engineering and Construction Co. Ltd. of Japan and was scheduled to come on-stream in 1989.

In April, P.T. Petrokimia Gresik brought on-stream the third unit of its ammonium sulfate plant with an annual capacity of 200,000 tons. The construction cost of the plant was estimated at $11 million. The company's combined production capacity of ammonium sulfate at Gresik, East Java, increased to 650,000 tons.

MINERAL FUELS

Coal.—Overall coal production reached another record-high level in 1986. However, the total output was about 600,000 tons below the Government production target of 3 million tons. Output from the Ombilin Mine in West Sumatra dropped to 710,000 tons from 770,750 tons in 1985, while output from the Bukit Asam Mine in South Sumatra rose to 1 million tons from 720,300 tons in 1985. Four private coal companies operated in East Kalimantan and two other small operators in the Province of Bengkulu, together producing about 680,000 tons.

Coal produced by P.N. Tambang Batubara (P.N. Batubara) from the Ombilin Mine and the Bukit Asam Mine was for domestic consumption mainly by the cement plants and powerplants as well as for exports principally to Japan and Malaysia. Coal output of about 430,000 tons from East Kalimantan and 250,000 tons from the Province of Bengkulu in South Sumatra was mostly for exports mainly to Bangladesh, Japan, the Republic of Korea, and the Philippines.

According to the Department of Mining and Energy, Indonesia's coal production, consumption, and exports in 1984-85 were as follows, in metric tons:

	1984	1985
Production:		
P.N. Tambang Batubara:		
Ombilin Mine	583,590	770,751
Bukit Asam Mine	501,074	720,301
P.T. Kitadin Corp	198,681	215,810
C.V. Fajar Bumi Sakti	84,227	104,659
C.V. Baiduri Enterprise	51,369	84,192
P.T. Tanito Harun	49,222	46,422
Total	1,468,163	1,942,135
Domestic consumption:		
Cement plants	243,030	328,800
Suralaya powerplant	119,647	267,863
Nickel mining and smelting	24,067	41,675
Tin mining and smelting	16,200	28,375
Coal mining	20,814	23,118
Railroads	3,597	1,763
Other	14,915	18,095
Exports	1,288,088	1,747,495

Because of further delay in completing the Bukit Asam coal expansion project, which was about 50% complete, and problems at the Tarahan coal terminal on the southern tip of Sumatra, Indonesia continued to import substantial amounts of coal

from Australia to meet the coal requirements for the Suralaya powerplant in West Java.

At the Ombilin Mine, Norwest Resources Consultants Ltd. of the United States reportedly completed its drilling in the Waringin region for development of an underground mine under the Ombilin II expansion project. A feasibility study for longwall mining methods with an annual capacity of 660,000 tons was expected to be completed by Norwest Resources in 1987. The estimated coal reserves in the Waringin area were about 70 million tons of bituminous coal with uniform quality and low sulfur content.

At the Bukit Asam Mine, a total of five bucket-wheel excavators with conveyor systems and spreaders was put into operation in the Air Laya area. Coal production from this area would begin in 1987. Coal production from an open pit mine at the Muara Tiga area averaged 88,000 tons per month. Fifteen locomotives, purchased from a General Motors Corp. plant in Canada, to haul coal from the Bukit Asam Mine to a new port in Tarahan were expected to be delivered by 1987.

P.T. Allied Indo Coal, which signed a 30-year production-sharing contract with the state-owned coal mining company, P.N. Batubara, was expected to spend about $16 million for development of the Parambahan coal mine near the Ombilin Mine in West Sumatra. According to the company's plan, coal production was expected to begin in the second half of 1987 at an annual rate of 500,000 tons.

In October, a bilateral cooperation agreement was signed between Indonesia and Japan for a 5-year joint coal exploration project in central Sumatra. The coal exploration would be conducted in the Rokan and Cerenti area of Riau Province and the Sinapar area of West Sumatra Province in four phases beginning in early 1987 and to be completed by March 1991. New Energy Development Organization of Japan was expected to undertake the exploration program in cooperation with Indonesia's Directorate General of General Mining, the Directorate General of Geology and Natural Resources, and the Coal Mining Corp. The total project cost was estimated at $7.7 million, of which the Japanese side would provide about $1 million per year.[14]

Petroleum and Natural Gas.—Despite a sharp drop in world oil prices, Indonesian crude oil production increased slightly over that of 1985. The output of crude oil, excluding condensate for the first 8 months, averaged 1.3 million barrels per day but decreased to about 1.2 million barrels per day for the last 4 months of the year because of the production ceiling reimposed by OPEC in September. The 1986 output averaged 1.29 million barrels per day compared with 1.18 million barrels per day in 1985.

The OPEC quota for Indonesia's crude oil production was 1.189 million barrels per day beginning in September. However, according to a December OPEC agreement, Indonesia reportedly would restrict its crude oil production to 1.133 million barrels per day effective January 1987. The primary goal on the OPEC December agreement was to stabilize the world oil price at $18.00 per barrel. According to the International Bank for Reconstruction and Development (World Bank), world oil prices averaged $13 per barrel compared with $25 per barrel in 1985. However, Indonesia's Minister of Mining and Energy reported that the average prices for Indonesian crude oil averaged about $11.00 per barrel in 1986.

During 1986, crude oil was produced by Indonesia's state-owned PERTAMINA, PPT MIGAS CEPU (formerly LEMIGAS), and 15 foreign oil companies under contract of work and production-sharing contract agreements with PERTAMINA. P.T. Caltex Pacific Indonesia (CPI) remained the largest and dominant crude oil producer, accounting for 46.6%, followed by Total Indonesie, 11.7%; Atlantic Richfield Indonesia Inc., 11.3%; PERTAMINA, 6.1%; Independent Indonesia American Petroleum Co., 5.9%; and Union Texas Co., 5.1%. The remainder was produced by PPT MIGAS CEPU and 10 other foreign oil companies.

In late March, MPI brought on-stream its Kakap block KH Oilfield offshore South China Sea, about 300 kilometers northwest of Great Natuna Island and 1,250 kilometers north of Jakarta. Indonesia's first FPSO system was inaugurated in August. Crude oil production from six producing wells in Kakap block KH Oilfield rose to 15,300 barrels per day in August from the initial rate of 5,200 barrels per day in April and reached 18,400 barrels per day in December. MPI's KH Oilfield has a peak capacity of 22,000 barrels per day. MPI signed a production-sharing contract with PERTAMINA in 1975 and discovered the Kakap Oilfield in September 1980. MPI was a joint venture firm of Marathon Oil Co., a wholly owned subsidiary of USX Corp. (formerly United States Steel Corp.), 37.5%; Aminoil Indonesia (Kakap) Inc., 15%; BP Petroleum

Development (Kakap) Ltd. and Lasmo (Kakap) Ltd., 13.5% each; Hudbay Oil (Kakap) Ltd., 10.5%; and PERTAMINA, 10%.

Kodele Energy Co. Ltd. (Kodeco) of the Republic of Korea reportedly suffered a major setback from a drastic drop in crude oil production from its KE 2 Oilfield offshore Madura. The output from the oilfield dropped to 2,200 barrels per day in March from 11,300 barrels per day in September 1985. During 1986, the output rose to 3,500 barrels per day in June but dropped again to 1,500 barrels per day in December. According to the company's official, falling pressure and increased gas and gaslocks caused by excessive production in the initial stage of production and lack of sufficient reserve engineering studies were the major factors for the sharp drop in the 1986 output. However, according to the industry's sources, the Madura block oilfield, first discovered by Cities Service Oil Co. of the United States in the early 1970's, was found not economically viable because of oil-bearing-formation problems and later was judged too risky to justify the investment. Kodeco reportedly had invested a total of $126 million in the Madura block oilfield. Owing to less than the expected oil output and problems of securing additional financing for the oil development, Kodeco reportedly was facing serious financial difficulties.

As a result of the sharp drop in world oil prices and new tax legislation, exploration activity (as measured by seismic survey, the number of exploratory wells drilled, and exploration expenditures) declined further. According to officials of PERTAMINA, between 1983 and 1986, seismic profiling declined to 28,734 kilometers from 54,000 kilometers, the number of exploratory wells drilled dropped to 156 wells from 254 wells, and the exploration budget was expected to be cut back by 25% from $861 million (revised) in 1985.[15]

During 1986, 19 oil and gas deposits were discovered. The significant discoveries included three gas deposits by Petromer Trend Corp. at West Klagagi-1, Klagagi-1, and Klalin-1 in Irian Jaya; two oil deposits by CPI at Giti-1 and Ayu-1 in Sumatra; three oil and gas deposits by Hudbay Oil (Malacca Strait) Ltd., onshore Padang Island, at MSTA-1 and MSBK-1, offshore in the Malacca Strait; an oil and gas deposit by Total Indonesie at Sisi-1, offshore East Kalimantan; an oil deposit by Unocal Indonesia Inc. at Ragat-1 offshore East Kalimantan; and an oil deposit by Atlantic Richfield Indonesia at NF-1, offshore northwestern Java.

For new oil and gas exploration in the next 6 years, PERTAMINA signed only three production-sharing contracts with foreign companies, compared with four contracts in 1985. In June, Jasmine Northern Petroleum Services of Brunei signed a 50-50 joint venture operating agreement with PERTAMINA for exploration in a 1,643-square-kilometer area onshore eastern Madura Island. In October, Total Indonesie of France signed a production-sharing contract with PERTAMINA for exploration of oil and gas in a 10,885-square-kilometer area of Muara Kampar in central Sumatra. In November, Esso Exploration and Production Dumai Inc. of the United States signed a production-sharing contract with PERTAMINA for exploration in a 11,875-square-kilometer area in the Dumai area onshore and offshore, central Sumatra. Both Esso Exploration and Total Indonesie were expected to spend $64 million each for oil and gas exploration over the next 6 years. All three contracts were under the new tax laws, which became effective in January 1984.

The output of natural gas remained at 1.6 trillion cubic feet while production of LNG dropped slightly owing to reduced exports to Japan. During the year, PERTAMINA reportedly was negotiating a new pricing formula of LNG for export to Japan. After more than 10 months of negotiation, PERTAMINA agreed to use its benchmark Minas crude oil prices as the base for pricing its LNG for export to Japan. Under an old pricing schedule, the so-called official Government selling prices, which did not reflect the actual prices of Indonesian crude oil, had been used as the base.

In 1986, Indonesia remained the world's largest exporter of LNG. Exports of LNG to Japan totaled 15.3 million tons compared with 15.5 million tons in 1985. As a result of the sharp decline in oil price, export earnings from LNG dropped 26% to $2.9 million.

The long-term sale contracts for exports of LNG to the Republic of Korea and Taiwan were still under negotiation. The final contract signings were expected in early 1987. The new pricing schedule for LNG sales to Japan could be used as a gauge for pricing LNG sales to the Republic of Korea and Taiwan. The sixth LNG train under the Arun-III project in Lhokseumawe, Sumatra, was completed 2 months ahead of schedule and started production in October for shipment to the Republic of Korea.

In October, a 330,000-ton-per-year metha-

nol plant was inaugurated on Bunyu Island in East Kalimantan. The $341 million plant, built by Lurgi GmbH of the Federal Republic of Germany and financed by a $220 million French export credit, was part of the Government policy to expand the country's petrochemical industry in an effort to reduce import reliance of the chemical industry's raw materials. Domestic consumption of methanol was mainly for production of wood glue and other uses in pharmaceuticals, dyestuffs, tanning materials, and explosives.

In July, a 10-year sale contract was signed between Indonesia and Japan for exports of LPG to Japan. Under the contract, Japan was to import 1.95 million tons of LPG per year beginning in July 1988 for a 10-year period. The seven Japanese importers of LPG were Mitsubishi Corp., Mitsui Liquefied Gas Corp., Nippon Petroleum Gas Co. Ltd., Idemitsu Kosan Co. Ltd., Cosmo Oil Co. Ltd., Kyodo Oil Co. Ltd., and Showa Shell Sekiyu K.K.[16]

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[1]Economist, Division of International Minerals.

[2]Where necessary, values have been converted from Indonesian rupiahs (Rp) to U.S. dollars at the rate of Rp1.282=US$1.00.

[3]U.S. Embassy, Jakarta, Indonesia. State Dep. Airgram A-20, Dec. 4, 1986, p. 2.

[4]Far Eastern Economic Review (Hong Kong). V. 134, No. 105, Nov. 6, 1986, p. 10. Fiscal year 1986 began Apr. 1985 and ended Mar. 1986.

[5]U.S. Embassy, Jakarta, Indonesia. State Dep. Telegram 9007, June 9, 1987, p. 2.

[6]Metal Bulletin (London). No. 7097, June 27, 1986, p. 13.

[7]Freeport-McMoRan Inc. 1986 Annual Report. Pp. 20, 57, 60.

[8]American Metal Market. V. 94, No. 235, Dec. 4, 1986, p. 16; v. 94, No. 243, Dec. 16, 1986, p. 8.

[9]Metal Bulletin (London). No. 7160, Feb. 13, 1987, p. 26; No. 7164, Feb. 27, 1987, p. 27.

[10]ANTARA News Bulletin (Jakarta). Dec. 3, 1986, p. A7.

[11]Inco Ltd. Annual Report—10K. Dec. 31, 1986, p. 15.

[12]Rock Products. V. 90, No. 4, Apr. 1987, pp. 30-31.

[13]Mining Journal (London). July 18, 1986, p. 43; Feb. 27, 1987, p. 146.
Industrial Minerals (London). No. 234, Mar. 1987, p. 75.

[14]Suara Karya (Jakarta). Oct. 10, 1986, p. 1.

[15]U.S. Embassy, Jakarta, Indonesia. State Dep. Telegram 2697, Feb. 19, 1987, 1 p.

[16]Petroleum News (Hong Kong). V. 17, No. 8, Nov. 1986, p. 9.

The Mineral Industry of Iran

By Michael D. Fenton[1]

Iran had a difficult year economically, owing to reduced oil earnings and the continuing major war with Iraq. Iran's own estimate of the annual cost of the war was $6.5 billion,[2] about 20% of the total gross domestic product (GDP). Annual oil production of 685,840 barrels accounted for more than 95% of exports and at least 90% of foreign exchange receipts. Revenue declined during Iran's fiscal year (FY) 1986 (March 21, 1986, to March 20, 1987) to an estimated $37 billion from about $50 billion in FY 1985, owing to lower crude oil prices and Iraqi military pressure. Expenditures exceeded revenues by an estimated $9.3 billion in FY 1986 compared with $4.7 billion in FY 1985. Foreign exchange earnings fell from $18.5 billion in FY 1984 to $17 billion in FY 1985 to an estimated $8 to $10 billion in FY 1986. To save foreign exchange, Iran engaged in barter deals and would only trade with countries that purchased or exchanged for Iranian goods.

Reduced oil earnings, caused by both reduced exports and falling prices, led to unprecedented cuts in imports, an industrial slowdown, increased unemployment, and rising inflation. The GDP declined from an estimated $120.3 billion in FY 1985 to $105.7 billion in FY 1986, of which the oil sector contributed about 58%. Iran continued to develop its oilfields, distribution networks, and refineries while trying to create export outlets far from the war zone. Iran also attempted to expand its mining industries by increasing Government investment and encouraging the private sector.

PRODUCTION AND TRADE

The National Iranian Oil Co. (NIOC) increased its estimate of Iran's recoverable oil reserves, including condensates, to 92.9 billion barrels. The reserves reported were the Khuzestan Fields, 58.2 billion barrels; gulf offshore fields, 23.2 billion barrels; other areas, 8.2 billion barrels; and condensate, 3.3 billion barrels. After the U.S.S.R., Iran had the world's largest proven gas reserves, about 460 billion cubic feet, about 15% of the world's proven gas reserves.

Accurate estimates of Iran's oil exports were difficult to make because of attacks by Iraq on export facilities, especially that of August 12 on Sirri Island. At that time, exports dropped from about 1.6 million barrels per day (bbl/d) to as low as 200,000 bbl/d. Iran abandoned direct export loading at Kharg Island and established transshipment points at Sirri Island in the southern part of the Persian Gulf and Larak Island in the Strait of Hormuz. Tanker loadings were also done offshore at Ganaveh and at the islands of Lavan and Hengan. Because of air attacks on refineries, imports of petroleum products averaged about 300,000 bbl/d. Products were supplied by processing deals involving refineries in Italy and Singapore, by spot market purchases, and by third parties from refineries in the Persian Gulf region.

Iran signed 1-year netback contracts in 1986 with companies in Italy, the Republic of Korea, Spain, and the United States, among others. Competition from other Middle Eastern producers for sales to Japan, at one time one of Iran's biggest customers, was intense, and Iran offered special prices to improve sales. At yearend, Turkey agreed to purchase 120,000 bbl/d in 1987 at

official Organization of Petroleum Exporting Countries (OPEC) prices, and Sri Lanka and Yugoslavia were negotiating for oil. Iran continued to ship free and discounted oil to Syria, according to a 1983 agreement.

U.S. imports of crude oil increased by 1,047,000 bbl/d to 4,130,000 bbl/d in 1986, and oil from OPEC members increased by 55% to 2,837,000 bbl/d. The United States imported only 19,000 bbl/d from Iran in 1986, compared with 27,000 bbl/d in 1985.[3]

Proven and probable mineral reserves in Iran were reported by the Government: iron ore, 500 million tons proven and 1.7 million tons probable; coal, 280 million tons proven and 358 million tons probable; copper, 427 million tons proven; kaolin and refractory clays, 22 million tons proven and 89 million tons probable.

About 73,500 employees in nearly 800 mines produced about 35 different minerals and rocks in Iran during FY 1986. Mineral exports, mostly metal ores, during FY 1985 were worth almost $70 million, and about $140 million of exports was expected by the Government for FY 1986. The Government increased investments in its mining industries and offered new incentives to promote investment by the private sector. The Supreme Mining Council was studying Iran's mineral resources and industries, and revising its mining law to more efficiently meet the country's local and export requirements. During FY 1986, 150 Government-private sector cooperative mining companies were formed, 20 operation permits for Government organizations were issued, and 600 6-year extraction and marketing contracts were made with the private sector. Full authorizations for export were granted by the Government for barite, clays, coke, gravel, gypsum, lime, neptunite, salt, sand, stone, carved turquoise, and others. New projects in the planning stages would increase production for export of chromite, furnace coal, kaolin, lead, magnesium, perlite, sodium sulfate, strontium, and zinc. Iran's shipping line increased its facilities for shipping mineral products abroad. Four mining schools had been established since 1980, which brought the total number of such schools to 5, but there still was a shortage of about 400 mining engineers.

Table 1.—Iran: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum metal, primary ingot	45,000	r e39,200	42,400	43,000	343,400
Chromium: Chromite, gross weight	49,000	48,000	59,000	56,000	56,000
Copper:					
Mine output, Cu content	43,000	57,600	43,300	50,000	348,000
Metal:					
Smelter	18,000	8,500	47,900	60,000	360,000
Refined	1,000	10,000	5,000	12,000	312,000
Iron and steel:					
Iron ore, gross weight thousand tons	1,150	1,665	2,711	2,799	2,800
Metal:					
Pig iron do	220	240	250	250	250
Steel, crude[e] do	1,200	r1,200	1,200	900	900
Lead, mine output, Pb content	e25,000	18,500	19,900	r e21,600	321,600
Molybdenum, mine output, Mo content[e]	--	500	500	500	3500
Zinc, mine output, Zn content	40,000	39,500	47,100	50,000	336,000
INDUSTRIAL MINERALS					
Barite[e]	80,000	85,000	90,000	90,000	90,000
Borax	672	700	700	1,200	1,200
Cement, hydraulic[e] thousand tons	9,500	10,000	311,803	r12,464	313,000
Clays:					
Bentonite	31,000	14,000	35,000	27,000	27,000
Kaolin and fire clay	390,000	260,000	622,000	429,000	429,000
Feldspar	21,000	24,000	33,000	32,000	32,000
Fluorite	2,900	3,300	3,300	3,300	3,300
Gypsum thousand tons	5,090	8,637	9,666	8,384	8,400
Lime[e] do	550	650	650	3500	500
Magnesite	665,000	850,000	830,000	2,240,000	2,240,000
Manganese	31,000	38,000	66,000	55,000	55,000
Mica	120	300	565	820	820
Nitrogen: N content of ammonia[e]	26,000	28,800	21,400	327,100	365,900
Pigments, mineral, natural	1,800	3,500	9,100	4,300	4,300
Salt, rock thousand tons	620	682	691	703	700
Sodium compounds: Caustic soda[e]	12,000	12,500	12,000	12,000	12,000

See footnotes at end of table.

Table 1.—Iran: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
INDUSTRIAL MINERALS —Continued					
Stone, sand and gravel:					
Limestone thousand tons	10,166	12,948	11,574	15,430	16,000
Marble, granite, and travertine do	2,169	2,900	3,072	3,291	3,300
Strontium minerals: Celestite	31,000	22,000	21,000	25,000	25,000
Sulfates, natural:					
Aluminum-potassium sulfate (alum)[e]	3,000	2,500	12,000	12,000	12,000
Sodium sulfate (mineral not specified)[e]	10,000	12,000	12,000	12,000	[3]123,000
Sulfur:					
Byproduct of petroleum and natural gas thousand tons	[e]10	16	130	150	150
Sulfuric acid[e] do	100	150	200	200	200
Talc	3,000	5,700	35,400	30,800	31,000
MINERAL FUELS AND RELATED MATERIALS					
Coal thousand tons	1,123	1,026	1,241	1,252	[3]1,262
Coke[e] do	[r]1,123	[r]1,026	[r]1,241	[r]1,252	1,262
Gas, natural:					
Gross million cubic feet	865,050	1,031,190	1,077,100	1,221,888	1,100,000
Marketed do	254,000	388,460	476,750	600,350	[3]536,783
Natural gas liquids, unspecified thousand 42-gallon barrels	5,475	3,650	3,600	3,600	3,600
Petroleum:					
Crude[4] do	808,110	890,600	793,510	803,370	[3]685,840
Refinery products:					
Gasoline do	37,000	34,300	26,100		
Kerosene do	44,400	41,800	25,300		
Distillate fuel oil do	63,700	59,900	77,100	NA	NA
Residual fuel oil do	74,800	69,700	70,600		
Other do	20,300	22,000	26,500		
Total do	240,200	227,700	225,600	NA	150,000

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

[1]Reported data are for years beginning Mar. 21 of that stated, except those for natural gas and petroleum, which are for regular calendar years. Table includes data available through October 1, 1987.

[2]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 produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Excludes petroleum reinjected into fields.

Table 2.—Iran: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984[r]	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Scrap	--	20	--	All to Japan.
Unwrought	5,640	--		
Chromium: Ore and concentrate	--	317	--	All to West Germany.
Copper:				
Ore and concentrate	21,877	--		
Metal including alloys:				
Scrap	--	49	--	United Kingdom 34; Japan 15.
Unwrought	230	--		
Semimanufactures	2,623	--		
Gold: Metal including alloys, unwrought and partly wrought troy ounces	--	707	--	All to West Germany.
Iron and steel: Metal, scrap	452	594	--	All to Japan.
Lead: Ore and concentrate	11,638	18,404	--	Spain 10,057; Italy 6,771; France 1,574.
Mercury 76-pound flasks	139	--		
Molybdenum: Ore and concentrate	--	262	--	All to United Kingdom.
Platinum-group metals: Waste and sweepings value, thousands	$60	$127	--	All to Netherlands.
Silver:				
Waste and sweepings[2] do	$114	$21	--	Netherlands $11; West Germany $10.
Metal including alloys, unwrought and partly wrought do	$1	--		

See footnotes at end of table.

Table 2.—Iran: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984[r]	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Ore and concentrate	8,767	--		
Ash and residue containing zinc	--	487	--	All to West Germany.
Metal including alloys, unwrought	4,999	--		
Zirconium: Ore and concentrate	--	13,625	--	Japan 7,500; Yugoslavia 5,125; United Kingdom 1,000.
Other:				
Ores and concentrates value, thousands	([3])	$991	--	All to Spain.
Ashes and residues	497	487	--	All to West Germany.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Dust and powder of precious and semiprecious stones including diamond value, thousands	$59	$8	--	All to Switzerland.
Grinding and polishing wheels and stones ---do	([4])	$2	$2	
Clays, crude	6	5	--	All to Italy.
Diamond:				
Gem, not set or strung value, thousands	$49	$17	$6	France $6; Thailand $5.
Industrial stones ---do	$60	--		
Dust and powder:				
Natural ---do	--	$19	$19	
Synthetic ---do	--	$88	$88	
Fertilizer materials:				
Crude, n.e.s	4,134	--		
Manufactured: Phosphatic	84,054	--		
Precious and semiprecious stones other than diamond: Natural value, thousands	$254	$12	$12	
Salt and brine	413	--		
Sodium compounds, n.e.s.: Sulfate, manufactured	8,500	--		
Stone, sand and gravel:				
Dimension stone: Crude and partly worked	4,214	2,104	([5])	Italy 1,962; France 105.
Gravel and crushed rock	21,976	--		
Limestone other than dimension value, thousands	--	$2	--	All to Japan.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum:				
Crude thousand 42-gallon barrels	585,531	206,676	23,890	Singapore 41,555; Spain 31,922; France 29,582.
Refinery products:				
Liquefied petroleum gas ---do	8	--		
Gasoline ---do	569	461	--	Japan 460.
Kerosene and jet fuel ---do	1,100	([6])	--	All to France.
Distillate fuel oil ---do	193	10	--	All to West Germany.
Residual fuel oil ---do	1,818	545	--	Italy 543.

[r]Revised.

[1]Table prepared by Virginia A. Woodson. Owing to a lack of official trade data published by Iran, this table should not be taken as a complete presentation of Iran's mineral exports. These data have been compiled from various sources, which include United Nations information and data published by partner trade countries. Unless otherwise specified, data are compiled from trade statistics of individual trading partners.

[2]May include platinum-group metals.

[3]Value unreported for 877 tons.

[4]Unreported quantity valued at $27,000.

[5]Unreported quantity valued at $43,000.

[6]Less than 1/2 unit.

Table 3.—Iran: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984[r]	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	1,301	26,152	23	Greece 25,000; West Germany 691.
Metal including alloys:				
Scrap	76	--	--	
Unwrought	9,219	2,171	--	Spain 1,999; West Germany 110.
Semimanufactures	18,577	8,239	--	Switzerland 2,826; United Kingdom 1,350.
Arsenic: Oxides and acids	4	67	--	All from West Germany.
Chromium: Oxides and hydroxides	52	189	--	Japan 119; United Kingdom 70.
Cobalt:				
Oxides and hydroxides	2	--		
Metal including alloys, all forms	1			
Copper: Metal including alloys:				
Scrap	18	--		
Unwrought	3,923	459	--	United Kingdom 247; West Germany 200.
Semimanufactures	31,328	36,751	8	Japan 8,123; West Germany 4,977; Italy 4,859.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	15	14	--	All from Netherlands.
Metal:				
Scrap	150	--		
Pig iron, cast iron, related materials	16,318	1,404	--	West Germany 577; Italy 427.
Ferroalloys:				
Ferrochromium	70	--		
Ferromanganese	2,118	12,043	--	France 12,040.
Ferrosilicon	1,711	--		
Silicon metal	3,061	--		
Unspecified	215	327	--	Japan 300; Austria 20.
Steel, primary forms	357,632	440,412	--	Japan 271,821; Italy 46,710; West Germany 35,589.
Semimanufactures:				
Bars, rods, angles, shapes, sections	277,589	251,051	1	Spain 135,967; West Germany 40,178; Japan 20,165.
Universals, plates, sheets	493,017	1,042,595	2	Japan 529,767; West Germany 221,315; Spain 102,932.
Hoop and strip	62,093	48,477	--	West Germany 24,560; Japan 16,201.
Rails and accessories	2,614	10,972	--	United Kingdom 7,525; Netherlands 1,746.
Wire	24,609	22,808	1	Japan 10,841; Yugoslavia 4,656; West Germany 4,201.
Tubes, pipes, fittings	322,370	65,461	37	Japan 22,421; West Germany 17,855; Spain 16,679.
Castings and forgings, rough	4,880	1,233	--	Italy 971; West Germany 202.
Lead:				
Oxides	218	126	--	All from West Germany.
Metal including alloys:				
Scrap	26	--		
Unwrought	15,466	11,170	--	Australia 9,999; Belgium-Luxembourg 602.
Semimanufactures	60	31	--	Belgium-Luxembourg 12; United Kingdom 8.
Magnesium: Metal including alloys:				
Unwrought	2	7	--	All from Switzerland.
Semimanufactures	70	19	--	United Kingdom 10; Switzerland 7.
Unspecified	--	3	--	Japan 1; Netherlands 1.
Manganese:				
Ore and concentrate, metallurgical-grade	3,818	1,500	--	All from Netherlands.
Oxides	67	500	--	All from Japan.
Mercury 76-pound flasks	--	174	--	All from West Germany.
Molybdenum: Metal including alloys all forms value, thousands	$26	--		
Nickel: Metal including alloys:				
Unwrought	29	60	--	All from Japan.
Semimanufactures	309	36	--	West Germany 24; United Kingdom 11.

See footnotes at end of table.

Table 3.—Iran: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984[r]	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$940	$1,379	--	West Germany $1,364.
Silver: Metal including alloys, unwrought and partly wrought do	$2,156	$578	--	West Germany $504; United Kingdom $73.
Tin: Metal including alloys:				
Unwrought	242	11	--	West Germany 8; Netherlands 3.
Semimanufactures	70	7	--	West Germany 6; United Kingdom 1.
Titanium:				
Ore and concentrate	2,000	--		
Oxides	235	295	--	Japan 218; Belgium-Luxembourg 40.
Metal including alloys, semimanufactures	2	--		
Tungsten: Metal including alloys, all forms	[2]4	6	--	Belgium-Luxembourg 4; Netherlands 1.
Zinc:				
Oxides	374	106	--	Belgium-Luxembourg 104.
Blue powder	60	--		
Metal including alloys:				
Unwrought	8,935	8,976	--	Spain 4,995; Belgium-Luxembourg 3,846.
Semimanufactures	9	1	--	All from Japan.
Zirconium: Metal including alloys, unwrought	1	--		
Other:				
Ores and concentrates	--	1,160	--	All from Netherlands.
Oxides and hydroxides	366	32	--	Italy 18; United Kingdom 10.
Ashes and residues	1	82	--	All from United Kingdom.
Base metals including alloys, all forms	21	--		
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	5	97	--	Netherlands 50; Italy 33; Austria 11.
Artificial: Corundum	90	13	--	All from Japan.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$1,408	$888	--	Switzerland $878; West Germany $10.
Grinding and polishing wheels and stones	2,854	1,730	--	Italy 590; West Germany 465; Yugoslavia 361.
Asbestos, crude	19,411	9,619	--	Canada 9,489; Italy 130.
Barite and witherite	3	--		
Boron materials: Oxides and acids	1,736	19	19	
Cement	14,120	6,224	--	Italy 2,500; New Zealand 1,723; West Germany 1,013.
Chalk	1,760	1,324	--	All from United Kingdom.
Clays, crude	636	1,021	--	West Germany 1,000; Austria 12.
Diamond:				
Gem, not set or strung value, thousands	$8	$427	--	Belgium-Luxembourg $416; West Germany $11.
Industrial stones do	$1,797	$890	--	All from Switzerland.
Diatomite and other infusorial earth	192	134	--	Austria 101; West Germany 18; Japan 15.
Fertilizer materials:				
Crude, n.e.s	--	99	99	
Manufactured:				
Ammonia	45	11	--	All from United Kingdom.
Nitrogenous	25,088	149,434	--	U.S.S.R. 107,287; Belgium-Luxembourg 25,476.
Phosphatic	43,001	30,750	--	All from Philippines.
Potassic	135	--		
Unspecified and mixed	45,195	40	--	All from United Kingdom.
Graphite, natural	8	45	--	West Germany 43.
Gypsum and plaster	61	--		
Magnesium compounds: Magnesite, crude	3,580	3,674	--	Austria 3,663.
Mica:				
Crude including splittings and waste	25	36	--	All from West Germany.
Worked including agglomerated splittings	17	2	--	West Germany 1; United Kingdom 1.

See footnotes at end of table.

Table 3.—Iran: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984[r]	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Pigments, mineral: Iron oxides and hydroxides, processed	1,120	138	--	West Germany 84; Italy 53.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	--	$105	--	All from West Germany.
Synthetic do.	$1	$4	--	West Germany $3; United Kingdom $1.
Salt and brine	110	2,732	--	United Kingdom 1,555; West Germany 1,177.
Sodium and potassium compounds, n.e.s.:				
Carbonate, manufactured	83	2,101	--	All from West Germany.
Sulfate, manufactured	90	6,001	--	Spain 4,000; West Germany 2,001.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	808	--		
Worked	171	243	--	Italy 131; Belgium-Luxembourg 108.
Gravel and crushed rock	700	1,117	--	France 912; Italy 145.
Quartz and quartzite	89	7	--	All from Italy.
Sand other than metal-bearing	10,028	460	--	Italy 345; United Kingdom 28.
Sulfur:				
Elemental:				
Crude including native and by-product	49	--		
Colloidal, precipitated, sublimed	52	--		
Dioxide	76	--		
Sulfuric acid	107	37	--	United Kingdom 22; Switzerland 14.
Talc, steatite, soapstone, pyrophyllite	63	72	--	West Germany 57; United Kingdom 15.
Other: Crude	700	1,469	--	United Kingdom 1,165; West Germany 304.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	20	1,611	--	United Kingdom 1,591; West Germany 20.
Carbon black	879	691	--	Japan 500; West Germany 162.
Coal:				
Anthracite and bituminous	818,141	231,638	--	Australia 199,582; Canada 30,800.
Lignite including briquets	35	104	--	All from United Kingdom.
Coke and semicoke	--	681	--	West Germany 601; United Kingdom 80.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	(3)	(3)	--	Mainly from Italy.
Gasoline do.	1,272	1,122	--	Singapore 963; Italy 156.
Mineral jelly and wax do.	14	636	--	Japan 632.
Kerosene and jet fuel do.	10,281	11,452	--	Singapore 4,061; Italy 1,818; United Kingdom 1,474.
Distillate fuel oil do.	2,580	6,698	--	Singapore 5,424; Italy 644; Japan 431.
Lubricants do.	782	567	5	Netherlands 273; France 116; Belgium-Luxembourg 91.
Nonlubricating oils do.	(3)	--		
Residual fuel oils do.	358	62	--	All from United Kingdom.
Bitumen and other residues do.	13	(3)	--	All from West Germany.
Bituminous mixtures do.	1	(3)	--	Do.
Petroleum coke do.	36	72	--	West Germany 71.

[r] Revised.

[1] Table prepared by Virginia A. Woodson. Owing to a lack of official trade data published by Iran, this table should not be taken as a complete presentation of Iran's mineral imports. These data have been compiled from various sources, which include United Nations information and data published by the partner trade countries. Unless otherwise specified, data are compiled from trade statistics of individual trading partners.

[2] Excludes an unreported quantity valued at $42,000 exported by the Netherlands.

[3] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—The Government made plans for a $250 million, 120,000-ton-per-year (tpy) aluminum smelter at Bandar Abbas that would begin producing in 1991 when domestic demand was expected to reach 240,000 tpy. The Arak aluminum plant was damaged, allegedly by an Iraqi warplane.

Chromite.—A total of 98,200 tons of chromite was exported to China, Czechoslovakia, the German Democratic Republic, Japan, and Poland between March 1985 and December 1986. Earnings on lumpy ore and concentrates were $16 million.

Copper.—The Sar Cheshmeh Mine decreased production to 48,000 tons from 50,000 tons of copper during FY 1985 from an ore reserve of 850 million tons grading 1.12% copper, with byproduct gold, molybdenum, rhenium, and silver. The 145,000-tpy-capacity mill and smelter produced 28,000 tons of blister copper and molybdenite for export during FY 1986. The 750-ton-per-day No. 1 furnace was replaced, and National Iranian Copper Industries Co. invested $153 million to increase annual output at the condensing and melting units by 60,000 and 40,000 tons, respectively.

The Industrial Development and Renovation Organization contracted with a Japanese company to build, near Kerman, a copper rolling mill that would produce 35,000 tpy of sheets and strips beginning in 1987.

Gold.—The Government announced a new gold reserve estimate for the Mouteh Mine: 1.2 million tons of ore grading 0.13 ounce per ton. The purchase of new refining equipment was planned.

Iron and Steel.—Iran had in progress three major projects in its steel industry: construction of the $4.7 billion, 3-million-tpy Mubarakeh mill; expansion of the Soviet-built Isfahan mill; and completion of the 400,000-tpy third unit at the Ahwaz complex. Mubarakeh, a very high-priority project, was not expected to be completed before 1990. Electric arc furnaces and rolling mills were to be of Italian origin, while the Japanese were to supply the direct-reduction plant. Mubarakeh was to receive iron ore from the Golgohar Mine and clay from the Shahid Nilchian Mine. In late 1986, an Iranian-Soviet committee agreed that Soviet technicians would return to Isfahan to help renovate and expand the Soviet-built steel mill. In early 1986, capacity of the Isfahan steelworks was 1.2 million to 1.3 million tpy, but full production was not possible because of shortages of spare parts, skilled workers, and war damage. Also, purchases of coke from the Federal Republic of Germany had to be reduced because of a shortage of foreign exchange. The Isfahan steelworks was responsible for all of Iran's production, which was 700,000 to 900,000 tpy at the beginning of 1986, an estimated one-sixth of consumption. Only steel rods and beams for construction were produced; steel plates and specialty steel for pipeline construction and military needs were imported. Much of this imported steel was from Turkey in exchange for Iranian oil and other goods. Construction at the Ahwaz mill, which had been inoperable since 1979, probably would not begin before 1988.

Two new iron ore mines were scheduled for completion by 1990: the high-priority Gol-e-Gohar Mine, 50 kilometers from Kerman in southeast Iran; and the Chadormelo Mine in the Yazd Province of central Iran, 500 kilometers southeast of Tehran. The Gol-e-Gohar deposit, 194 million tons of ore, would be mined at a rate of 5 million tpy and converted to concentrates at a rate of 2.4 million tpy containing 70% iron, 0.016% phosphorus, and 0.21% sulfur. Sweden's Gränges International Mining AB was doing the engineering work on the $250 million project, which was scheduled to be on-stream in 1987. The Chadormelou deposit, near the operating Choghart Mine, contained 350 million tons of ore grading 59% iron, 1% phosphorus, and 0.15% sulfur ore. Annual crude ore output would be 2.5 million tpy initially and eventually rise to 10 million tpy, to be converted to 6 million tpy of concentrates. The $1.5 million project was to begin production about 1990 when the Mubarakeh steelworks, which will require about 4.5 million tpy of concentrates, opens.

Ferrosilicon.—The state-owned Bank of Industry and Mines formed a new company to build a 20,000-tpy ferrosilicon plant that was scheduled to begin production in 1989. The plant, a high-priority project in Azna, would provide 75% silicon material for the Iranian and Persian Gulf steel industries.

Lead and Zinc.—The Ministry of Mines and Metals was planning to build several smelters for lead and zinc that would produce over 100,000 tpy of lead-zinc concentrates for domestic use. The Ministry of Mines and Metals was trying to acquire equipment and technology for the proposed high-priority Zanjan lead-zinc smelter that would produce 40,000 tpy lead and 60,000 tpy zinc. Production would begin about 1989.

The General Co. of Mines, under the Ministry of Mines and Metals, was expected to earn $2.5 million in foreign exchange for lead concentrates during FY 1986, compared with only $7 million during FY 1980-85. Production of lead and zinc by this company was more than 1,200 tons in FY 1985.

About 33,760 tons of lead and zinc concentrates was exported by the Kushk Mines in Yazd Province during FY 1986.

INDUSTRIAL MINERALS

Barite.—Mining of barite began at two new mines, the Ilit Mine and the Komeshcheh Mine, Esfahan Province.

Cement.—Total annual cement productive capacity reached about 16 million tons by yearend 1986. Annual cement production increased to 13 million tons during FY 1986 and was expected to reach 17 million tons after a planned expenditure during the next few years of more than $2.8 billion on 25 new cement works. Cement exports were expected to begin during FY 1986 and to reach nearly 1 million tons by March 21, 1987.

Completion of the new Ourmia Cement Co. plant was scheduled for 1987. The new plant was to have a 2,300-ton-per-day precalciner kiln, a Tirax raw mill, and two Unidan cement mills. A second plant, having a 2,000-ton annual capacity was also under construction at Shahroud.

Fertilizer Materials.—Iran was ranked first among the Arab gulf states in terms of installed ammonia and urea capacity, with nameplate nitrogen fertilizer capacity of 905,000 tpy of nitrogen in ammonia, 577,000 tpy of nitrogen in urea, and 74,000 tpy ammonium nitrate. As a result of war damage, capacity was reduced to about 361,000 tpy of nitrogen in ammonia and 252,000 tpy of nitrogen in urea. This includes capacity reduction of 450,000 tpy of nitrogen in urea at the Shiraz petrochemicals complex that was commissioned in March. There had been no imports of ammonia since 1982, but urea imports were 250,000 to 280,000 tons of nitrogen annually during the past 2 years. Purchases of ammonia were made in 1986 from Abu Dhabi, Qatar, Saudi Arabia, and the U.S.S.R. A top-priority economic goal of Iran was self-sufficiency in chemical fertilizers and farm products before 1991, and a saving of $128 million annually in foreign exchange. The planned increase in gas production during coming years should allow Iran's National Petrochemical Co. (NPC) to increase urea production at its Shiraz plant to 800,000 to 850,000 tpy.

The Barite Co. reported a total production of mineral fertilizers of 46,212 tons during the first half of FY 1986, which was a 1.5% increase over the same period in FY 1985.

Lime.—The new lime kiln at Damen near Iran-shar began experimental production in January 1986 at a rate of 200 tons of industrial lime per day. The plant consisted of 100-ton crushers, a 1,400-cubic-meter depot, an automatic 100-ton double lime furnace, three spherical hammer mills, a 500-ton silo, and a 500-kilowatt generator. The lime would be sent to the local steel industry, refineries, and power stations.

Pigments.—The General Co. of Mines produced 1,640 tons of very high-quality red earth from the Hormoz red earth mines for Iranian paint manufacturers in FY 1985. Exports earned over $1 million.

Salt.—During FY 1985, 500 tons of salt was exported to Persian Gulf states, and 2,000 tons was to be exported to Persian Gulf and African states in FY 1986.

Stone.—The extraction of facade and decorative stone was changed from detonation to block cutting to prevent unnecessary waste of stone. During the year ending March 20, 1986, more than 50,000 tons of stone was exported from Iran.

MINERAL FUELS

Coal.—Coal production by the National Iranian Steel Corp. from the Kerman Basin was 661,750 tons, and 600,000 tons was produced from 300 mines in the Elborz Range. The largest coal mine, the Papedana Mine, produced 400,000 tons. All of this low-quality coal was coked for the local blast furnaces. An additional 200,000 tons of high-grade coking coal was imported from Australia and the Federal Republic of Germany. The Government invested $62 million in the $125 million Tabas coal mine, in Khorassan Province, to increase production. The Tabas area contained about 80 million tons of coal and 50 million tons of asbestos.

Total proved reserves in Iran were 282 million tons.

Gas.—Iran planned to more than double gas production to more than 7 billion cubic feet per day. Gas from new fields would be processed in 10 to 12 plants to produce a total of 150,000-170,000 bbl/d of natural gas liquids (NGL).

The high-priority, $1 billion Vali Asr gas-gathering and gas-refining complex at the Nar-Kangan Gasfields on the gulf coast was nearing completion in late 1986. The four refining units would be fed by 23 gas wells, and refining capacity would be 1,200 million cubic feet per day with a potential for 2,825 million cubic feet per day. Development of the Nar Field was scheduled for completion by late 1987, and the nearby Kangan Field would be developed later. The Nar-Kangan Gasfields were originally intended to supply the U.S.S.R. through the IGAT-2 pipeline, construction of which was stopped at Isfahan in 1980 after the Iranian revolution. In 1986, Iran and the U.S.S.R. discussed the proposed resumption of gas shipments from Iran through the IGAT-1 pipeline and the possible completion of IGAT-2.

Turkey's state pipeline corporation and the National Iranian Gas Co. (NIGC) awarded a contract to British Gas International Ltd. to study the West European market for Iranian piped gas. Both countries had been considering the feasibility of constructing a gas pipeline from Iran's southern fields to Europe via Turkey. Iran also proposed to supply gas over the long term to the Federal Republic of Germany and other European countries through either the proposed Turkish pipeline or a Soviet pipeline network.

NIGC was rapidly laying 3- and 6-inch natural gas distribution lines from IGAT-1 to homes and businesses in Tehran that would enable the city to switch from gasoline and kerosene for heating and other energy needs. Iran had been importing gasoline and kerosene for about 5 years, mostly from Libya, and the Government was interested in ending this dependency because of recent shortages and the need to ration. Construction tools and high-grade steel for pipe were imported from the United States and other countries.

Petroleum.—*Exploration.*—Iran and the U.S.S.R. agreed to cooperate toward discovery of new oil and associated gas reserves in the Caspian Sea. The U.S.S.R. had been producing about 200,000 bbl/d of oil and significant gas from the region over the past 20 years, but Iran had never progressed beyond the exploration stage.

Production.—Iran produced about 6 million bbl/d before the war with Iraq that began in 1980, second only to Saudi Arabia in the Middle East. Production was as low as 1.43 million bbl/d in September 1986.

At the October 1986 meeting of OPEC, Iran was assigned a crude oil production quota of about 2.3 million bbl/d for the remainder of 1986. At the December meeting, the 1987 quotas for Iran were set at 2,255,000 bbl/d for January through June, 2,369,000 bbl/d for July through September, and 2,612,000 bbl/d for October through December.

Iran planned to increase onshore productive capacity to 3.5 million bbl/d by 1988 from the current 3.3 million bbl/d. Prerevolution offshore capacity was 800,000 bbl/d, but production dropped to less than 200,000 bbl/d as a result of the Iran-Iraq war. Iran's plan to increase offshore production was blocked by the war. Onshore oil was produced from 32 fields; 75% of it was from four giant fields, Agha Jari, Ahwaz, Gach Saran, and Marun. Most offshore oil came from the Rostam and Salman Fields; a small amount came from the Sirri Field. Production was stopped from at least five fields west of Kharg Island because of the war. The Ahwaz, Imam Hassan, Marun, Rostan, Salman, and Sassan Oilfields were damaged.

Iran began to revive part of the gas-injection secondary recovery project for the Khuzestan Oilfields, which was canceled after the Iranian revolution in 1979. Two plants would treat 3 billion cubic feet per day of dome gas from the Pazanan Oilfield for reinjection into the Gachsaran and Marun Reservoirs, and an additional 580 million cubic feet per day of wet associated gas from Gachsaran would be collected for reinjection.

Refining.—Iran's ability to produce refined products was reduced by late 1986 as a result of war damage at the Isfahan, Kermanshah, Shiraz, Tabriz, and Tehran refineries to perhaps as low as 410,000 bbl/d, and rationing and importing were required to satisfy local demand, 700,000 to 750,000 bbl/d. The 200,000-bbl/d Tehran refinery was operating at 120,000-bbl/d capacity, because one unit had been severely damaged. The 80,000-bbl/d Tabriz refinery was running at less than 50% capacity, and the 240,000-bbl/d Isfahan refinery was at 60% to 70% capacity. Required imports were

expected to be nearly 200,000 bbl/d well into 1987, but estimates as high as 300,000 bbl/d were made in 1986.

Progress continued toward the completion of new refineries by 1989 at Bandar Abbas on the Strait of Hormuz and at Arak, 200 kilometers southwest of Tehran. Total refining capacity would be increased to about 1.2 million bbl/d. Three other 200,000-bbl/d refineries were in the planning stages: at Ilam near the Iraqi border, at Mahad in the northeast, and at Abadan. About 90% of refinery throughput would be consumed domestically.

International companies were requested in July to bid for a turnkey contract to build a 220,000-bbl/d refinery at Bandar Abbas, and then were asked to offer revised bids by the end of October. The $1 billion to $1.5 billion complex would consist of a 200,000-tpy lube oil plant and a hydrocracker for middle distillates. The location of the plant, to be supplied by tanker from the Kharg Island export terminal, was expected to be beyond reach of Iraqi warplanes, but Iraq successfully struck the Larak Island export terminal about 50 kilometers south of Bandar Abbas.

Iran proposed to pay 10% of the estimated $400 million cost to build an oil refinery in Zimbabwe to ensure an outlet for Iranian crude exports. The new refinery would replace the outdated, inoperative Feruka refinery that was owned in part by the Kuwait National Petroleum Corp. Iran was eager to compete in this market against Kuwait, which had been Zimbabwe's main oil supplier in recent years.

Petrochemicals.—Twice in 1986 Iran failed to make scheduled repayments of interest and principal on Japanese loans to the Iran-Japan Petrochemical Co. (IJPC) complex at Bandar Khomeini on Iran's gulf coast. The plant was about 85% complete when construction ceased after the 1979 revolution in Iran. The loan of 28.8 billion yen was made by the Export-Import Bank of Japan and several Japanese commercial banks to IJPC, a 50-50 joint venture between Iran Chemical Development Co. and Iran's NPC. To compound the problem, the unfinished plant was damaged by Iraqi warplanes, which brought a protest by the Japanese.

Snamprogetti S.p.A. of Italy outbid six international companies for a contract to design and engineer a $50 million petrochemicals complex at Isfahan. The 50,000-tpy plant was to make linear alkyl benzene for detergents.

Iran's state-owned bank, Melli Iran, announced its plan to partly finance the proposed $1.3 billion petrochemical plant at Arak, 250 kilometers southwest of Tehran. Hard-currency expenditures were expected to be about $900 million. Feedstock would come from the Isfahan refinery and a 200,000-bbl/d refinery to be built at Arak. When completed in 5 to 6 years, the high-priority, 200,000-bbl/d plant would meet 70% of Iran's plastics and synthetic rubber requirements.

The NPC was planning to have its 255-ton-per-day methanol plant at Shiraz in operation by 1988.

Shipping and Storage.—A new oil export terminal, Val Fajr-2, was established at Larak Island, south of Bandar Abbas in the Strait of Hormuz, to supplement other Iranian export facilities. The export capacity of the terminal was 1.5 million bbl/d. Tankers using the terminal would be exempted from war-risk insurance premiums because of its distance from Iraq and its proximity to military bases at Bandar Abbas. Iranian oil would, therefore, be more competitive in the market.

Shipments of oil started at midyear from two single-buoy mooring installations at Ganaveh on the coast about 40 miles northeast of Kharg Island. Each of the systems was serviced by a 42-inch pipeline and manifold, with two sets of 24-inch loading hoses. Loading capacity was 100,000 barrels per hour.

The preliminary design of the new oil export port at Jask, the Ramezan project, was completed. The cost of this port may be $6 billion, but its capacity would exceed that of Kharg Island at its peak.

British Petroleum Ltd. and Iran's National Iranian Tanker Co. (NITC) agreed to disband a joint venture shipping company that was operating a 10-ship fleet. NITC bought the world's largest oil tanker, the 564,783-deadweight-ton (dwt) *Seawise Giant,* for storage at the Val Fajr-2 terminal. Three additional tankers, each of about 300,000 dwt, that NITC was chartering from Norway were purchased.

Iran and Turkey agreed to begin a feasibility study on the proposed 1,900-kilometer, 1-million-bbl/d oil pipeline between Iran's Khuzestan Oilfields to the Turkish Port of Iskanderun on the Mediterranean Sea.

The Government reported that local contractors were completing the Moharram

export pipeline from the Gurreh pumping station on the mainland north of Kharg Island, to Taheri or Asaluyeh in the Kangan region, where floating terminals would provide a safer alternative to the Kharg facilities. There was to be an additional terminal at Bushehr, at the pipeline midpoint.

Uranium.—Iran began to develop a reserve of 5,000 tons of high-grade uranium-lead-zinc ore in the Saghand region of Yazd Province to provide uranium to the new Isfahan Nuclear Technology Center and the nuclear reactor at Tehran University.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Iranian rials (Rls) to U.S. dollars at the rate of Rls75.664=US$1.00.

[3]Energy Information Administration (U.S. Department of Energy). Monthly Energy Review. May 1987.

The Mineral Industry of Iraq

By George A. Morgan[1]

As in previous years, the country's economy was dominated by petroleum. The war with Iran adversely affected various sectors of the mining industry, including petroleum refining and iron and steel processing facilities. Proven oil reserves increased to 72 billion barrels, and unproven reserves were 40 billion barrels. Exploration continued, and reserves were expected to increase further.

Iraq's foreign debt was placed at about $50 billion,[2] of which about one-half was from oil and cash payments received from various countries in the Persian Gulf. Of $20 billion in commercial debt, $15 billion was long term, and $5 billion was short term. Annual civilian and military financial requirements were $15 billion, with $7 billion for military spending, $6.5 for imports, and the remainder for debt servicing. Total revenues, primarily from oil sales, were estimated at $8.5 billion. Among major commercial trading partners, the countries to which Iraq was most heavily in debt were Italy, $2.4 billion; Japan, $1.8 billion; the Federal Republic of Germany, $1.5 billion; France, $1.4 billion, and Turkey, $1.3 billion. In 1986, Iraq sought to make payment partly or wholly in oil as petroleum output increased, as with India, Italy, and Japan. Foreign labor constituted an important facet of the economy, particularly owing to work force requirements for the war effort. About 20,000 Chinese were employed on more than 143 projects in Iraq. The Government served notice that certain categories of Egyptian workers would be limited in their ability to transfer funds home owing to economic conditions. Only those under Government contract on development projects would not be affected.

PRODUCTION AND TRADE

Official production data for the mineral industry continued to be unavailable, and detailed trade data have not been reported for a number of years. In 1985, total nonoil exports amounted to $294 million compared with $260 million in 1984. Crude petroleum exports to Pakistan may be resumed, mainly as a means of paying for imports from that country. Pakistani exports were terminated following destruction of the loading terminals in the Persian Gulf near the beginning of the war in early 1980.

Oil was being shipped to India in settlement of debts owed to contractors from two 1983 deferred payments. About 50% of the $190 million worth of oil due was shipped by yearend 1986. A $100 million technical and trade agreement signed with Egypt in July provided for exports of cement, sulfur, fertilizer, and other products to that country. A 5-year economic agreement was signed with the U.S.S.R. covering cooperation in oil, energy, and irrigation. Annual trade between the two countries was over $1 billion.

Table 1.—Iraq: Production of mineral commodities[1]

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Iron and steel:					
Sponge iron—metric tons	60	--	--	--	--
Steel, crude—do	[e]45,000	--	--	--	--
INDUSTRIAL MINERALS					
Cement, hydraulic[e]—thousand metric tons	5,600	5,600	8,000	8,000	8,000
Gypsum[e]—do	170	170	300	300	300
Nitrogen:[e]					
N content of ammonia—do	80	80	80	60	60
N content of urea—do	50	50	60	60	60
Phosphate rock[e]—do	[3]363	1,199	1,000	1,000	1,000
Salt[e]—do	80	80	80	70	70
Sulfur, elemental:[e]					
Native, Frasch—do	300	300	500	500	600
Byproduct—do	40	40	70	70	70
Total—do	340	340	570	570	670
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural:[e]					
Gross—million cubic feet	400,000	400,000	400,000	450,000	450,000
Marketed[4]—do	60,000	60,000	60,000	80,000	80,000
Natural gas liquids:[e]					
Natural gasoline—thousand 42-gallon barrels	400	400	400	400	400
Propane and butane—do	1,000	1,000	1,000	1,000	1,000
Petroleum:					
Crude—do	[e]310,000	400,000	437,800	520,900	617,000
Refinery products[e]—do	75,000	100,000	110,000	110,000	110,000

[e]Estimated. [p]Preliminary.
[1]Includes data available through June 1, 1987.
[2]In addition to the commodities listed, lime and a variety of crude construction materials (clays, sand and gravel, and stone) are also produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.
[3]Reported figure.
[4]Includes reinjected, if any.

COMMODITY REVIEW

INDUSTRIAL MINERALS

Cement.—Overdue payments owed to a joint venture from the Federal Republic of Germany for work performed at the Samawa cement works led to abandonment of the site. The plant reportedly was underdesigned and suffered technical problems. Two subcontractors at the site, Chris Tan International of Thailand and a Czechoslovakian company, were asked to assume the operation and maintenance contract. Two operation and maintenance contracts for the Taslouja and Fallouja cement works valued at $12 million were awarded to Enka Teknik of Turkey. A government-to-government credit agreement with China reportedly made it possible to finance an operation and maintenance contract for the Kerbala cement works by an unidentified Chinese company. The Chinese firm replaced a Norwegian firm which withdrew due to difficult local conditions. The Associated Cement Co. of India was responsible for management of a 1-million-ton cement export contract with Egypt with cement from the Upper Euphrates cement works. Contract price reportedly was $20 million, and the quantity shipped was expected to be increased to 2 million tons.

Fertilizers.—A U.S.-Japanese consortium was awarded a contract to build a fertilizer complex at Baiji at a cost of $275 million. The plant was to be completed in 1988 with a capacity of 1,000 tons per day of ammonia and 1,700 tons per day of urea. Private transport companies were invited to bid on contracts to ship 150,000 to 250,000 tons of chemical fertilizers to the port of Aqaba in Jordan for the State Organization for Iraqi Exports. Tenders were completed for the shipment of 200,000 to 300,000 tons of sulfur via Turkey.

Phosphate Rock.—The Ministry of Industry and Minerals reported the discovery of an estimated 3.5 billion tons of phosphate rock.

MINERAL FUELS

Natural Gas.—Iraq continued to work toward higher utilization of associated natural gas produced from its oilfields. Construction of gas pipelines to Kuwait was complet-

ed, with Kuwait paying the construction costs. Gas shipments commenced in September, and were expected during the first phase to be up to 200 million cubic feet per day from Iraq's southern oilfields. A contract was signed with the U.S.S.R. for the first stage of a 540-kilometer-long gas pipeline from the southern oilfields to a 1,200-megawatt powerplant being built at Mussayib. The pipeline was to be built by Tsvetmetporexport and financed under a $2 billion long-term credit from the U.S.S.R. Work also continued on development of underground gas storage reservoirs near Basrah. Iraq's domestic utilization of natural gas produced was about 18%, with the remainder flared.

Liquefied Petroleum Gas.—Production capacity was 6.6 million tons per year, consisting of production plants at Rumaila, 4 million tons; Baiji, 1.4 million tons; and Kirkuk, 1.2 million tons. A $250 million gas processing plant was tendered for the West Qurnah Oilfield. Yearly throughput capacity was to be 5 billion cubic meters.

Petroleum.—*Production.*—Total production capacity was put at 4 million barrels per day, compared with an output of about 2 million barrels per day. Expansion work on the Iraq Pipeline Trans Saudi Arabia (IPSA-1) was begun in November, reducing throughput of Basrah light crude oil to about 100,000 barrels per day. Full capacity of 500,000 barrels per day was to be achieved in early 1987. Pipeline exports through Turkey and Saudi Arabia were about 1.5 million barrels per day. Three consortia bid on contracts with the State Organization for Oil Projects for phase 2 of the IPSA pipeline. Funding of the 800-kilometer-long pipeline project was to include a barter and finance agreement. Cost of the project was estimated at $1.5 billion.

Work continued on a second major pipeline through Turkey, which was planned to begin operation in midyear 1987, with a daily capacity of 500,000 barrels. Agreement to build a third line was revived. The 240-kilometer line would extend from the Ain Zalah Oilfields near Mosul to Batman refinery in Turkey. Construction was expected to last 1 year, and capacity would be from 50,000 to 70,000 barrels per day.

Refining.—A new refinery was commissioned at Baiji with a capacity of 150,000 barrels per day. About 10,000 barrels per day of crude petroleum was exported to Jordan for refining at the Zerga refinery.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Iraqi dinars (ID) to U.S. dollars at the rate of ID0.31=US$1.00.

The Mineral Industry of Ireland

By Richard H. Singleton[1]

Ireland continued to be a significant producer of alumina, barite, lead, peat, and zinc. A significant and promising lead-zinc deposit was discovered. Alumina production increased. Production of barite and natural gas decreased significantly. Peat output recovered partially, but the combined 2-year production for 1985 and 1986 was little more than that for 1984. Imports of coal and crude petroleum increased.

No significant growth in Ireland's economy occurred for the second consecutive year as the expected large increase in net exports was thwarted by a marked appreciation of the Irish pound against the British pound and the U.S. dollar. Total exports, about $12 billion,[2] increased slightly in real value while the real value of imports, also about $12 billion in 1986, remained constant. Exports to the United States decreased by more than 50% to nearly $1 billion. Total Government debt remained above the annual gross national product (GNP), which was approximately $22 billion. Unemployment continued to worsen, increasing slightly to 18%. On the positive side, the deficit in the balance of payments decreased to less than 2% of GNP. Also, the rate of increase in consumer prices moderated to 4%.

PRODUCTION AND TRADE

A 40% decrease in barite production was caused by decreased demand for drilling muds in the North Sea as well as the near exhaustion of the Silvermines barite deposit after 25 years of mining. Exports of fuel oil increased by 23% to 3.9 million barrels as markets were reestablished on the Western European mainland, mainly in the lowland countries, although most continued to go to the United Kingdom.

Table 1.—Ireland: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
METALS					
Alumina thousand tons	--	66	653	555	686
Copper, mine output, Cu content	1,600	--	--	--	--
Iron and steel: Steel, crude thousand tons	[r]61	141	[r]166	203	208
Lead:					
Mine output, Pb content	36,200	33,600	37,200	34,600	36,400
Metal, refined, secondary	10,000	8,000	9,100	9,000	8,400
Silver, mine output, Ag content thousand troy ounces	352	[r]319	279	276	262
Zinc, mine output, Zn content	167,200	[r]185,900	[r]205,900	191,600	181,700
INDUSTRIAL MINERALS[2]					
Barite thousand tons	266	199	220	214	128
Cement, hydraulic do	1,580	1,486	1,377	1,457	1,398
Gypsum do	371	352	325	304	289
Lime	46,500	[e]50,000	67,900	84,800	87,600
Magnesia[3] thousand tons	71	65	[r e]75	[r e]75	[e]70
Nitrogen: N content of ammonia do	371	294	371	338	355
Pyrites	13,800	--	--	--	--
Sand and gravel[4] thousand tons	6,497	[e]6,500	6,714	6,749	6,550
Stone and other quarry products:					
Limestone[4] do	11,831	[e]11,000	10,598	9,337	7,865
Other[4 5] do	3,126	[e]3,000	2,665	2,411	2,041
Sulfur: S content of pyrites[e]	6,200	--	--	--	--
MINERAL FUELS AND RELATED MATERIALS					
Coal: Anthracite and bituminous thousand tons	63	75	70	57	54
Gas, natural: Marketed million cubic feet	71,800	77,500	82,200	85,200	59,300
Peat:					
For agricultural use thousand tons	95	[e]95	96	96	97
For fuel use:					
Sod peat[6] do	1,680	[e]1,650	1,643	1,107	1,185
Milled peat[7] do	3,599	[e]5,000	6,291	1,521	3,864
Total do	5,279	[e]6,650	7,934	2,628	5,049
Peat briquets do	406	[e]400	410	486	473
Petroleum refinery products:					
Gasoline, motor thousand 42-gallon barrels	969	2,669	2,610	2,694	2,762
Distillate fuel oil do	[r]1,170	[r]2,812	[r]3,120	3,255	3,788
Residual fuel oil do	[r]1,261	[r]2,828	[r]2,886	3,166	3,744
Liquefied petroleum gas do	70	209	162	186	104
Naphtha do	[r]9	[r]45	[r]99	126	378
Refinery fuel and losses do	[r]185	[r]276	[r]659	645	685
Total do	[r]3,664	[r]8,839	[r]9,536	10,072	11,461

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

[1]Table includes data available through July 31, 1987.

[2]Ireland also produces significant quantities of synthetic diamond and is the major overseas supplier of this material to the United States. However, output is not quantitatively reported, and available general information is inadequate to make reliable estimates of output levels.

[3]Based on exports.

[4]Excludes output by local authorities and road contractors.

[5]Includes clays for cement production, fire clay, granite, marble, rock sand, silica rock, and slate.

[6]Includes production by farmers and by Bord Na Mona.

[7]Includes milled peat used for briquet production.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals: Alkali metals	23	--		
Aluminum:				
Oxides and hydroxides	654,077	571,986	257	United Kingdom 244,915; Norway 201,586; West Germany 78,769.
Metal including alloys:				
Scrap	4,123	5,190	--	United Kingdom 2,472; West Germany 1,231; Netherlands 616.
Unwrought	1,099	585	3	United Kingdom 564.
Semimanufactures	1,007	2,483	51	United Kingdom 1,086; West Germany 456.
Arsenic: Oxides and acids	--	(2)	--	All to United Kingdom.
Chromium:				
Oxides and hydroxides	7	--		
Metal including alloys, all forms	10	(2)	--	All to United Kingdom.
Cobalt: Metal including alloys, all forms	88	32	29	West Germany 2; United Kingdom 1.
Copper:				
Matte and speiss including cement copper	20	--		
Oxides and hydroxides	4	--		
Sulfate	63	27	--	All to United Kingdom.
Ash and residue containing copper	--	404	--	West Germany 270; Spain 104.
Metal including alloys:				
Scrap	8,897	6,928	--	Belgium-Luxembourg 2,659; Netherlands 2,054; Netherlands 1,017.
Unwrought	903	1,062	--	Netherlands 606; United Kingdom 211.
Semimanufactures	1,749	1,513	602	United Kingdom 521; Netherlands 119.
Iron and steel: Metal:				
Scrap	42,972	50,045	--	United Kingdom 42,433; Belgium-Luxembourg 3,532; West Germany 2,439.
Pig iron, cast iron, related materials	404	60	--	United Kingdom 8; unspecified 43.
Ferroalloys:				
Ferromanganese	129	110	--	All to Belgium-Luxembourg.
Silicon metal	--	1	--	All to United Kingdom.
Unspecified	9	4	--	Do.
Steel, primary forms	678	183	(2)	United Kingdom 169.
Semimanufactures:				
Bars, rods, angles, shapes, sections	128,258	170,828	(2)	United Kingdom 59,544; West Germany 29,635; France 22,700.
Universals, plates, sheets	5,273	8,907	11	United Kingdom 8,439; West Germany 261.
Hoop and strip	908	777	6	United Kingdom 613.
Rails and accessories	758	478	1	United Kingdom 451.
Wire	1,636	1,149	1	United Kingdom 1,055.
Tubes, pipes, fittings	5,752	4,771	1	United Kingdom 4,170; West Germany 300.
Castings and forgings, rough	98	197	--	United Kingdom 101; Netherlands 76.
Lead:				
Ore and concentrate	61,114	62,622	5,150	France 16,883; Brazil 15,064; West Germany 12,044.
Oxides	1	--		
Ash and residue containing lead	369	199	--	All to United Kingdom.
Metal including alloys:				
Scrap	5,107	4,085	--	Belgium-Luxembourg 2,032; West Germany 731; Netherlands 701.
Unwrought	294	132	(2)	United Kingdom 126.
Semimanufactures	4,109	4,235	--	United Kingdom 3,886; Malaysia 177.
Magnesium: Metal including alloys:				
Scrap	42	7	--	All to West Germany.
Semimanufactures	1	18	18	
Manganese: Oxides	22	2	--	All to United Kingdom.
Mercury 76-pound flasks	(2)	--		
Molybdenum:				
Ore and concentrate	--	1	--	All to United Kingdom.
Metal including alloys, all forms	(2)	(2)	(2)	
Nickel:				
Matte and speiss	--	1	(2)	Mainly to West Germany.
Ash and residue containing nickel	1	--		
Metal including alloys:				
Scrap	149	151	52	United Kingdom 46; Netherlands 27.
Unwrought	59	36	4	United Kingdom 31.
Semimanufactures	291	216	1	West Germany 71; Switzerland 70; France 32.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	13,343	13,311	32	United Kingdom 13,279.
Silver:				
Waste and sweepings[3] value, thousands	$701	$713	$10	West Germany $505; United Kingdom $192.
Metal including alloys, unwrought and partly wrought troy ounces	950,764	36,073	--	Mainly to United Kingdom.
Tin: Metal including alloys:				
Scrap	1,374	1,366	--	Belgium-Luxembourg 1,214.
Unwrought	7	11	--	Netherlands 10.
Semimanufactures	89	108	--	United Kingdom 90.
Titanium:				
Oxides	8	--		
Metal including alloys, all forms	3	45	--	United Kingdom 40.
Tungsten: Metal including alloys, all forms	5	1	(2)	Mainly to United Kingdom.
Zinc:				
Ore and concentrate	403,706	370,754	--	Belgium-Luxembourg 125,475; Italy 95,594; West Germany 52,576.
Oxides	90	34	4	United Kingdom 29.
Ash and residue containing zinc	425	114	--	West Germany 80; United Kingdom 34.
Metal including alloys:				
Scrap	112	309	--	United Kingdom 179; West Germany 60; Belgium-Luxembourg 54.
Unwrought	246	56	--	All to United Kingdom.
Semimanufactures	66	91	13	United Kingdom 73.
Zirconium: Metal including alloys, all forms	2	(2)	(2)	
Other:				
Oxides and hydroxides	32	1	--	All to United Kingdom.
Ashes and residues	67	55	--	Do.
Base metals including alloys, all forms	20	--		
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	12	23	--	All to Unied Kingdom.
Artificial:				
Corundum	8	--		
Silicon carbide	18	281	--	United Kingdom 280.
Dust and powder of precious and semi-precious stones including diamond kilograms	4,859	6,531	2,410	Japan 1,476; West Germany 901; Italy 485.
Grinding and polishing wheels and stones	38	56	14	United Kingdom 25.
Asbestos, crude	197	151	--	United Kingdom 149.
Barite and witherite	221,558	198,933	23,920	United Kingdom 65,347; Norway 32,210; Kuwait 19,500.
Bromine	--	1	--	All to United Kingdom.
Cement	82,414	259,315	--	United Kingdom 257,371.
Clays, crude:				
Bentonite	634	483	--	United Kingdom 40; unspecified 443.
Kaolin	1	--		
Unspecified	170	57	19	United Kingdom 38.
Diamond:				
Gem, not set or strung value, thousands	$8	--		
Industrial stones do	$15	$392	--	West Germany $366.
Diatomite and other infusorial earth	1	--		
Fertilizer materials:				
Crude, n.e.s	5,036	2,735	--	All to United Kingdom.
Manufactured:				
Ammonia	95,266	115,813	--	Spain 70,142; United Kingdom 15,143; France 10,859.
Nitrogenous	69,503	86,119	--	United Kingdom 48,228; Netherlands 16,430; Belgium-Luxembourg 11,791.
Phosphatic	42	780	--	United Kingdom 760.
Potassic	1,260	--		
Unspecified and mixed	77,587	55,472	--	United Kingdom 55,439.
Graphite, natural	5	--		
Gypsum and plaster	51,539	62,623	--	All to United Kingdom.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Iodine	2	16	--	All to United Kingdom.
Lime	3,450	5,101	--	United Kingdom 5,097.
Magnesium compounds:				
Magnesite, crude	31	10	--	All to United Kingdom.
Oxides and hydroxides	619	3,591	--	Belgium-Luxembourg 2,660; United Kingdom 931.
Mica: Crude including splittings and waste	20	6	--	All to United Kingdom.
Phosphates, crude	294	419	--	Do.
Phosphorus, elemental	7	--		
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$51	$94	$12	Switzerland $42; West Germany $29; Greece $10.
Synthetic do	$3	$92	$92	
Salt and brine	1,042	973	--	United Kingdom 956.
Sodium compounds, n.e.s.: Carbonate, manufactured	527	106	--	United Kingdom 105.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,809	1,169	50	United Kingdom 760; Netherlands 265.
Worked	7,152	8,303	5,986	United Kingdom 2,029.
Gravel and crushed rock	415,115	463,747	--	United Kingdom 392,192; West Germany 71,555.
Limestone other than dimension	758	98	--	United Kingdom 77; Netherlands 21.
Quartz and quartzite	230	138	--	United Kingdom 113; Netherlands 18.
Sand other than metal-bearing	7,068	2,905	--	United Kingdom 2,902.
Sulfur:				
Elemental: Crude including native and byproduct	39	--		
Sulfuric acid	1,510	488	--	All to United Kingdom.
Talc, steatite, soapstone, pyrophyllite	22	1	--	NA.
Other:				
Crude	77	111	--	United Kingdom 100.
Slag and dross, not metal-bearing	501	370	--	All to United Kingdom.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	289	17	--	Do.
Carbon black	430	530	15	Netherlands 487.
Coal:				
Anthracite	6,574	6,699	--	All to United Kingdom.
Bituminous	18,622	9,938	--	United Kingdom 9,910.
Lignite including briquets	186	190	--	All to United Kingdom.
Coke and semicoke	(2)	22	--	Do.
Gas, manufactured	32	217	--	Do.
Peat including briquets and litter	192,505	239,877	82	United Kingdom 217,354; France 9,152; Netherlands 3,049.
Petroleum:				
Crude 42-gallon barrels	--	755,742	--	All to United Kingdom.
Refinery products:				
Liquefied petroleum gas do	72,546	86,884	--	Do.
Gasoline do	74,486	106,055	--	Netherlands 65,323; United Kingdom 30,464.
Mineral jelly and wax do	1,251	1,283	--	Netherlands 582; United Kingdom 212.
Kerosene and jet fuel do	--	93	NA	NA.
Distillate fuel oil do	85,797	67	--	All to United Kingdom.
Lubricants do	18,179	13,538	--	United Kingdom 11,907; France 637.
Residual fuel oil do	3,017,293	3,234,576	--	All to United Kingdom.
Bitumen and other residues 42-gallon barrels	25,282	1,145	--	United Kingdom 1,133.
Bituminous mixtures do	1,594	285	--	All to United Kingdom.
Petroleum coke do	1,183	--		

NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.
[3]May include other precious metals.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	23	1	--	All from United Kingdom.
Alkaline-earth metals	15	6	--	United Kingdom 5.
Aluminum:				
Ore and concentrate thousand tons	1,127	1,322	--	Guinea 1,320.
Oxides and hydroxides	3,148	4,684	232	United Kingdom 2,943; West Germany 1,064.
Ash and residue containing aluminum	5	10	--	All from United Kingdom.
Metal including alloys:				
Scrap	160	457	36	United Kingdom 261; Hungary 99; Canada 36.
Unwrought	3,065	2,597	--	Spain 1,401; United Kingdom 596; Norway 388.
Semimanufactures	32,178	31,662	71	United Kingdom 16,707; West Germany 5,096; France 4,139.
Antimony:				
Ore and concentrate	1	--		
Metal including alloys, all forms	1	--		
Beryllium: Metal including alloys, all forms	--	(2)	(2)	
Bismuth: Metal including alloys, all forms	--	(2)	--	All from United Kingdom.
Cadmium: Metal including alloys, all forms	1	--		
Chromium:				
Ore and concentrate	3,803	11	--	Do.
Oxides and hydroxides	141	115	--	United Kingdom 93; West Germany 22.
Metal including alloys, all forms	98	34	1	United Kingdom 25; Republic of Korea 7.
Cobalt:				
Oxides and hydroxides	7	21	1	United Kingdom 20.
Metal including alloys, all forms	103	65	57	United Kingdom 7.
Columbium and tantalum: Metal including alloys, all forms:				
Columbium (niobium)	--	(2)	--	All from United Kingdom.
Tantalum	2	10	9	Sweden 1.
Copper:				
Ore and concentrate	--	81	--	Netherlands 80.
Matte and speiss including cement copper	6	--		
Sulfate	1,114	1,642	2	U.S.S.R. 1,279; Belgium-Luxembourg 193.
Ash and residue containing copper	442	664	--	Netherlands 576; Belgium-Luxembourg 88.
Metal including alloys:				
Scrap	484	380	--	United Kingdom 367; West Germany 7.
Unwrought	275	246	--	United Kingdom 181; West Germany 46.
Semimanufactures	20,525	22,946	204	United Kingdom 10,593; Belgium-Luxembourg 2,894; West Germany 2,219.
Gold:				
Waste and sweepings value, thousands	$21	$64	NA	NA.
Metal including alloys, unwrought and partly wrought do.	$3,604	$6,114	NA	NA.
Iron and steel:				
Iron ore and concentrate including roasted pyrite	21	17	--	Netherlands 12.
Metal:				
Scrap	87,580	135,912	56	United Kingdom 120,084; Netherlands 1,594.
Pig iron, cast iron, related materials	1,245	1,462	7	United Kingdom 1,358; Sweden 54.
Ferroalloys:				
Ferrochromium	12	24	--	All from Sweden.
Ferromanganese	891	123	--	West Germany 98; United Kingdom 25.
Ferromolybdenum	3	22	--	All from Denmark.
Ferrosilicomanganese	1,035	1,220	--	Portugal 700; Norway 400.
Ferrosilicon	232	1,227	--	France 700; United Kingdom 245; Norway 200.
Silicon metal	182	186	--	United Kingdom 87; France 54; Italy 18.
Unspecified	16	47	(3)	United Kingdom 23; Netherlands 15.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Steel, primary forms	3,238	3,145	12	United Kingdom 1,841; France 752.
Semimanufactures:				
Bars, rods, angles, shapes, sections	123,412	118,245	118	United Kingdom 73,019; Spain 8,737; France 8,088.
Universals, plates, sheets	136,199	138,707	18	United Kingdom 69,449; France 13,924; Netherlands 9,934.
Hoop and strip	20,377	19,948	23	United Kingdom 14,392; West Germany 2,948.
Rails and accessories	9,328	6,775	--	West Germany 5,578; United Kingdom 1,192.
Wire	18,860	20,794	22	United Kingdom 7,265; France 4,830; Belgium-Luxembourg 4,044.
Tubes, pipes, fittings	63,157	57,453	168	United Kingdom 29,282; Belgium-Luxembourg 5,273; Italy 4,546.
Castings and forgings, rough	2,442	2,737	42	United Kingdom 866; West Germany 578; France 569.
Lead:				
Ore and concentrate	--	(2)	(2)	
Oxides	2,284	2,327	1	United Kingdom 2,320.
Ash and residue containing lead	--	20	--	All from Netherlands.
Metal including alloys:				
Scrap	4,700	4,787	181	United Kingdom 4,332; United Arab Emirates 205.
Unwrought	2,204	257	--	All from United Kingdom.
Semimanufactures	382	363	3	United Kingdom 301.
Lithium: Oxides and hydroxides	--	(2)	(2)	
Magnesium: Metal including alloys:				
Unwrought	91	17	--	Norway 15.
Semimanufactures	106	217	(2)	United Kingdom 90; West Germany 45.
Manganese:				
Ore and concentrate, metallurgical-grade	28,072	24,178	--	Ghana 23,691; Brazil 315.
Oxides	301	288	11	Belgium-Luxembourg 143; United Kingdom 112.
Metal including alloys, all forms	23	--		
Mercury 76-pound flasks	32	577	--	United Kingdom 566.
Molybdenum:				
Ore and concentrate	--	(2)	--	All from United Kingdom.
Metal including alloys, all forms	5	4	4	
Nickel:				
Ore and concentrate	5	13	--	United Kingdom 8; New Zealand 5.
Matte and speiss	--	1	(2)	Mainly from Austria.
Oxides and hydroxides	2	11	11	
Ash and residue containing nickel	28	--		
Metal including alloys:				
Scrap	1	19	--	All from United Kingdom.
Unwrought	220	305	18	United Kingdom 241; U.S.S.R. 34.
Semimanufactures	675	401	62	West Germany 177; United Kingdom 116.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	40,157	11,253	NA	United Kingdom 7,748.
Rare-earth metals including alloys, all forms	13	21	--	All from United Kingdom.
Selenium, elemental	9	1	--	Do.
Silicon, high-purity	1	25	4	United Kingdom 21.
Silver:				
Waste and sweepings[3] value, thousands	$1	--		
Metal including alloys, unwrought and partly wrought troy ounces	369,833	825,798	137,831	United Kingdom 647,843.
Tellurium, elemental and arsenic	10	16	--	All from United Kingdom.
Tin:				
Oxides	11	1	--	Do.
Metal including alloys:				
Scrap	--	(2)	(2)	
Unwrought	57	7	--	All from United Kingdom.
Semimanufactures	319	366	1	United Kingdom 172; Netherlands 93; Italy 60.
Titanium:				
Ore and concentrate	878	432	256	West Germany 93; Netherlands 59.
Oxides	3,419	3,071	1	United Kingdom 1,458; West Germany 624; France 460.
Metal including alloys, semimanufactures	60	73	38	West Germany 33.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Tungsten: Metal including alloys, all forms	13	13	9	United Kingdom 3.
Uranium and thorium:				
Ore and concentrate	--	19	--	All from United Kingdom.
Metal including alloys, all forms	46	(2)	--	Do.
Vanadium: Oxides and hydroxides	1	--		
Zinc:				
Ore and concentrate	--	1	--	All from United Kingdom.
Oxides	1,167	936	1	United Kingdom 834; West Germany 74.
Blue powder	--	17	(2)	United Kingdom 16.
Ash and residue containing zinc	69	54	--	All from West Germany.
Metal including alloys:				
Scrap	310	152	--	All from United Kingdom.
Unwrought	1,442	1,298	--	Netherlands 419; United Kingdom 405; Belgium-Luxembourg 179.
Semimanufactures	452	489	1	United Kingdom 303; Canada 144.
Zirconium:				
Ore and concentrate	--	5	--	All from United Kingdom.
Metal including alloys, all forms	--	12	10	Belgium-Luxembourg 1.
Other:				
Ores and concentrates	985	605	--	Republic of South Africa 604.
Oxides and hydroxides	181	33	10	United Kingdom 21.
Ashes and residues	1	54	--	United Kingdom 32; Belgium-Luxembourg 22.
Base metals including alloys, all forms	7	4	--	United Kingdom 3.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	200	156	3	United Kingdom 128.
Artificial:				
Corundum	110	153	--	United Kingdom 77; West Germany 76.
Silicon carbide	276	36	1	Italy 18; United Kingdom 13.
Dust and powder of precious and semi-precious stones including diamond kilograms	3,499	3,165	3,094	Japan 31.
Grinding and polishing wheels and stones	521	587	43	United Kingdom 192; West Germany 147; Austria 66.
Asbestos, crude	5,687	5,244	(2)	Republic of South Africa 2,877; Canada 1,419; Cyprus 852.
Barite and witherite	423	391	2	United Kingdom 308; West Germany 80.
Boron materials:				
Crude natural borates	608	364	--	United Kingdom 363.
Elemental	14	--		
Oxides and acids	102	114	(2)	France 112.
Bromine	24	47	--	All from United Kingdom.
Cement	99,650	101,981	72	United Kingdom 61,742; East Germany 13,072; West Germany 6,815.
Chalk	4,416	3,897	--	United Kingdom 3,317; France 428; Belgium-Luxembourg 81.
Clays, crude:				
Bentonite	1,625	1,507	1	United Kingdom 1,429; Denmark 19; Netherlands 18.
Chamotte earth	9,080	5,796	--	Spain 5,745.
Fuller's earth	NA	114	--	All from United Kingdom.
Kaolin	7,910	5,973	1	United Kingdom 5,943.
Unspecified	8,560	10,357	365	United Kingdom 7,197; Spain 1,633; China 1,000.
Cryolite and chiolite	1	--		
Diamond:				
Gem, not set or strung value, thousands	$736	$954	--	United Kingdom $472; Belgium-Luxembourg $451.
Industrial stones do.	$8	$81	--	United Kingdom $75.
Diatomite and other infusorial earth	329	364	265	Spain 60; United Kingdom 34.
Feldspar, fluorspar, related materials:				
Feldspar	176	101	--	All from United Kingdom.
Fluorspar	8	43	--	United Kingdom 34.
Unspecified	6,241	7,468	--	Norway 6,710; United Kingdom 754.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Fertilizer materials:				
Crude, n.e.s	2,438	2,819	--	United Kingdom 2,777.
Manufactured:				
Ammonia	801	8,459	--	United Kingdom 8,332.
Nitrogenous	252,385	339,406	--	Belgium-Luxembourg 88,732; Netherlands 87,399; Spain 53,638.
Phosphatic	165,696	159,048	26,656	Netherlands 45,458; Sweden 41,156; Tunisia 13,909.
Potassic	332,815	328,470	3,050	West Germany 225,445; East Germany 40,916; Belgium-Luxembourg 20,254.
Unspecified and mixed	594,926	570,239	49,632	United Kingdom 192,922; Netherlands 96,043; Belgium-Luxembourg 87,426.
Graphite, natural	22	5	2	United Kingdom 3.
Gypsum and plaster	5,107	4,647	349	United Kingdom 3,835; West Germany 459.
Iodine	55	42	--	Switzerland 39.
Kyanite and related materials	218	220	--	All from United Kingdom.
Lime	1,240	914	--	United Kingdom 905.
Magnesium compounds:				
Magnesite, crude	17	110	--	All from United Kingdom.
Oxides and hydroxides	43,931	36,092	--	United Kingdom 17,389; China 10,660; Spain 4,763.
Other	148	397	--	West Germany 361.
Mica:				
Crude including splittings and waste	241	135	5	United Kingdom 118.
Worked including agglomerated splittings	2	5	1	United Kingdom 3.
Nitrates, crude	33	90	--	All from United Kingdom.
Phosphates, crude	7,369	7,239	--	Morocco 4,225; West Germany 1,230; Tunisia 1,070.
Phosphorus, elemental	12	7	--	United Kingdom 5.
Pigments, mineral:				
Natural, crude	--	(2)	--	All from Switzerland.
Iron oxides and hydroxides, processed	2,391	2,127	46	West Germany 1,704; United Kingdom 258.
Precious and semiprecious stones other than diamond:				
Natural ----- value, thousands	$294	$325	$1	Switzerland $148; United Kingdom $110.
Synthetic ----------do----	$382	$58	$13	Japan $14; Switzerland $13.
Pyrite, unroasted	2	3	--	All from United Kingdom.
Salt and brine	90,400	102,967	20	United Kingdom 55,860; West Germany 16,558; Spain 16,192.
Sodium compounds, n.e.s.: Carbonate, manufactured	7,818	13,970	--	Netherlands 5,244; United Kingdom 5,142; Spain 2,127.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	4,090	5,371	--	Italy 2,337; Republic of South Africa 1,998; West Germany 747.
Worked	7,120	6,839	184	Italy 2,607; United Kingdom 1,252; Canada 1,127.
Dolomite, chiefly refractory-grade	1,752	1,183	--	United Kingdom 653; Netherlands 460; Sweden 54.
Gravel and crushed rock	274,785	240,684	3	United Kingdom 239,950; France 500.
Limestone other than dimension	20,989	19,804	--	All from United Kingdom.
Quartz and quartzite	317	590	(2)	Japan 191; United Kingdom 187; Portugal 160.
Sand other than metal-bearing	122,947	90,725	53	Belgium-Luxembourg 47,219; United Kingdom 40,354.
Sulfur:				
Elemental:				
Crude including native and by-product	271	327	27	United Kingdom 161; West Germany 118.
Colloidal, precipitated, sublimed	47	45	--	West Germany 27; United Kingdom 15.
Dioxide	653	696	--	Sweden 642.
Sulfuric acid	76,837	80,815	2	Norway 36,105; United Kingdom 30,562; France 10,790.
Talc, steatite, soapstone, pyrophyllite	2,414	2,143	13	United Kingdom 958; China 404; Hong Kong 140.
Vermiculite, perlite, chlorite	3,790	3,868	--	United Kingdom 1,993; Netherlands 1,875.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Other:				
Crude	3,278	5,005	10	Republic of South Africa 1,895; Italy 1,600; France 1,371.
Slag and dross, not metal-bearing	3,175	2,614	--	Netherlands 1,364; Belgium-Luxembourg 1,183.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	3,990	2,005	--	United Kingdom 1,897; Trinidad and Tobago 108.
Carbon black	8,051	7,722	5	United Kingdom 4,133; Finland 2,649; Netherlands 399.
Coal:				
Anthracite thousand tons	42	87	10	United Kingdom 26; Republic of South Africa 19; Netherlands 13.
Bituminous do	1,352	1,824	318	Poland 735; United Kingdom 373.
Lignite including briquets do	24	22	--	West Germany 19.
Coke and semicoke do	8	7	--	United Kingdom 6.
Gas, manufactured	13	26	--	NA.
Peat including briquets and litter	870	947	--	United Kingdom 918.
Petroleum:				
Crude thousand 42-gallon barrels	8,525	9,625	--	United Kingdom 9,505.
Refinery products:				
Liquefied petroleum gas do	1,518	1,558	--	United Kingdom 1,367; Netherlands 174.
Gasoline do	5,356	4,956	(2)	United Kingdom 4,644; France 254.
Mineral jelly and wax do	32	34	(2)	United Kingdom 27.
Kerosene and jet fuel do	2,574	2,606	(2)	United Kingdom 2,072; U.S.S.R. 455.
Distillate fuel oil do	6,723	6,862	--	United Kingdom 5,448; U.S.S.R. 755.
Lubricants do	386	339	16	United Kingdom 292.
Residual fuel oil do	8,636	7,617	--	United Kingdom 3,942; Netherlands 1,333; France 885.
Bitumen and other residues do	616	517	--	United Kingdom 232; France 125; Belgium-Luxembourg 94.
Bituminous mixtures do	35	21	(2)	United Kingdom 19.
Petroleum coke do	146	234	214	Belgium-Luxembourg 18.

NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—The 800,000-ton-per-year Aughinish alumina plant produced at about 75% of capacity during the first half of the year and at nearly full capacity during the remainder of the year. The year's production increased by 24%. Discussions continued with the Government regarding lower prices for electrical power in order to make the product more competitive. Over 98% of the bauxite raw material was obtained from mines at Boke, Guinea, in west Africa. The alumina product was exported, primarily to the United Kingdom, 39%; Norway, 20%; and the Federal Republic of Germany, 20%. Total exports increased by 17% to 667,000 tons.

Lead and Zinc.—In January, Outokumpu Oy, Finland's largest mining company, acquired for $56 million a controlling interest, 75%, in Tara Mines Ltd., Ireland's only lead-zinc mine, claimed to be the world's sixth largest. The remaining 25% was held by the Government of Ireland. The previous majority owner was Tara Exploration and Development Co. Ltd., a Canadian-owned company. Tara Mines produced zinc concentrate and lead concentrate, in order of volume, in County Meath, 35 miles northwest of Dublin; the lead concentrate contained a significant amount of silver. The concentrates were exported to mainland Western European smelters on the basis of long-term contracts. Deliveries were expected to begin in subsequent years to

Outokumpu's smelter at Kokkola in Finland. Reserves were sufficient for about 25 years at current extraction rates.

A small Dublin-based exploration company, Conroy Petroleum and Natural Resources PLC, discovered massive lead-zinc deposits in Carboniferous reef limestones near the small village of Galmoy about 60 miles southwest of Dublin. Twelve exploratory holes were drilled; all intersected lead-zinc mineralizations at an average depth of approximately 300 feet. Partial core analysis indicated 12% to 18% combined lead-zinc in a layer 28 to 38 feet thick. This preliminary work suggested a deposit similar in size to the Tara Mines. Outokumpu had earlier procured a 20% interest in Conroy.

MINERAL FUELS

The Government's aim for greater dependence on indigenous sources of energy and less dependence on imported oil was set back by a significant decrease in the production of natural gas. Also, although peat recovered partially, the combined 2-year production for 1985 and 1986 was little more than that for 1984. Imports of crude petroleum increased for the second consecutive year to 10.2 million barrels in 1986. Coal imports increased significantly for the second successive year to nearly 2.7 million tons in 1986, nearly twice that of 1984. Much of this was to create a stockpile for Ireland's first coal-fired powerplant at Moneypoint, County Clare, which was expected to be in full operation in 1987.

Gas.—Production of natural gas, all from the Kinsale Field in the Celtic Sea, decreased 30% to 59 million cubic feet after peaking in 1985. The producer, Marathon Petroleum Ireland Ltd., had reduced output to the contractual rate, 60 million cubic feet per year, because of its dispute with the Government-owned purchaser and distributor, Bord Gais Eireann Teorante. Approximately one-half of Ireland's electrical power was generated from gas in 1985, requiring about two-thirds of total gas production. Pipelines were extended in 1986 from the onshore terminal near Cork to Limerick and Waterford. The grid also included Mallow and Dublin. The Dublin intercity network was complete. No gas was exported.

Peat.—Following the drastic reduction in peat output in 1985, production partially recovered in 1986 to 65% of the 1984 level. The lost output, caused by 2 years of wet weather, resulted in significant worker reductions and a marked drop in consumption in 1986. Government financial support was being sought by Bord na Mona, the large Government-owned peat firm. Peat fueled nearly 30% of the country's electrical power in 1985, requiring about two-thirds of Ireland's production of peat during the year. Milled peat was used to produce briquets as well as to fire powerplants. Nearly one-third of total peat production was used for domestic heating.

Petroleum.—The Government modified its royalty regime for offshore oil and gas exploration in September to provide more incentive to private industry particularly in view of lowered world oil prices. Licensees could then accrue credits against royalty payments. The Government was to share later in any profits. The credit applied to drilling for exploration and appraisal but not to drilling for field development.

Exploration for offshore oil and gas continued at a moderate pace. A total of seven exploratory wells were drilled in shallow waters, one in the Irish Sea Basin by Hydrocarbons Ireland Ltd., a subsidiary of British Gas Corp.; one by Gulf Oil (Ireland) Ltd. in the St. George's Channel between the Celtic and Irish Seas; one by Charterhouse Petroleum Ireland Exploration Ltd. in the Kish Basin off Dublin; and four in the northeastern part of the North Celtic Sea. Three of the Celtic Sea wells were drilled for Marathon; the fourth was drilled by BP Petroleum Development Ltd. None of the wells indicated significant quantities of oil or gas.

BP was becoming the most active and enthusiastic firm seeking Irish offshore oil and gas. Extensive seismic exploration in the deepwater Porcupine Basin off the west coast as well as in the Celtic Sea areas near the Kinsale Field was conducted by BP. It acquired much of the exploratory activities previously assigned to Gulf Oil, including block 50/6 in the Celtic Sea in which oil had been found in 1985. The oil find by Gulf Oil in 1983 in nearby block 49/9 was considered to have potential. Chevron Corp. and Union Oil (Ireland) Ltd. each began withdrawal from Irish offshore exploration activities.

Ireland's sole oil refinery, the 56,000-barrel-per-day Government-owned Whitegate complex in County Cork, continued to operate at 50% of capacity during 1986, producing fuel oil, diesel oil, and gasoline, in order of volume. Nearly all of the oil was exported, primarily to the United Kingdom.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Irish pounds (I£) to U.S. dollars at the rate of I£1 = US$1.34, the average for 1986.

The Mineral Industry of Israel

By Kevin Connor and David J. Ellis[1]

The mineral industry of Israel was centered mainly around the industrial minerals obtained from the brine deposits of the Dead Sea. In 1986, apart from a 5% rise in the level of bromine production and a 10% decrease in phosphate rock production, there was relatively little significant change from 1985 output levels.

Israel Chemicals Ltd. (ICL), which controls most of Israel's mineral producing companies and their subsidiary processing plants, continued its $500 million, multiyear development program on various new projects. These included a new conveyer belt for the Dead Sea Works Ltd. (DSW) potash plant and downstream projects for Dead Sea Bromine Ltd. and its affiliate, Bromine Compounds Ltd. Expansion of production capabilities was planned at most of ICL's subsidiaries.

A consortium of U.S. and Israeli investors, Negev Joint Venture (NJV), was granted two oil and gas exploration concessions, one in the Negev Desert and one offshore.

The Ministry of Energy allocated almost $40 million to a 4-year program consisting of several energy-related projects based in the Negev, with the objective of making Israel less dependent on imported oil.

PRODUCTION AND TRADE

The Government of Israel continued its program for economic stabilization, begun in 1985, with mixed results. The gross national product increased at about 2%, and inflation continued the downward trend begun in 1985 by finishing at just over 20% in 1986 compared with 185% the year before. Total commercial exports increased by 14% compared with that of 1985, while industrial exports rose 7%. However, imports also continued to increase, rising by 16% in value and leading to a trade deficit of about $2.36 billion,[2] a substantial increase over $1.94 billion in 1985. Foreign debt increased correspondingly to $24.4 billion, up 4% from that of 1985. Total trade in diamonds increased to $3.4 billion, up almost 26% from that of 1985. Trade in diamonds comprised 26% of Israel's exports and 16% of imports.

Israel's main trading partner continued to be the United States, which received 33% of Israel's exports and provided 19% of its imports. Israel's trade balance with the United States, excluding trade in diamonds, showed an increased deficit of $363 million compared with $327 million in 1985. However, the United States imported close to $1 billion in gem stones from Israel, mainly diamonds. The United States made loans of approximately $3.5 billion to Israel in 1986, of which over $1.5 million was for military aid.

Production of phosphate rock dropped by 10% as world prices slumped, but exports increased for the second straight year, rising by 8% to 2.49 million tons. Of that total, almost 80% went to Western Europe, where France, the Netherlands, and Italy were the three leading importers. Turkey imported 269,000 tons, or 11% of the total, thus maintaining its 1985 ranking as the fourth largest market for Israeli phosphate rock.[3]

Israel's other major trade market remained the countries of the European Economic Communities (EEC). The EEC received 31% of Israel's exports while supplying 51% of Iasrael's imports. The United Kingdom received 7% of Israel's goods by value, while supplying 11% of Israeli imports. This left Israel with a trade deficit of $473 million. The Federal Republic of Germany supplied 13% of Israel's imports while receiving 5% of the Israeli exports for a trade deficit of

$841 million. Israel's largest trade deficit was with Belgium, which provided 13% of Israeli imports while receiving 5% of Israel's exports, leaving a trade deficit of almost $1 billion. Approximately 70% of the value of Israel's trade with Belgium was in diamonds. Israel's major non-EEC trading partner in Europe was Switzerland, which supplied 8% of Israel's imports while being the recipient of 3% of Israel's exports, creating a trade deficit of $595 million.

Israel continued to intensify its marketing efforts in the Far East in 1986, and showed a 65% increase in trade with Japan that provided a positive trade balance of $16 million. Similarly, exports to Taiwan increased by 44%, with a positive trade balance of $214 million.

Table 1.—Israel: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Copper, oxide (80%-90% Cu):[e]					
Gross weight	4,200	4,200	3,500	--	--
Cu content	3,500	3,500	2,900	--	--
Iron and steel: Steel, crude[e]	120,000	150,000	200,000	150,000	130,000
INDUSTRIAL MINERALS					
Bromine:[e]					
Elemental	70,000	70,000	90,700	100,000	105,000
Compounds	50,500	50,500	65,300	70,000	73,000
Cement, hydraulic (from domestic clinker) thousand tons	2,189	2,058	2,064	2,020	[3]2,059
Clays:					
Bentonite	12,000	6,838	5,898	[r e]6,000	6,000
Flint clay	25,000	9,108	[e]9,000	[e]9,000	9,000
Kaolin	12,000	26,844	[e]27,000	[e]27,000	27,000
Other	35,000	18,274	[e]19,000	[e]19,000	19,000
Gypsum	42,000	42,000	46,000	[e]45,000	45,000
Lime	50,000	41,000	[e]50,000	[e]50,000	50,000
Nitrogen: N content of ammonia	49,300	53,400	57,500	57,500	57,000
Phosphate rock, beneficiated thousand tons	2,171	2,969	3,312	4,076	[3]3,673
Potash, K_2O equivalent do	1,004	1,000	1,100	1,200	[3]1,255
Salt, marketed (mainly marine)[e]	[3]148,200	145,000	145,000	150,000	150,000
Sand:					
Glass sand	65,000	61,000	61,000	[e]61,000	61,000
Other (for building industry) thousand tons	4,000	4,300	4,300	[e]4,300	4,300
Sodium and potassium compounds: Caustic soda	29,346	30,974	28,501	31,248	27,000
Stone:					
Crushed thousand cubic meters	6,000	4,500	6,000	[e]6,000	6,000
Dimension, marble	17,000	12,000	13,000	[e]13,000	13,000
Sulfur:					
Byproduct from petroleum[e] thousand tons	10	10	10	10	10
Sulfuric acid do	154	171	189	178	[3]182
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural, marketed million cubic feet	7,000	6,300	2,400	[e]2,400	2,400
Peat[e] thousand tons	20	20	20	20	20
Petroleum:					
Crude thousand 42-gallon barrels	100	92	365	365	365
Refinery products:					
Gasoline do	8,810	9,410	8,830	[e]8,800	9,000
Kerosene and jet fuel do	5,930	5,560	5,256	[e]5,300	5,000
Distillate fuel oil do	11,700	11,600	9,640	[e]9,600	10,000
Residual fuel oil do	23,800	22,500	19,300	[e]19,000	19,000
Other do	2,450	2,580	2,250	[e]2,200	2,000
Refinery fuel and losses do	2,640	2,580	2,260	[e]2,300	2,000
Total do	55,330	54,230	47,536	[e]47,200	47,000

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

[1]Table includes data available from the Apr. 1987 monthly Bulletin of Statistics, Israel Central Bureau of Statistics, v. 38, No. 4, Jerusalem; and the Israel Geological Survey.

[2]In addition to the commodities listed, Israel reportedly had the capacity to produce 71 tons of U_3O_8 per year, but official data are not reported, and available information is inadequate to make reliable estimates of actual output levels.

[3]Reported figure.

COMMODITY REVIEW

INDUSTRIAL MINERALS

Bromine.—The Dead Sea Bromine Group (DSB), composed of Dead Sea Bromine and its affiliate, Bromine Compounds, were ICL's most profitable subsidiaries in 1986. Production of elemental bromine and its compounds rose for the third consecutive year as the production capacity at the Sdom plant was increased by about 10%, with total sales of close to $180 million.

DSB had embarked on a 5-year, $150 million development program in 1985, with plans for further increases in production and exports of bromine and its compounds. Plans were made for the first stage of development, which was to be a 67-ton-per-year plant at Sdom to produce more chlorine, an essential reactant in the removal of bromine from the Dead Sea brines. The second part of the development would involve construction of new downstream processors to convert the excess bromine production into new compounds for marketing. These improvements were still in the planning stage in 1986, with implementation tentatively set for 1988.

Some financing for these new projects was expected to come from partial privatization of DSB as part of the Government of Israel's economic recovery program. DSB hoped to realize $50 million from the sale of about 25% of its stock on the New York exchange. An agreement was made with a consortium of Bear, Stearns and Co. Ltd. and Shearson Lehman Brothers Inc. to put the stock up for sale in midyear.

U.S. producers of bromine were concerned about the possibility of tariff-free Israeli bromine, in the form of sodium bromide, saturating the U.S. market in the wake of the Free Trade Agreement with Israel that was signed in 1985. The U.S. Bromine Alliance petitioned for the permanant removal of sodium bromide from the list of imports that receive duty-free treatment. Its petition was denied, but under a provisional rule, the Israeli sodium bromide was denied duty-free treatment for a year, pending a review in 1987.

Fertilizer Materials.—*Phosphorus.*—The value of Israel's exports dropped markedly from that of 1985, owing to the slump in phosphate rock prices in 1986. Despite this, Negev Phosphates Ltd. (NPL) claimed to have made a profit in 1986 on the basis of accounting changes that alleviated the tax burden. Industry sources estimate that reserves at the current mines will be depleted by 1990, and plans to develop the promising phosphate deposits at Sde Zohar continued.

NPL continued to mine and beneficiate phosphate rock at three sites in the northern Negev. An increase in production at the principal mining complex near Zin was planned, and a 500,000-ton-per-year flash calcination plant was scheduled for construction at the mine near Oron, about 10 kilometers northwest of Zin. This plant would create select grades of phosphate to produce high-quality phosphoric acid. The third minesite was at Arad, which lies about 50 kilometers north of Zin and just west of the Dead Sea. ICL's subsidiary Rotem Fertilizers Ltd., near Arad, increased its phosphoric acid production capacity from 120,000 tons to 180,000 tons per year, as well as increasing its fertilizer granulation units capacity from 200,000 tons to 300,000 tons per year.[4]

Potash.—The DSW began marketing its own potash following a split with Kali Export, the European potash trade association. This development meant that DSW no longer faced production restraints. DSW therefore stepped up its marketing drive in Europe and the United States, which were Israel's best consumers of potash.

Production of potash increased about 5%, but exports decreased owing to the continued slump in world prices. Construction continued on the conveyer belt that would carry the potash from Sdom to the railhead at Nahal Zin. Completion was scheduled for early 1987, and the transport savings were expected to be about $3 million per year.

About 80% of the potash was exported directly; much of the remainder was processed and exported as potassium nitrate and other compounds. Haifa Chemicals Ltd., another of ICL's subsidiaries, marketed the processed potash among other products.

MINERAL FUELS

Coal.—As a result of the drop in oil prices in 1986, there was less demand for coal and shipments declined from the 3.26 million tons imported in 1985. The principal suppliers continued to be, in descending order of tonnage, the Republic of South Africa, Australia, the United States, and Columbia.

Petroleum (Exploration).—Interest in oil exploration resumed after a 2-year hiatus. NJV, a group of investors headed by Isramco Ltd. of New York began exploration on two concessions covering almost one-half of

Israel's territory. In December, drilling commenced on the first concession, which covered 2 million acres in the Negev. Preparatory seismic studies over the previous 18 months had shown enough promise to merit further exploration. The second concession was issued to the NJV in November and covered a 1-million-acre offshore block extending seaward from the coastal city of Ashkelon and southward offshore from the Gaza strip. This concession bordered on the successful Mango Oilfield under development by Egypt. Unfortunately, the oil-bearing strata off the coast of Israel were known to be at depths of 1,000 meters, which seemed to make development uneconomical in light of the availability of inexpensive imported oil.[5]

Israel was dependent on imported oil for over 98% of its energy needs in 1986, and imports of crude oil cost about $700 million, down 40% from that of 1985.

Energy.—Despite the lower price of oil in 1986, research and development on various alternate energy sources continued to be supported by the Ministry of Energy. A series of major projects were launched in the Negev Desert in the ongoing quest to make Israel more independent of foreign energy sources. The largest of these projects was the planning of a $26 million, 5-megawatt power station to be fueled by oil shale. Several million dollars were allocated for research and development on two projects associated with oil shale. One of the projects was a study of extracting oil from the shale for burning, while the second project involved an attempt to perfect a means of burning the crushed ore as fuel with a minimum of processing. There was estimated to be enough oil shale just under the surface of the Negev to supply Israel's energy needs for 50 years.

Another project, funded at $500,000, was an exploration program for various minerals, especially uranium. Four million dollars was allocated for a multifaceted solar research center at Sde Boker for testing photovoltaic systems, parabolic trough concentrators, and parabolic dish collectors. Ground was broken at the site in 1986, with plans for inauguration in early 1987. The final project was for an experimental wind turbine center in the Negev, which received funding of $1 million.[6]

The U.S. Department of Energy was consulted for aid and information on these projects.

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[1]Physical scientists, Division of International Minerals.
[2]Where necessary, values have been converted from New Israeli shekels (I) to U.S. dollars at the average rate of I1.179 = US$1.00 for 1985 and I1.488 = US$1.00 for 1986.
[3]International Fertilizer Industry Association Ltd. Phosphate Rock Statistics 1986. May 6, 1987, pp. 1-30.
[4]European Chemical News. V. 46, No. 1223, Apr. 28, 1986, p. 22.
[5]Financial Times. No. 30046, Oct. 1, 1986, p. 5.
[6]The Jerusalem Post. Oct. 15, 1986, p. 4.

The Mineral Industry of Italy

By John R. Craynon[1]

Italy's small mining industry continued to decline in terms of world importance in 1986. However, Italy produced 50% of the world's pumice and almost 30% of its feldspar. In addition, mine production of asbestos, barite, bentonite, cement, fluorspar, magnesite, potash, and talc was of some world significance. The mineral processing, metallurgical, and petroleum refining sectors were among the most important in Western Europe.

At yearend, the Government organization Ente Nazionale Idrocarburi carried out a major reorganization of its subsidiary Società per Azioni Minero-Metallurgiche (SAMIM). The mining activities of SAMIM were transferred to a new company, Società Italiana Minière, which is a subsidiary of Azienda Generali Italiana Petroli-Minière S.p.A. (Agip Minière). SAMIM's smelters and metallurgical activities were delegated to its successor company, Nuova Società per Azioni Minero-Metallurgiche.

Privatization in the steel industry, the startup of an electrolytic zinc plant, and the discovery of a major oilfield in the Ticino area were other major events impacting on the mineral industry.

PRODUCTION

Although the Italian economy grew at a rate of nearly 3%, the aggregated growth in the extractive industries was minimal. The continued large declines in the production of metallic minerals were primarily responsible for the slow growth. Industrial mineral production remained the most important extractive sector, although the value of total production in this sector declined slightly. Domestic production of natural gas increased 12% and petroleum increased over 7%, giving rise to the overall positive trend in the extractive industries. Smelter and refinery production of most metals decreased slightly, as did the output of many industrial mineral products.

Table 1.—Italy: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[p]
METALS					
Aluminum:					
Bauxite	23,010	r13,100	--	--	--
Alumina	698,329	465,671	607,274	555,319	618,374
Metal:					
Primary	232,861	195,694	230,207	221,055	242,632
Secondary	242,000	278,000	283,000	283,000	e280,000
Antimony:					
Mine output, Sb content	339	--	244	495	305
Metal, total	1,047	720	1,121	1,039	715
Bismuth metal	28	23	26	54	66
Cadmium metal, smelter	475	385	452	538	411
Copper:					
Mine output, Cu content	138	1,538	875	130	--
Metal, refined, all kinds	19,600	31,200	r50,300	64,300	64,800
Iron and steel:					
Iron ore and concentrate:[2]					
Gross weight	3,000	--	--	--	--
Fe content	1,500	--	--	--	--
Metal:					
Pig iron thousand tons	11,537	10,341	11,628	11,658	11,898
Ferroalloys:					
Blast furnace:					
Ferromanganese	59,353	50,274	36,092	50,111	48,002
Spiegeleisen	r957	r494	r935	1,001	1,151
Silicon pig iron (10%-12% Si)	1,024	580	342	686	968
Electric furnace:					
Ferrochromium	36,541	r45,414	r49,942	57,654	55,939
Ferromanganese	r15,987	r12,647	r15,651	17,166	11,653
Ferrosilicon	63,947	51,913	71,157	75,302	62,799
Silicomanganese	58,118	37,244	72,779	64,858	66,083
Silicon metal	14,012	11,737	22,812	17,812	968
Other	11,552	42,219	50,755	15,862	14,022
Total	r261,491	r252,522	r320,465	300,452	261,585
Steel, crude thousand tons	23,981	21,674	24,061	23,744	22,869
Semimanufactures:					
Wire rod do.	2,098	2,027	2,027	2,256	e2,000
Sections do.	6,909	6,874	6,874	7,135	e7,000
Plates and sheets do.	5,021	8,409	5,836	5,062	e5,000
Hoop and strip do.	593	461	461	526	e500
Railway track material do.	240	234	234	280	e200
Ingots, semimanufactures, solids for tubes do.	903	957	948	1,198	e1,100
Castings and forgings do.	614	453	435	326	e300
Other do.	1,784	1,515	1,524	1,383	e1,500
Total do.	r18,162	r20,930	r18,339	18,166	e17,600
Lead:					
Mine output, Pb content	16,187	23,561	20,883	15,622	11,119
Metal, refined:					
Primary	36,360	36,955	37,558	29,538	29,333
Secondary	97,300	89,400	102,900	96,700	101,700
Magnesium:					
Mine output, Mg content	e9,350	9,781	9,300	9,831	9,046
Metal, primary	9,943	7,687	7,491	7,863	12,417
Manganese, mine output:					
Gross weight	8,727	7,205	9,582	8,621	6,396
Mn content	2,618	2,215	r2,858	2,586	1,689
Mercury metal 76-pound flasks	4,612	--	--	--	--
Silver metal thousand troy ounces	1,791	2,361	1,554	2,301	1,813
Zinc:					
Mine output, Zn content	39,601	42,944	42,288	45,438	26,303
Metal, primary	158,560	155,893	169,672	215,644	229,397
INDUSTRIAL MINERALS					
Asbestos	116,410	139,054	147,272	136,006	115,208
Barite	180,022	139,090	107,128	128,356	114,132
Bromine[e]	600	500	500	600	450
Cement, hydraulic thousand tons	39,728	39,216	37,782	36,677	35,340
Clays, crude:					
Bentonite do.	237	297	309	304	300
Refractory excluding kaolinitic earth do.	254	284	332	400	381
Fuller's earth do.	7	20	30	30	31
Kaolin do.	53	53	53	60	35
Kaolinitic earth do.	29	25	25	26	21
Diatomite[e]	20,000	25,000	28,000	30,000	27,000

See footnotes at end of table.

Table 1.—Italy: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[p]
INDUSTRIAL MINERALS —Continued					
Feldspar	783,411	826,856	985,573	1,115,575	1,237,058
Fluorspar:					
Acid-grade	134,127	102,910	110,330	95,450	90,900
Metallurgical-grade	32,822	74,760	77,931	56,762	54,536
Total	166,949	177,670	188,261	152,212	145,436
Graphite, all grades	3,210	2,299	--	--	--
Gypsum thousand tons	1,335	1,388	1,264	1,261	e1,300
Lime, hydrated and quicklime do	2,167	2,021	r2,402	2,276	e2,100
Nitrogen: N content of ammonia do	1,046	1,060	1,210	1,217	e1,200
Perlite[e]	80,000	75,000	80,000	80,000	70,000
Pigments, mineral: Iron oxides, natural[e]	800	900	800	850	875
Potash, crude salts:					
Gross weight thousand tons	1,406	1,674	1,481	1,701	1,261
K_2O equivalent do	146	184	162	205	158
Pumice and related materials:					
Pumice and pumiceous lapilli do	774	931	903	r e750	e700
Pozzolan do	4,997	5,590	5,712	e5,000	e4,500
Pyrites, all types, gross weight do	667	646	443	690	761
Salt:					
Marine, crude[3] do	858	736	723	570	574
Rock and brine do	3,605	3,454	3,255	3,176	3,433
Sand and gravel:					
Foundry sand do	100	--	--	--	--
Volcanic sand do	160	110	115	e110	e100
Silica sand do	4,690	4,085	4,415	e4,400	e4,200
Other sand and gravel do	124,000	124,000	120,694	e122,000	e123,000
Sodium and potassium compounds:[e]					
Caustic soda	9,000	9,000	8,000	8,500	8,700
Sodium carbonate thousand tons	90	85	90	90	80
Sodium sulfate do	85	90	80	80	75
Stone:					
Dimension:[4]					
Calcareous:					
Alabaster and onyx do	11	20	17	e20	e20
Marble in blocks:					
White do	1,455	2,256	1,777	e1,500	e1,600
Colored do	850	1,785	1,756	e1,800	e1,800
Schist (calcareous) do	178	496	510	e500	e500
Travertine do	1,069	1,075	1,066	e1,100	e1,100
Tufa do	4,333	4,521	5,207	e5,000	e4,500
Other:					
Gneiss do	374	259	319	e300	e300
Granite do	4,717	2,556	2,385	e2,500	e2,500
Lava, basalt, trachyte do	14,900	6,879	8,799	e7,000	e8,000
Porphyry do	1,121	1,226	1,205	e1,200	e1,200
Sandstone do	600	1,781	1,855	e1,800	e1,800
Slate do	115	119	124	e120	e120
Tuff, volcanic do	5,100	5,826	5,930	e5,900	e5,800
Crushed and broken:					
Dolomite do	550	849	887	e900	e850
Limestone do	150,000	120,000	117,025	e120,000	e110,000
Marl for cement do	12,127	11,653	11,502	11,458	10,574
Serpentine do	2,500	2,339	1,204	e1,500	e1,500
Quartz and quartzite do	313	266	316	e300	e250
Strontium minerals: Celestite	3,272	414	--	4,611	4,667
Sulfur:					
Gross weight of ore thousand tons	88	41	20	5	--
Recovered as elemental and in compounds:					
Elemental from ore do	10	9	8	1	--
S content of pyrites do	269	271	192	280	309
Byproduct, oil refining[e] do	10	10	10	10	10
Byproduct, other sources[e] do	200	200	190	190	175
Total do	489	490	400	481	494
Talc and related materials	163,970	158,974	142,727	129,614	151,206
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bituminous rock, natural	85,838	93,306	91,988	88,700	65,889
Carbon black[e]	160,000	150,000	160,000	150,000	155,000
Coal:					
Lignite thousand tons	1,913	1,737	1,806	1,892	1,573
Subbituminous (Sulcis coal)	--	4,458	8,112	18,773	13,708

See footnotes at end of table.

Table 1.—Italy: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[p]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Coke, metallurgical thousand tons	7,335	6,419	6,920	7,377	[e]7,000
Gas, natural: Marketed million cubic feet	512,377	458,930	488,650	503,058	563,735
Natural gas liquids thousand 42-gallon barrels	430	383	383	360	[e]400
Petroleum:					
Crude do	11,881	14,961	15,635	16,024	17,230
Refinery products:					
Liquefied petroleum gas do	21,518	22,132	21,286	19,964	[e]20,000
Gasoline, all kinds do	132,693	125,732	123,522	124,617	[e]120,000
Naphtha do	24,738	24,269	22,876	27,175	[e]25,000
Jet fuel do	8,312	7,880	8,664	9,400	[e]9,000
Kerosene do	23,405	18,933	18,514	17,042	[e]18,000
Distillate fuel oil do	181,822	172,288	171,557	169,499	[e]170,000
Residual fuel oil do	212,793	190,322	173,466	146,087	[e]150,000
Other do	39,326	41,300	40,957	43,988	[e]40,000
Refinery fuel and losses do	48,151	46,167	48,631	36,735	[e]45,000
Total do	692,758	649,023	629,473	594,507	[e]597,000

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Sept. 22, 1987.
[2]Excludes pelletized iron oxide derived from pyrite.
[3]Does not include production from Sardinia and Sicily estimated at 200,000 tons annually.
[4]Output of limestone and serpentine for dimension stone use is included with "Stone: Crushed and broken."

TRADE

The decline in the value of the dollar in terms of the lira and the low world price for oil gave Italy a current account trade surplus in 1986. Imports from the United States were down nearly 18% compared with those of 1985. Energy products valued at $651 million,[2] down 30% from 1985 values, were among the major imports from the United States. U.S. imports of Italian goods decreased in value by 15% compared with those of 1985. Metals were the major U.S. mineral imports from Italy. The value of Italian metal products imported by the United States declined by over 23%. France and the Federal Republic of Germany remained Italy's most important trading partners. Because of the decline in prices for most metals and energy materials, the importance of mineral-related trade, in terms of value, decreased.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	137	495	--	Algeria 293; Switzerland 105; Yugoslavia 25.
Alkaline-earth metals	25	4	--	France 2; Iran 2.
Aluminum:				
Ore and concentrate	12,287	7,273	--	Greece 4,260; Turkey 1,950; West Germany 540.
Oxides and hydroxides	325,125	283,421	--	Netherlands 210,603; Yugoslavia 25,231; Tunisia 20,240.
Ash and residue containing aluminum	6,814	7,373	--	West Germany 3,508; France 3,237; Spain 214.
Metal including alloys:				
Scrap	3,894	5,816	62	West Germany 2,448; United Kingdom 1,729; France 1,181.
Unwrought	32,238	43,797	185	West Germany 13,748; United Kingdom 6,931; France 4,955.
Semimanufactures	119,961	134,664	11,682	West Germany 32,108; France 22,963; United Kingdom 10,531.

See footnote at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Antimony:				
Ore and concentrate	126	582	--	Austria 352; France 230.
Oxides	650	362	--	West Germany 324; Denmark 14; United Kingdom 11.
Metal including alloys, all forms	34	1	--	Mainly to West Germany.
Arsenic: Metal including alloys, all forms	18	24	--	United Kingdom 18; Morocco 3; Spain 3.
Beryllium:				
Oxides and hydroxides	(2)	38	--	Bulgaria 20; United Kingdom 18.
Metal including alloys, all forms	3	20	--	All to Austria.
Bismuth: Metal including alloys, all forms	22	40	--	Netherlands 20; Israel 17; Austria 1.
Cadmium: Metal including alloys, all forms	148	322	--	Belgium-Luxembourg 164; U.S.S.R. 79; France 25.
Cesium and rubidium: Metal including alloys, all forms	9	5	--	Greece 3; Bolivia 1; India 1.
Chromium:				
Ore and concentrate	678	1,544	--	Austria 655; Yugoslavia 460; Greece 123.
Oxides and hydroxides	37,212	25,549	--	Netherlands 23,282; Hong Kong 2,267.
Metal including alloys, all forms	40	138	(2)	West Germany 135; Switzerland 3.
Cobalt:				
Ore and concentrate	44	2	--	All to Yugoslavia.
Oxides and hydroxides	27	20	--	Netherlands 17; Belgium-Luxembourg 2; Hong Kong 1.
Metal including alloys, all forms	81	55	(2)	West Germany 23; United Kingdom 3; Yugoslavia 3.
Columbium and tantalum: Metal including alloys, all forms:				
Columbium (niobium)	(2)	(2)	--	Mainly to France.
Tantalum	1	6	--	Austria 2; France 2; Iraq 1.
Copper:				
Ore and concentrate	8,860	1,685	--	Spain 1,478; France 205.
Matte and speiss including cement copper	1,060	1,192	18	Spain 1,017; Algeria 110; France 44.
Oxides and hydroxides	1,199	2,042	--	West Germany 466; France 455; Netherlands 382.
Sulfate	5,147	--		
Ash and residue containing copper	5,889	5,084	--	West Germany 2,194; United Kingdom 972; Austria 637.
Metal including alloys:				
Scrap	13,174	14,814	--	West Germany 10,450; France 1,273; Yugoslavia 784.
Unwrought	14,880	14,112	137	United Kingdom 6,958; France 1,601; Yugoslavia 994.
Semimanufactures	111,762	124,236	9,003	France 29,778; West Germany 23,105; Austria 9,325.
Gallium: Metal including alloys, all forms	54	NA		
Germanium: Metal including alloys, all forms	21	1	--	Mainly to France.
Gold:				
Waste and sweepings value, thousands	$384	$13	NA	NA.
Metal including alloys, unwrought and partly wrought troy ounces	98,125	166,189	24,821	Belgium-Luxembourg 56,811; France 30,479.
Hafnium: Metal including alloys, all forms	(2)	(2)	(2)	
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	678	35	--	All to Venezuela.
Pyrite, roasted	45,051	22,873	--	France 18,805; Israel 3,035; Switzerland 930.
Metal:				
Scrap	19,424	9,861	31	West Germany 4,683; France 3,882; Netherlands 447.
Pig iron, cast iron, related materials	20,196	33,234	611	West Germany 7,261; Turkey 6,726; Egypt 5,001.
Ferroalloys:				
Ferrochromium	20,082	24,401	270	West Germany 10,101; France 7,287; United Kingdom 3,540.
Ferromanganese	319	301	--	West Germany 145; United Kingdom 49; Pakistan 33.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Ferroalloys —Continued				
Ferromolybdenum	764	175	--	Austria 100; France 57; Switzerland 11.
Ferronickel	1	(2)	--	All to Portugal.
Ferrosilicochromium	81	191	--	France 102; West Germany 73.
Ferrosilicomanganese	11,561	2,677	--	Switzerland 673; Bermuda 650; Greece 509.
Ferrosilicon	14,004	16,782	61	West Germany 6,481; France 4,687; Japan 1,575.
Silicon metal	13,288	9,973	2,612	Japan 2,541; Hungary 1,005.
Unspecified	8,710	7,648	83	United Kingdom 1,263; France 979; West Germany 962.
Steel, primary forms thousand tons	994	1,138	97	Turkey 193; France 158; West Germany 82.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	2,490	2,569	103	West Germany 695; France 516; U.S.S.R. 188.
Universals, plates, sheets do	1,696	1,805	148	U.S.S.R. 582; France 240; West Germany 192.
Hoop and strip do	155	185	10	France 46; West Germany 41; Austria 11.
Rails and accessories do	24	16	(2)	Switzerland 5; Yugoslavia 4; Egypt 3.
Wire do	136	173	13	France 43; West Germany 24; Switzerland 19.
Tubes, pipes, fittings do	2,268	2,092	180	U.S.S.R. 568; Saudi Arabia 283; West Germany 230.
Castings and forgings, rough do	54	59	1	Yugoslavia 13; West Germany 6; France 5.
Lead:				
Ore and concentrate	30,906	24,907	8,400	Spain 6,850; Austria 4,463.
Oxides	1,463	2,502	--	U.S.S.R. 1,250; Romania 1,135; Ecuador 28.
Ash and residue containing lead	10,221	4,425	--	Belgium-Luxembourg 2,836; France 1,395; United Kingdom 120.
Metal including alloys:				
Scrap	320	1,255	--	Spain 550; Turkey 390; Yugoslavia 196.
Unwrought	8,805	11,786	17	Algeria 2,147; Iran 2,000; Yugoslavia 1,719.
Semimanufactures	307	179	3	France 42; West Germany 42; Yugoslavia 20.
Lithium:				
Oxides and hydroxides	25	18	--	Turkey 10; France 7; Switzerland 1.
Metal including alloys, all forms	--	(2)	--	All to West Germany.
Magnesium: Metal including alloys:				
Scrap	1,186	858	353	West Germany 346; Brazil 39.
Unwrought	5,336	5,216	40	West Germany 2,023; Belgium-Luxembourg 1,216; Austria 651.
Semimanufactures	294	640	1	Belgium-Luxembourg 428; France 96; United Kingdom 35.
Manganese:				
Ore and concentrate, metallurgical-grade	1,918	1,272	--	France 780; Netherlands 467; Switzerland 25.
Oxides	98	260	--	Belgium-Luxembourg 107; Netherlands 48; Yugoslavia 25.
Metal including alloys, all forms	31	70	--	West Germany 45; Cuba 16; Greece 5.
Mercury 76-pound flasks	2,378	563	--	Belgium-Luxembourg 406; Iran 68; Republic of Korea 48.
Molybdenum:				
Ore and concentrate	--	43	--	Netherlands 37; Belgium-Luxembourg 6.
Oxides and hydroxides	(2)	10	--	All to Netherlands.
Metal including alloys:				
Scrap	--	1	--	All to West Germany.
Unwrought	42	(2)	--	All to India.
Semimanufactures	7	3	2	Mainly to Netherlands.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Nickel:				
Matte and speiss	24	18	1	United Kingdom 16; France 1.
Oxides and hydroxides	20	1	--	All to Venezuela.
Ash and residue containing nickel	185	358	--	Canada 210; Austria 91; West Germany 41.
Metal including alloys:				
Scrap	169	118	37	West Germany 62; Switzerland 9.
Unwrought	141	125	1	United Kingdom 66; France 23; Netherlands 17.
Semimanufactures	1,117	1,168	41	Switzerland 171; France 165; United Kingdom 142.
Platinum-group metals:				
Waste and sweepings value, thousands	$13	$53	--	All to West Germany.
Metals including alloys, unwrought and partly wrought thousand troy ounces	3,096	78	12	United Kingdom 21; West Germany 17; Switzerland 11.
Rare-earth metals including alloys, all forms	34	38	--	Austria 23; Portugal 6; Greece 4.
Rhenium: Metal including alloys, all forms	3	1	(2)	Mainly to Belgium-Luxembourg.
Selenium, elemental	4	1	--	All to France.
Silicon, high-purity	196	214	77	Japan 99; West Germany 14.
Silver:				
Waste and sweepings value, thousands	$2	$5	--	Switzerland $3; Israel $2.
Metal including alloys, unwrought and partly wrought thousand troy ounces	2,611	5,405	61	Switzerland 4,617; France 170; Tunisia 80.
Tellurium and arsenic, elemental	--	(2)	--	All to Albania.
Tin:				
Oxides	185	238	--	Spain 59; Netherlands 53; United Kingdom 36.
Ash and residue containing tin	139	160	--	United Kingdom 136; West Germany 24.
Metal including alloys:				
Scrap	94	60	--	United Kingdom 35; Netherlands 19; Spain 4.
Unwrought	141	197	(2)	Yugoslavia 87; Netherlands 49; United Kingdom 36.
Semimanufactures	95	136	3	West Germany 28; Belgium-Luxembourg 23; Switzerland 23.
Titanium:				
Ore and concentrate	990	1,906	--	Yugoslavia 1,799; Albania 30.
Oxides	1,931	874	2	West Germany 143; Yugoslavia 108; Greece 102.
Metal including alloys:				
Scrap	73	35	18	United Kingdom 9; West Germany 7.
Unwrought	22	4	--	Canary Islands 2; West Germany 1; Singapore 1.
Semimanufactures	105	90	(2)	West Germany 25; Brazil 8; India 6.
Tungsten:				
Ore and concentrate	--	5	--	All to Austria.
Oxides and hydroxides	--	1	--	All to Netherlands.
Ash and residue containing tungsten	30	4	--	All to Austria.
Metal including alloys:				
Scrap	41	46	--	West Germany 18; Switzerland 13; Belgium-Luxembourg 10.
Unwrought	44	125	--	West Germany 114; Switzerland 4; United Kingdom 2.
Semimanufactures	15	15	(2)	United Kingdom 5; West Germany 4; Belgium-Luxembourg 2.
Uranium and thorium:				
Ore and concentrate	158	21	--	All to Albania.
Metal including alloys, all forms:				
Uranium	2	1	(2)	Mainly to United Kingdom.
Thorium	1	--		
Vanadium:				
Ore and concentrate	56	--		
Oxides and hydroxides	14	1	--	Mainly to Venezuela.
Ash and residue containing vanadium	2,534	1,901	380	West Germany 1,441; Republic of South Africa 54.
Metal including alloys:				
Scrap	1	--		
Unwrought	6	(2)	--	All to Sweden.
Semimanufactures	--	1	--	Mainly to Sweden.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Ore and concentrate	18,938	25,283	--	Austria 12,599; Yugoslavia 12,211; West Germany 413.
Oxides	6,168	5,334	25	West Germany 2,429; France 1,868; Belgium-Luxembourg 256.
Blue powder	489	315	--	France 130; Spain 83; West Germany 28.
Matte	1,164	555	23	West Germany 382; Austria 69; Netherlands 49.
Ash and residue containing zinc	8,919	6,233	36	West Germany 2,794; Sweden 2,291; Belgium-Luxembourg 569.
Metal including alloys:				
Scrap	3,755	4,512	--	West Germany 3,911; France 485; Belgium-Luxembourg 48.
Unwrought	45,137	45,772	--	Turkey 11,501; Yugoslavia 10,281; Netherlands 4,425.
Semimanufactures	1,232	1,776	--	France 585; West Germany 346; Portugal 195.
Zirconium:				
Ore and concentrate	5,112	5,073	--	Hungary 4,127; Turkey 220; Yugoslavia 163.
Metal including alloys:				
Scrap	37	9	9	
Unwrought	(2)	2	--	Mainly to Belgium-Luxembourg.
Semimanufactures	4	63	6	Switzerland 48; Yugoslavia 8.
Other:				
Ores and concentrates	424	4,655	11	Turkey 2,750; Tunisia 600; Austria 511.
Oxides and hydroxides	122	37	3	Switzerland 10; France 7; Venezuela 6.
Ashes and residues	19,662	16,789	--	France 7,509; Spain 3,632; West Germany 2,392.
Base metals including alloys, all forms	64	154	7	Belgium-Luxembourg 78; Turkey 21; West Germany 19.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	71,727	109,356	420	United Kingdom 50,047; Algeria 43,547; West Germany 5,310.
Artificial:				
Corundum	4,325	6,386	454	Bulgaria 1,321; Austria 1,202; France 955.
Silicon carbide	9,430	11,711	993	West Germany 2,648; France 1,906; Belgium-Luxembourg 1,156.
Dust and powder of precious and semi-precious stones including diamond kilograms	66	330	13	Portugal 167; France 78; United Kingdom 37.
Grinding and polishing wheels and stones	26,824	27,997	1,250	France 2,929; West Germany 2,408; Saudi Arabia 2,334.
Asbestos, crude	57,659	66,244	173	West Germany 15,356; France 10,028; Japan 7,131.
Barite and witherite	9,609	27,136	60	Angola 9,600; Nigeria 7,521; Albania 4,600.
Boron materials:				
Crude natural borates	309	2,461	--	Netherlands 1,449; West Germany 490; Belgium-Luxembourg 389.
Elemental	20	44	--	United Kingdom 19; Spain 16; France 3.
Oxides and acids	19,062	17,307	--	Hungary 9,579; Poland 7,728.
Bromine	18	73	--	Belgium-Luxembourg 55; Switzerland 15; Spain 2.
Cement	521,977	383,633	26,384	Switzerland 129,398; Algeria 46,727; Austria 21,164.
Chalk	3,083	5,931	24	West Germany 4,925; Austria 679; Switzerland 277.
Clays, crude:				
Bentonite	38,144	28,063	--	France 14,285; Iraq 3,220; Nigeria 2,700.
Chamotte earth	3,629	3,199	--	Tunisia 2,500; Switzerland 390; West Germany 129.
Kaolin	33,918	50,305	94	France 35,249; Syria 5,842; Israel 4,077.
Unspecified	7,516	14,346	40	Turkey 9,778; France 1,358; Switzerland 901.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Cryolite and chiolite	139	43	--	Switzerland 34; Jordan 5; India 2.
Diamond:				
Gem, not set or strung carats	1,230	3,454	--	Mainly to Switzerland.
Industrial stones do	56,510	49,029	NA	United Kingdom 43,912; Yugoslavia 2,444.
Diatomite and other infusorial earth	3,003	4,114	44	Austria 1,413; West Germany 597; Switzerland 557.
Feldspar, fluorspar, related materials:				
Feldspar	35,469	39,139	--	West Germany 16,492; Switzerland 15,297; Algeria 1,100.
Fluorspar	70,801	44,786	8,400	West Germany 19,500; Romania 12,585.
Unspecified	1,164	564	--	NA.
Fertilizer materials:				
Crude, n.e.s	24,973	24,891	--	France 11,382; Saudi Arabia 3,356; Switzerland 3,067.
Manufactured:				
Ammonia	91,170	129,076	--	Greece 61,428; Israel 34,609; Turkey 23,229.
Nitrogenous	854,465	1,106,832	15,137	Turkey 293,295; Greece 159,941; Egypt 110,460.
Phosphatic	362	5,477	20	Gambia 4,000; Switzerland 434; United Arab Emirates 333.
Potassic	129,887	111,417	26	Algeria 58,500; Greece 19,570; Japan 11,750.
Unspecified and mixed	532,938	481,486	(2)	West Germany 91,713; France 75,418; United Kingdom 46,179.
Graphite, natural	5,481	444	--	West Germany 212; France 116; Hungary 29.
Gypsum and plaster	14,306	16,773	14	Switzerland 9,646; Austria 2,858; Saudi Arabia 2,369.
Iodine	3	2	--	Austria 1; West Germany 1.
Kyanite and related materials	802	--	--	
Lime	40,472	39,872	--	Switzerland 35,120; Sudan 2,030; Israel 500.
Magnesium compounds:				
Magnesite	946	2,373	30	Saudi Arabia 1,200; Netherlands 672; Spain 317.
Oxides and hydroxides	127,684	116,014	1,063	West Germany 28,356; Austria 26,087; Netherlands 15,537.
Other	--	68	--	Spain 48; Romania 20.
Mica:				
Crude including splittings and waste	556	229	--	West Germany 119; Libya 73; France 24.
Worked including agglomerated splittings	40	34	(2)	France 17; United Kingdom 6; Turkey 2.
Nitrates, crude	50	42	--	All to France.
Phosphates, crude	773	366	37	West Germany 104; France 68; Netherlands 48.
Pigments, mineral:				
Natural, crude	209	602	156	Dominican Republic 151; Somalia 76.
Iron oxides and hydroxides, processed	7,682	9,452	19	France 2,240; West Germany 1,157; United Kingdom 938.
Potassium salts, crude	--	(2)	--	All to West Germany.
Precious and semiprecious stones other than diamond:				
Natural kilograms	12,756	2,530	5	Austria 122; Yugoslavia 72; unspecified 2,279.
Synthetic do	1,377	1,076	NA	Mainly to Spain.
Pyrite, unroasted	5,005	4,778	231	West Germany 2,524; France 865; Austria 686.
Quartz crystal, piezoelectric kilograms	8	NA		
Salt and brine	314,781	428,589	52,550	United Kingdom 132,182; Netherlands 80,838.
Sodium compounds, n.e.s.: Carbonate, manufactured	46,912	53,037	741	Israel 22,625; Greece 13,005; Algeria 11,141.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	494	459	23	West Germany 63; France 37; Spain 32.
Worked do	1,707	1,765	193	West Germany 434; Saudi Arabia 419.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel —Continued				
Dolomite, chiefly refractory-grade thousand tons	48	35	--	Switzerland 15; France 12; West Germany 3.
Gravel and crushed rock do	839	804	1	Algeria 145; Switzerland 122; Kuwait 77.
Limestone other than dimension do	4	3	--	Austria 2; Switzerland 1.
Quartz and quartzite do	28	31	(2)	Switzerland 14; West Germany 7; France 6.
Sand other than metal-bearing do	13	12	(2)	Switzerland 7; France 1; Libya 1.
Sulfur:				
Elemental:				
Crude including native and by-product	4,714	14,455	--	Greece 7,700; Yugoslavia 5,793; France 359.
Colloidal, precipitated, sublimed	82	21	--	West Germany 13; Greece 5; Zaire 3.
Dioxide	238	82	--	Israel 33; Switzerland 23; Yugoslavia 20.
Sulfuric acid	68,310	117,500	19	Greece 48,232; Belgium-Luxembourg 25,334; United Kingdom 8,214.
Talc, steatite, soapstone, pyrophyllite	41,863	41,987	5,222	West Germany 14,354; France 5,875; United Kingdom 8,214.
Vermiculite, perlite, chlorite	59,880	61,976	--	United Kingdom 48,405; France 8,587; India 1,717.
Other:				
Crude	12,425	13,716	70	Switzerland 4,333; Romania 3,424; Yugoslavia 762.
Slag and dross, not metal-bearing	582,076	187,438	--	Greece 140,098; Austria 33,508; France 9,243.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	3,948	717	22	Switzerland 210; Tanzania 102; Iraq 96.
Carbon:				
Carbon black	2,367	1,542	--	Yugoslavia 1,392; Morocco 61.
Gas carbon	59,080	71,350	490	Yugoslavia 22,052; Austria 13,292; Turkey 10,781.
Coal:				
Anthracite	5,147	7,039	--	France 3,694; West Germany 2,828.
Bituminous	6,557	33,398	--	Hungary 27,229; Romania 3,600.
Briquets of anthracite and bituminous coal	321	488	--	France 435; Israel 43.
Lignite including briquets	35	26	--	West Germany 20; Israel 6.
Coke and semicoke	523,489	450,766	--	Romania 134,270; Hungary 96,967; Bulgaria 61,865.
Gas, natural: Gaseous million cubic feet	1	2	--	Mainly to France.
Peat including briquets and litter	299	154	--	West Germany 62; Libya 29; Austria 18.
Petroleum:				
Crude thousand 42-gallon barrels	1,430	1,900	--	West Germany 1,899.
Refinery products:				
Liquefied petroleum gas do	2,792	2,956	374	France 1,147; Greece 505.
Gasoline do	32,505	37,343	14,741	France 5,826; Libya 3,835.
Mineral jelly and wax do	1,387	50	(2)	West Germany 37; Switzerland 2.
Kerosene and jet fuel do	11,413	11,529	155	Greece 3,049; Netherlands 2,249; Iran 1,818.
Distillate fuel oil do	14,225	16,713	26	France 4,760; Greece 2,405; Netherlands 2,249.
Lubricants do	4,254	3,397	18	Netherlands 352; West Germany 335; Yugoslavia 223.
Residual fuel oil do	13,683	19,490	4,191	Netherlands 5,825; Greece 1,940.
Bitumen and other residues do	758	871	--	Austria 247; Switzerland 194; Tunisia 186.
Bituminous mixtures do	23	25	1	Netherlands 6; Belgium-Luxembourg 3; Austria 2.
Petroleum coke do	180	64	--	Belgium-Luxembourg 24; Austria 19; Yugoslavia 18.

NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	4,256	6,123	1	France 2,916; West Germany 2,766.
Alkaline-earth metals	150	162	--	Austria 78; France 50; U.S.S.R. 10.
Aluminum:				
Ore and concentrate thousand tons	1,281	1,277	(2)	Australia 684; Guinea 506; China 45.
Oxides and hydroxides	271,818	291,344	351	Guinea 100,895; France 100,257; West Germany 56,952.
Ash and residue containing aluminum	124,402	96,583	85	Austria 71,574; France 11,498.
Metal including alloys:				
Scrap	133,276	148,472	4,647	France 39,595; West Germany 32,851; Austria 19,657.
Unwrought	291,820	319,876	--	Netherlands 78,265; West Germany 71,998; Yugoslavia 36,893.
Semimanufactures	118,168	123,358	3,120	West Germany 54,095; France 20,915; Belgium-Luxembourg 11,925.
Antimony:				
Ore and concentrate	5	57	--	West Germany 47; Netherlands 10.
Oxides	764	893	--	Belgium-Luxembourg 421; United Kingdom 221; France 120.
Metal including alloys, all forms	222	247	--	Turkey 87; Netherlands 79; West Germany 31.
Arsenic: Oxides and acids	621	454	--	France 160; Belgium-Luxembourg 124; West Germany 63.
Beryllium:				
Oxides and hydroxides	(2)	23	--	All from West Germany.
Metal including alloys, all forms	3	(2)	(2)	
Bismuth: Metal including alloys, all forms	69	89	(2)	United Kingdom 77; Belgium-Luxembourg 5; Netherlands 3.
Cadmium: Metal including alloys, all forms	107	54	--	Netherlands 20; France 17; West Germany 8.
Cesium and rubidium: Metal including alloys, all forms	10	7	(2)	West Germany 6; United Kingdom 1.
Chromium:				
Ore and concentrate	220,529	229,118	--	Republic of South Africa 107,024; Albania 92,936; U.S.S.R. 9,750.
Oxides and hydroxides	2,083	2,050	187	West Germany 1,428; United Kingdom 193.
Metal including alloys, all forms	244	193	(2)	United Kingdom 105; France 59; Netherlands 15.
Cobalt:				
Ore and concentrate	--	3	--	Zambia 2; Tanzania 1.
Oxides and hydroxides	184	230	--	Belgium-Luxembourg 124; West Germany 61; Finland 26.
Metal including alloys, all forms	409	415	22	West Germany 107; France 95; Belgium-Luxembourg 50.
Columbium and tantalum: Metal including alloys, all forms:				
Columbium (niobium)	64	2	1	Mainly from West Germany.
Tantalum	4	4	1	Austria 1; West Germany 1; North Korea 1.
Copper:				
Ore and concentrate	4	24	--	All from West Germany.
Matte and speiss including cement copper	374	683	21	Brazil 433; Austria 227.
Oxides and hydroxides	360	299	3	Norway 150; Belgium-Luxembourg 104.
Sulfate	2,699	2,719	--	Yugoslavia 2,405; France 229.
Ash and residue containing copper	3,576	7,367	104	Austria 5,281; Canada 1,003; U.S.S.R. 403.
Metal including alloys:				
Scrap	112,098	120,860	14,284	France 31,037; United Kingdom 27,877; West Germany 25,784.
Unwrought	336,680	363,440	565	Chile 106,828; Zambia 55,516; Zaire 33,905.
Semimanufactures	151,534	145,503	228	West Germany 50,864; France 46,434; Belgium-Luxembourg 14,415.
Gallium: Metal including alloys, all forms	5	NA		
Germanium: Metal including alloys, all forms	(2)	84	--	All from Belgium-Luxembourg.
Gold:				
Waste and sweepings value, thousands	$2,800	--		
Metal including alloys, unwrought and partly wrought thousand troy ounces	6,516	7,458	2	Republic of South Africa 3,874; Switzerland 2,911.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Hafnium: Metal including alloys, all forms	(2)	(2)	(2)	
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	19,240	18,294	55	Brazil 5,280; Liberia 3,231; Mauritania 2,907.
Pyrite, roasted do	5	(2)	--	Mainly from Yugoslavia.
Metal:				
Scrap do	5,486	5,777	327	France 1,988; West Germany 1,967; U.S.S.R. 659.
Pig iron, cast iron, related materials	417,031	351,494	2,131	West Germany 80,320; France 69,419; Brazil 51,608.
Ferroalloys:				
Ferrochromium	106,703	97,833	16	Republic of South Africa 42,861; Zimbabwe 18,254; Sweden 9,914.
Ferromanganese	115,780	81,823	--	France 30,483; Republic of South Africa 23,185; Norway 9,147.
Ferromolybdenum	1,247	1,500	--	Netherlands 517; Austria 397; Belgium-Luxembourg 287.
Ferronickel	16,134	22,085	--	France 9,739; Colombia 3,765; Dominican Republic 1,729.
Ferrosilicochromium	581	1,114	--	West Germany 785; France 255; Belgium-Luxembourg 47.
Ferrosilicomanganese	27,968	27,008	39	Norway 12,959; Republic of South Africa 5,220; Portugal 4,775.
Ferrosilicon	65,505	48,133	(2)	France 14,937; Norway 11,366; West Germany 10,648.
Silicon metal	10,701	13,349	--	Norway 6,748; France 3,074.
Unspecified	9,028	6,338	214	France 2,299; United Kingdom 656; Belgium-Luxembourg 547.
Steel, primary forms thousand tons	2,769	2,971	33	France 766; Belgium-Luxembourg 574; West Germany 495.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	934	1,035	2	France 277; West Germany 235; Switzerland 125.
Universals, plates, sheets do	1,509	1,594	19	France 389; Belgium-Luxembourg 295; West Germany 250.
Hoop and strip do	222	206	(2)	West Germany 74; France 65; Austria 20.
Rails and accessories do	107	78	(2)	Netherlands 30; West Germany 19; Belgium-Luxembourg 7.
Wire do	83	94	(2)	Yugoslavia 34; Belgium-Luxembourg 24; France 12.
Tubes, pipes, fittings do	295	341	1	West Germany 128; France 86; Austria 22.
Castings and forgings, rough do	10	14	(2)	France 4; West Germany 3; Spain 3.
Lead:				
Ore and concentrate	11,329	12,019	--	Iran 6,771; Spain 2,427; Turkey 2,338.
Oxides	2,091	1,762	9	West Germany 1,155; Netherlands 579.
Ash and residue containing lead	1,063	4,237	2,350	West Germany 1,100; Cyprus 181.
Metal including alloys:				
Scrap	14,188	12,763	22	Switzerland 6,860; France 3,706; United Kingdom 886.
Unwrought	124,743	114,995	31	West Germany 34,686; Morocco 31,981; Peru 13,015.
Semimanufactures	2,176	774	3	West Germany 341; Belgium-Luxembourg 310; France 98.
Lithium:				
Oxides and hydroxides	416	798	--	West Germany 246; United Kingdom 16; Netherlands 13.
Metal including alloys, all forms	5	6	(2)	United Kingdom 5; West Germany 1.
Magnesium: Metal including alloys:				
Scrap	2,580	1,662	15	Netherlands 594; West Germany 511; Belgium-Luxembourg 137.
Unwrought	1,950	2,519	--	Norway 1,091; France 1,065; Belgium-Luxembourg 119.
Semimanufactures	1,709	754	54	France 542; Switzerland 51.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Manganese:				
Ore and concentrate, metallurgical-grade	273,191	392,646	--	Gabon 168,190; Republic of South Africa 160,383; Brazil 16,643.
Oxides	2,550	2,417	1	Belgium-Luxembourg 1,186; France 615; Netherlands 254.
Metal including alloys, all forms	2,653	3,521	42	West Germany 1,219; France 979; Republic of South Africa 733.
Mercury 76-pound flasks	3,993	4,930	--	Algeria 2,059; Netherlands 1,914; Yugoslavia 406.
Molybdenum:				
Ore and concentrate	4,438	4,810	209	Netherlands 3,636; Chile 499; Belgium-Luxembourg 307.
Oxides and hydroxides	86	65	--	United Kingdom 41; West Germany 17; Belgium-Luxembourg 6.
Metal including alloys:				
Scrap	14	(2)	--	All from West Germany.
Unwrought	26	29	1	West Germany 23; Austria 3; United Kingdom 2.
Semimanufactures	149	113	17	Austria 52; France 9.
Nickel:				
Ore and concentrate	--	118	--	West Germany 60; France 37; Austria 21.
Matte and speiss	4,261	4,426	58	Australia 1,839; Cuba 1,649; Canada 581.
Oxides and hydroxides	2,106	975	(2)	Cuba 661; Australia 220; Czechoslovakia 48.
Ash and residue containing nickel	62	8,545	--	Greece 8,458; France 61.
Metal including alloys:				
Scrap	87	270	--	Yugoslavia 70; France 31; Finland 30.
Unwrought	20,283	17,919	3,601	Republic of South Africa 2,751; Netherlands 2,634.
Semimanufactures	2,473	3,039	297	West Germany 1,157; United Kingdom 673.
Platinum-group metals:				
Waste and sweepings value, thousands	$4,783	$4,001	$50	Yugoslavia $2,435; Switzerland $881; Albania $314.
Metals including alloys, unwrought and partly wrought troy ounces	157,759	202,358	3,601	United Kingdom 81,471; Switzerland 44,208; West Germany 19,451.
Rare-earth metals including alloys, all forms	54	16	(2)	Canada 6; United Kingdom 6; Austria 2.
Rhenium: Metal including alloys, all forms	(2)	(2)	--	Mainly from West Germany.
Selenium, elemental	36	290	2	West Germany 173; Belgium-Luxembourg 69; Netherlands 25.
Silicon, high-purity	52	7	--	Switzerland 6; West Germany 1.
Silver:				
Waste and sweepings value, thousands	$3,072	$3,556	$968	France $1,178; Switzerland $1,056.
Metal including alloys, unwrought and partly wrought thousand troy ounces	12,610	8,842	508	Switzerland 3,247; West Germany 1,842; Belgium-Luxembourg 1,601.
Tellurium and arsenic, elemental	33	59	(2)	Sweden 58.
Tin:				
Oxides	72	28	--	West Germany 26; Brazil 2.
Ash and residue containing tin	61	12	--	France 7; Greece 5.
Metal including alloys:				
Scrap	3	5	--	All from West Germany.
Unwrought	5,962	5,636	40	Indonesia 2,045; Malaysia 1,952; United Kingdom 400.
Semimanufactures	251	245	2	West Germany 152; United Kingdom 55; Singapore 20.
Titanium:				
Ore and concentrate	22,382	146,179	--	Canada 141,417; Republic of South Africa 4,554.
Oxides	39,053	29,601	27	West Germany 14,708; United Kingdom 4,006; France 3,793.
Metal including alloys:				
Scrap	2,356	2,481	733	Austria 1,626; West Germany 72.
Unwrought	81	75	(2)	U.S.S.R. 43; United Kingdom 26.
Semimanufactures	369	453	83	Japan 129; West Germany 121.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Tungsten:				
Ore and concentrate	157	181	18	Canada 90; Netherlands 73.
Oxides and hydroxides	(2)	26	--	Austria 23; West Germany 3.
Metal including alloys:				
Scrap	--	1	--	All from Denmark.
Unwrought	20	39	3	West Germany 12; France 9; United Kingdom 8.
Semimanufactures	57	91	7	West Germany 23; United Kingdom 15; Denmark 10.
Uranium and thorium:				
Ore and concentrate	48	67	--	Mainly from Republic of South Africa.
Metal including alloys, all forms:				
Uranium	1	18	--	France 14; West Germany 4.
Thorium	2	1	--	All from Sweden.
Vanadium:				
Ore and concentrate	(2)	--		
Oxides and hydroxides	135	30	--	All from Belgium-Luxembourg.
Ash and residue containing vanadium	1,511	2,508	--	Austria 1,281; West Germany 598; Belgium-Luxembourg 331.
Metal including alloys:				
Scrap	(2)	8	--	All from Spain.
Unwrought	5	27	--	West Germany 20; Belgium-Luxembourg 7.
Semimanufactures	1	(2)	--	Mainly from West Germany.
Zinc:				
Ore and concentrate	291,425	395,978	9,505	Peru 73,121; Ireland 63,781; Spain 46,325.
Oxides	5,419	5,048	2	West Germany 1,697; France 1,334; Portugal 690.
Blue powder	1,705	1,716	--	West Germany 771; France 464; Norway 234.
Matte	8,943	12,230	113	West Germany 4,912; France 2,111; United Kingdom 1,631.
Ash and residue containing zinc	6,078	6,483	17	West Germany 5,198; Greece 561; Switzerland 318.
Metal including alloys:				
Scrap	13,073	10,563	--	France 5,056; West Germany 1,917; United Kingdom 1,215.
Unwrought	105,306	78,350	79	West Germany 26,874; Belgium-Luxembourg 12,867; Netherlands 10,044.
Semimanufactures	4,307	4,203	2	West Germany 2,835; France 873; Belgium-Luxembourg 431.
Zirconium:				
Ore and concentrate	71,099	84,627	16	Australia 71,375; Republic of South Africa 12,786.
Metal including alloys:				
Scrap	9	7	--	All from France.
Unwrought	1	4	--	United Kingdom 3.
Semimanufactures	21	49	33	West Germany 12; France 4.
Other:				
Ores and concentrates	1,197	1,655	1	China 1,279; Austria 229; West Germany 52.
Oxides and hydroxides	711	369	37	West Germany 247; United Kingdom 21.
Ashes and residues	47,467	99,229	2,910	Republic of South Africa 76,417; Yugoslavia 3,299.
Base metals including alloys, all forms	21	144	49	France 42; West Germany 16.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	2,002	3,782	69	Greece 3,335; West Germany 126; Yugoslavia 91.
Artificial:				
Corundum	26,784	33,778	521	Austria 9,659; West Germany 8,769; Yugoslavia 5,892.
Silicon carbide	12,303	12,468	(2)	Norway 3,263; West Germany 2,710; France 2,134.
Dust and powder of precious and semiprecious stones including diamond kilograms	2,465	2,729	668	Switzerland 945; Ireland 659.
Grinding and polishing wheels and stones	3,561	4,240	17	Austria 1,663; West Germany 835; France 412.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Asbestos, crude	41,421	47,952	55	Canada 23,824; U.S.S.R. 10,119; Zimbabwe 6,708.
Barite and witherite	11,787	19,388	--	Spain 7,627; Ireland 5,750; United Kingdom 2,560.
Boron materials:				
Crude natural borates	181,086	121,375	--	Turkey 120,361; France 365; Peru 270.
Elemental	1	(2)	--	Mainly from United Kingdom.
Oxides and acids	2,604	3,839	--	Turkey 2,719; Yugoslavia 591; Finland 288.
Bromine	1,737	1,614	--	Israel 1,077; France 355; East Germany 180.
Cement	252,338	381,461	38	Yugoslavia 306,185; France 66,680; Denmark 3,260.
Chalk	37,067	27,649	--	France 27,218; Austria 65; Greece 55.
Clays, crude:				
Bentonite	48,559	20,731	266	Greece 16,367; West Germany 1,748; United Kingdom 965.
Chamotte earth	73,355	64,681	2,192	France 42,298; Czechoslovakia 8,864; West Germany 5,677.
Kaolin	603,297	635,996	116,694	United Kingdom 268,869; Brazil 49,227.
Unspecified	934,669	936,110	1,099	West Germany 729,742; France 121,026; United Kingdom 51,007.
Cryolite and chiolite	228	814	--	Denmark 528; West Germany 276; France 10.
Diamond:				
Gem, not set or strung carats	193,540	218,458	NA	Belgium-Luxembourg 97,738; Israel 43,845; India 38,423.
Industrial stones do	179,458	187,880	NA	Belgium-Luxembourg 121,880; Netherlands 21,700; United Kingdom 10,668.
Diatomite and other infusorial earth	4,658	5,044	64	France 4,078; Spain 431; Iceland 183.
Feldspar, fluorspar, related materials:				
Feldspar	13,117	12,423	330	Yugoslavia 4,721; France 2,871; West Germany 2,340.
Fluorspar	97,836	91,645	--	Spain 29,357; Mexico 24,615; France 20,501.
Unspecified	17,608	13,936	--	Norway 8,273; Canada 3,879; Netherlands 1,690.
Fertilizer materials:				
Crude, n.e.s	4,158	2,711	131	France 1,301; West Germany 766; Malta 209.
Manufactured:				
Ammonia	241,493	160,482	--	U.S.S.R. 84,247; Yugoslavia 31,568; Austria 26,849.
Nitrogenous	290,649	274,265	133	Austria 105,356; West Germany 59,055; France 20,650.
Phosphatic	157,817	211,590	9,942	Tunisia 52,703; Israel 48,905; Turkey 43,435.
Potassic	671,217	647,695	21	Israel 185,885; U.S.S.R. 119,968; Spain 84,170.
Unspecified and mixed	718,406	716,680	266,129	Tunisia 119,548; West Germany 75,552.
Graphite, natural	6,280	5,955	(2)	West Germany 1,490; Brazil 1,405; Austria 1,054.
Gypsum and plaster	9,470	13,443	1,002	West Germany 9,516; France 1,473; Austria 1,228.
Iodine	294	538	1	Japan 287; West Germany 143; Netherlands 72.
Kyanite and related materials	36,357	41,159	957	Republic of South Africa 25,363; Spain 5,828; West Germany 5,163.
Lime	847	3,115	11	Yugoslavia 2,415; West Germany 410; Denmark 143.
Magnesium compounds:				
Magnesite	23,141	20,266	--	Greece 17,437; Czechoslovakia 474; France 174.
Oxides and hydroxides	90,310	79,027	201	Greece 28,632; China 13,130; Austria 12,749.
Other	4,279	3,117	--	West Germany 1,991; Republic of South Africa 1,090.
Mica:				
Crude including splittings and waste	1,297	1,510	221	France 483; Austria 134.
Worked including agglomerated splittings	450	543	25	France 183; Belgium-Luxembourg 149; West Germany 87.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Nitrates, crude	396	402	--	Belgium-Luxembourg 308; Republic of South Africa 70; Austria 24.
Phosphates, crude thousand tons	1,449	1,296	85	Morocco 565; Israel 288; Togo 104.
Phosphorus, elemental	2	94	--	West Germany 53; United Kingdom 41.
Pigments, mineral:				
Natural, crude	262	314	--	Cyprus 145; France 98; Spain 69.
Iron oxides and hydroxides, processed	19,666	20,404	287	West Germany 15,867; France 1,814; Belgium-Luxembourg 921.
Potassium salts, crude	10,757	9,090	--	France 7,686; West Germany 1,404.
Precious and semiprecious stones other than diamond:				
Natural kilograms	73,370	77,083	2,582	Brazil 30,415; West Germany 15,479.
Synthetic do	5,914	6,675	13	Switzerland 1,346; Thailand 795; Republic of Korea 249.
Pyrite, unroasted	186,607	167,574	--	Norway 65,641; Cyprus 49,860; U.S.S.R. 18,290.
Quartz crystal, piezoelectric kilograms	1,304	629	NA	Mainly from Japan.
Salt and brine	706,662	943,874	--	Netherlands 523,933; France 230,471; Tunisia 54,644.
Sodium compounds, n.e.s.: Carbonate, manufactured	31,808	30,744	--	Switzerland 12,477; Yugoslavia 10,877; Romania 2,165.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	885,252	971,585	5,494	Spain 279,126; Finland 151,655; Brazil 129,805.
Worked	9,646	9,386	17	Yugoslavia 1,663; Greece 1,607; Spain 1,386.
Dolomite, chiefly refractory-grade	2,335	2,063	5	West Germany 1,173; Netherlands 417; France 386.
Gravel and crushed rock	76,097	14,752	9	France 12,224; West Germany 721; Yugoslavia 545.
Limestone other than dimension	208	503	--	West Germany 343; Canada 78; Austria 50.
Quartz and quartzite	40,188	83,622	117	Switzerland 29,068; Sweden 16,519; Yugoslavia 11,544.
Sand other than metal-bearing	997,032	1,006,583	385	France 603,970; Belgium-Luxembourg 189,099; West Germany 105,143.
Sulfur:				
Elemental:				
Crude including native and by-product	376,160	399,495	22,024	Canada 180,030; Poland 83,982; Saudi Arabia 52,808.
Colloidal, precipitated, sublimed	1,364	1,215	--	West Germany 785; Yugoslavia 260; France 133.
Dioxide	23	(2)	--	Mainly from West Germany.
Sulfuric acid	68,131	29,870	--	Yugoslavia 15,365; Spain 7,318; Austria 5,434.
Talc, steatite, soapstone, pyrophyllite	26,065	24,963	39	Austria 14,148; France 4,701; Belgium-Luxembourg 2,986.
Vermiculite, perlite, chlorite	57,600	40,996	--	U.S.S.R. 17,424; Greece 11,335; Republic of South Africa 7,957.
Other:				
Crude	37,371	34,133	2,683	Spain 8,639; West Germany 5,682.
Slag and dross, not metal-bearing	5,009	7,269	--	Switzerland 1,734; France 1,644; West Germany 1,191.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	861	1,059	895	West Germany 109; France 44.
Carbon:				
Carbon black	5,915	14,024	303	United Kingdom 3,110; France 2,288; West Germany 1,982.
Gas carbon	22,969	20,129	471	France 12,093; West Germany 3,675; Spain 1,597.
Coal:				
Anthracite thousand tons	540	674	112	Republic of South Africa 429; U.S.S.R. 86.
Bituminous do	19,638	20,125	8,946	Republic of South Africa 5,220; Australia 2,226.
Briquets of anthracite and bituminous coal do	1	71	--	Republic of South Africa 70; France 1.
Lignite including briquets do	96	148	(2)	West Germany 80; Yugoslavia 62; East Germany 6.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coke and semicoke ___ thousand tons__	175	135	(2)	France 63; West Germany 36; Egypt 14.
Gas, natural_____million cubic feet__	771,863	751,707	__	Algeria 342,411; U.S.S.R. 221,518; Netherlands 182,498.
Peat including briquets and litter_____	90,819	140,589	65	West Germany 91,369; U.S.S.R. 22,554; Austria 9,977.
Petroleum:				
Crude_ thousand 42-gallon barrels__	468,744	480,662	__	Libya 106,427; Nigeria 54,997; Egypt 50,217.
Refinery products:				
Liquefied petroleum gas _do____	13,376	19,670	231	Algeria 5,714; Libya 5,229; France 2,361.
Gasoline _____do____	21,829	24,609	42	Kuwait 4,468; Libya 3,196; Egypt 2,599.
Mineral jelly and wax __do____	205	369	5	Singapore 171; West Germany 54; Hungary 46.
Kerosene and jet fuel___do____	850	529	1	Libya 338; United Kingdom 81; Finland 48.
Distillate fuel oil _____do____	40,886	47,242	2	Romania 15,054; Algeria 8,956; Kuwait 7,681.
Lubricants _____do____	647	877	37	Greece 225; West Germany 170; France 153.
Residual fuel oil_____do____	120,746	129,204	866	Kuwait 29,870; U.S.S.R. 18,635; Venezuela 13,347.
Bitumen and other residues do____	2,017	2,359	1,659	Yugoslavia 370; France 125.
Bituminous mixtures___do____	11	12	1	France 5; Netherlands 1.
Petroleum coke _____do____	9,895	13,187	10,250	Syria 889; U.S.S.R. 798.

NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—Elkem A/S of Norway entered into an agreement to become a member of the Alfin Group. Alfin, an association of 14 independent aluminum fabricators founded in 1985, gave Elkem a one-fifteenth share in the group in exchange for a long-term primary aluminum supply contract. The agreement ensures that the independent fabricators receive supplies of necessary raw material and provide Elkem with a secure outlet for an important part of its production, according to Elkem officials.

Italy's Government-owned aluminum producer MCS Aluminia S.p.A. continued to move ahead with its restructuring. In March, MCS Aluminia reached an agreement with Reynolds Aluminium Italia S.p.A. (RAI) to take over the 25,000-ton-per-year extrusion plant at Cisterna di Latina, which was previously jointly owned by MCS Aluminia and RAI. In exchange, MCS Aluminia gave RAI its share in the jointly owned subsidiary Società Lavorazioni Industriali Metali S.p.A., which operates a sheet and foil production facility at Fossa Nova.

MCS Aluminia continued its negotiations with Swiss Aluminium Ltd. (Alusuisse) regarding the purchase of Alusuisse's 50% share in Alluminio Veneto S.p.A. (SAVA), of which MCS Aluminia owns the other 50%. The SAVA operation produces primary aluminum at Porto Marghera and Fusina, rolled products at Fusina, and foils at Nembro. The deal would give MCS Aluminia 45% of Italy's rolled product output and 4% of Western European output. The deal, reportedly worth about $20.1 million, was to be approved by Italian state holding company Ente Participazioni e Finanziamento Industria Manufatturiera in early 1987. Final terms of the agreement between MCS Aluminia and Alusuisse had not been determined by yearend.

Alcan Alluminio Italia S.p.A. reached an agreement with Trefilerie e Laminatori di Metalli S.p.A. (TLM) to take over the sheet division of TLM effective January 1, 1987. A

new company, TLM Industria S.p.A., was formed in September 1986 to contain the sheet division. This new company was to be spun off from TLM in order to facilitate the takeover. The acquisition of the Pieve Emanuele plant's sheet capacity will complement Alcan Alluminio Italia's Bresso mill production of painted and finished products, according to company officials.

Ferroalloys.—Ferrotitanium producer Officine Elettrochimiche Trentine Calusco S.p.A. (OET) halted production in mid-November as a result of low ferrotitanium prices coupled with high prices for scrap feed material. OET operated its 3,000-ton-per-year plant at a reduced level for much of the year. Company officials blamed unusually large availability of Soviet ferrotitanium on Western European markets for the slide in alloy prices.

Iron and Steel.—Output of crude steel in Italy decreased 4% in 1986, which was equivalent to the drop for market economy countries as a whole. Production was far below capacity levels, and further cuts in capacity and production were being discussed to bring the country in line with European Economic Community (EEC) quotas.

Privatization was the major focus in the steel sector. In early July, a group of private companies signed a letter of intent to buy a 68% interest in the steel plant at Cornigliano in Genoa operated by state-owned Nuova Italsider S.p.A. Three companies, Lucchini Siderurgica S.p.A., Acciaierie e Ferriera Luigi Leali S.p.A., and Acciaierie e Ferriera Riva S.p.A., initially took a 49% stake in the operating company, Corporazione Geonese Acciaierie S.p.A. (COGEA), but have the option to increase their share to 61% in 1988. Three other private steel producers, Emilio Regis, Lucio Bellicini, and Araldo Sassone, will share 19% ownership in the works effective in 1988.

Installation of two eight-strand continuous casters continued at the Cornigliano works in 1986. The new equipment will increase capacity to about 1 million tons of billets and blooms annually from the 750,000-ton-per-year level it operated at in 1986. COGEA operated coke ovens, a blast furnace, and a bottom-blown oxygen steelmaking plant at the site, which was an integrated flat products works until 1984.

Società Finanziaria Siderúrgica p.A. (Finsider) began negotiations with a group of private companies interested in purchasing 51% of Deltasider S.p.A. The group of private steelmakers, which reportedly included Lucchini, Ori Martin S.p.A., Acciaierie e Ferriera di Brescia, Leali, Riva, and Acciaierie e Ferriera Lombarde Falck S.p.A., among others, was interested in purchasing several of Deltasider Group's works. The logistics of the privatization were expected by industry sources to be complex. The negotiations were expected to continue throughout 1987.

As a move to thwart a hostile takeover bid, Italy's largest private-sector steelmaker, Falck, sold an 8.5% stake to the Argentine steel and engineering company, Cía. Técnica International (Techint). Techint reportedly retained an option to increase its holding at a later date. Three Techint executives were appointed to the Falck board, giving the company an active role in Falck management. Later in the year, Irving Trust Co. of the United States purchased 5% of Falck, which had been held by the stockholder group that had planned the hostile takeover. The stockholder group reportedly was seeking to sell its remaining 21% stake in the company at yearend.

Negotiations between Falck and Finsider on the transfer of the production quota of Falck's Sesto San Giovanni hot-strip mill near Milan to Finsider's newly modernized Bagnoli plant near Naples were discontinued early in the year without a resolution. Finsider blamed the failure of the talks on Falck's demand that it be compensated for closing the Sesto San Giovanni mill by being allowed to acquire Finsider's Campi plate plant near Genoa. Falck officials reportedly felt that the deal was not worth pursuing if the Campi plant was not included. The closure of the Sesto San Giovanni mill would have freed 730,000 tons of capacity for the Bagnoli works. Bagnoli was permitted to produce 1.2 million tons, but has a capacity of over 2 million tons. Finsider officials stated that the plant was operating at a loss because of its underutilization.

A program of investment aimed at increasing the electric steelmaking capacity of a Finsider Group company, Società per l'Industria e l'Elettricita S.p.A. in Terni, by nearly 200,000 tons per year commenced. The improvements, which were planned to be operational by 1989, include a 140-ton argon-oxygen decarburization converter, a new continuous caster for stainless steel slabs, a ladle furnace, and modifications to the hot-rolling mill to increase slab width. The Terni works produced about 220,000 tons of carbon steel, 220,000 tons of electric-furnace steel, 200,000 tons of stainless steel,

and 30,000 tons of forging steel in 1986.

Finsider also agreed to sell its subsidiary, Acciaierie del Tirreno S.p.A., to private steelmaker Ferriera di Domegliara S.p.A. Terms of the sale were to be dependent on EEC action regarding production quotas on heavy sections and on a decision by Sicilian authorities regarding the financing of a quay to serve the works at Tirreno.

Lucchini acquired the San Zeno Naviglio billet plant of Acciaierie San Zeno S.p.A. The works had been closed since 1983. Lucchini planned to transfer the operations of its Bisider plant, which is situated in the center of the city of Brescia and cannot be expanded, to the San Zeno Naviglio plant. Until the purchase by Lucchini, Acciaierie San Zeno was owned by steelmakers Fenotti e Comini S.p.A., Acciaierie e Ferriera, Acciaierie e Ferriera Stefana Fratelli fu Girolamo S.p.A., and Predalva Acciaierie e Ferriera S.r.l., and the Banca San Paelo of Brescia.

A six-strand straight-mold continuous caster came on-stream at Deltasider's Piombino works. The caster is capable of producing 127- to 160-square-millimeter billets of low-carbon, alloy, spring, bearing, and fine-grained steels. The caster ladle has a capacity of 120 tons and is equipped for electromagnetic stirring.

The No. 5 continuous-casting plant at Nuova Italsider's Taranto steelworks came on-stream in August. The plant, which was designed to allow blooms to move onto the strip mill without an intermediate reheating, was reported to be able to handle almost all of the steel produced at Taranto. Total output in 1985 was about 8.5 million tons, of which 6 million tons was continuously cast. Construction took just over a year to complete and cost nearly $100 million.

Lead and Zinc.—Although the reorganization of SAMIM was not effective until yearend, mineral production from the company's mines in Sardinia was disrupted. Market difficulties were also responsible for the decreased output. Expansion of the mineral processing plant at Monteponi was virtually completed during the year. The facility became the centralized treatment plant for all of the SAMIM Sardinian mine production.

At the Masua Mine in Sardinia, the major preparatory work was completed on the third production panel in the Marx ore body. Excavations on the access ramp and the underground crushing chamber were finished. Work to improve the safety of the tailings impoundment was nearly complete at yearend. Exploration on the Nebida South area focused on the region between Alice and Santa Margherita. Additional investigations were carried out on the Marx North and Northeast Masses. Preliminary results indicated additional ore mineralization.

At the Monteponi-San Giovanni-San Benedetto Mine, major developments transpired. All excavations relating to the high-grade kainitic ore were completed. The construction of the underground plant at the Milena pit was completed, as was the cement infill plant at San Benedetto. Production of infill cement at the new plant at Campo Pisano began although the plant was not fully finished. The reconstruction of the Campo Pisano treatment plant was nearly completed, with only the installation of automation and control systems and the initial trials to be performed.

In the Monteponi area, prospection on the Central Masses, particularly Mass 3, demonstrated positive results. Additional drilling and geophysical surveys carried out on the various ore bodies in the area have given the company more detailed information on the grade and limits of the ore mineralization to use in estimating reserves and mine planning.

Survey work continued in the area of the idle Funtana Raminosa Mine. Investigations in the Brebegargiu ramp were aimed at establishing the downward trend of the previously worked mineralization. Some drilling was completed on geophysical anomalies already discovered at the site.

Società Mineraria e Metallurgica di Pertusola S.p.A. permanently closed its Salafossa lead-zinc mine in the Trentino at the end of July as a result of exhausted reserves. The mine, which had been operational since 1959, produced 111,000 tons of crude ore in 1986, yielding nearly 5,500 tons of zinc concentrate and 800 tons of lead concentrate.

Work was completed on SAMIM's electrolytic zinc plant at the company's Porto Vesme complex in Sardinia. The installation, adjacent to SAMIM's Imperial lead and zinc smelter, has a capacity of 80,000 tons annually. Actual production from the plant was just under 68,000 tons in 1986.

Construction of the Kivcet lead smelter at the complex was finished. The smelter uses technology developed in the U.S.S.R. Start-up of the 84,000-ton-per-year plant was delayed because of continued negotiations with the unions regarding the relocation of

some workers to Porto Vesme. The plant, which cost approximately $10 million, was built in part to make up for the 70,000 tons of capacity lost when the San Gavino smelter was closed for environmental reasons in 1981. The advanced technology of the plant will allow it to process varied feed material including concentrates, slimes, residues, and lead sulfates. Bullion from the smelter is to be refined at the San Gavino refinery, which is only 50 kilometers from Porto Vesme.

INDUSTRIAL MINERALS

Advanced Materials.—Italy's total dependence on imported sources of ceramic fibers ended with the opening of a new facility in southern Italy at Atella in Potenza Province at midyear. The operation, owned by Fibertek S.p.A., will produce 2,000 tons per year of bulk fibers and fiber blankets, mostly of alumino-silicate compositions for refractory applications.

Asbestos.—The new special fibers section at the plant of Italy's sole asbestos producer, Amiantifera di Balangero S.p.A., neared completion at yearend. The $2 million facility will allow the company to increase its output of special classes 5, 6, and 7 fibers used by brake lining and gasket manufacturers. About 50% of the output from the quarry at San Vittore, near Turin, was exported in 1985. Nearly 70% of the 1986 domestic sales was used by the asbestos cement industry, with the remainder mainly used as compressed sheets for brake linings and gaskets. Production at the mine was of classes 4, 5, 6, and 7, along with some very short fibers. The very short fibers were mainly sold to the paint and insulation industries.[3]

Barite.—Bariosarda S.p.A. continued improvements to its processing facility for treatment of ore from its Barega and Mont'-Ega Mines. The modifications were aimed at solving environmental problems while increasing the recovery of barite and by-products such as fluorine and lead. Production at the mines was accomplished by sublevel stoping and sublevel caving methods. Output was down owing to the decrease in petroleum well drilling, the major market for barite.

Potash.—Construction was started on an underground plant at a new mine at Milena in Sardinia. Exploratory shafts sunk into the kainitic formation confirmed the ease of extraction and the high grade (greater than 12% potash) of the seams.

Salt.—The reserves at the San Cataldo Mine in Sicily neared exhaustion, and production decreased accordingly. Production of brine resumed at the Timpa del Salta Mine in Calabria, owned by Italy's largest chemical producer, Montedison S.p.A. Extraction had been discontinued in 1984 after numerous problems at the mine. Brine production using water injection was expected to be at full capacity starting in 1987.

Stone (Dimension).—Ornamental and dimension stone have been produced in Italy for over 2,000 years. In terms of tonnage, dimension stone is the most important industrial mineral produced in Italy. There were an estimated 3,000 to 4,000 dimension stone quarries throughout the country in 1986. There were five or six areas where the production of marble, the major dimension stone product, was concentrated. The most important white marble producing area was in the Apuan Alps in Tuscany, particularly near the town of Carrara. The Lombardy region, the Po Valley, Venetia, Puglia, Sicily, and Lazio were important colored marble producing areas. One-half of the 1985 output was in block form, and 47% of the total was exported. Major domestic uses were in the construction and monument industries. Italian producers continued to change their emphasis toward value-added products and toward shaping, cutting, and polishing imported stone.

Talc.—Development work began on a new production level at the Fontane Mine of Talco e Grafite Val Chisone S.p.A. (Val Chisone) in the Germanasca Valley near Pinerolo. The new 1360 level will be situated on the Crosetto cross section and will be linked to the existing levels by a large-section ramp capable of handling the rubber-tired equipment introduced in the mine in 1986. The high-quality talc produced at the mine lies in a vein at depths of 200 to 500 meters. The host rock is comprised of gneiss, masses of dolomitic rock, and mica schists. This geologic setting is responsible for the high-purity, soft talc found in the deposit. The extraction method, descending stoping with cement infill, was expensive and complex. The mining was being done selectively to ensure that only the whitest grades were hoisted. The mined material was further hand sorted on the surface before being transported to the company's two milling plants near Pinerolo. About 70,000 tons was produced at the Pinerolo operations, the majority of which was used in the cosmetic and pharmaceutical industries.

Expansion of capacity at Mineraria Valle

Spluga S.r.l., a subsidiary of Western Europe's largest talc producer, Talc de Luzenac S.A. of France, continued during the year. The mine had a production capacity of 50,000 tons per year from reserves estimated at 2 billion tons. After the completion of the project, scheduled for the first quarter of 1987, the mine in Valmelenco will be capable of producing 80,000 tons annually.

In September, Valle Spluga closed its Novate Mezzola plant, 80 kilometers from the mine, in favor of using the underutilized plant of Mineraria Valtellinese S.p.A. near Sondrio, only 30 kilometers from the mine. The processing plant, which had a capacity of 40,000 tons per year in 1986, was being expanded to handle 60,000 tons annually. Excess mine production of 20,000 tons will be crushed to 4 centimeters and sold for applications in the ceramics industry.

Industria Mineraria Italiana S.p.A., which operated two mines in Sondrio Province, the Santella Mine at Lanzada and the Pra Mosin Mine at Torre Santa Maria, continued with plans to develop a new talc and steatite mine at Le Prese. The company also planned to increase the capacity at the Pra Mosin operation and to improve quality control at its processing facility at Torre Santa Maria.

MINERAL FUELS

Domestic production of energy materials remained extremely inadequate to meet the country's needs. A new national energy plan was approved to continue the policies of diversification of sources and conservation in every sector. Government forecasts for the 1986-90 period projected a significant decrease in the percentage of primary energy provided by petroleum, to be offset by increases in the importance of solid fuels, natural gas, and nuclear power. Negative public reaction to nuclear power as a result of the Chernobyl accident caused speculation whether coal could absorb the increases otherwise planned for the nuclear power sector.

Coal.—Work continued on the reactivation of the Sulcis coal mines in Sardinia. The operating company, Carbosulcis S.p.A., began the excavation of the passageways that will serve as the basic structure of the new underground mine. All the infrastructure was completed at the Nuraxi Figus and Seruci pits. Development aimed at dewatering the Nuraxi Figus Mine's minus-400 level was also finished. A contract was signed at the end of October for the development of a 3,500-meter-long, 28-square-meter shaft for ventilation and coal and equipment transport. Exploration continued, using both surface and underground drilling.

At Ente Nazionale Elettrica's open pit lignite mines, diversion of equipment to overburden removal and declines in the calorific value of the lignite extracted caused a major reduction in the quantity of electricity produced from domestic fuels. Production was limited to the Santa Barbara Mine in Tuscany and the Pietrafitta Mine in Umbria.

Geothermal Energy.—Production of electricity from geothermal sources amounted to 2,757 gigawatt hours in 1986, or about 7% of total energy consumption. The wells were in the Larderello, Monte Amiata, and Travale areas in Tuscany.

Petroleum and Natural Gas.—A very important oilfield was discovered by the state oil company AGIP, in the Ticino area between Piedmont and Lombardy. The drilling of the exploratory well at Galliate, Piedmont, was started in 1985. The reservoir, estimated to cover 15 square kilometers, was located at a depth of 6,200 meters. A second well in the area confirmed the find. The Galliate well was planned to be brought to a production level of 5,000 barrels per day. The discovery had the potential of increasing domestic crude production by 100%.

Oilfields and gasfields came into production at Ovanengo in Brescia, Bessa in Cremona, San Benedetto del Tronto in Ascoli Piceno, Santa Maria in Chieti, Termoli in Campobasso, and Masseria Spavento in Foggia. A total of 224 wells were drilled during the year; 39 found gas and 6 found oil.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Italian lira (Lit) to U.S. dollars, at the rate of Lit1,491 = US$1.00, the average rate in 1986.

[3]For an explanation of asbestos fiber classifications see Clifton, R. A. "Asbestos," in BuMines Bull. 675, 1985, p. 57.

The Mineral Industry of Japan

By John C. Wu[1]

In an effort to survive the impact of a stronger Japanese yen and lower domestic demand for minerals and metals, Japan's mineral industry began another major restructuring program in the mining and mineral processing industries after the first round of streamlining in 1983. The Government of Japan, through the Ministry of Labor and the Ministry of International Trade and Industry (MITI), reportedly was to provide financial assistance in the form of employment-adjustment subsidies and low-interest loans to the mining industry.

As a result of a further decline in domestic prices of minerals and metals, and more losses incurred by the major mining and mineral processing companies, Japan's production capacities of metal and industrial minerals mining was reduced substantially in 1986. The full operation of Japan's largest and richest gold mine, the Hishikari in southern Kyushu, operated by Sumitomo Metal Mining Co. Ltd., remained the only bright spot in Japan's nonfuel mineral mining industry. According to MITI's annual survey, the number of operating mines and number of employees decreased 13% and 16%, respectively,[2] between 1983 and 1986, as shown in the following tabulation:

Fiscal year[1]	Number of operating mines		Number of employees	
	Metal	Industrial minerals	Metal	Industrial minerals
1983	68	691	9,943	17,048
1984	67	679	9,242	16,108
1985	59	679	8,950	15,811
1986	52	608	7,743	14,891

[1]Fiscal year begins on Apr. 1 and ends on Mar. 31 of the following year.

The situation in Japan's coal mining industry was equally depressed because of wider price gaps between high-priced domestic coal and low-priced imported coal and increased opposition by domestic major coal consumers to the purchase of the allocated domestic coal. In November, following recommendations of MITI's Coal Mining Council and negotiations between Japan's coal mining industry and the iron and steel, utility, and cement industries, MITI announced the Eighth National Coal Mining Policy.

Under the eighth 5-year plan (1987-91), Japan's coal production capacity would be reduced gradually to 10 million tons per year by the end of the eighth 5-year plan from 20 million tons per year in the beginning of the seventh 5-year plan. As a result, 6 to 7 of Japan's 11 major coal mines mainly in Hokkaido and Kyushu would be closed permanently and mining of coking coal would be abandoned entirely by 1991. The first coal mine closure in 1986 was Japan's oldest coal mine, Takashima, operated by Mitsubishi Coal Mining Co. Ltd. of Nagasaki in southern Kyushu.

Production capacities of primary aluminum, cobalt, copper, nickel, steel, titanium, and zinc were reduced because of the appreciation of the Japanese yen and other economic reasons. Higher production costs and lower import prices led the primary aluminum smelting industry to shut down all smelters but one operated by Nippon Light Metal Co. Ltd. at Kanbara in Shizuoka with a 63,900-ton-per-year capacity. Cobalt and nickel production facilities were either shut down completely or underutilized owing to lack of imported raw materials. Copper and zinc production facilities were reduced by closing two copper smelters at Hibi, Okayama Prefecture, and Miyako, Iwate Prefecture; and two zinc refineries at

Miike, Fukuoka Prefecture, and Hosokura, Miyagi Prefecture, because of unprofitable operations. As a result of heavy losses caused by reduced domestic demand for steel and decreased steel exports due to the stronger Japanese yen, Japan's five major steelmakers announced plans to reduce production capacity and the work force drastically from 15% to 30% in the next 3 years. Production capacity of titanium sponge metal was underutilized also because of reduced domestic demand and decreased exports.

Production capacities of the cement and fertilizer materials industries, reduced in the past 3 years, were cut back further in 1986 because of stagnant domestic demand and reduced exports resulting from yen appreciation and lower prices. Because of import liberalization of gasoline, kerosene, and diesel fuel and declining domestic demand for heavy fuel oil, production capacity of the petroleum refinery industry would be reduced by another 20% to 4 million barrels per day by 1988.

The impact of the stronger Japanese yen on the mineral industry was also felt by the Japanese economy in general and the industrial production in particular. According to the Economic Planning Agency, Japan's economy, as measured by the change in real gross national product (GNP) in 1980 constant dollars, grew only 2.5% in 1986, the slowest growth rate since 1974 following the first oil crisis. However, the output of the mining and manufacturing sector had a 0.3% negative growth compared with a 4.5% positive growth in 1985. In 1986, Japan's GNP in 1980 constant dollars was estimated at $1,770 billion and in current dollars was estimated at $1,963 billion.[3] According to the Management and Coordination Agency, the unemployment rate rose slightly to 2.8% from 2.6% in 1985 while the labor force also rose to 60.2 million workers from 59.6 million in 1985. Japan's inflation rate, as measured by the change in the Consumer Price Index, declined to 0.6% from 2.0% (revised) in 1985.

Despite a decline in exports on a real quantity basis, Japan's export earnings ballooned to $209 billion resulting from a 42% appreciation of the Japanese yen. Despite a substantial increase in imports on a real quantity basis, the value of Japan's imports rose only slightly to $126 billion resulting from reduced import bills of mineral fuels because of a sharp decline in world oil prices. As a result, the merchandise trade surplus in 1986 jumped 80% to $83 billion, a record-high level.

Government Policies and Programs.—In August, an expanded Government financial assistance plan was announced by MITI to increase the existing $74 million emergency low-interest loans by an additional $89 million to help the domestic nonferrous metal mining industry to survive the impact of the stronger Japanese yen and stagnant domestic market. The interest rate on emergency loans was reduced from 2.7% (revised) to 2.2% with a $12 million Government interest subsidy.

In September, the Mining Industry Council, an MITI advisory body, made recommendations to MITI on Japan's future mining policy. In its recommendations, the council urged the basic needs for (1) maintaining existing domestic mining mainly by the private industry's own efforts with some Government assistance in streamlining operations to ensure a stable supply of mineral resources, (2) retaining mining technology for ongoing and future overseas mineral exploration and development, and (3) retaining bargaining power for imports of mineral resources. The council also urged the private sector to scale down or close operations of poor-quality and inefficient mines, explore and develop overseas mineral resources, and diversify into other business.[4]

Japan's stockpile of chromium, cobalt, manganese, molybdenum, nickel, tungsten, and vanadium by three rare-metal stockpile programs was expected to reach a 26.4-day supply by the end of fiscal year 1986. However, the stockpile was 21.6 days below the target of a 48-day supply. In June, the Government reportedly reaffirmed its intention to meet its target of a 60-day supply by the end of fiscal year 1989 ending March 31, 1990, by rapidly increasing the volume of stockpiling to a 12-day supply for the next 2 fiscal years. The 60-day supply of the seven rare metals in their physical form are as follows, in tons: ferrochromium, 86,000; cobalt metal, 260; ferromanganese, 85,000; electrolytic manganese oxide, 3,300; electrolytic manganese metal, 620; molybdenum concentrate, 1,800; ferronickel, 40,000; nickel metal, 5,700; nickel oxide, 1,500; tungsten concentrate, 620, and ferrovanadium, 890.

To secure and diversify the supply sources of its growing requirements for rare

metals, Japan signed a 5-year joint mineral exploration agreement with China in August. Under the agreement, Japan, through the Metal Mining Agency of Japan (MMAJ), was to provide technical assistance to the National Nonferrous Metals Industry Corp. of China for exploring for cobalt, molybdenum, and vanadium in the northern part of Heilongjiang Province; and columbium, rare earths, tantalum, and zirconium along the southern coast of Guangdong Province in China. The technical assistance included exploration technology and separation technology of complex polymetallic minerals. The $15 million joint project was expected to begin in fiscal year 1987, and a $2 million budget was proposed by MMAJ for the first year of exploration.[5]

PRODUCTION

Japan's mine production of most nonfuel minerals was at a lower level than that of 1985 because of lower domestic prices and further appreciation of the Japanese yen in 1986. Many Japanese major mining companies were forced to cut back their mine output or simply close down mining operations to cut their losses. Mine output of chromium, copper, dolomite, iron ore, lead, limestone, manganese, tin, tungsten, and zinc all declined because of production cutbacks or mine closures. Japan stopped production of manganese ore in mid-1986 after the last manganese mine at Jokoku in Hokkaido was shut down permanently in May. However, mine production for gold and silver registered a substantial increase owing to increased output of gold and silver from the newly opened Hishikari gold mine in southern Kyushu.

Coal production dropped to a historical low level in 1986 because of reduced demand for domestic coal and further widening of price gaps between domestic and imported coal. The Takashima Mine, offshore Nagasaki in southern Kyushu and 1 of Japan's 11 major coal mines, was closed permanently in November because of high production costs. Production of crude petroleum rose to a new high level since 1975 while production of natural gas dropped slightly.

Activity in Japan's mineral processing area was also affected by the lower domestic metal prices and further appreciation of the Japanese yen. As a result of reduced domestic demand for ferrous and nonferrous metals, most metal production including primary aluminum, lead, magnesium, steel, titanium sponge, and zinc declined, while metal production of cobalt, copper, gold, nickel, and other rare metals remained steady. The impact of the stronger Japanese yen reportedly was felt most by the primary aluminum and iron and steel industries. These two industries were expected to decline further in 1987.

Activity in industrial mineral processing including cement, fertilizer materials, and sulfur also declined with lower production capacity. Reduced overseas demand and lower export prices were the main causes for the continuing decline in production of these three major processed industrial minerals. The Japanese petroleum refinery industry, which had scrapped 16.3% of its refining capacity in 1983, was to reduce its capacity further by 20% to 4 million barrels per day in the next 3 years resulting from import liberalization of refined petroleum products in 1986.

Table 1.—Japan: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
METALS					
Aluminum:					
Alumina, gross weight ____ thousand tons__	959	1,065	1,172	978	607
Metal:					
Primary:					
Regular grades _____do____	351	256	287	227	140
High-purity _____do____	4	3	4	5	8
Secondary _____do____	761	802	819	861	876
Antimony:					
Oxide _____	6,446	7,596	9,698	8,243	9,677
Metal _____	260	273	253	296	194
Arsenic, white (equivalent of arsenic acid)[e] _____	100	300	500	500	500
Bismuth _____	486	573	563	642	640

See footnotes at end of table.

Table 1.—Japan: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
METALS —Continued					
Cadmium	2,034	2,214	2,423	2,535	2,489
Chromium:					
Chromite, gross weight	11,129	8,396	7,420	11,920	10,642
Metal	3,785	2,786	3,452	3,800	3,500
Cobalt metal	1,942	1,371	905	1,277	1,338
Columbium and tantalum: Tantalum metal	44	40	[e]45	[e]45	[e]45
Copper:					
Mine output, Cu content	50,658	46,045	43,309	43,208	34,978
Metal:					
Blister and anode:					
Primary	948,200	944,600	821,100	802,300	827,700
Secondary	98,100	117,300	107,900	130,300	123,700
Total	1,046,300	1,061,900	929,000	932,600	951,400
Refined:					
Primary	948,158	944,551	821,064	802,341	827,657
Secondary	126,816	147,378	114,092	133,636	115,380
Total	1,074,974	1,091,929	935,156	935,977	943,037
Gallium metal[2]	7	8	17	19	[e]22
Germanium:					
Oxide	10	11	11	14	14
Metal	7	7	8	10	9
Gold:					
Mine output, Au content thousand troy ounces	104	101	104	171	331
Metal do	1,271	1,296	1,342	1,383	1,575
Indium metal do	482	449	482	514	[e]514
Iron and steel:					
Iron ore and iron sand concentrate:					
Gross weight thousand tons	362	298	324	338	292
Fe content do	227	185	202	212	182
Roasted pyrite concentrate (50% or more Fe) do	327	329	225	218	205
Metal:					
Pig iron and blast furnace ferroalloys do	77,658	72,936	80,403	80,569	74,651
Electric-furnace ferroalloys:					
Ferrochrome	328,480	304,053	323,930	349,496	286,925
Ferromanganese	538,355	389,381	485,008	441,703	359,044
Ferronickel	214,523	180,826	217,053	227,043	200,311
Ferrosilicon	192,372	157,939	153,386	150,167	107,236
Silicomanganese	269,379	222,204	233,061	216,916	148,429
Ferrochromium-silicon[3]	9,845	7,152	6,451	9,463	6,377
Other:					
Calcium silicon	3,834	2,357	1,724	2,496	2,005
Ferrocolumbium	1,039	530	1,031	1,072	862
Ferromolybdenum	3,413	3,104	3,299	3,143	1,894
Ferrotungsten	329	200	144	114	122
Ferrovanadium	4,465	2,821	3,733	3,353	2,867
Unspecified	2,309	2,159	2,727	2,575	2,015
Total[4]	1,568,343	1,272,726	1,431,547	1,407,541	1,118,087
Steel, crude thousand tons	99,548	97,179	105,586	105,279	98,275
Semimanufactures, hot-rolled:					
Of ordinary steels do	78,206	77,552	82,765	82,731	78,136
Of special steels do	13,660	13,286	16,070	16,802	15,004
Lead:					
Mine output, Pb content	45,873	46,888	48,735	49,951	40,327
Metal, refined:					
Primary	183,132	203,325	233,816	233,706	232,732
Secondary	119,068	118,317	129,179	133,257	128,860
Magnesium metal:					
Primary	5,555	6,026	7,103	8,458	8,116
Secondary	21,670	13,012	15,656	20,894	[e]14,500
Manganese:					
Ore and concentrate:					
Gross weight	78,045	75,199	61,635	21,140	5,905
Mn content	19,928	19,860	16,679	5,562	1,535
Oxide	45,990	47,182	47,807	49,081	57,159
Metal	3,873	3,939	4,323	4,631	[e]4,300

See footnotes at end of table.

Table 1.—Japan: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
METALS —Continued					
Molybdenum:					
Mo content of concentrate[e]	97	97	147	98	--
Metal	392	438	493	565	586
Nickel metal:					
Refined	23,327	23,812	23,356	23,257	24,628
Ni content of nickel oxide sinter	7,200	12,600	15,150	15,300	18,000
Ni content of ferronickel	60,030	45,739	50,842	54,235	49,169
Total	[r]90,557	[r]82,151	[r]89,348	92,792	91,797
Platinum-group metals:					
Palladium metal troy ounces	27,862	37,122	33,802	43,703	46,699
Platinum metal do.	15,411	21,460	19,523	22,216	21,312
Rare-earth metals:					
Lanthanum oxide	118	160	235	254	210
Cerium metal	628	[e]600	[e]630	[e]630	[e]630
Selenium, elemental	410	433	465	497	427
Silicon:					
Metal	8,124	--	--	--	--
High-purity	605	652	908	1,471	2,094
Silver:					
Mine output, Ag content thousand troy ounces	9,843	9,877	10,403	10,915	11,294
Metal, primary do.	41,573	48,794	50,952	52,817	55,448
Tellurium, elemental	63	55	65	[e]63	[e]60
Tin:					
Mine output, Sn content	529	600	485	510	500
Metal, smelter	1,296	1,260	1,354	1,391	1,280
Titanium:					
Metal	16,850	10,590	15,368	21,897	14,481
Oxide	[r]184,026	[r]195,889	[r]204,685	217,695	222,941
Tungsten:					
Mine output, W content	604	475	477	568	511
Metal	1,775	1,842	2,386	2,638	2,557
Uranium metal kilograms	5,000	4,000	4,000	5,000	[e]5,000
Vanadium metal:[5] Secondary	684	706	700	762	843
Zinc:					
Mine output, Zn content	251,356	255,712	252,700	253,021	222,071
Oxide	60,924	64,796	72,794	72,832	68,277
Metal:					
Primary	549,010	579,021	644,360	629,504	626,489
Secondary	159,407	171,016	162,317	160,652	127,291
Zirconium:					
Metal	45	[e]45	[e]45	[e]45	[e]45
Oxide	4,320	4,900	6,250	[e]6,700	[e]6,700
INDUSTRIAL MINERALS					
Asbestos	4,135	[e]4,000	[e]4,000	[e]4,000	[e]4,000
Barite	59,492	69,699	66,018	76,997	52,848
Bromine, elemental[e]	12,000	12,000	12,000	12,000	15,000
Cement, hydraulic thousand tons	80,688	80,892	78,859	72,845	71,261
Clays:					
Bentonite	484,431	440,923	410,079	461,530	408,864
Fire clay	1,321,002	1,260,678	1,423,235	1,148,196	1,004,150
Kaolin	197,346	230,720	224,614	221,996	203,653
Feldspar and related materials:					
Feldspar	30,160	30,996	35,526	30,895	32,063
Aplite	349,355	401,266	441,005	469,386	457,375
Gypsum thousand tons	6,363	5,845	[e]6,050	[e]6,300	[e]6,400
Iodine, elemental	7,180	7,273	7,302	7,251	7,389
Lime: Quicklime thousand tons	7,777	7,436	7,753	7,454	6,717
Nitrogen: N content of ammonia do.	1,652	1,545	1,668	1,628	[e]1,550
Perlite[e]	75,000	75,000	75,000	75,000	75,000
Salt, all types thousand tons	966	921	[r]955	1,200	1,370
Sodium compounds, n.e.s.:					
Carbonate	1,162,398	1,103,378	1,036,133	1,057,102	1,020,869
Sulfate	255,969	260,661	278,941	276,814	253,450
Stone, crushed and broken:					
Dolomite thousand tons	4,996	4,386	4,268	4,329	3,953
Limestone do.	168,259	169,780	169,825	164,156	162,358
Sulfur:					
S content of pyrite do.	276	272	259	253	[e]160
Byproduct:					
Of metallurgy do.	1,268	1,239	1,191	1,201	[e]1,170
Of petroleum do.	1,051	1,102	1,142	1,044	[e]1,030

See footnotes at end of table.

Table 1.—Japan: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
INDUSTRIAL MINERALS —Continued					
Talc and related materials:					
Talc	99,886	87,124	84,522	78,616	63,851
Pyrophyllite	1,392,418	1,378,699	1,414,424	1,355,625	1,270,112
Vermiculite[e]	17,000	17,000	17,000	17,000	17,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black thousand tons	504	568	602	632	616
Coal:					
Anthracite do	32	17	23	26	13
Bituminous[6] do	17,574	17,045	16,622	16,357	15,999
Total do	17,606	17,062	16,645	16,383	16,012
Coke including breeze:					
Metallurgical do	46,520	43,600	48,145	48,622	45,132
Gashouse including breeze do	3,261	3,073	3,130	3,120	3,006
Fuel briquets, all grades do	334	282	306	315	241
Gas, natural:					
Gross[7] million cubic feet	72,305	73,645	75,293	78,562	74,351
Marketed do	70,440	68,957	75,329	80,122	77,989
Natural gas liquids:					
Natural gasoline thousand 42-gallon barrels	49	55	53	57	56
Liquefied petroleum gas from natural gas (field plants only)[e] do	300	300	300	300	300
Peat[e]	60	60	60	60	60
Petroleum:					
Crude thousand 42-gallon barrels	2,937	3,095	2,962	3,929	4,629
Refinery products:					
Gasoline:					
Aviation do	101	82	88	75	82
Other do	222,489	223,590	227,678	215,514	214,866
Jet fuel do	27,109	27,933	23,499	27,229	25,285
Kerosene do	169,825	168,982	168,774	152,477	151,484
Distillate fuel oil do	113,581	144,936	155,817	147,596	164,308
Residual fuel oil do	528,299	485,258	479,836	408,655	386,452
Lubricants do	10,774	11,517	12,032	12,133	11,730
Asphalt and bitumen do	27,078	29,682	30,719	29,814	33,418
Liquefied petroleum gas do	45,890	48,733	47,029	50,243	44,010
Naphtha do	71,804	72,509	73,175	65,093	60,822
Paraffin do	1,025	981	1,050	994	[e]980
Petroleum coke do	761	717	881	1,088	956
Unfinished oils do	NA	4,478	48,243	39,525	40,928
Refinery fuel and losses do	118,708	88,591	[8]130,666	[8]153,968	[8]136,458
Total do	1,337,444	1,307,989	1,399,487	1,304,404	[e]1,271,779

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

[1]Table includes data available through Sept. 1, 1986.

[2]Includes scrap recovery.

[3]For reasons not evident in sources, these figures are reported as negative numbers. (See also footnote 4.)

[4]Sum of listed detail as reported, but adding quantity bearing footnote 3 as positive numbers. Japanese sources provide the following totals for ferroalloy output in the years indicated, in metric tons: 1982—1,548,653; 1983—1,258,422; 1984—1,418,645; 1985—1,388,615; and 1986—1,105,333. These totals represent the sum of listed detail using the quantities bearing footnote 3 as negative numbers, thereby not only omitting the footnoted numbers, but actually subtracting them from the sum of all other alloys. The reason for this procedure in source publications is not explained.

[5]Represents metal content of vanadium pentoxide recovered from petroleum residues, ashes, and spent catalysts.

[6]Includes coking coal and steam coal.

[7]Includes output from gas wells and coal mines.

[8]May include some additional unfinished oils.

TRADE

Japan's merchandise trade surplus rose 80% and reached another record-high level at $83 billion. Export earnings increased 19% to $209 billion primarily because of a 42% appreciation of the Japanese yen on the U.S. dollar-based export commodities despite reduced exports of iron and steel products, electronic products, motor vehicles, and ships on a real quantity basis. Imports dropped slightly to $126 billion mainly because of further reductions in crude petroleum imports resulting from a

sharp drop in world oil prices.

In mineral and metal trade, imports included $19.5 billion of crude and partially refined petroleum, $4.9 billion of coal, $4.6 billion of refined petroleum products, $3.7 billion of nonferrous metals, $2.8 billion of iron ore, $2.1 billion of nonferrous ore, and $375 million of iron and steel scrap. Exports of minerals and metals included $12.7 billion of iron and steel products, $3.9 billion of nonferrous metal products, and $2.4 billion of industrial mineral products.

In overall merchandise trade, exports of machinery and equipment valued at $155 billion accounted for 74% of total export earnings while imports of mineral fuels and foodstuff valued at $40 billion and $19 billion accounted for 32% and 15% of total imports, respectively. The value of two-way merchandise trade between the United States and Japan totaled $109.5 billion. The United States accounted for 38% of Japan's total exports and 23% of Japan's total imports.

The United States was a major supplier of primary aluminum, aluminum scrap, beryllium, coal, copper, gold, iron and steel scrap, kaolin, primary magnesium, molybdenum, petroleum coke, phosphate rock, silver, and precious and semiprecious stones to Japan. On the other hand, Japan was a major supplier of aluminum and copper semimanufactured products, iodine, iron and steel products, iron oxide and hydroxide, manganese oxide, titanium sponge metal, and titanium mill products to the United States. Other major minerals trading partners of Japan were Australia, Brazil, Canada, China, Chile, India, Indonesia, Malaysia, Mexico, New Caledonia, Peru, the Philippines, Saudi Arabia, the Republic of South Africa, and the United Arab Emirates.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	281	292	3	Taiwan 236; Republic of Korea 38.
Aluminum:				
Ore and concentrate	135	340	--	Republic of Korea 330.
Oxides and hydroxides	573,071	481,536	3,775	Canada 287,273; Indonesia 62,558; Republic of Korea 45,336.
Metal including alloys:				
Scrap	2,259	2,317	12	Taiwan 1,796; Republic of Korea 348.
Unwrought	2,283	2,239	21	Thailand 621; Republic of Korea 523; Taiwan 338.
Semimanufactures	228,827	246,130	161,027	China 17,465; Republic of Korea 11,991.
Beryllium: Metal including alloys, all forms kilograms	3,176	109	--	Republic of Korea 106.
Bismuth: Metal including alloys, all forms	159	230	36	Netherlands 143; China 30.
Cadmium: Metal including alloys, all forms	446	382	10	Netherlands 113; Austria 97; East Germany 96.
Chromium:				
Ore and concentrate	718	756	--	Republic of Korea 567; China 156.
Oxides and hydroxides	3,353	3,247	611	Republic of Korea 1,116; Taiwan 888; Kuwait 225.
Cobalt: Oxides and hydroxides	74	12	--	India 3; Republic of Korea 3; North Korea 2.
Columbium and tantalum: Metal including alloys, all forms, tantalum	10	12	2	West Germany 6; North Korea 4.
Copper:				
Sulfate	620	508	34	Taiwan 326; United Kingdom 68.
Metal including alloys:				
Scrap	18,542	51,591	13	China 39,153; Taiwan 5,206.
Unwrought	4,041	7,559	--	China 4,099; Republic of Korea 1,781.
Semimanufactures	226,481	193,882	41,174	Taiwan 27,031; Hong Kong 23,712; China 22,794.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Gold:				
Waste and sweepings value, thousands	$22	--		
Metal including alloys, unwrought and partly wrought troy ounces	203,853	143,497	13,432	Singapore 58,237; Republic of Korea 20,017; Taiwan 10,747.
Iron and steel: Metal:				
Scrap	146,473	165,636	84	Republic of Korea 63,719; Taiwan 59,581; China 35,835.
Pig iron, cast iron, related materials	291,801	1,085,391	7,385	China 1,003,992; Taiwan 31,321; Republic of Korea 21,929.
Ferroalloys:				
Ferrochromium	2,095	5,468	1,436	India 2,135; Republic of Korea 812; Australia 330.
Ferromanganese	22,822	25,988	2,721	North Korea 7,006; China 3,464; Qatar 3,000.
Ferronickel	4,365	4,475	1,792	Netherlands 2,183.
Ferrosilicomanganese	93	170	--	Malaysia 165.
Ferrosilicon	1,199	913	33	Republic of Korea 399; Taiwan 186; Singapore 121.
Unspecified	2,398	2,077	283	Republic of Korea 1,185; Taiwan 401.
Steel, primary forms thousand tons	3,309	3,168	330	Republic of Korea 780; China 756.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	7,503	7,844	936	China 3,807; Hong Kong 488; Republic of Korea 382.
Universals, plates, sheets do	13,340	12,554	2,135	China 3,484; Republic of Korea 622; Taiwan 618.
Hoop and strip do	704	598	121	China 124; Taiwan 47.
Rails and accessories do	369	361	171	China 112; Canada 35.
Wire do	354	317	115	China 45; Hong Kong 17; Iraq 14.
Tubes, pipes, fittings do	6,485	6,871	1,146	China 1,514; U.S.S.R. 1,493; Saudi Arabia 571.
Castings and forgings, rough do	27	23	11	Singapore 5; Taiwan 2.
Lead:				
Ore and concentrate	14,172	5,343	--	Republic of Korea 3,174; North Korea 2,169.
Oxides	160	74	(2)	Republic of Korea 27; China 25.
Metal including alloys, all forms	18,454	29,711	12	Republic of Korea 10,321; Taiwan 4,792; North Korea 3,047.
Magnesium: Metal including alloys, all forms	1,547	2,661	--	U.S.S.R. 1,920; China 236; North Korea 168.
Manganese:				
Ore and concentrate	2,476	1,605	--	Republic of Korea 474; Bangladesh 360; Philippines 252.
Oxides	37,069	44,267	17,049	U.S.S.R. 8,000; Indonesia 3,656; Republic of Korea 1,536.
Mercury 76-pound flasks	2,169	9,600	1,501	Netherlands 6,805; Vietnam 291.
Molybdenum: Metal including alloys, all forms	41	56	1	Hungary 15; Republic of Korea 13; West Germany 11.
Nickel: Metal including alloys, all forms	1,930	4,211	2,453	U.S.S.R. 477; Republic of Korea 331.
Platinum-group metals:				
Waste and sweepings value, thousands	$228	$22	$22	
Metals including alloys, unwrought and partly wrought troy ounces	117,017	127,499	53,335	Taiwan 42,949; United Kingdom 8,084.
Selenium, elemental	218	273	42	Netherlands 139; United Kingdom 32.
Silver: Metal including alloys, unwrought and partly wrought thousand troy ounces	4,268	3,003	23	Hong Kong 1,426; Taiwan 794; Republic of Korea 262.
Tin:				
Oxides	6	11	(2)	North Korea 5.
Metal including alloys, all forms	704	695	36	Hong Kong 240; Malaysia 105; Republic of Korea 95.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Titanium:				
Oxides	17,222	19,007	130	China 5,827; Taiwan 5,502; Republic of Korea 2,741.
Metal including alloys, all forms	r9,701	7,330	3,054	West Germany 1,127; France 947; Netherlands 554.
Tungsten: Metal including alloys, all forms	195	235	45	West Germany 60; Taiwan 28.
Uranium and/or thorium: Oxides and other compounds	387	428	86	Republic of Korea 126; Taiwan 79; Thailand 41.
Zinc:				
Oxides	794	809	112	Cuba 212; Taiwan 119; Republic of Korea 78.
Metal including alloys, all forms	52,791	38,522	2,094	Taiwan 13,081; Philippines 7,079; Republic of Korea 5,447.
Other:				
Ores and concentrates	561	310	--	Thailand 180; Republic of Korea 89.
Ashes and residues	9,323	9,388	--	Belgium-Luxembourg 2,533; Taiwan 1,937; United Kingdom 1,880.
Base metals including alloys, all forms	2,600	3,121	1,425	Netherlands 497; United Kingdom 295.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	7,399	11,845	3	Republic of Korea 5,942; Hong Kong 3,999; Taiwan 1,212.
Artificial:				
Corundum	24,489	19,235	432	Republic of Korea 9,460; Taiwan 3,070; Romania 1,549.
Silicon carbide	4,947	3,027	49	Republic of Korea 1,585; Taiwan 1,078.
Dust and powder of precious and semiprecious stones including diamond kilograms	873	2,226	671	Hong Kong 1,350; Republic of Korea 76.
Grinding and polishing wheels and stones	9,527	9,482	1,638	U.S.S.R. 984; Thailand 778; Hong Kong 768.
Asbestos, crude	431	292	--	Republic of Korea 259.
Barite and witherite	400	13	--	Brazil 10.
Boron materials:				
Crude natural borates	1,600	2,190	--	Republic of Korea 1,148; Taiwan 1,039.
Oxides and acids	326	188	1	Republic of Korea 143; Taiwan 17.
Cement thousand tons	11,482	9,130	972	Hong Kong 2,193; Saudi Arabia 1,827; Kuwait 1,485.
Clays, crude	66,636	63,554	5	Taiwan 31,401; Republic of Korea 12,767; Iraq 5,588.
Diamond:				
Gem, not set or strung carats	2,173	1,192	399	Hong Kong 660; Belgium-Luxembourg 104.
Industrial stones do	29,369	4,694	--	West Germany 3,710; Republic of Korea 400.
Diatomite and other infusorial earth	2,200	2,599	1	Iraq 920; Australia 672; Taiwan 467.
Feldspar	31,770	27,646	--	Taiwan 24,409; Indonesia 1,968.
Fertilizer materials: Manufactured:				
Ammonia	14,081	2,137	--	Thailand 1,122; Philippines 778.
Nitrogenous	935,021	739,909	1,425	Thailand 319,036; Malaysia 113,371; China 80,329.
Phosphatic	4,190	3,659	--	Fiji 1,050; Sudan 745; Paraguay 600.
Potassic	580	82	--	Philippines 43; Republic of Korea 25.
Unspecified and mixed	164,767	150,918	1,902	Thailand 42,637; Pakistan 19,582; Sri Lanka 18,500.
Fluorspar	327	157	--	Taiwan 63; Republic of Korea 40.
Graphite, natural	2,927	2,553	126	Republic of Korea 588; Cuba 512; Taiwan 421.
Gypsum and plaster	9,658	6,142	6	Taiwan 1,787; Republic of Korea 1,284; Indonesia 1,123.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Iodine including bromine and fluorine	5,230	6,605	1,881	United Kingdom 999; West Germany 866; France 669.
Kyanite and related materials	9,238	11,946	991	Republic of Korea 4,211; Taiwan 3,348; Indonesia 1,815.
Lime	58,361	34,219	42	Australia 16,750; Papua New Guinea 12,791.
Magnesium compounds: Oxides and hydroxides	115,532	108,776	15,997	Republic of Korea 25,307; Netherlands 10,663.
Mica, all forms	1,283	1,159	32	Taiwan 418; Hong Kong 274; Republic of Korea 252.
Nitrates, crude	--	15	--	All to Republic of Korea.
Phosphorous, elemental	97	301	41	China 170; North Korea 20.
Pigments, mineral: Iron oxides and hydroxides, processed	19,818	15,025	2,014	Taiwan 5,342; Republic of Korea 3,522; Indonesia 461.
Precious and semiprecious stones other than diamond:				
Natural kilograms	37,626	25,159	483	Republic of Korea 15,880; Hong Kong 3,910.
Synthetic do	86,445	67,580	16,447	Malaysia 17,024; Republic of Korea 7,544; Hong Kong 6,903.
Pyrite, unroasted	4,655	248	--	Australia 200; Republic of Korea 46.
Salt and brine	1,250	1,414	420	North Korea 299; Burma 100.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	13,377	64,865	4	China 18,177; Indonesia 17,678; Philippines 8,787.
Sulfate, manufactured	5,907	6,138	2	Indonesia 2,508; Republic of Korea 2,427; Thailand 780.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,809	405	--	Republic of Korea 322; Taiwan 61.
Worked	3,741	8,581	185	Republic of Korea 3,025; Singapore 2,709; Kuwait 1,586.
Dolomite, chiefly refractory-grade	5,812	5,704	--	Saudi Arabia 2,500; Indonesia 1,160; Taiwan 955.
Gravel and crushed rock	197,356	186,445	--	Australia 184,000; Republic of Korea 624.
Limestone other than dimension	1,755,191	1,041,283	730	Australia 1,005,626; Singapore 27,766.
Quartz and quartzite	5,401	267	--	Taiwan 84; Republic of Korea 63; Malaysia 53.
Sand other than metal-bearing	4,545	4,083	(2)	Republic of Korea 1,809; Taiwan 752; Singapore 641.
Sulfur:				
Elemental: Crude including native and byproduct	274,095	165,981	136	Republic of Korea 113,795; Taiwan 48,223.
Sulfuric acid	199,052	322,568	5	Taiwan 97,868; Turkey 78,194; Republic of Korea 49,385.
Talc, steatite, soapstone, pyrophyllite	4,838	4,792	70	Republic of Korea 2,605; Taiwan 863; Philippines 387.
Other:				
Crude	21,745	24,584	596	Republic of Korea 15,679; Taiwan 3,909.
Slag and dross, not metal-bearing	470,440	325,275	14,000	Singapore 124,270; Taiwan 20,310.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	133	7	--	Western Samoa 4.
Carbon black	10,517	9,940	287	Republic of Korea 2,477; China 2,211; Taiwan 1,375.
Coal, all grades including briquets	13,874	4,242	--	Republic of Korea 1,549; Cuba 1,300.
Coke and semicoke thousand tons	2,489	2,264	350	Romania 641; Taiwan 167; Philippines 158.
Peat including briquets and litter	35	253	--	North Korea 221.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	274	410	375	Italy 30.
Gasoline do.	115	319	136	Taiwan 88; Republic of Korea 73.
Mineral jelly and wax do.	538	493	96	Republic of South Africa 123; Republic of Korea 71.
Kerosene and jet fuel do.	12	414	--	Iran 402.
Distillate fuel oil do.	1	419	--	Iran 418.
Lubricants do.	1,349	1,195	75	Republic of Korea 339; Taiwan 199; Singapore 139.
Nonlubricating oils do.	278	255	2	Republic of Korea 81; Taiwan 58; China 24.
Residual fuel oil do.	705	1,444	--	Mainly to Republic of Korea.
Bitumen and other residues do.	66	40	--	Singapore 11; Hong Kong 9; Malaysia 5.
Bituminous mixtures do.	8	7	(2)	Indonesia 1; Thailand 1.
Petroleum coke do.	183	390	85	U.S.S.R. 143; Netherlands 127.

[r]Revised.
[1]Excludes exports under Japanese-United States Mutual Defense Agreement or for account of U.S. military forces. Table prepared by Audrey D. Wilkes.
[2]Less than 1/2 unit.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkaline-earth metals	35	71	10	France 40; China 16.
Unspecified	546	859	124	China 428; France 240.
Aluminum:				
Ore and concentrate thousand tons	3,862	3,519	(2)	Australia 2,199; Indonesia 778; Malaysia 423.
Oxides and hydroxides	142,851	44,005	795	Australia 39,097; West Germany 2,231.
Metal including alloys:				
Scrap	243,250	361,053	256,920	Australia 19,708; Hong Kong 16,686; Canada 10,765.
Unwrought thousand tons	1,348	1,576	248	Australia 323; Indonesia 193; Venezuela 176.
Semimanufactures	41,632	34,825	3,609	Venezuela 6,763; France 4,609; Spain 4,225.
Antimony:				
Ore and concentrate	6,987	5,091	--	Bolivia 2,867; China 1,785.
Oxides	2,467	2,672	15	United Kingdom 1,212; China 1,103.
Metal including alloys, all forms	5,118	4,269	--	Mainly from China.
Arsenic: Oxides and acids	199	144	--	France 140; China 4.
Beryllium:				
Oxides and hydroxides	85	100	80	China 20.
Metal including alloys, all forms kilograms	2,993	744	741	West Germany 3.
Chromium:				
Ore and concentrate	823,394	987,240	--	Republic of South Africa 542,805; India 125,154; Albania 94,123.
Oxides and hydroxides	2,004	2,278	962	West Germany 789; U.S.S.R. 380.
Cobalt:				
Oxides and hydroxides	412	259	41	Belgium-Luxembourg 169; Finland 27.
Metal including alloys, all forms	2,586	2,312	207	Zaire 1,323; Zambia 193; Belgium-Luxembourg 169.
Columbium and tantalum:				
Ore and concentrate	2,317	2,195	--	Canada 1,759; Nigeria 125; Brazil 116.
Metal including alloys, all forms, tantalum	57	79	39	West Germany 22; Belgium-Luxembourg 11.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Copper:				
Ore and concentrate thousand tons	2,930	3,010	366	Canada 804; Chile 344; Philippines 299.
Matte and speiss including cement copper	1,311	132	--	Taiwan 76; Republic of South Africa 52.
Sulfate	368	400	--	China 170; Thailand 119; France 106.
Metal including alloys:				
Scrap	92,595	81,663	37,248	Hong Kong 12,758; Saudi Arabia 6,554; Singapore 6,348.
Unwrought	537,912	393,072	22,233	Zambia 152,123; Philippines 65,079; Peru 62,731.
Semimanufactures	12,150	14,268	1,038	Taiwan 7,612; Republic of Korea 3,902.
Germanium: Metal including alloys, all forms kilograms	1,959	3,975	10	China 2,785.
Gold:				
Waste and sweepings do.	1,329	1,011	--	Singapore 998.
Metal including alloys, unwrought and partly wrought thousand troy ounces	r6,172	6,328	52	Switzerland 2,903; United Kingdom 1,114; Republic of South Africa 719.
Indium: Metal including alloys, all forms kilograms	31,639	8,249	2,240	Belgium-Luxembourg 3,004; China 1,825.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite thousand tons	125,372	124,513	(2)	Australia 54,321; Brazil 29,064; India 18,855.
Metal:				
Scrap do.	4,018	3,254	1,933	U.S.S.R. 400; Australia 283.
Pig iron, cast iron, related materials do.	823	748	1	Republic of South Africa 300; Brazil 141; North Korea 69.
Ferroalloys:				
Ferrochromium	395,381	317,595	--	Republic of South Africa 197,416; Philippines 33,719; Brazil 32,392.
Ferromanganese	14,102	5,878	--	India 4,947; Brazil 771.
Ferromolybdenum	591	988	10	Chile 277; Austria 272; Netherlands 154.
Ferronickel	44,754	46,155	1,501	New Caledonia 20,247; Indonesia 14,689; Dominica 7,281.
Ferrosilicochromium	8,665	10,026	--	Zimbabwe 5,607; Republic of South Africa 4,419.
Ferrosilicomanganese	114,082	121,600	879	Republic of South Africa 53,096; Brazil 39,772.
Ferrosilicon	338,646	306,830	491	Norway 97,272; Brazil 61,258; Republic of South Africa 26,215.
Silicon metal	84,958	102,797	915	China 23,300; Norway 20,351; Republic of South Africa 14,820.
Unspecified	11,754	10,839	95	Brazil 3,990; France 2,501; China 1,400.
Steel, primary forms	2,076,226	41,644,374	525	Republic of Korea 833,858; Brazil 377,454; North Korea 69,995.
Semimanufactures:				
Universals, plates, sheets	1,798,433	51,075,305	2,348	Republic of Korea 564,373; Brazil 109,698; Romania 52,006.
Unspecified	168,802	682,925	1,502	Republic of Korea 71,487; Thailand 4,480.
Lead:				
Ore and concentrate	249,226	261,795	1,472	Peru 76,261; Australia 65,429; Canada 58,977.
Oxides	5,921	8,518	6	Mexico 6,244; Singapore 1,820.
Metal including alloys:				
Scrap	450	185	--	Papua New Guinea 123; Singapore 45.
Unwrought	108,448	87,840	1,255	Australia 50,920; Taiwan 8,469; North Korea 7,868.
Semimanufactures	42	41	37	Belgium-Luxembourg 3.
Lithium:				
Oxides and hydroxides	858	797	703	Hong Kong 48; China 34.
Metal including alloys, all forms	32	42	27	West Germany 10.
Magnesium: Metal including alloys:				
Scrap	192	293	--	Taiwan 122; Malaysia 54.
Unwrought	14,642	15,621	11,305	Norway 3,154; Canada 898.
Semimanufactures	308	318	312	West Germany 4.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Manganese:				
Ore and concentrate thousand tons	2,212	2,183	--	Republic of South Africa 1,234; Australia 495.
Oxides	1,371	1,782	12	Belgium-Luxembourg 1,767.
Mercury 76-pound flasks	1,522	513	--	China 411; Spain 100.
Molybdenum:				
Ore and concentrate	18,246	21,138	7,357	Chile 7,054; Netherlands 4,267; Canada 1,823.
Oxides and hydroxides	578	384	362	West Germany 22.
Metal including alloys, all forms	r422	427	137	West Germany 186; Switzerland 43.
Nickel:				
Ore and concentrate thousand tons	2,835	2,976	--	New Caledonia 1,365; Indonesia 853; Philippines 757.
Matte and speiss	49,219	52,462	--	Indonesia 29,745; Australia 21,671.
Metal including alloys:				
Scrap	3,242	2,622	1,530	Taiwan 760; United Kingdom 102.
Unwrought	32,840	25,092	1,244	Canada 8,254; U.S.S.R. 4,598; Norway 3,264.
Semimanufactures	3,471	5,577	668	Philippines 1,770; United Kingdom 1,609; Canada 1,036.
Platinum-group metals:				
Waste and sweepings kilograms	1,710	2,664	1,205	Taiwan 1,043.
Metals including alloys, unwrought and partly wrought:				
Palladium thousand troy ounces	1,258	1,107	99	U.S.S.R. 675; Republic of South Africa 214.
Platinum do	r1,206	1,304	212	Republic of South Africa 639; United Kingdom 234; U.S.S.R. 106.
Rhodium do	58	61	5	Republic of South Africa 23; U.S.S.R. 21.
Iridium, osmium, ruthenium do	89	86	(2)	Republic of South Africa 72.
Rare-earth metals including alloys, all forms	131	60	5	Brazil 40.
Selenium, elemental	28	12	(2)	Republic of Korea 5; Belgium-Luxembourg 4.
Silicon, high-purity	114	144	60	Italy 23; France 16; Denmark 14.
Silver:				
Ore and concentrate	--	68	9	Spain 59.
Waste and sweepings kilograms	1,613	701	--	Malaysia 608.
Metal including alloys, unwrought and partly wrought thousand troy ounces	16,169	18,351	990	Mexico 11,389; Peru 3,994.
Tellurium, elemental	39	4	(2)	Netherlands 2.
Tin: Metal including alloys:				
Scrap	1	15	--	Philippines 9; Hong Kong 5.
Unwrought	31,895	30,282	(2)	Malaysia 12,338; Indonesia 5,670; China 5,630.
Semimanufactures	16	53	10	Thailand 23; Singapore 19.
Titanium:				
Ore and concentrate	645,972	604,044	6,562	Australia 296,592; Malaysia 168,173; Sri Lanka 57,160.
Oxides	6,262	6,285	13	Republic of Korea 1,960; Belgium-Luxembourg 1,198; China 1,016.
Tungsten:				
Ore and concentrate	2,905	2,869	--	Portugal 868; Republic of Korea 525; Bolivia 288.
Metal including alloys, all forms	256	350	63	Republic of Korea 144; West Germany 112.
Uranium and/or thorium:				
Ore and concentrate	71	--		
Oxides and other compounds kilograms	17	807	201	India 600.
Metal including alloys, all forms, uranium do	9	36	7	France 29.
Vanadium: Oxides and hydroxides	4,602	3,786	34	Republic of South Africa 3,238; China 372.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Ore and concentrate	954,676	856,648	6,079	Australia 479,737; Peru 205,122; Canada 62,401.
Oxides	6,675	6,746	36	Republic of Korea 3,198; Taiwan 2,319; Singapore 596.
Metal including alloys:				
Scrap	464	345	24	Singapore 169; United Arab Emirates 80.
Unwrought	60,797	70,549	222	North Korea 28,718; Peru 15,839; Canada 6,927.
Semimanufactures	391	385	57	West Germany 129; Norway 54.
Zirconium:				
Ore and concentrate	217,648	238,321	6,620	Australia 198,511; Republic of South Africa 30,906.
Metal including alloys, all forms	163	173	43	France 130.
Other:				
Ores and concentrates	196	119	--	Mainly from Malaysia.
Oxides and hydroxides	1,167	592	14	Norway 332; Canada 229.
Ashes and residues	104,443	89,898	17,946	Australia 30,372; Taiwan 12,565; Philippines 10,880.
Base metals including alloys, all forms	6,219	6,470	1,358	Republic of South Africa 3,739; China 677.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	9,182	9,889	1,547	India 5,916; Australia 2,064.
Artificial:				
Corundum	20,226	22,529	78	China 11,808; Brazil 6,226.
Silicon carbide	17,629	23,994	21	China 11,805; Brazil 4,019; Norway 3,607.
Dust and powder of precious and semiprecious stones excluding diamond kilograms	221,215	421,400	--	West Germany 307,400; India 108,000.
Grinding and polishing wheels and stones	318	352	36	Austria 140; Italy 88; Brazil 30.
Asbestos, crude	239,747	261,648	10,780	Canada 102,979; Republic of South Africa 57,955; U.S.S.R. 45,493.
Barite and witherite	41,681	50,356	18	China 50,170.
Boron materials:				
Crude natural borates	51,800	59,075	--	All from Turkey.
Elemental[7]	55	41	4	Sweden 35.
Oxides and acids	24,828	26,393	19,352	Italy 3,957; Turkey 1,459.
Bromine and iodine	3,559	3,156	269	Israel 2,887.
Cement	173,675	476,928	66	Republic of Korea 289,764; Taiwan 182,853.
Clays, crude:				
Kaolin	684,405	706,745	529,864	Republic of Korea 55,570; Brazil 54,452.
Unspecified	282,003	281,951	113,066	China 139,808; Republic of Korea 15,570.
Diamond:				
Gem, not set or strung thousand carats	1,098	1,224	43	India 565; Israel 270; Belgium-Luxembourg 220.
Industrial stones do	682	722	87	Republic of South Africa 346; Zaire 123; Ghana 42.
Dust and powder do	31,961	33,056	11,976	Ireland 19,426; Zaire 928.
Diatomite and other infusorial earth	3,985	3,164	2,962	Taiwan 200.
Feldspar	9,611	7,802	45	China 5,173; Canada 1,268; India 1,186.
Fertilizer materials:				
Crude, n.e.s	1,452	1,184	--	Philippines 644; France 234; Norway 167.
Manufactured:				
Ammonia kilograms	1,021	435	435	
Nitrogenous	59,946	73,151	6,221	Indonesia 28,047; Chile 16,599; U.S.S.R. 5,060.
Phosphatic	73,694	54,588	21,643	China 20,416; Republic of Korea 12,509.
Potassic	1,345,745	1,375,430	132,062	Canada 597,132; U.S.S.R. 272,936; West Germany 149,427.
Unspecified and mixed	333,274	324,610	290,197	Philippines 11,000; Republic of Korea 6,226.
Fluorspar	513,284	570,656	--	China 344,562; Republic of South Africa 87,541; Thailand 86,752.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Graphite, natural	85,009	78,857	168	Republic of Korea 38,040; China 27,691.
Gypsum and plaster	256,253	305,694	506	Mexico 237,822; Morocco 26,630.
Kyanite and related materials	27,515	28,413	4,207	Republic of South Africa 22,968.
Magnesium compounds:				
Magnesite	50,420	38,538	--	China 38,118.
Oxides and hydroxides	278,277	304,073	16	China 236,173; North Korea 66,824.
Mica:				
Crude including splittings and waste	13,001	10,865	619	India 5,052; China 2,164; Canada 1,367.
Worked including agglomerated splittings	84	105	1	India 64; Belgium-Luxembourg 39.
Nitrates, crude	3,500	3,000	--	All from Chile.
Phosphates, crude thousand tons	2,323	2,414	1,348	Morocco 618; Jordan 292.
Phosphorus, elemental	22,346	24,552	8,090	Canada 6,862; Netherlands 4,095; China 1,550.
Pigments, mineral:				
Natural, crude	686	386	--	China 327; Austria 34.
Iron oxides and hydroxides, processed	8,999	12,724	3,008	West Germany 6,627; China 1,019.
Precious and semiprecious stones other than diamond:				
Natural:				
Gem material kilograms	376,635	331,822	25,991	Brazil 167,553; India 28,673; Republic of South Africa 18,819.
Industrial stones do	34	5	--	West Germany 3; Switzerland 2.
Synthetic do	179,758	79,735	58,615	West Germany 12,012; Poland 4,519.
Pyrite, unroasted	(2)	2,281	--	Philippines 2,248.
Salt and brine thousand tons	6,458	6,833	NA	Australia 3,305; Mexico 2,846; China 681.
Sodium compounds, n.e.s.:				
Carbonate, natural and manufactured	3,057	1	(2)	Mainly from Kenya.
Sulfate, manufactured	55,419	85,274	23,606	China 37,772; Mexico 16,294.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	667,716	704,910	24,651	Republic of Korea 190,053; India 177,852; China 80,228.
Worked	92,683	107,649	166	Republic of Korea 57,363; Italy 23,781; China 12,677.
Dolomite, chiefly refractory-grade	516,328	488,511	3,556	Philippines 359,107; Republic of Korea 86,146.
Gravel and crushed rock	285,794	217,421	8	Taiwan 193,972.
Limestone other than dimension	804	648	--	France 637.
Quartz and quartzite	104,939	142,496	1,359	India 75,203; Thailand 25,000; Republic of Korea 18,250.
Sand other than metal-bearing thousand tons	1,055	1,229	1	Australia 766; Taiwan 340.
Sulfur:				
Elemental: Crude including native and byproduct	--	87	(2)	Iraq 85.
Sulfuric acid	8,901	5	5	
Talc, steatite, soapstone, pyrophyllite	619,260	573,901	16,387	China 452,466; Australia 76,197.
Other:				
Crude	356,699	272,664	6,666	Republic of Korea 142,139; Spain 35,964; Philippines 24,998.
Slag and dross, not metal-bearing	r386,842	434,449	19,676	Republic of Korea 125,183; Republic of South Africa 106,844.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	23,489	3,186	2,767	Trinidad and Tobago 295.
Carbon black	9,012	9,173	5,877	Canada 1,203; West Germany 859; Republic of Korea 489.
Coal:				
Anthracite thousand tons	1,511	1,950	(2)	Republic of South Africa 980; Australia 319; North Korea 259.
Bituminous do	86,307	91,040	13,750	Australia 43,958; Canada 16,823; Republic of South Africa 7,641.
Lignite including briquets	24,870	31,585	1,117	U.S.S.R. 25,629; Australia 4,065.
Coke and semicoke	18,515	34,805	2	Australia 34,432.
Gas, natural: Liquefied thousand tons	25,892	27,790	1,016	Indonesia 15,000; Brunei 5,083; Malaysia 4,442.
Peat including briquets and litter	19,961	20,789	40	Canada 20,028.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum:				
Crude_ thousand 42-gallon barrels_ _	r1,329,453	1,218,423	(2)	Saudi Arabia 282,961; United Arab Emirates 263,473; Indonesia 134,086.
Refinery products:				
Liquefied petroleum gas do_ _ _ _	r131,762	133,645	(2)	Saudi Arabia 62,988; United Arab Emirates 28,127; Australia 16,636.
Gasoline _ _ _ _ _ _ _ _ _ _do_ _ _ _	r102,758	109,990	286	Saudi Arabia 23,492; Singapore 15,958; China 14,754.
Mineral jelly and wax _ _do_ _ _ _	87	76	35	Republic of South Africa 23; China 11.
Kerosene and jet fuel_ _ _do_ _ _ _	r15,213	12,817	766	Singapore 4,379; Republic of Korea 3,739; China 1,568.
Distillate fuel oil _ _ _ _ _do_ _ _ _	r3,892	3,168	1,144	China 1,323; Venezuela 491; Romania 105.
Lubricants _ _ _ _ _ _ _ _ _do_ _ _ _	318	226	99	Netherlands Antilles 53; Singapore 27.
Residual fuel oil_ _ _ _ _ _do_ _ _ _	r87,600	93,207	9,883	Indonesia 26,275; Singapore 18,244; Republic of Korea 9,686.
Bitumen and other residues do_ _ _ _	64	140	73	Republic of Korea 66.
Bituminous mixtures_ _ _do_ _ _ _	10	11	6	Republic of Korea 2; United Kingdom 2.
Petroleum coke _ _ _ _ _ _do_ _ _ _	18,279	19,960	17,910	China 798; U.S.S.R. 457.

rRevised. NA Not available.

[1]Excludes imports under Japanese-United States Mutual Defense Agreement or for account of U.S. military forces. Table prepared by Audrey D. Wilkes.

[2]Less than 1/2 unit.

[3]May also contain some waste and scrap of germanium.

[4]Excludes unreported quantity valued at $1,257,000.

[5]Excludes unreported quantity valued at $17,497,000.

[6]Excludes unreported quantity valued at $57,411,000.

[7]May include some arsenic.

COMMODITY REVIEW

METALS

Aluminum.—Japan's production of primary aluminum dropped to a new low level since 1961. A further decline in production of primary aluminum was due to permanent closures, in February, of the Chiba plant operated by Showa Light Metal Co. Ltd. (SLM) and the Toyama plant in October operated by Sumitomo Aluminium Smelting Co. Ltd. (SAS). In March, part of the mothballed prebaked potline from the Chiba plant reportedly was sold and shipped to Baiyin near Lanzhou of Gansu Province in northwestern China. The remaining assets of SLM, a 600,000-ton-per-year alumina plant at Yokohama, was taken over by Showa Denko K.K. Because of high electricity costs, low aluminum prices, further strengthening of the Japanese yen, and earlier implementation of tariff reductions by the Government on primary aluminum and aluminum mill products, Mitsui Aluminium Co. Ltd. and Ryoka Light Metal Industries Ltd. announced plans to close their smelters, the Miike plant and the Sakaide plant, respectively, in March 1987.

Following the closure of the Chiba plant, SLM was dissolved in November 1986, and its 200 employees and assets and liabilities were absorbed by the parent company, Showa Denko. SLM, established in 1976, was 50% owned by Comalco Ltd., a subsidiary of CRA Ltd. of Australia. According to industry sources, Showa Denko agreed to transfer 20.6% of its 41.3% equity in New Zealand Aluminium Smelters Ltd. to Comalco as part of the settlement for dissolving SLM.

After closures of the Toyama plant at the end of October, SAS was liquidated by its parent company, Sumitomo Chemical Co. Ltd. Later, a new subsidiary, Sumitomo Aluminium Sales Co. Ltd., was formed to take over the importing and marketing of primary aluminum. Another unnamed subsidiary was expected to take over aluminum casting operations of the Toyama plant.

In October, Mitsubishi Chemical Industries Ltd., the parent company of Ryoka Light Metal Industries, announced plans to close down its Sakaide plant in March 1987 and transfer 160 workers at the plant to other divisions. In November, following the announcement by Mitsubishi Chemical, Mitsui Aluminium also decided to close its Miike plant in March 1987. However, Mitsui Aluminium was expected to continue casting operations of the Miike plant. A gloomier outlook for 1987-88 because of further tariff reduction on primary aluminum and mill products was cited by the two companies as the most important factor for closing down their aluminum smelters.

In 1985, the Government of Japan cut the tariff on imports of aluminum mill products to 9.2% effective January 1986 and agreed to cut tariffs further on mill products to 3% and on primary aluminum from 9% to 1% effective 1988. However, in October, the Government agreed to implement a 50% tariff cut with the rate of 5% on primary aluminum and 6.1% on mill products effective April 1987. The Government's action on early implementation of tariff reduction reportedly was part of the trade agreement between Japan and the United States to open the Japanese domestic market to foreign commodities.

Because of further appreciations in the Japanese yen, which made Japanese alumina less competitive in the world market and reduced domestic demand for alumina, Nippon Light Metal decided to close down its 360,000-ton-per-year alumina plant at Tomakomai in Hokkaido in December. The company reportedly also planned to reduce its primary aluminum production at the Kanbara plant to about 35,000 tons in 1987 from 46,200 tons in 1986. The company's Kanbara smelter would become the sole primary aluminum producer in Japan after March 1987. The smelter has its own hydroelectric powerplant and was not expected to be shut down in the near future.

In 1986, despite a slight increase in domestic demand and decrease in domestic production, imports of primary aluminum dropped 13% to 1,214,184 tons, of which 1,041,411 tons was regular-grade ingot, 34,942 tons was high-grade, and 137,831 tons was low-grade and aluminum alloy ingots. A substantial drawdown in stocks of domestic smelters and consumers was the main cause of reduced imports. Imports of primary aluminum ingot totaled 1,073,921 tons, of which 275,022 tons was from Australia; 161,740 tons, from New Zealand; 158,217 tons, from Indonesia; 154,363 tons, from Venezuela; 130,248 tons, from the United States; 65,118 tons, from Canada; and the remainder, from Bahrain, Brazil, and other countries. Of total imports of primary aluminum, 586,000 tons was from captive-import development projects in Australia, Canada, Indonesia, New Zealand, the United States, and Venezuela; 420,000 tons was imported under long-term contract; and 194,000 tons was imported from the spot market.[6]

Imports of primary aluminum from the captive Alumínio Brasileiro S.A. (ALBRÁS) project in Brazil had been delayed owing to a breakdown in pricing negotiations between Cia. Vale Do Rio Doce (CVRD) of Brazil and Nippon Amazon Aluminium Co. (NAAC) of Japan in June. However, in October, the first shipment of primary aluminum from the ALBRÁS smelter reportedly left Brazil and arrived in Japan in mid-November. The second shipment was expected to arrive in Japan in mid-January 1987. Under an agreement, Japan was to take 33,000 tons in 1986. In July, NAAC, the partner of CVRD in the Alúmina do Norte do Brasil S.A. (ALUNORTE) alumina project in Brazil, reportedly exercised its right to halt participation in the alumina project but kept open its option to return to the project pending further studies on viability of the project. NAAC invested $23 million in equity capital and provided $50 million in loans to the project. Construction of the ALUNORTE alumina plant was about 40% completed in 1986. NAAC was to provide an additional $200 million for 30% of the total project costs.[7]

Domestic demand for primary aluminum rose slightly to about 1.8 million tons owed largely to a slight increase in consumption for mill products in 1986. Consumption of primary aluminum by semimanufactured products were as follows: mill products, 1,461,143 tons; casting and die castings, 125,655 tons; wire and cable, 71,928 tons; steel deoxidation, 43,918 tons; and other, 101,976 tons. Exports of primary aluminum rose 84% to 971 tons, of which 551 tons went to the Republic of Korea in 1986.

As a result of reduced imports and domestic production, the overall stocks of primary aluminum decreased 56% to 210,367 tons at yearend. Of the total stocks, 62,986 tons was held by producers, 95,991 tons by consumers, and 51,390 tons by dealers. The 14,849 tons held by the privately funded Light Metal Stockpiling Association in 1985 was sold by the end of October 1986.

Table 4.—Japan: Primary aluminum capacity and production

(Metric tons)

Company and plant location	Annual capacity			Production	Status
	1979	1981	1986	1986	
Mitsui Aluminium Co. Ltd.: Miike	163,830	144,370	124,906	44,811	To be closed in Mar. 1987.
Nippon Light Metal Co. Ltd.:					
Kanbara	94,960	63,850	63,854	46,193	The sole producer after Mar. 1987.
Niigata	147,660	--	--	--	Closed in Dec. 1980.
Tomakomai	134,410	134,410	--	--	Closed in Apr. 1985.
Ryoka Light Metal Industries Ltd.:[1]					
Naoetsu	160,160	160,160	--	--	Closed in Sept. 1981.
Sakaide	192,480	76,430	50,951	22,433	To be closed in Mar. 1987.
Showa Aluminium Industries K.K.:					
Chiba	170,290	127,510	31,690	3,030	Closed in Feb. 1986.
Kitakata	28,720	16,920	--	--	Closed in June 1982.
Ohmachi	42,800	17,940	--	--	Closed in Sept. 1982.
Sumikei Aluminium Industries Ltd.:					
Sakata	98,710	98,710	--	--	Closed in May 1982.
Sumitomo Aluminium Smelting Co. Ltd.:					
Isoura	78,980	78,980	--	--	Closed in Mar. 1982.
Nagoya	52,800	--	--	--	Closed in Apr. 1979.
Toyama	177,680	118,450	82,917	23,720	Closed in Oct. 1986.
Toyo	98,710	98,710	--	--	Closed in Apr. 1985.
Total	1,642,190	1,136,440	354,318	140,187	

[1]Formerly Mitsubishi Light Metal Industries Co. Ltd., a subsidiary of Mitsubishi Chemical Industries Ltd.

Chromium.—Domestic production of chromium ore and concentrate principally by Nippon Chrome Industries Ltd. from its Wakamatsu Mine in the southern Tottori Prefecture decreased slightly. Hirose Mining Co. Ltd. closed its Takase Mine in Okayama Prefecture in May and its Hirose Mine in Tottori Prefecture in mid-September.

Imports of chromium ore and concentrate dropped 32% to 670,625 tons owing to reduced consumption of metallurgical-grade chromite by the ferroalloy industry and increased imports of ferrochromium. The major overseas suppliers of chromium ore and concentrate to Japan were the Republic of South Africa, 379,867 tons; Madagascar, 102,567 tons; India, 49,710 tons; and Albania, 37,659 tons.

According to the latest MITI estimate reported by MMAJ during fiscal year 1986, consumption of chromium ore and concentrate decreased from 809,000 tons to 800,000 tons. Consumption by the steel industry dropped from 698,000 tons to 689,000 tons. Consumption by the refractory industry also dropped from 38,000 tons to 37,000 tons, while consumption by the chemical and chromium metal manufacturing industries rose from 73,000 tons to 74,000 tons. Stocks of chromium ore and concentrate at the end of fiscal year 1986 rose from 336,000 tons to 382,000 tons.

To meet the domestic demand for ferrochromium by the specialty steel industry, Japan imported 372,513 tons of ferrochromium principally from the Republic of South Africa, 235,213 tons; the Philippines, 43,181 tons; Zimbabwe, 34,679 tons; and India, 22,706 tons. Japan continued to stockpile ferrochromium through its three rare-metal stockpile programs. By the end of fiscal year 1986, the stockpile of ferrochromium totaled 26.4 days, an increase of 4.8 days from that of the previous fiscal year, but was 21.6 days below the target of a 48-day supply by fiscal year 1986. Japan's import reliance of chromium remained at 99% in 1986.

Cobalt.—Production of cobalt metal using imported raw materials from Australia and the Philippines rose slightly from that of 1985. However, cobalt production by Nippon Mining Co. Ltd.'s subsidiary, Nikko Nickel Cobalt Refining Co. Ltd., at the Nikko plant in Ibaraki Prefecture began to drop in May following suspension of feed imports from the Greenvale Mine in Queensland, Australia. Cobalt production by Sumitomo Metal Mining at its Niihama plant in Ehime Prefecture also began to decline in September owing to a shortage of feed following suspension of feed imports from the Surigao Mine on Nonoc Island in the Philippines.

Nippon Mining suspended nickel and cobalt refining at its Nikko plant at the end of August. Imports of nickel-cobalt mixed sulfide by Nippon Mining from Australia were

terminated at the end of April owing to the failure to reach a long-term supply agreement with Metals Exploration Queensland Pty. (MEQ) of Australia on terms of imports in February. Between May and August, the Nikko plant was operating at less than 50% of its 100-ton-per-month capacity on its remaining feedstocks imported from the Greenvale Mine earlier. According to Japanese sources, the mixed sulfide produced from the Greenvale Mine reportedly delivered the feed to Outokumpu Oy of Finland through an understanding with Nippon Mining. The Nikko plant remained suspended by yearend because of difficulty in obtaining the nickel-cobalt mixed sulfide from other supply sources.[8]

Sumitomo Metal Mining stopped receiving nickel-cobalt mixed sulfide in June from the Surigao Mine because of the curtailment by Nonoc Mining and Industrial Corp. (NMIC) of the Philippines. NMIC suspended its Nonoc operations at the end of March because of a 3-month strike and shortage of fresh capital to resume operation. Sumitomo Metal Mining ran out of feedstocks at the end of September and began small-scale cobalt refining at less than 15% of its 133-ton-per-month capacity using nickel-matte residues imported from Western Mining Corp. Ltd. of Australia.[9]

To meet the domestic demand for cobalt, Japan imported 3,340 tons of cobalt metal including powder and flakes mainly from Zaire, 2,016 tons; Belgium, 396 tons; Zambia, 359 tons; Norway, 198 tons; and the United States, 131 tons in 1986.

According to the latest MITI estimate reported by MMAJ during fiscal year 1986, consumption of cobalt metal dropped from 2,689 tons to 1,745 tons. Consumption for high-speed specialty steel and heat-resistant alloys increased from 419 tons to 441 tons; for magnetic materials, decreased from 473 tons to 347 tons; for carbide tool steels, decreased from 268 tons to 239 tons; and for other uses, increased from 646 tons to 682 tons. Stocks at the end of fiscal year 1986 were 557 tons compared with 830 tons in previous fiscal years. Japan's stockpile of cobalt metal through three rare-metal stockpile programs totaled 26.4 days of supply by the end of fiscal year 1986.

In March, several cobalt-rich seabed crusts were discovered by a team of scientists from Tokai University near an island called Minami Torishima, about 1,500 kilometers offshore southeast of Tokyo. According to Tokai University, the cobalt crusts were found on flat tops of eight seabed mountains. The cobalt content of the crust from the first survey conducted in December 1985 was 0.96%. Between May 21 and June 18, about 1 ton of cobalt crust samples had been collected from the eight seabed mountains by a 1,200-ton ocean research vessel, *No. 2 Bosei Maru.* According to industry sources, the cobalt content of the crust samples reportedly was more than 0.5%.[10]

Copper, Lead, and Zinc.—Japan's mine production of copper, lead, and zinc declined sharply because of production cutbacks and mine closures resulting from lower prices of the metals in the domestic market and the sharp appreciation of the Japanese yen, which induced more imports of overseas raw materials. During the year, reduced mine production of copper was caused by a production cutback by Shin-Kamaishi Mining Co. Ltd., a subsidiary of Nittetsu Mining Co. Ltd.; and closures in March of the Minami-Furutobe Mine in Akita, operated by Furutobe Mining Co. Ltd., a subsidiary of Mitsubishi Metal Corp., because of ore depletion, and the Hanawa Mine in Akita, operated by Hanawa Mining Co. Ltd., a subsidiary of Nippon Mining, because of low metal prices. Reduced mine production of lead and zinc was caused by production cutbacks by Syakanai Mining Co. Ltd., a subsidiary of Nippon Mining; Hosokura Mining Co. Ltd., a subsidiary of Mitsubishi Metal; and Nippon Zinc Mining Co. Ltd., a subsidiary of Mitsui Mining & Smelting Co. Ltd., as well as closure of the Jokoku Mine in Hokkaido operated and owned by Chuugai Mining Co. Ltd. in May.

According to MMAJ, Mitsubishi Metal announced plans to shut down its Akenobe Mine in Hyogo and its Hosokura Mine in Miyagi in March 1987. Nippon Mining also planned to shut down its Syakanai Mine in Akita in March 1987 owing to further strengthening of the Japanese yen and mounting losses from continuing operations resulting from high production costs and low metal prices. To streamline the mining operations, Dowa Mining Co. Ltd. reorganized the company structure and separated two of its copper, lead, and zinc mines into two independent mining subsidiaries. Hanaoka Mining Co. Ltd. and Uchinotai Mining Co. Ltd. were established in October to operate the Hanaoka Mine in Akita and the Kosaka Mine also in Akita, respectively. Mitsui Mining & Smelting also established an independent mining subsidiary, Kamio-

ka Mining and Smelting Co. Ltd., in July to operate its lead and zinc operations at the Kamioka Mine in Gifu.

To meet the raw material requirements of domestic copper, lead, and zinc smelters, Japan imported more ores and concentrates in 1986 than in 1985. Imports of copper ore and concentrate were 3,036,896 tons, principally from Canada, 910,020 tons; the United States, 457,312 tons; Chile, 322,202 tons; and the Philippines, 306,858 tons. Imports of lead ore and concentrate were 273,829 tons, principally from Canada, 67,319 tons; Australia, 60,665 tons; and Peru, 45,007 tons. Imports of zinc ore and concentrate were 916,166 tons, mainly from Australia, 496,981 tons; Peru, 225,549 tons; and Canada, 129,865 tons.

Table 5.—Japan: Mine production of copper, lead, and zinc in 1985

(Metric tons, metal content)

Company and location	Copper	Lead	Zinc
Akenobe Mining Co. Ltd.: Akenobe, Hyogo[1]	3,953	--	11,825
Chuugai Mining Co. Ltd.: Jokoku, Hokkaido[2]	--	459	1,138
Hanaoka Mining Co. Ltd.: Hanaoka, Akita[3]	14,209	11,210	52,183
Hanawa Mining Co. Ltd.: Hanawa, Akita[4]	2,051	559	4,563
Hosokura Mining Co. Ltd.: Hosokura, Miyagi[1]	--	5,599	15,135
Kamioka Mining and Smelting Co. Ltd.: Kamioka, Gifu[5]	--	4,438	61,588
Nippon Zinc Mining Co. Ltd.: Nakatatsu, Fukui	--	2,831	20,886
Shin-Kamaishi Mining Co. Ltd.: Kamaishi, Iwate	4,906	--	--
Syakanai Mining Co. Ltd.: Syakanai, Akita[1]	4,061	5,178	23,274
Toyoha Mining Co. Ltd.: Toyoha, Hokkaido	--	9,903	32,878
Uchinotai Mining Co. Ltd.: Kosaka, Akita[3]	3,776	4,853	17,163
Yatani Mining Co. Ltd.: Yatani, Yamagata	--	2,375	4,547
Other	10,252	2,546	7,841
Total	43,208	49,951	253,021

[1]Scheduled for closing in Mar. 1987.
[2]Closed in May 1986.
[3]Formerly Dowa Mining Co. Ltd.
[4]Closed in Sept. 1986.
[5]Formerly Mitsui Mining & Smelting Co. Ltd.

Despite a continuing decline in mine output of copper, metal production of copper rose slightly resulting from reduced imports of refined copper with a steady domestic demand. Metal production of copper was from the following sources: domestic ore, 2.3%; imported ore, 85.5%; scrap, 7.5%; and other residual, 4.7%. Capacity utilization of the copper smelting and refining industry averaged 76%. Imports of blister copper and refined copper both decreased to 27,758 tons and 272,437 tons, respectively. Peru was the dominant supplier of blister copper, while Australia, Chile, Peru, the Philippines, and Zambia remained the principal suppliers of refined copper to Japan.

Metal production of lead and zinc declined because of reduced domestic demand. Metal production of lead and zinc by sources of raw materials was as follows: for lead, 17.1% from domestic ore, 65.1% from imported ore, 2.2% from scrap, and 15.6% from other residual; and for zinc, 31.1% from domestic ore, 57.4% from imported ore, 6.1% from scrap; and 5.4% from other residual. Capacity utilization of the lead and zinc smelting and refining industries averaged 91% and 72%, respectively. Imports of refined lead and zinc were 27,799 tons and 92,220 tons, respectively. Australia, Mexico, and Peru remained the major suppliers of refined lead while Mexico, North Korea, and Peru were the principal suppliers of refined zinc to Japan.

Domestic consumption of refined copper remained at about 1,360,000 tons, of which about 910,000 tons was consumed by the wire and cable sector; 435,000 tons by the Brass mill sector; and 17,000 tons by manufacturers of copper alloys, powder, and other sectors such as coin. Exports of refined copper dropped 19% to 60,790 tons while overall stocks of refined copper dropped 39% to 102,850 tons at yearend.

Domestic demand for refined lead declined slightly to 273,000 tons, of which 159,400 tons was for storage batteries; 61,800 tons, for inorganic chemicals; 10,500 tons, for wire and cable, 11,000 tons, for tubes and plates; and 30,300 tons, for other. Exports of refined lead totaled 24,800 tons. At yearend, overall stocks of refined lead rose 18% from that of 1985 to 35,900 tons. Domestic de-

mand for refined zinc also declined slightly to 715,000 tons, of which 312,000 tons was for sheet galvanizing; 103,000 tons, for other galvanizing; 123,000 tons, for brass and zinc rolling; and 177,000 tons, for other such as zinc oxide and inorganic chemicals. Exports of refined zinc totaled 23,400 tons. At year-end, overall stocks of refined zinc rose 32% from that of 1985 to 99,300 tons.

Table 6.—Japan: Annual capacity of copper, lead, and zinc smelters and refineries in 1986

(Metric tons)

Company and plant	Smelting	Refining
Copper:		
Dowa Mining Co. Ltd.:		
Kosaka, Akita	60,000	60,000
Okayama, Okayama	[1]15,120	[1]8,400
Furukawa Co. Ltd.: Ashio, Tochigi	50,400	--
Furukawa Electric Co. Ltd.: Nikko, Tochigi	--	57,600
Godo Shigen Sangyo Co.: Miyako, Iwate	[2]42,000	--
Hibi Kyodo Smaelting Co. Ltd.: Tamano, Okayama	164,000	136,800
Mitsubishi Metal Corp.: Naoshima, Kagawa	193,200	163,200
Mitsui Mining & Smelting Co. Ltd.:		
Hibi, Okayama	[3]39,600	--
Takehara, Hiroshima	--	87,600
Nippon Mining Co. Ltd.:		
Hitachi, Ibaraki	[1]36,000	120,000
Saganoseki, Ooita	300,000	180,000
Onahama Smelting Co. Ltd. Onahama, Fukushima	294,000	234,000
Sumitomo Metal Mining Co. Ltd.: Besshi, Ehime	216,000	192,000
Total	1,410,320	1,239,600
	Electrolytic	Dry smelting
Lead:		
Dowa Mining Co. Ltd.: Kosaka, Akita	25,200	--
Hosokura Mining Co. Ltd.: Hosokura, Miyagi (a subsidiary of Mitsubishi Metal Corp.)	21,600	--
Mitsubishi Cominco Smelting Co. Ltd.: Naoshima, Kagawa	--	42,000
Mitsui Mining & Smelting Co. Ltd.:		
Kamioka, Gifu	33,600	--
Takehara, Hiroshima	43,800	--
Nippon Mining Co. Ltd.: Saganoseki, Ooita	36,000	--
Sumiko ISP Co. Ltd.: Harima, Hyogo	26,400	--
Toho Zinc Co. Ltd.: Chigirishima, Hiroshima	84,000	--
Total	270,600	42,000
	Electrolytic	Distillation
Zinc:		
Akita Smelting Co. Ltd.: Iijima, Akita	156,000	--
Hachinohe Smelting Co. Ltd.: Hachinohe, Aomori	--	84,000
Hosokura Mining Co. Ltd.: Hosokura, Miyagi	[4]21,600	--
Mitsubishi Metal Corp.: Akita, Akita	97,200	--
Mitsui Mining & Smelting Co. Ltd.:		
Hikoshima, Yamaguchi	84,000	--
Kamioka, Gifu	72,000	5,280
Miike, Fukuoka	--	[5]116,400
Nippon Mining Co. Ltd.: Mikkaichi, Toyama	--	120,000
Sumiko ISP Co. Ltd.: Harima, Hyogo	--	79,200
Toho Zinc Co. Ltd.:		
Annaka, Gunma	139,200	--
Chigirijima, Hiroshima	--	[1]5,160
Total	570,000	410,040

[1]Closed prior to 1986.
[2]Shut down in May 1986.
[3]Shut down in Sept. 1986.
[4]Scheduled to be shut down in Mar. 1987.
[5]Shut down in June 1986.

As a result of reduced sales and profitability owing to the strong Japanese yen and low metal prices in the domestic and world markets, Godo Shigen Sangyo Co. closed its 42,000-ton-per-year copper smelter at Miyako, Iwate, in May. Mitsui Mining & Smelting shut down its 39,600-ton-per-year copper smelter at Hibi, Okayama, in September and its 116,400-ton-per-year zinc refinery at Miike, Fukuoka, in June. Mitsui Mining & Smelting reportedly reduced its work force of 4,413 by 14% and created two independent subsidiaries to operate its two remaining zinc smelters at Hikoshima, Yamaguchi, and Kamioka, Gifu, respectively.

In February, an agreement was signed between Sumitomo Metal Mining and Phelps Dodge Corp. of the United States for joint operation of the Morenci copper mine in Arizona. Under the agreement, Sumitomo Metal Mining and Sumitomo Corp., a trading company, were to invest $75 million or 15% of the equity in the Morenci copper operation. To oversee their participation in the project, a new company called Sumitomo Metal Mining Arizona Inc. was created by the two Japanese firms. In return for the 15% equity holding, Sumitomo Metal Mining was to take 37,500 tons of copper in concentrate per year from the Morenci Mine over a 20-year period. The first shipment of copper concentrate from the mine arrived in Japan in April.

In July, six Japanese copper smelters reportedly signed a long-term contract with Montana Resources Corp. of the United States to import 27,000 tons of copper in concentrate per year from Montana Resources' Butte Mine in Montana over an 18-month period. The Butte Mine was to be reopened in September, and delivery of the concentrate was to begin in October 1986. C. Itoh & Co. Ltd. was to handle imports of the concentrate for Dowa Mining, Mitsubishi Metal, Mitsui Mining & Smelting, Nippon Mining, Nittetsu Mining, and Sumitomo Metal Mining.[11]

Gold and Silver.—Despite closings of several small gold and silver mines in 1986, Japan's mine production of gold and silver continued to increase. Mine output of gold reached another record-high level since 1942 and mine output of silver reached its highest level since 1971. Full production of gold and silver by Sumitomo Metal Mining at its Hishikari Mine in Kagoshima Prefecture of southern Kyushu remained the major factor in the overall increase in Japan's gold and silver production.

As a result of declining ore grade and depletion of ore reserves, Chitose Mining Co. Ltd. closed its gold and silver mine at Chitose, Hokkaido, in February; Godo Shigen Sangyo closed its gold and silver mines at Sangru, Hokkaido, in April and at Ashahi, Hyogo, in July; and Shimokawa Mining Co. Ltd. closed its gold and silver mine at Nebazawa, Gunma, in August.

Metal production of gold and silver continued to increase and reached a new record-high level in 1986 owing to increased input of domestic ore that accounted for 29% of gold metal production and 20% of silver metal production, respectively. The shares of imported ore (gold and silver contained mostly in imported copper ore and concentrate) in metal production of gold and silver were 58% and 52%, respectively.

Imports of gold ingot and fabricated gold more than tripled that of 1985 to 19.5 million troy ounces. A large portion of the increased imports was for minting the Hirohito commemorative gold coin. However, increased demand for private hoarding and jewelry induced by the strong Japanese yen or low yen price of gold also contributed to this unprecedented increase in gold imports. Japan's imports of gold were equivalent to 38.3% of total gold mine production in the world. The United States was the largest supplier of gold to Japan accounting for 39% of total imports, followed by the United Kingdom, 22%; Switzerland, 19%; Australia and the U.S.S.R., 6% each; the Republic of South Africa, 5%; and the remainder from Canada, Papua New Guinea, and other countries.

According to industry sources, Japan began imports of gold in large quantity from the United States between April and October primarily for improving the U.S. trade deficit with Japan. Gold imports from the United States totaled 7,552,232 troy ounces in 1986 compared with only 51,345 troy ounces in 1985. A large portion of gold imports from the United States was for the minting of commemorative coins for the 60th anniversary of Emperor Hirohito's reign.

Imports of silver metal dropped 15% to 14.2 million troy ounces owing to increased domestic metal production and excess imports of silver metal in 1985. Mexico was the dominant supplier of silver to Japan accounting for 58% of total imports, followed by Peru, 25%; and the United States, 10%.

According to industry sources, domestic

demand for gold, excluding about 9.6 million troy ounces for minting commemorative coins, rose 41% to 11.6 million troy ounces, of which 41% was for private hoarding; 23%, for jewelry; 16%, for communication and electrical equipment; 4%, for dental and medical uses; and the remainder, for arts and crafts, pottery, watches, and other uses. Additionally, the Tokyo Commodity Exchange for Industry reported sales of gold amounted to 700,000 troy ounces compared with 525,000 troy ounces in 1985. Domestic demand for silver rose 19% to 89.5 million troy ounces, of which 56% was for photographic materials; 9%, for industrial silver nitrate; 8%, for electric contact points; 5%, for fabricated products; 4% each, for brazing alloys and plating; and 14%, for silverware, jewelry, dental, medical, and other.

The Hishikari Mine, which began operation in July 1985 by Sumitomo Metal Mining in Kagoshima Prefecture of southern Kyushu, reportedly produced 69,000 troy ounces of gold and 88,350 troy ounces of silver in 1985. In 1986, the mine reached full capacity with an output of 220 tons of ore per day and averaged 2.44 troy ounces of gold and 1.54 troy ounces of silver per ton of ore. Production of gold and silver from the Hishikari Mine was estimated at 204,300 troy ounces and 129,100 troy ounces, respectively.[12] The Kushikino Mine, operated by Mitsui Kushikino Mining Co. Ltd., also in Kagoshima Prefecture, reportedly produced 9,600 troy ounces of gold and 68,100 troy ounces of silver in 1985. During 1986, mine operating costs were reduced and gold recovery rate increased. Mitsui Mining & Smelting, the parent company of Mitsui Kushikino Mining, was to spend about $1.7 million in 1986 for gold exploration in an area about 5 kilometers southwest of the Hishikari Mine in southern Kyushu.

Iron and Steel.—Production of both iron ore and roasted pyrite declined considerably because of reduced output from the Kamaishi Mine in Iwate Prefecture of northeastern Honshu operated by Shin-Kamaishi Mining, a subsidiary of Nittetsu Mining. To meet the demand for iron ore by the iron and steel industry, Japan continued to rely on imports of iron ore, pellets, and briquets for over 99% of its requirements in 1986.

Imports of iron ore including iron sands, pellets, and sinters declined to 115.2 million tons from 124.5 million tons in 1985 because of reduced consumption by the iron and steel industry. Australia, Brazil, and India remained the three dominant suppliers of iron ore to Japan accounting for 41%, 23%, and 18%, respectively. Other significant suppliers included the Republic of South Africa, 5%; Chile, 4%; the Philippines, 3%; and Canada and New Zealand, 2% each. Japan also imported 519,355 tons of ferruginous manganese ore and concentrate principally from the Republic of South Africa, 56%; and India, 43%.

Consumption of iron ore decreased to 122.4 million tons from 132.2 million tons in 1985 because of reduced production of pig iron. The output of pig iron mostly by blast furnaces dropped 7% to 74.7 million tons or equivalent to 70% of the industry's installed capacity. Between 1985 and 1986, the industry's blast furnace capacity was cut further by 17.1 million tons to 106.4 million tons per year. In 1986, only 38 of 54 blast furnaces were operating.

Japan remained the world's second largest crude steel producer accounting for 14% of total world production in 1986. Production of crude steel dropped 7% to 98.3 million tons owing to a decline in domestic steel demand and reduced exports. The crude steel output was equivalent to 65% of the industry's capacity of 150.7 million tons per year. Between 1985 and 1986, the capacity of basic oxygen and electric furnaces was cut further by 1.6 million tons to 150.7 million tons per year. The industry's capacity of continuous casting machines was reduced by 1.3 million tons to 86 million tons per year.

According to the Japan Iron and Steel Federation, domestic apparent consumption of steel in crude steel equivalent dropped 5% to 70 million tons in 1986. Exports of steel in crude steel equivalent also declined 9% to 32 million tons while imports rose 14% to 3.5 million. The lower level of domestic steel demand was caused by reduced sales to export-oriented manufacturing industries, such as industrial machinery and equipment, electrical machinery and equipment, shipbuilding and marine equipment, and automobiles. The lower level of production by these industries was in turn effected by reduced exports of their products resulting from appreciation of the Japanese yen during 1985-86. For the same reason, exports of steel products also declined, especially to the United States.

Table 7.—Japan: Domestic orders for ordinary and specialty steel products, by end use

(Thousand metric tons)

End use	Ordinary		Specialty	
	1985	1986	1985	1986
Automobiles	10,026	9,211	2,012	1,935
Construction	11,212	12,096	479	435
Conversion and processing	2,962	2,783	3,444	3,199
Electric machinery	2,544	2,244	82	73
Home and office equipment	698	606	199	174
Industrial machinery	1,653	1,375	1,025	860
Rolling stock	105	93	51	42
Shipbuilding	3,248	2,049	68	66
Steel dealers	16,064	16,279	988	1,003
Tanks and containers	2,004	1,899	68	37
Other	301	245	85	69
Total	50,817	48,880	8,501	7,893

According to MITI, exports of iron and steel products decreased from 33.3 million tons (revised) in 1985 to 30.3 million tons in 1986, of which 25.7 million tons was ordinary steel; 2.3 million tons was specialty steel; 1.1 million tons was pig iron, ferroalloys, and ingots; and 1.2 million tons was steel wire products, semimanufactured steel products, and other steel products. The decline in overall exports of iron and steel products was caused by reduced exports to China, the United States, and Saudi Arabia resulting from higher prices of Japanese steel products because of the strong Japanese yen. Exports to China dropped 15% to 9.2 million tons; the United States, 25% to 4 million tons; and Saudia Arabia, 53% to 610,000 tons. However, exports to the U.S.S.R. rose 16% to 2.5 million tons; the Republic of Korea, 22% to 2.4 million tons; and Taiwan, 71% to 1.9 million tons.

On the other hand, because of the strong Japanese yen, imports of iron and steel products rose 17% to 5,252,000 tons, of which 2,889,000 tons was ordinary steel; 969,000 tons, ferroalloys; 968,000 tons, pig iron; and 426,000 tons, ingots, semimanufactured steel products, specialty steel, and other steel products. The Republic of Korea and Taiwan remained the two dominant suppliers of ordinary and specialty steel products, and Brazil, China, Norway, and the Republic of South Africa remained the major suppliers of ferroalloys to Japan in 1986.

The impact of the strong Japanese yen on the Japanese manufacturing sector reportedly was felt most by the iron and steel industry. As a result of reduced sales of steel products in the domestic market and decreased exports in the world market, cost-cutting measures including further cutbacks in production capacities, massive layoffs of steel workers, and reductions in capital spending were expected to be taken by the major steelmakers as early as February 1987 before operating results for the fiscal year were ended in March 1987.

By December, Nippon Steel Corp. announced plans to shut down 12 blast furnaces and reduce its work force by 30% or 19,000 workers by March 1989. Sumitomo Metal Industries planned to cut its work force by 20% or 6,000 workers; Kawasaki Steel Corp., by 14% or 1,000 workers; Kobe Steel Corp., by 20% or 6,000 workers; and Nippon Kokan K.K. was expected to announce its cutback plan in February 1987.[13]

Magnesium.—Production of primary magnesium dropped from 12,000 tons in 1979 to 6,000 tons in 1981 because of the high energy cost in Japan. Domestic production began to recover to 8,500 tons in 1985, then dropped to 8,100 tons in 1986, resulting from reduced demand by light metal rolling and aluminum alloys. Primary magnesium was produced by Furukawa Magnesium Co. Ltd. and Ube Kogyo Co. Ltd. in 1986. In 1986, Japan imported about 64% of its primary magnesium requirements or 12,650 tons, principally from the United States, 68%; Norway, 18%; and Canada, 9%.

According to Japan's Light Metal Association, domestic demand for primary magnesium declined to 19,617 tons from 21,582 tons in 1985. Light metal rolling and aluminum alloys remained the dominant consumers accounting for 67% of total demand followed by nodular cast iron and power, 8% each; and other including light metal casting, diecasting, and magnesium galvanic anodes, 17%. Exports of primary magnesium dropped sharply to 922 tons from 2,533 tons in 1985 owing to a cutback in imports by the U.S.S.R. in 1986.

Manganese.—Mine production of manganese ore and concentrate declined to a

historical low owing to the closing of the only manganese mine at Jokoku, Hokkaido, operated by Chuugai Mining in May. All 111 workers at the mine had been laid off. Since June, Japan had not produced manganese ore.

To meet domestic demand for manganese, Japan imported 1.3 million tons of manganese ore and concentrate principally from the Republic of South Africa (56%) and Australia (31%) and 1,859 tons of high-grade manganese dioxide from Mexico (89%) and China (11%). Consumption of manganese ore and concentrate by the iron and steel industry dropped 20% to 814,000 tons resulting from cutbacks in domestic production of ferromanganese and silicomanganese because of reduced steel production in 1986.

Japan remained the world's leading producer of electrolytic manganese dioxide. Production of manganese dioxide continued to increase and reached another record high in 1986 owing to a 31% increase in domestic demand for manganese batteries to 22,300 tons. Exports of electrolytic manganese dioxide dropped to 35,119 tons from 43,898 tons resulting from the further appreciation of the Japanese yen in 1986.

Nickel.—Japan remained the world's third largest producer of refined nickel and a major consumer of nickel ore, ferronickel, and refined nickel in the world because of its position as the world's leading producer of specialty steel. However, Japan continued to rely 100% on imports of its raw materials requirements for nickel.

Because of cutbacks in ferronickel production by the ferroalloy industry, imports of nickel ore dropped 3% to 2.9 million tons. Indonesia, New Caledonia, and the Philippines remained the three suppliers of nickel ore to Japan, accounting for 47%, 34%, and 18%, respectively. However, in 1986, a small quantity of nickel ore, about 20,000 tons, reportedly was imported from Papua New Guinea. Consumption of nickel ore for ferronickel production decreased 11% to 2 million tons. Production of ferronickel by four ferronickel producers led by Pacific Metal Co. Ltd. decreased 12% to 200,311 tons containing about 49,630 tons of nickel. To meet domestic demand for ferronickel, Japan also imported 38,700 tons of ferronickel containing about 10,000 tons of nickel principally from New Caledonia, 35%; Indonesia, 34%; the Dominican Republic, 20%; and Colombia, 7%.

Imports of nickel matte for refined nickel production totaled 58,187 tons, of which 35,858 tons was from Indonesia; 21,753 tons, from Australia; and 576 tons, from Albania and Yugoslavia. Imports of nickel-cobalt mixed sulfides from the Philippines and Australia were small because of production curtailment by NMIC of the Philippines and termination of a supply contract with MEQ of Australia in early 1986. (See "Cobalt" section.)

As a result of a raw materials shortage, Nippon Mining stopped production of refined nickel at its Nikko nickel plant by the end of August while Sumitomo Metal Mining and Shimura Kako Co. Ltd. continued to operate at a lower capacity level following termination of shipments from the Philippines in mid-1986. However, overall production of refined nickel increased slightly from that of 1985. Imports of refined metal including wire, foil, powder, and flakes totaled 28,353 tons. The major suppliers of refined nickel to Japan in 1986 included Canada, 5,000 tons; the United Kingdom, 4,937 tons; the U.S.S.R., 3,744 tons; Zimbabwe, 3,262 tons; Australia, 2,890 tons; Norway, 2,776 tons; and China, 1,582 tons. Production of nickel oxide sinter by Nippon Nickel Co. Ltd. and Tokyo Nickel Co. Ltd. using nickel matte imported from the Soroaka Mine in Indonesia, rose 24% to 18,900 tons of nickel metal. Because of increased demand for nickel oxide sinter by the specialty steel industry, Tokyo Nickel reportedly was to double the production capacity to 32,000 tons per year at its Matsuzaka plant in Mie Prefecture.

Japan's 1986 supply and demand for nickel estimated by Sumitomo Corp. was as follows, in thousand metric tons of nickel content:

Item	Nickel	Ferro-nickel	Nickel oxide	Total
Stocks, beginning of year	14	3	3	20
Production	25	49	18	92
Imports	22	10	2	34
Total supply	61	62	23	146
Domestic demand	44	57	18	119
Exports	.5	1	2	3.5
Total demand	44.5	58	20	122.5
Stocks, yearend	16.5	4	3	23.5

Consumption of nickel in Japan was mainly for production of so-called 42-nickel alloy, ferronickel, and nickel oxide sinters for production of stainless steel. Other consumers of nickel included manufacturers of

galvanized sheets, nonferrous alloys, magnetic materials, rolled sheets, batteries, and catalysts.

Tin.—Mine production of tin decreased slightly owing to the shut down of a small tin mine in Kagoshima of southern Kyushu in July. However, most tin output was from the copper-tin-zinc operation of the Akenobe Mine in Hyogo, which was scheduled to be shut down in March 1987. Domestic mine production was equivalent to less than 2% of Japan's tin requirements in 1986.

Tin metal production using domestic ore and other residual materials dropped 8% owing to increased imports and stagnant domestic demand. To meet demand for tin, Japan imported 31,769 tons of refined tin mainly from Malaysia, 47%; Thailand, 28%; Indonesia, 15%; and China and Brazil, 4% each.

Domestic demand for tin remained at 31,500 tons, of which 43% was for silver solders; 29%, for tin plates; 9%, for plastic stabilizers; 5% each, for cable coverings and brass mill products; and 9%, for other including tinning, foil, powder, bearing metals, and others.

In August, Kokan Mining Co. Ltd., a subsidiary of Nippon Kokan, reportedly was conducting a joint exploration of tin and tantalum with Greenbushes Ltd. of Australia in the Pilbara area, about 200 kilometers south of Port Hedland in Western Australia. MMAJ was to provide a low-interest loan for part of the exploration cost. A joint venture firm would be established by the two companies if the tests of ore were proven economically viable.[14]

Titanium.—Production of titanium sponge dropped sharply in 1986 owing to a drastic decline in domestic demand and exports. The 1986 output was equivalent to 42% of the industry's installed capacity. However, Japan remained the world's third largest titanium sponge producer.

According to Japan's Titanium Society, domestic demand for titanium sponge including sponge producers' in-house consumption dropped 24% to 9,030 tons while exports declined 21% to 3,382 tons. As a result, stocks at the end of 1986 rose 31% to 8,777 tons. Reduced domestic demand was caused by a production cutback in titanium mill products. Exports of titanium sponge and mill products both declined because of a further appreciation of the Japanese yen and weak demand from Western European countries and the United States.

In 1986, titanium sponge was exported mainly to the United States, 1,491 tons; France, 564 tons; the United Kingdom, 528 tons; the Netherlands, 362 tons; and the Federal Republic of Germany, 271 tons. Exports of titanium mill products totaled 2,618 tons, of which about 58% was exported mainly to the United States, Sweden, India, and China in the order of volume.

Production of titanium dioxide pigments continued to increase because of the growing demand in both domestic and overseas markets especially in the Far East. Ishihara Sangyo Co. Ltd., Japan's largest producer of titanium dioxide, announced that it would construct a 72,000-ton-per-year chloride-process titanium dioxide plant in Jurong, Singapore. The $176 million plant would be completed in two stages. The first stage construction was scheduled for completion with a 36,000-ton-per-year capacity by mid-1989. The second-stage construction would depend on future supply and demand conditions of the Southeast Asian market. Raw materials requirement for the Singapore plant reportedly would come from a 100,000-ton-per-year ilmenite beneficiation plant at North Capel, Western Australia, to be completed in February 1987. The North Capel ilmenite plant was a joint venture project of Ishihara Sangyo, Westralian Sands Ltd. of Australia, and Tioxide International Ltd. of the United Kingdom. According to an agreement signed in 1984, Ishihara Sangyo, with a 15% stake in the project, was entitled to take 40,000 tons of synthetic rutile per year.

Tungsten.—Mine production of tungsten ore and concentrate dropped to 1,900 tons containing 644 tons of tungsten trioxide compared with 1,922 tons containing 716 tons of tungsten trioxide in 1985. Domestic mine production was equivalent to 17% of Japan's tungsten ore requirement in 1986. Most tungsten was produced from the Kiwaden Mine and the Kuga Mine in the southeastern part of Yamaguchi Prefecture. In September, Nippon Mining reportedly closed its Fujigatani Mine in Yamaguchi.

To meet domestic requirements for tungsten, Japan imported 1,769 tons of tungsten ore and concentrate, mainly from Portugal, 689 tons; the Republic of Korea, 334 tons; Bolivia, 231 tons; and China, 109 tons. Consumption of tungsten ore and concentrate in 1986 totaled 3,762 tons, of which 2,937 tons was for the production of tungsten metal products, mostly powder; 676 tons, for calcium tungsten; 138 tons, for ferrotungsten; and 11 tons, for inorganic

chemicals and other. A substantial reduction in consumption was caused by cutbacks in production of tungsten powder. Japan also imported about 180 tons of tungsten powder and flake principally from the Republic of Korea and the Federal Republic of Germany to meet domestic tungsten metal requirements. The 1986 demand for tungsten metal was about 3,500 tons. Over 70% of tungsten metal was for production of ultrahard alloys used for cutting tools and wear-resistant materials.

INDUSTRIAL MINERALS

Cement.—Japan's cement production dropped to the lowest level since 1976 resulting from a sharp decline in exports and a further increase in imports with little change in domestic demand. The 1986 cement production represented less than 72% of the industry's capacity of 99.4 million tons per year.

Exports of cement dropped 38% to 5.6 million tons owing to reduced exports to the Middle East and Southeast Asia caused by a further slowdown in construction activities of Saudi Arabia and Kuwait and price competition in the Southeast Asian market. Exports to Saudi Arabia and Kuwait dropped 48% to 1.7 million tons, while exports to Hong Kong and Singapore declined 22% to 2.5 million tons. Strengthening of the Japanese yen had placed the Japanese cement producers in a less competitive position. However, exports of cement to the United States decreased only slightly to 837,966 tons from 972,283 tons in 1985.

Imports of cement mainly from the Republic of Korea and Taiwan reached 1.2 million tons compared with 476,928 tons in 1985. According to industry sources, import prices were about $6 to $12 per ton cheaper than domestic prices. The lower import prices were caused by an excess supply of cement in the Far East.

According to a recent international industry's survey, the breakdown of the Japanese cement industry's operating costs in 1985 were as follows: energy, 37%; raw materials, 21%; capital, 16%; wages, 7%; and other including maintenance, bagging, general management, and subcontracting, 19%.[15]

Fertilizer Materials.—Japan's nitrogen fertilizer industry reportedly had completed its capacity reduction programs by June. According to Japan Urea and Ammonium Sulfate Industry Association, under the guidelines of the Specific Industries Structural Adjustment Law, Japan's ammonia and urea production capacity had been reduced by 32% or 1,068,000 tons to 2,303,000 tons per year and 37% or 858,000 tons to 1,460,000 tons per year, respectively.

Production of ammonia and urea both declined because of the lower level of domestic demand and substantial reduction in exports owing to a sharp fall of urea price in the world market. According to the industry association, Japan's supply and demand for ammonium sulfate, urea, and ammonium chloride are shown in table 8. In 1985-86, the nitrogen industry not only was facing the problems of weak domestic demand and reduced exports but also suffered from a drastic increase in imports of urea. Between 1985 and 1986, urea imports reportedly increased more than 300% to 175,043 tons because of low import prices. The major supplying countries were Indonesia, Malaysia, Qatar, the U.S.S.R., and the United States.

Table 8.—Japan: Supply and demand for ammonium sulfate, urea, and ammonium chloride

(Thousand metric tons)

	Ammonium sulfate		Urea		Ammonium chloride	
	FY 1985	FY 1986	FY 1985	FY 1986	FY 1985	FY 1986
Stocks, beginning	269	255	138	118	34	33
Production	1,855	1,805	1,144	828	334	240
Domestic demand:						
Fertilizer	1,183	1,126	270	243	248	257
Industrial use	48	40	592	501	25	24
Exports	637	613	302	105	62	45
Stocks, ending	255	282	118	96	33	28

Source: Japan Chemical Annual, 1986.

The phosphatic fertilizer industry reportedly had reduced its production capacity of phosphoric acid to 630,000 tons per year from 930,000 tons per year in 1978 and production capacity of fused phosphate to 620,000 tons per year from 740,000 tons per year in 1983. Production capacity of compound fertilizers also had reduced to 6.3 million tons per year from 6.8 million tons per year in 1983. The industry's efforts in reducing production capacity was to bring supply in line with the declining demand by the agricultural sector resulting from the Government policy of restricting further expansion in domestic agricultural production of rice, vegetables, fruits, and dairy farming.

Japan continued to rely on imports of raw materials except sulfuric acid for production of superphosphate and high analysis compound fertilizers. In 1986, Japan imported 2.1 million tons of phosphate rock principally from the United States, 53%; Morocco, 23%; and Jordan, 15%. Imports of potash fertilizers including potassium chloride and potassium sulfate totaled 1.1 million tons mainly from Canada, 51%; the U.S.S.R., the Federal Republic of Germany, and the United States, 15% each; and France, 4%.

Sulfur.—Japan continued to produce sulfur mostly as a byproduct of petroleum refining and nonferrous metal smelting. Only a small fraction of total output was recovered from domestic pyrites. Most sulfur, in turn, was for production of sulfuric acid used by the fertilizer and chemical industries for the manufacture of phosphatic fertilizer, chemical fibers, titanium dioxide, and hydrofluoric acid.

Table 9.—Japan: Supply and demand for sulfur and sulfuric acid

(Thousand metric tons)

	FY 1984	FY 1985	FY 1986[e]
Sulfur:			
Production	1,142	1,044	1,029
Demand:			
Sulfuric acid	649	658	663
Other	254	267	266
Exports	264	132	98
Sulfuric acid:			
Production:			
Smelter gas	3,727	3,760	3,676
Pyrite	536	532	530
Sulfur	1,964	1,988	1,995
Other	314	308	310
Demand:			
Industrial use	4,232	4,209	4,137
Fertilizer	2,011	2,038	2,046
Exports	236	346	386

[e]Estimated.

Source: Sulfuric Acid Association, Japan.

MINERAL FUELS

Coal.—Japan's coal mining industry faced the most difficult year in its history as the price gap between domestic and imported coal had widened further because of higher domestic production costs and lower import prices caused by the stronger Japanese yen with a lower domestic demand for coal. As a result, coal mine production dropped to a new historical low in 1986.

Stronger opposition was voiced by the major domestic coal consumers including the steel, utility, and cement industries to MITI for continuing purchases of high-priced domestic coal. In November, MITI finally announced the Eighth National Coal Mining Policy following the recommendations of its Coal Mining Council to cut domestic coal production gradually from 16 million tons in 1986 to about 10 million tons with no production of coking coal by the end of the eighth 5-year plan in 1991. MITI also would allow the steel industry to gradually eliminate purchases of domestic coking coal, and the utility and cement industries to reduce purchases of domestic steam coal over the next 5 years.

According to local press reports, domestic prices for coking and steam coal were $152 per ton and $125 per ton, respectively, while import prices were $57 per ton and $45 per tons, respectively, in 1986. To protect the Japanese coal industry, major domestic coal consumers were required to purchase up to 20% of their supply from high-priced domestic sources under the previous national coal policy.

Domestic coal was produced by 11 major coal mines and 17 small- and medium-size coal mines.[16] By December, one major mine in the Kyushu area and three small- and medium-size mines in the Hokkaido area were closed.

Mitsubishi Coal Mining reportedly had shut down its 105-year-old Takashima Mine, on a small island off Nagasaki in southern Kyushu, in late November because of mounting losses. The Takashima Mine was the oldest and 1 of the 11 major coal mines in Japan. According to local press reports, Mitsui Coal Mining Co. Ltd., the largest coal producer in Japan, announced that it planned to shut down its Sunagawa Mine in Kamisunagawa, Hokkaido, in May 1987 and to cut its coal production by 1 million tons per year to 3.5 million tons per year at its Miike Mine, about 50 kilometers south of Fukuoka in southern Kyushu over the next few years. Under the eighth 5-year plan, 4

additional major coal mines were expected to be closed, and about 9,300 coal miners would be affected. These coal mines, all in Hokkaido, included the Horonai Mine, the Mayachi Mine, the Minami-Oyubari Mine, and the Ashibetsu Mine.

Table 10.—Japan: Coal production by company and by type in fiscal year 1985

(Thousand metric tons)

Company and coal mine	Coking coal	Steam coal	Total
Hokutan Mayachi Coal Mining Co. Ltd.: Mayachi, Hokkaido	480	220	700
Hokutan Horonai Coal Mining Co. Ltd.: Horonai, Hokkaido	--	1,240	1,240
Mitsubishi Coal Mining Co. Ltd.:			
Minami-Oyubari, Hokkaido	570	260	830
Takashima, Kyushu	340	240	580
Mitsui Coal Mining Co. Ltd.:			
Ashibetsu, Hokkaido	420	560	980
Miike, Kyushu	1,310	3,220	4,530
Sunagawa, Hokkaido	150	790	940
Mitsui-Matsushima Coal Mining Co. Ltd.: Ikeshima, Kyushu	480	1,050	1,530
Sorachi Coal Mining Co. Ltd.: Sorachi, Hokkaido	110	810	920
Sumitomo Sekitan Akabira Coal Mining Co. Ltd.: Akabira, Hokkaido	220	780	1,000
Taiheiyo Coal Mining Co. Ltd.: Taiheiyo, Hokkaido	--	2,490	2,490
Other	--	780	780
Total	4,080	12,440	16,520

In 1986, Japan continued to import over 86% of its coal requirements. Imports of coal totaled 90 million tons, of which 66.3 million tons was coking coal, 22.0 million tons was steam coal, and 1.7 million tons was anthracite. Coking coal was imported principally from Australia, 42%; Canada, 24%; the United States, 17%; and the Republic of South Africa, 8%. Steam coal was imported mainly from Australia, 64%; the Republic of South Africa, 13%; and China, 10%. The Republic of South Africa remained the dominant supplier of anthracite to Japan in 1986. According to the Ministry of Finance, the 1986 average import c.i.f. prices per ton of coking coal were $54 from Australia, $68 from Canada, $66 from the United States, and $48 from the Republic of South Africa. The 1986 average import c.i.f. prices per ton of steam coal were $45 from Australia, $46 from the Republic of South Africa, and $47 from China.

Domestic demand for coal dropped 5% to 105.4 million tons resulting from a 5% reduction in demand by the iron and steel industry and an 18% decline in demand by the cement and ceramics industries owing to production cutbacks by these industries in 1986. Demand for coal by the utility industry remained steady at 22.6 million tons. In 1986, the utility industry purchased about 9.3 million tons of high-priced domestic coal. However, according to an agreement reached between Japan's Electric Power Federation and MITI under the Eighth National Coal Mining Policy, the utility industry would reduce its purchase of domestic coal by 1.7 million tons per year over the next 5 years. The financially troubled steel industry, which purchased about 2 million tons of high-priced domestic coking coal, would gradually reduce its purchases of domestic coking coal until it reaches zero in fiscal year 1991. The cement industry, which consumed about 1 million tons of domestic coal, would also reduce its purchases of domestic coal gradually to zero in fiscal year 1991.[17]

Table 11.—Japan: Coal consumption, by sector

(Thousand metric tons)

Sector	1985	1986
Manufacturing:		
Cement, ceramics, other:		
Domestic	2,250	1,496
Imported	11,110	10,554
Coke:		
Domestic	913	621
Imported	4,912	4,908
Iron and steel:		
Domestic	2,371	1,971
Imported	63,399	60,576
Utilities:		
Electric power:		
Domestic	9,710	9,297
Imported	13,096	13,284
Gas:		
Domestic	393	281
Imported	788	727
Other:		
Domestic	1,669	1,632
Imported	9	10
Total demand	110,620	105,357
Of which:		
Domestic	17,306	15,298
Imported	93,314	90,059

Petroleum and Natural Gas.—Japan's crude oil production continued its upward trend and reached another record high at 4.6 million barrels in 1986. Increased output of crude oil from the Aga-North (Aga-Kita) Oilfield offshore Niigata Prefecture reportedly contributed most to the overall in-

crease in crude oil production. Production of natural gas decreased slightly owing to reduced output of natural gas from the old gasfield and coal mines.

In 1986, Japan was the world's second largest importer of crude petroleum, following the United States, and the world's largest importer of natural gas in the form of LNG. Japan's import reliance on crude petroleum and natural gas remained extremely high at 99.6% and 95%, respectively. However, imports of crude petroleum dropped slightly to 1,223.5 million barrels from 1,247.5 million barrels in 1985 because of the continuing decline in refinery production of type C heavy fuel oil and reduced production of gasoline resulting from increased imports of gasoline that began in 1986.

The percentage share of crude petroleum imports from the Middle East dropped to 69% for the first time since 1981 because of a significant drop in imports from Saudi Arabia while the percentage share from the Asia region rose to 24% from 23% resulting from increased imports from China and Malaysia. In 1986, the major suppliers of crude petroleum to Japan were the United Arab Emirates, 22%; Saudi Arabia, 13%; Indonesia, 12%; Oman, 8%; China and Iran, 7% each; Mexico and the Iraq-Saudi Arabia Neutral Zone, 6% each; Iraq and Qatar, 5% each; and Malaysia, 4%.

Japan continued to increase imports of crude petroleum directly from foreign national oil companies of producing countries on a government-to-government basis. According to the Petroleum Association of Japan, Japan's crude petroleum imports by supplier in 1986 were as follows: from foreign national oil companies of producing countries, 60.6%; from major international oil companies, 26.5%; Japanese oil companies operating in foreign countries, 10.2%; and from independent oil companies, 2.7%. Japan's imports of crude petroleum from the spot market accounted for 29.5% of total imports compared with 31.4% in 1985, 22.6% in 1984, and 10.1% in 1980.

Consumption of crude oil by the refinery industry dropped 4% to 1,092 million barrels because of reduced production of heavy fuel oil, gasoline, and naphtha. The industry's refining capacity was 4.9 million barrels per day in 1986. The average capacity utilization of the refinery industry was 59.9% compared with 62.3% in 1985.

In 1986, Japan began importing refined petroleum products after lifting the ban on imports of gasoline, kerosene, and diesel fuel in December 1985. The 1986 imports of gasoline, kerosene, and diesel fuel were 20.7 million barrels, 16.7 million barrels, and 5.6 million barrels, respectively. The 1986 gasoline imports were equivalent to 8.8% of domestic gasoline consumption of about 235.5 million barrels. Kerosene imports were equivalent to 10.3% of domestic kerosene consumption of about 162.2 million barrels. Diesel fuel imports were equivalent to 33% of domestic diesel fuel consumption of about 169.6 million barrels.

Import duties effective from January 1, 1986, until March 31, 1987, were $2.13 per barrel for aviation gasoline, $1.62 per barrel for other gasoline, $0.76 per barrel for kerosene, and $1.43 per barrel for diesel fuel. The major suppliers of gasoline to Japan were Singapore, 28%; the United States, 26%; and the Republic of Korea, 13%. The major suppliers of kerosene were Saudi Arabia, 23%; Singapore, 20%; and the United Arab Emirates, 17%. The principal suppliers of diesel fuel were Algeria, 29%; Saudi Arabia, 24%; and the United States, 22%.

According to industry sources, 23 Japanese oil companies reportedly applied to register with MITI as importers of gasoline, kerosene, and diesel fuel. However, only 12 oil companies had contracts with overseas suppliers to import gasoline in 1986. These companies were Idemitsu Kosan Co. Ltd., Toa Nenryo Kogyo K.K., Nippon Oil Co. Ltd., Showa Shell Sekiyu K.K., Cosmo Oil Co. Ltd., Kyodo Oil Co. Ltd., Mitsubishi Oil Co. Ltd., General Sekiyu Seisei K.K., Taiyo Oil Co. Ltd., Kyokuto Petroleum Industries Ltd., Kyushu Oil Co. Ltd., and Nichimo Sekiyu Seisei K.K.

Following import liberalization of refined petroleum products, MITI proposed a plan to the petroleum refinery industry in January to voluntarily reduce its refining capacity by 20% to 4 million barrels per day in 3 years beginning in 1986.[18] According to MITI, the industry's refining capacity was reduced slightly to 4,891,610 barrels per day from 4,972,610 barrels per day in 1985.

Consumption of natural gas continued its upward trend because of the growing demand by the city gas and utility industries. Imports of natural gas in the form of LNG rose 2.6% to 28.3 million tons from 27.6 million tons in 1985. Brunei, Indonesia, Malaysia, the United Arab Emirates, and the United States remained the five suppliers of LNG to Japan.

[1]Economist, Division of International Minerals.
[2]Journal of the Mining and Metallurgical Institute of Japan (Tokyo). V. 103, No. 1189, Mar. 1987, p. 6.
[3]Where appropriate, values have been converted from Japanese yen (Y) to U.S. dollars at the rate of Y238.54=US$1.00 for 1985, and Y168.52=US$1.00 for 1986.
[4]U.S. Embassy, Tokyo, Japan. State Dep. Telegram 16465, Aug. 26, 1986; Telegram 18576, Sept. 30, 1968.
[5]———. State Dep. Telegram 22329, Dec. 1, 1986.
[6]Sumitomo Corp. (Tokyo). Nonferrous Metals in Japan. No. 78, Mar. 1987, p. 68.
[7]Metal Bulletin (London). No. 7137, Nov. 18, 1986, p. 13.
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[8]Japan Metal Journal (Tokyo). V. 16, No. 5. Feb. 3, 1986, p. 10; V. 16, No. 7, Feb. 7, 1986, p. 1.
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[10]———. State Dep. Telegram 13127, July 7, 1986.
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[11]———. V. 94, No. 129, July 11, 1986, p. 6.
[12]Journal of the Mining and Metallurgical Institute of Japan (Tokyo). V. 103, No. 1189, Mar. 1987, p. 6; v. 103, No. 1190, Apr. 1987, p. 20.
[13]American Metal Market. V. 94, No. 249, Dec. 24, 1986, p. 2; v. 94, No. 251, Dec. 30, 1986, p. 2.
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[14]Metal Bulletin Monthly (London). No. 188, Aug. 1986, p. 121.
[15]Rock Products. V. 90, No. 4., Apr. 1987, p. 31.
[16]U.S. Embassy, Tokyo, Japan. State Dep. Telegram 15797, Aug. 15, 1986.
[17]———. State Dep. Telegram 20545, Oct. 3, 1986; Telegram 20271, Oct. 27, 1986; Telegram 20989, Nov. 6, 1986.
[18]———. State Dep. Telegram 01651, Jan. 28, 1986.

The Mineral Industry of Jordan

By Michael D. Fenton[1]

Jordan's principal natural resources—phosphates, potash, and fertilizer derivatives—continued to be the major means of acquiring foreign exchange and manufactured and agricultural products. Phosphate exports were the most important source of revenue, 20% of Jordanian export earnings. The Jordan Phosphate Mines Co. (JPMC) was the world's fifth largest phosphate rock producer, and it led the world in exporting phosphates during the first half of 1986. Jordan's Arab Potash Co. (APC) supplied about 2% of the world's potash supply from the Dead Sea. Jordan Fertilizer Industries Co. (JFIC) was an important source of diammonium phosphate (DAP) and phosphoric acid. Other minor minerals produced included kaolin, glass sand, gypsum, limestone for cement, and marble.

Jordan had no known coal deposits, its hydroelectric potential was minimal, and its oil shale and heavy oil deposits were far from exploitable at current production costs. Therefore, Jordan remained dependent on imported crude oil, fuel oil, and liquefied petroleum gas for its energy requirements. In an effort to reduce its dependence on these imports and the consequent drain of limited foreign exchange, Jordan continued to practice conservation, to find alternative sources of energy, and to search aggressively for domestic oil deposits.

Oil exploration was increased, and the Government's oil policy was to pursue independent exploration efforts in tandem with operations by foreign oil companies. The areas of exploration interest were the Azraq, Risha, Sirhan, Dead Sea-Jordan rift, Al-Jafr, Central Plateau, northern, and southern areas. The Natural Resources Authority (NRA) drilled two exploration wells, and production-sharing agreements were signed by Amoco Jordan Petroleum Co., a Jordan-based subsidiary of Standard Oil Co. (Indiana) of the United States, and Jordan Hunt Oil Co. Belgium's Petrofina was negotiating for a similar concession.

PRODUCTION AND TRADE

Proven reserves of phosphate rock in Jordan were nearly 800 million tons. JPMC produced 6.25 million tons of phosphate rock during 1986, of which 5.2 million tons was exported. These production and export figures represent increases over the 1985 figures of 6.07 million tons and 4.61 million tons, respectively. Jordan aggressively increased its exports to Eastern Europe and acquired new markets elsewhere. Major markets continued to be in East and South Asia (51% of exports) and in Eastern Europe (over 35% of exports). Most of the available annual phosphate production capacity of nearly 6.8 million tons was at the El Hasa and Wadi El Abiyad Mines, with minor capacity at Ruseifa. Main grades and quantities produced were 2.25 million tons of 69% to 72% bone phosphate lime (BPL) and 4.0 million tons of 73% to 75% BPL. JFIC used 941,000 tons of phosphate production and 559,000 tons of fertilizers was exported, compared with 503,000 tons in 1985. JPMC signed a 10-year supply agreement with Thailand for 650,000 tons of phosphate annually. Jordan was a significant supplier to India, where sales of 1.2 million tons during India's fiscal year

1986[2] (710,000 tons during 1986) were double that of 1985; sales to Yugoslavia rose from 769,000 tons in 1985 to 535,000 tons, and Romania and Indonesia were also important buyers. JPMC was involved in financing modifications to a Yugoslav plant to enable it to take Jordanian phosphate rock. Jordan shipped 5,000 tons of aluminum fluoride to Yugoslavia, and also increased sales of DAP and potash to India by 20% to 360,000 tons during the Indian fiscal year 1986.

Jordan continued to participate in barter and countertrade arrangements with several countries, including railway cars from France for phosphate rock; grains, oils, seeds, and sugar from Ethiopia for DAP and potash; an engineering contract to Japan to expand a Jordanian cement factory for phosphate rock; earthmoving equipment from India for phosphate rock; coffee, cooking oil, plywood, rubber, tea, and textiles from Indonesia for phosphate and potash; and aluminum pellets, fabrics, food, and urea from Egypt.

APC produced 1.1 million tons of potash in 1986, 21% more than that of 1985, and the most during 4 years of operation. All potash was exported to markets east of Suez, 68%; Latin America, 15%; and Europe, 12%. The company's projected 1987 production of 1.2 million tons was sold in advance. APC lost $16.4 million[3] in 1985 and expected to lose another $11.6 to $14.5 million in 1986 because of declining international potash prices and the decline in the value of the U.S. dollar. The company was hoping to improve its financial position by expanding production by 1989.

Jordan received 25,000 barrels of oil per day from Saudi Arabia, 25,000 barrels of oil per day from Iraq, and 5,000 to 8,000 barrels of heavy fuel oil per day from Iraq for cracking at the Zarqa refinery, but fuel pricing policies and conservation measures in industry caused significant foreign exchange savings, and the use of solar power in homes was encouraged. As a result of these efforts, the annual increase in oil demand declined by about 3.5% in 1986, compared with 15% to 20% in the mid-1970's. Nevertheless, the 1986 fuel bill of $600 million, down from $650 million in 1985, came to 80% to 90% of export earnings. The lower fuel bill was attributed in part to the declining price of oil. Tests of wind-power devices were conducted, and a geothermal project was in progress.

Greece agreed to import 200,000 tons of phosphates, 50,000 tons of fertilizers, 40,000 tons of potash, and 5,000 tons of phosphoric acid on an annual basis.

The Jordan Cement Factories Co. (JCFC) completed its merger with South Cement Co. (SCC) and operated two plants at Fuheis and Rashadiya. SCC's Rashadiya plant had an annual capacity of 2 million tons, while the JCFC Fuheis plant's annual capacity was 2.2 million tons. Construction activity in Jordan and the Middle East was depressed, and these plants operated at below capacity. Production was expected to be 3.5 million tons, of which 1.6 million tons would be for local consumption. Egypt agreed to take 750,000 tons in a barter arrangement in 1986 and an additional 1 million tons annually starting in 1988. Egypt will provide aluminum pellets, cotton and other fabrics, peanuts, rice, sesame, and urea. Saudi Arabia was expected by JCFC to take 250,000 tons in 1987.

Iraq began exporting crude oil to Brazil from the new oil berth constructed at Aqaba. The new $12.4 million berth can handle about 87,000 barrels of crude and fuel oil per day.

Estimated resources of high-quality gypsum are in Upper Cretaceous sediments in Wadi Karak at the southeastern end of the Dead Sea. Thick beds of Triassic age gypsum were mined at Wadi Zarqa, south of Jarash, at an annual rate of 45,000 tons for the local building and construction industry.

Table 1.—Jordan: Production of mineral commodities[1]

Commodity		1982	1983	1984	1985[p]	1986[e]
Cement, hydraulic	metric tons	795,000	1,271,332	1,988,424	2,022,952	[2]1,794,679
Clays	do.	14,335	7,817	26,035	[e]26,000	[2]14,144
Gypsum	do.	39,959	41,187	109,863	[e]110,000	[2]70,083
Iron and steel: Steel, crude[e]	do.	140,000	140,000	140,000	140,000	140,000
Lime	do.	59,839	[3]267,093	[3]224,318	[e] [3]224,000	[3]224,000
Petroleum:						
Crude	thousand 42-gallon barrels	--	--	--	14	14
Refinery products:						
Gasoline	do.	2,771	2,695	3,161	4,900	
Jet fuel	do.	2,400	[r]1,976	1,760	1,474	
Kerosene	do.	1,442	1,734	1,138	1,481	
Distillate fuel oil	do.	5,118	5,132	5,200	9,700	NA
Residual fuel oil	do.	4,809	5,300	5,900	4,720	
Liquefied petroleum gas	do.	986	875	900	930	
Other	do.	1,162	[r]911	865	890	
Total	do.	18,688	[r]18,623	18,924	24,095	NA
Phosphate:						
Mine output	thousand metric tons	4,390	4,748	6,120	6,067	[2]6,250
P_2O_5 content[e]	do.	1,427	1,544	2,069	2,011	2,063
Phosphatic fertilizer	metric tons	117,000	365,122	568,968	500,650	[2]550,880
Potash:						
Crude salts	do.	[e]15,000	280,000	486,868	908,560	[2]1,103,716
K_2O equivalent	do.	[e]9,100	170,000	[e]297,000	550,000	[2]660,000
Salt	thousand metric tons	[e]50	34	22	32	32
Stone:						
Limestone[e]	metric tons	7,000	7,000	7,000	7,000	7,000
Marble	do.	[e]5,100	102	4,625	4,600	4,600

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Table includes data available through June 26, 1987.
[2]Reported figure.
[3]Includes aggregates of unspecified type.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985
METALS			
Aluminum: Metal including alloys, all forms	4,347	--	
Copper: Metal including alloys, all forms	655	20	All to Iraq.
Gold: Metal including alloys, unwrought and partly wrought, troy ounces	96	30,190	Switzerland 20,126; West Germany 3,633.
Iron and steel: Metal:			
Scrap	9,594	9,723	India 5,051; Syria 4,100.
Semimanufactures	4,056	327	Iraq 78; Saudi Arabia 74; Taiwan 51.
Lead: Metal including alloys, all forms	201	--	
Titanium: Ore and concentrate	81	--	
Zinc:			
Blue powder	200	--	
Metal including alloys, scrap	378	--	
INDUSTRIAL MINERALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc	270	--	
Grinding and polishing wheels and stones	--	9	Mainly to Iraq.
Cement	178,821	387,906	Saudi Arabia 369,361.
Clays, crude: Kaolin	7,126	--	
Fertilizer materials: Manufactured:			
Ammonia	--	6	Mainly to Saudi Arabia.
Nitrogenous	530,049	375,452	India 230,781; Saudi Arabia 36,725; China 20,000.
Phosphatic	852	776	United Arab Emirates 651; Saudi Arabia 75.
Lime	6,138	10,679	Saudi Arabia 8,364.
Phosphates, crude, thousand tons	4,873	5,079	India 968; Romania 684; Indonesia 445.
Potassium salts, crude	458,232	844,773	India 274,270; Brazil 99,500; France 98,980.
Salt and brine	306	222	Qatar 192; Saudi Arabia 18.
Sodium compounds, n.e.s.: Sulfate, manufactured	4,785	422	All to Iraq.

See footnote at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985
INDUSTRIAL MINERALS —Continued			
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	41,857	10,296	Lebanon 5,959; Kuwait 2,644.
Worked	78,758	62,538	Kuwait 51,063; Saudi Arabia 2,947.
Gravel and crushed rock	--	1,651	Lebanon 1,111; Kuwait 470.
Quartz and quartzite	--	1,444	Kuwait 1,335.
Sand other than metal-bearing	9,441	10,053	Kuwait 7,856; Saudi Arabia 2,070.
Sulfur: Sulfuric acid	79	81	All to Saudi Arabia.
Talc, steatite, soapstone, pyrophyllite	5,221	7,310	Saudi Arabia 5,888; Kuwait 1,355.
MINERAL FUELS AND RELATED MATERIALS			
Coal, all grades	82	--	
Coke and semicoke	64	42	Saudi Arabia 30; Iraq 12.
Petroleum refinery products: Lubricants 42-gallon barrels	1,050	162	Syria 161.

[1]Table prepared by Virginia A. Woodson. No exports of mineral commodities were reported to the United States in 1985.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	9,147	4,536	--	France 4,500.
Metal including alloys:				
Scrap	160	19	--	Kuwait 11; Saudi Arabia 7.
Unwrought	2,658	5,330	--	Kuwait 2,501; Bahrain 1,031; Egypt 972.
Semimanufactures	5,096	7,653	26	Austria 4,457; Turkey 754; Greece 440.
Chromium: Oxides and hydroxides	--	50	--	All from West Germany.
Copper:				
Ore and concentrate	44	--		
Metal including alloys:				
Scrap	1,014	310	--	Saudi Arabia 245; Iraq 65.
Unwrought	--	47	--	Mainly from Italy.
Semimanufactures	1,332	1,112	13	Republic of Korea 418; Belgium-Luxembourg 237; Greece 143.
Gold:				
Waste and sweepings value, thousands	--	$2,266	--	Switzerland $2,264.
Metal including alloys, unwrought and partly wrought troy ounces	809,169	439,307	32	Switzerland 375,649; United Kingdom 50,830.
Iron and steel: Metal:				
Scrap	2,551	2,073	--	Saudi Arabia 1,106; Kuwait 723; Iraq 150.
Pig iron, cast iron, related materials	241	16,087	--	Spain 16,000.
Ferroalloys:				
Ferromanganese	350	--		
Ferrosilicon	63	60	1	Italy 47; Brazil 12.
Steel, primary forms	145,536	164,384	(2)	Spain 51,515; Turkey 46,672; Australia 15,000.
Semimanufactures:				
Bars, rods, angles, shapes, sections	64,359	53,384	--	Taiwan 8,955; Brazil 8,894; Czechoslovakia 6,898.
Universals, plates, sheets	41,754	40,679	--	Japan 15,867; West Germany 5,156; Czechoslovakia 4,397.
Hoop and strip	717	452	--	West Germany 211; Hungary 118.
Rails and accessories	605	148	(2)	Italy 116; Japan 15.
Wire	9,409	9,368	(2)	Belgium-Luxembourg 3,067; West Germany 2,053; Poland 1,818.
Tubes, pipes, fittings	44,572	50,863	201	West Germany 12,947; Italy 11,114; Belgium-Luxembourg 5,011.
Unspecified	--	270	--	West Germany 204; Japan 35.
Lead:				
Oxides	134	--		
Metal including alloys, unwrought	[3]332	314	--	Saudi Arabia 231; Kuwait 80.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Nickel: Metal including alloys, semimanufactures	8	5	--	Canada 4.
Platinum-group metals:				
Waste and sweepings value, thousands	--	$176	--	Saudi Arabia $174; Austria $2.
Metal including alloys, unwrought and partly wrought, platinum troy ounces	147,668	1,222	--	All from Switzerland.
Silver: Metal including alloys, unwrought and partly wrought do	71,214	8,713	386	Switzerland 4,276; Italy 2,186.
Tin: Metal including alloys:				
Unwrought	20	13	--	Sweden 10; United Kingdom 3.
Semimanufactures	--	9	--	All from United Kingdom.
Titanium: Oxides	2,173	1,921	397	United Kingdom 999; France 244.
Zinc:				
Oxides	41	62	--	Belgium-Luxembourg 29; France 22; West Germany 11.
Metal including alloys:				
Scrap	200	41	--	Belgium-Luxembourg 40.
Unwrought	499	603	--	Poland 400; Belgium-Luxembourg 199.
Semimanufactures	203	121	--	Belgium-Luxembourg 94; West Germany 22.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	237	1,233	--	Greece 850; United Kingdom 284.
Artificial: Corundum	--	35	--	All from Italy.
Dust and powder of precious and semiprecious stones including diamond kilograms	2	--		
Grinding and polishing wheels and stones	534	384	(2)	Italy 293; West Germany 57.
Cement	60,286	36,637	14	Lebanon 18,954; Iraq 11,397.
Chalk	1,300	1,308	--	United Kingdom 1,044; France 159.
Clays, crude:				
Kaolin	399	511	--	United Kingdom 304; West Germany 75; Finland 60.
Unspecified	--	1,065	--	Turkey 454; United Kingdom 416; West Germany 112.
Diamond:				
Gem, not set or strung carats	--	85,000	--	Belgium-Luxembourg 80,000; India 5,000.
Industrial stones do	35,000	700,000	--	All from Belgium-Luxembourg.
Diatomite and other infusorial earth	1,579	--		
Feldspar, fluorspar, related materials	2,251	640	--	Turkey 315; Netherlands 98; Belgium-Luxembourg 97.
Fertilizer materials:				
Crude, n.e.s	1,925	165	--	Finland 90; France 46; United Kingdom 20.
Manufactured:				
Ammonia	67,895	56,458	--	U.S.S.R. 15,985; Kuwait 15,808; Qatar 15,034.
Nitrogenous	24,526	24,269	21	Kuwait 5,698; Saudi Arabia 3,999.
Phosphatic	3,808	5,784	--	Iraq 4,943; Lebanon 810.
Potassic	18	753	--	Belgium-Luxembourg 500; United Kingdom 203.
Unspecified and mixed	5,101	8,101	127	Netherlands 3,665; Egypt 1,880; Italy 630.
Graphite, natural	--	80	--	Japan 44; China 32.
Gypsum and plaster	2,383	2,015	--	Iraq 929; Lebanon 635.
Kyanite and related materials	[4]2,345	--		
Lime	1,830	1,304	--	All from Lebanon.
Magnesite, crude	--	26	--	Italy 25.
Pigments, mineral:				
Natural, crude	--	47	--	Finland 23; Belgium-Luxembourg 18.
Iron oxides and hydroxides, processed	237	88	--	West Germany 65; Spain 23.
Precious and semiprecious stones other than diamond:				
Natural kilograms	5	51	2	China 43.
Synthetic do	710	55	--	China 37; Italy 10.
Pyrite, unroasted	--	49	--	Italy 43; West Germany 6.
Salt and brine	1,306	1,442	39	Saudi Arabia 1,066; Kuwait 225.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Sodium compounds, n.e.s:				
Carbonate, manufactured	2,934	667	--	France 259; Romania 124; West Germany 111.
Sulfate, manufactured	7,205	3,217	8	Saudi Arabia 1,197; United Arab Emirates 804; Tunisia 750.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	14,892	10,092	--	Italy 7,808; Greece 1,326.
Worked	711	1,351	--	Italy 1,055; Spain 211.
Gravel and crushed rock	3,188	2,993	--	Italy 2,862.
Sand other than metal-bearing	342	371	3	Belgium-Luxembourg 135; Netherlands 101; Syria 37.
Sulfur:				
Elemental:				
Crude including native and byproduct	126,426	169,300	--	Iraq 142,344; Saudi Arabia 26,956.
Colloidal, precipitated, sublimed	102,469	15,682	--	Iraq 15,293.
Sulfuric acid	111	546	--	Iraq 370; Greece 100.
Talc, steatite, soapstone, pyrophyllite	220	329	--	Norway 128; Austria 105.
Other: Crude	60	94	20	Austria 50; Japan 20.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	90	64	--	West Germany 63.
Coal:				
Anthracite and bituminous	529	245	--	West Germany 127; Belgium-Luxembourg 100.
Briquets of anthracite and bituminous coal	--	73	72	United Kingdom 1.
Lignite including briquets	100	--		
Coke and semicoke	633	574	10	West Germany 247; Belgium-Luxembourg 150; Lebanon 122.
Peat including briquets and litter	1,032	1,446	--	Ireland 360; Denmark 246; Netherlands 237.
Petroleum:				
Crude[5] thousand 42-gallon barrels	17,586	16,304	--	Saudi Arabia 12,831; Iraq 3,472.
Refinery products:				
Gasoline ---do---	(2)	(2)	--	Mainly from Syria.
Mineral jelly and wax ---do---	3	1	--	Mainly from Iraq.
Kerosene and jet fuel ---do---	(2)	2	--	All from Saudi Arabia.
Distillate fuel oil ---do---	--	2,944	--	All from Iraq.
Lubricants ---do---	176	--		
Nonlubricating oils ---do---	4	4	(2)	France 1; United Kingdom 1.
Bituminous mixtures ---do---	14	--		

[1]Table prepared by Virginia A. Woodson.
[2]Less than 1/2 unit.
[3]Includes scrap.
[4]May include bentonite.
[5]May include shale oils.

COMMODITY REVIEW

METALS

The small copper deposit in Wadi Araba was not mined, but a feasibility study of a 3,000-ton-per-year copper extraction and refinery plant was studied by Seltrust Engineering Ltd. of the United Kingdom.

Engineering designs were completed and 21 international companies prequalified for the contract to supply and install equipment worth $58.4 million at the Arab Engineering Industries Co. iron foundry at Yarmouk. Initial annual capacity in 1988 of pipe fittings and general engineering castings was expected by the company to be 10,000 tons. Output would gradually rise to 17,000 tons annually.

INDUSTRIAL MINERALS

Cement.—The JCFC-SCC merger was completed, and the paid-up capital of the new company was doubled to $150 million. SCC had been operating at a loss since it began production at its Rashadiya works in

early 1984, while JCFC was consistently profitable and was expected to make a profit of about $191.6 million between 1985 and 1989. Seventeen local banks and financial institutions were to provide a 7-year loan at 9-1/2% interest, with a 2-year grace period.

Fertilizer Materials.—*Phosphate.*—Bucyrus Erie Co. of the United States agreed to sell two electric draglines to JPMC for an estimated $9 million. The draglines were expected to begin operating in early 1987 at the El Hasa and Wadi El Abiyad Mines. This purchase of two large, expensive draglines suggests that easily mined surface deposits are being exhausted and that Jordan's costs will go up, thereby giving the advantage to competitors such as Morocco. JPMC claims that draglines are necessary to lower production costs, thereby lowering prices to compete in the marketplace. This purchase brought a protest from U.S. phosphate producers on the grounds that Export-Import Bank funds were used for a purchase that would increase production in an oversupplied market to the detriment of U.S. producers of phosphate. In reply, JPMC claimed that any increase in production would only bring the mines closer to their potential annual capacity of nearly 6.8 million tons, which has not increased since 1980. Also, recent increasing sales have been to established customers who have been increasing demand; Jordan's percentage of the market has remained stable. JPMC also accused U.S. producers of "dumping" rather than selling their phosphate at more than production cost.

JPMC's $178 million plan to buy the loss-making JFIC was approved by the Trade and Industry Ministry, and the estimated $195 million debt owed by the company was assumed by JPMC. JPMC then received a Government-guaranteed $69.2 million loan package to refinance outstanding loans and provide working capital. JFIC was expected to have a $178 million loss during 1986-90 after a loss of $120 million in 1985; export prices for its DAP were too low to cover raw material costs for ammonia, phosphate rock, and sulfur.

A $3.8 million feasibility study by the French company Société Française d'Études Minières on the Shidiyah phosphate mines project near Ma'an, which was designed to raise annual production of 3 million tons in 1991 to 9 million tons by the turn of the century, was completed, and work on the site was expected to begin in early 1987. Initial work was to include installation of high-voltage cables to the site and construction of a 27-kilometer asphalt road to link Al Mudawarra with Ma'an, about 260 kilometers south of Amman. The mine is 60 kilometers from Ma'an. The production line was expected to be operational by late 1988 at an initial 1 million tons per year on a 20-hour basis with three daily shifts. Housing facilities for workers would be located at the mine. The proposed Shidiyah-Aqaba railway would transport phosphate rock to the export port and could form the nucleus of a national line to link the country's south with the north and to other neighboring countries. The Transport Ministry allocated $297 million during the 1986-90 development plan to Aqaba Railway Corp. for building the railway line. The project would create about 2,200 jobs from the mining to the marketing phases.

The Parkano works of Rauma-Repola Oy of Finland was installing five drying units for JPMC at the El Hasa Mine at an estimated cost of $1.9 million to save power and to ensure 100% capacity, rather than the current 80%. Equipment worth $1.9 million was scheduled to be installed by early 1987. Annual output at the mine was about 3.8 million tons.

JPMC established a 10%, $90 million share in the Thai Fertilizer Corp. that was building Thailand's first fertilizer plant, which would be worth $480 million.

Potash.—APC received two loans totaling $20 million from the International Bank for Reconstruction and Development (World Bank) and the Islamic Development Bank (IDB). IDB money will partially finance the $11 million first stage of the company's modification of its Ghor-al-Safi plant. As a result, potash production is expected to reach 1.2 million tons per year. The World Bank funds will partially finance stage 1 and will fund the $5 million second stage that is to bring production capacity to 1.4 million tons per year by 1988-89. Also planned was a feasibility study to be financed by the U.S. Agency for International Development to develop a new cold-crystallization process that would increase capacity to an annual 2 million tons. The process was expected to be 30% more efficient and would require less energy than the hot leach system in use, but expansion of the plant would ultimately cost $100 million.

The French engineering company Krebs et Cie. S.A. was studying the feasibility of a complex-fertilizers plant having an annual capacity of 150,000 to 250,000 tons that

would be a joint venture between APC, JFIC, and JPMC.

MINERAL FUELS

Oil Shale.—The country had perhaps as much as 4,000 million tons of oil-bearing shale that could yield as much as 1.2 billion barrels of oil. However, at current oil price levels, the economics of extraction were questionable.

The NRA shipped 1,700 tons of oil shale to China's Fu-shun refinery for processing as part of a continuing study of the possible development of the oil shale resource in the Lajjun region of south Jordan. China was planning to send a team to Jordan to conduct a plant design study. NRA personnel also did experimental work on oil shale samples in the Federal Republic of Germany. A process developed there was expected to extract over 6,500 tons of oil daily while using only 5 million cubic meters of water annually, rather than the originally estimated 22 million cubic meters. West German engineers recommended that an unspecified number of 1,500-ton-per-year pilot plants be built and operated for 18 months before being integrated into a bigger plant at a total cost of about $56 million.

Petroleum.—*Exploration.*—The first oil discovery in Jordan was the Hamza Oilfield, near Azraq, which produced an average 600 barrels per day of good quality, low sulfur (0.375%), 30° API crude. The state-owned NRA completed 14 wells in the area and 7 encountered oil, but the commercial potential of the field was not established.

The Minister of Oil of Iraq and the Jordanian Prime Minister met to discuss ways and means of strengthening cooperation between the two countries in oil and gas exploration and providing Jordan with Iraqi technical assistance. Earlier, an Iraqi team had completed seismic surveys of 1,340 square kilometers in the Jordan Valley and Dead Sea areas, and the data indicated the presence of oil and gas formations.

The Director of the Petroleum Department of the NRA sought assistance from the U.S. Government in determining the economic feasibility of developing an asphalt, bitumen, and heavy oil from a horizon approximately 750 meters deep in the Hamza Oilfield.

Amoco Jordan Petroleum was the first foreign oil company to sign a production-sharing agreement in Jordan. The 2.8-million-acre area consists of two blocks: block 1, 1.6 million acres, in the central part of the eastern desert, and block 4, 1.2 million acres, in the Jordan Valley-Dead Sea area. The company was to drill five exploration wells after gravity and seismic surveys. Jordan Hunt Oil also signed a 9-month agreement to explore the Al-Jafr block near the Saudi Arabian border in the southern part of Jordan. After a seismic program, the first of four wells was to be drilled in 1988. NRA leased three Romanian drilling rigs to extend its exploration program to the Risha area on the border with Iraq and to Skimat al-Hasa in the south.

Refining.—Bechtel Corp. of the United States completed a $1 million study for the Energy and Natural Resources Ministry, which suggested that about 20,000 tons of oil could be saved annually at Jordan Petroleum Refinery Co.'s Zarqa refinery by introducing an $11.2 million investment program. The 3- to 5-year program would consist of modifications to the refinery, including improving furnaces and heat recovery.

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[1]Physical scientist, Division of International Minerals.
[2]Fiscal year 1986=Apr. 1, 1986, through Mar. 31, 1987.
[3]Where necessary, values have been converted from Jordanian dinars (JD) to U.S. dollars at the rate of JD0.34=US$1.00.

The Mineral Industry of the Republic of Korea

By E. Chin[1]

Because of limited resources, the Republic of Korea imports almost all mineral raw materials required by the country's manufacturing industries. The largest metallurgical sector in 1986 was iron and steel, which is dominated by a state-owned iron and steel complex at Pohang, which is regarded to be the most efficient steelmaking operation in the world. The largest industrial minerals processing sector was cement. A private company operated the largest single cement plant in the world at Donghae. The United States was the country's largest trade partner.

The gross national product (GNP) in current prices increased from $82 billion in 1985 to $97 billion[2] in 1986. The input of mining and quarrying to the GNP in 1986 was only $1.3 billion, or a little over 1% of the GNP. In comparison, the largest component was manufacturing, which comprised 31% of the GNP.

The average monthly salary in the mining sector was $413, compared with $342 for manufacturing. The average monthly salary for coal mining was $442, followed by metal ore mining, $380, and other mining, $288. Monthly earnings in other industries were petroleum refining, $838; iron and steel, $489; nonferrous metals, $427; and industrial minerals products, $364.

Total employment in 1986 was 15.5 million persons. Employment in the mining sector was 187,000 persons. In contrast, employment in the other sectors of the economy included services, 7.8 million; manufacturing, 3.8 million; and agriculture, forestry, and fishing, 3.7 million. The unemployment rate in 1986 was 3.8%.[3]

There were 1,896 mining operations: 1,518 for industrial minerals mining, 328 for coal mining, and 50 for metal ore mining. The gross output value for coal mining was $843 million; for other mining, $295 million; and for metal ores, $73 million. In the manufacturing sector, the gross output value for chemical and petroleum products was $216 billion; fabricated metal products, $25.1 billion; basic metals, $8.1 billion; and industrial minerals products, $3.6 billion.

Marine transportation arrivals for selected commodities with departure given in parentheses, were as follows, in million tons: oil, 48.7 (18.4); mineral ores, 18.6 (2.4); anthracite, 6.9 (2.4); cement, 5.2 (9.5); and fertilizer, 0.1 (1.3). Railway freight carried during the year, in million tons, included anthracite, 24.0; cement, 11.8; minerals, 3.9; oil, 3.4; fertilizers, 1.6; and ferrous materials, 0.6.

The wholesale price index (1980=100) for all commodities was 126. Indices for select products were electricity, 148; clays, stone, and glass products, 129; iron and steel products, 121; chemicals, 120; petroleum, 110; and nonferrous metals products, 107. Wholesale prices for select commodities were $1,763 per ton of refined copper; $267 per ton for steel reinforcing bar, $150 per kiloliter of heating oil; $41 per ton of anthracite; $13 per gram of gold; and $2 per kilogram of aluminum.[4]

PRODUCTION

Mine output of anthracite coal was the most important minerals sector by volume and value. Since 1980, annual coal production has averaged 21 million tons. Domestic coal is important to the economy inasmuch as there are no indigenous resources of oil and natural gas. Mine production of metallic ores in 1986 included copper, iron, lead and zinc, and tungsten, with only the latter significant in terms of world output. Iron and steel is the largest metals sector. However, the industry was almost wholly dependent on foreign raw materials for iron ore, coking coal, and ferroalloying ingredients. Small amounts of aluminum, copper, lead, and zinc metals were produced. There were no domestic resources of bauxite, and alumina was imported for aluminum production. Domestic mine output of copper accounted for less than 1% of the ore requirement for copper metal production, that of lead for 34%, and that of zinc for about 30%.

In terms of industrial minerals, the country produced significant quantities of diatomaceous earth, feldspar, graphite, kaolin, pyrophyllite, and silica. Cement and fertilizer were the largest industrial minerals processing sectors. Raw materials for the former was from domestic resources while that for the latter was largely from imported material.

The country's large and strategic minerals and metals companies were state-run enterprises. These companies are under the control of either the Ministry of Trade and Industry, the Ministry of Energy and Resources, or the Ministry of Construction.

Table 1.—Republic of Korea: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum, primary	15,226	12,629	18,252	17,695	18,643
Arsenic, mine output, white arsenic equivalent	306	560	NA	NA	NA
Bismuth metal	95	100	126	135	--
Cadmium, smelter	320	320	230	--	--
Copper:					
Mine output, Cu content	320	389	279	309	220
Metal:					
Smelter	119,400	124,000	100,200	106,900	165,024
Refined, primary	110,818	123,289	129,078	140,144	157,846
Gold metal troy ounces	55,750	72,083	79,156	77,258	149,436
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	620	655	625	542	528
Fe content do	347	367	350	304	296
Metal:					
Pig iron do	8,445	8,024	8,763	8,833	9,017
Ferroalloys:					
Ferromanganese	60,306	52,896	58,600	61,396	53,721
Ferrosilicon	32,478	32,489	35,300	34,840	30,939
Other	33,240	43,824	50,215	54,879	66,499
Total	126,024	129,209	144,115	151,115	151,159
Steel, crude thousand tons	11,753	11,916	13,034	13,539	14,554
Lead:					
Mine output, Pb content	12,167	12,226	10,837	8,811	10,031
Metal, smelter	9,500	10,500	12,000	22,890	22,890
Manganese ore and concentrate:					
Gross weight	--	--	74	--	177
Mn content	--	--	30	--	69
Molybdenum, mine output, Mo content	361	142	158	333	315
Silver metal thousand troy ounces	3,237	3,366	3,759	3,990	5,034
Tin, mine output, Sn content	--	--	19	21	1
Tungsten, mine output, W content	2,420	2,480	2,702	2,384	2,265
Zinc:					
Mine output, Zn content	58,175	55,980	49,232	44,828	38,683
Metal, primary	99,211	107,860	108,460	111,653	127,439
INDUSTRIAL MINERALS					
Asbestos	15,933	12,506	8,062	4,703	2,983
Barite	--	552	2,729	2,785	3,768
Cement, hydraulic thousand tons	17,887	21,282	20,413	20,424	23,403
Clays: Kaolin	625,824	684,447	721,220	658,282	846,742

See footnotes at end of table.

Table 1.—Republic of Korea: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
INDUSTRIAL MINERALS —Continued					
Diatomaceous earth	55,249	55,968	48,496	53,613	54,841
Feldspar	85,040	109,896	127,057	145,414	130,895
Fluorspar, metallurgical-grade	3,667	6,361	4,672	705	243
Graphite:					
Crystalline	627	695	2,305	1,602	641
Amorphous	26,338	32,571	56,258	69,877	96,577
Total	26,965	33,266	58,563	71,479	97,218
Kyanite and related materials: Andalusite	33	289	209	42	33
Mica: All grades	20,355	14,402	24,436	20,044	41,997
Nitrogen: N content of ammonia	543,302	430,169	464,194	441,983	426,778
Salt	864,000	481,000	518,000	643,000	729,000
Sodium carbonate, manufactured	185,670	230,600	247,927	250,890	264,213
Stone, sand and gravel:					
Agalmatolite	315,800	NA	--	--	--
Limestone thousand tons	30,736	32,992	33,456	31,037	32,595
Quartzite do.	490	842	868	872	885
Sand including glass sand do.	657	1,223	858	1,096	1,233
Sulfur: S content of pyrites	--	127	--	--	--
Talc and related materials:					
Pyrophyllite	466,324	460,922	656,442	738,304	587,098
Talc	124,793	171,214	192,208	194,174	210,631
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	58,047	75,424	82,369	91,019	120,534
Coal: Anthracite thousand tons	20,116	19,861	21,370	23,627	25,240
Coke do.	4,539	4,682	5,199	NA	NA
Fuel briquets: Anthracite briquets	20,865	18,932	21,316	19,453	20,595
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	5,182	4,902	5,519	9,729	9,821
Jet fuel do.	6,521	9,074	10,469	10,000	9,662
Kerosene do.	8,368	9,199	9,109	10,452	9,559
Distillate fuel oil do.	41,701	48,560	54,156	54,783	58,859
Residual fuel oil do.	81,679	87,140	84,907	75,566	75,937
Lubricants do.	2,081	1,733	1,962	3,807	7,317
Other do.	26,577	30,860	43,288	19,031	13,576
Refinery fuel and losses[e] do.	6,260	6,700	6,400	4,036	4,000
Total do.	178,369	198,168	215,810	187,404	188,731

[e]Estimated. [p]Preliminary. NA Not available.
[1]Includes data available through Aug. 4, 1987.

TRADE

The country's total trade has increased dramatically. The value of trade in 1986 was $66 billion compared with $12 billion in 1975. In 1986, exports were valued at $34.7 billion, and for imports, $31.6 billion. The Republic of Korea's economy is export-oriented to value-added goods. It largely imports raw materials for processing. Receipts of crude materials, mineral fuels, and chemicals accounted for 41% of the total value of imports in 1986. On the other hand, shipments of manufactured goods to foreign destinations accounted for 89% of total exports.

The United States and Japan were the country's largest trade partners. Exports to the United States were $13.9 billion; followed by Japan, $5.4 billion; Hong Kong, $1.7 billion; and Canada and the Federal Republic of Germany, each with $1.2 billion. These countries collectively accounted for 67% of the total value of exports.

Imports from Japan were valued at $10.9 billion; followed by the United States, $6.5 billion; the Federal Republic of Germany, $1.2 billion; and Australia, $1.1 billion. Receipts from these countries constituted 63% of total imports. The Republic of Korea imported ores and concentrates, primary metals, and scrap metals for processing to support its manufacturing sector. Owing to limited domestic production of coal, the country imported over 10 million tons of coal as well as all of its requirements for petroleum and coke.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	11,610	25,347	498	Hong Kong 13,316; Japan 1,660; Philippines 1,660.
Arsenic: Oxides and acids	186	307	--	Malaysia 170; Taiwan 69; Indonesia 34.
Bismuth: Metal including alloys, all forms	136	139	13	Netherlands 121.
Cadmium:				
Oxides and hydroxides	159	179	--	Taiwan 130; Japan 38.
Metal including alloys, all forms	393	145	--	Netherlands 80; Japan 65.
Chromium: Oxides and hydroxides kilograms	300	--		
Cobalt:				
Oxides and hydroxides	18	30	--	Japan 26.
Metal including alloys, all forms kilograms	6	--		
Columbium and tantalum: Metal including alloys, all forms, tantalum do.	465	14	--	All to Japan.
Copper: Metal including alloys:				
Scrap	1,517	751	4	Japan 720.
Unwrought	2,933	4,035	1,911	United Arab Emirates 788; Japan 544.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	8,072	476	--	Philippines 461.
Iron and steel: Metal:				
Scrap	135,288	74,006	--	Japan 50,001; Thailand 19,000.
Pig iron, cast iron, related materials	10,837	82	47	Japan 18.
Ferroalloys:				
Ferromanganese	338	30	--	All to Thailand.
Ferronickel	34	--		
Ferrosilicomanganese	350	--		
Ferrosilicon	71	36	--	All to Japan.
Unspecified	3,001	1,021	--	Japan 1,017.
Steel, primary forms thousand tons	1,578	1,605	236	Japan 859; Philippines 134.
Semimanufactures do.	4,554	4,181	1,326	Japan 768; Saudi Arabia 649; Hong Kong 339.
Lead:				
Ore and concentrate	3,000	1,700	--	All to Japan.
Metal including alloys, all forms	71	458	NA	Japan 247; Saudi Arabia 159.
Magnesium: Metal including alloys:				
Scrap	--	27	--	All to Japan.
Unwrought	--	19	--	Do.
Nickel: Metal including alloys:				
Scrap	58	108	--	Do.
Unwrought	18	--		
Platinum-group metals:				
Waste and sweepings value, thousands	$231	$140	--	All to United Kingdom.
Metal including alloys, unwrought and partly wrought troy ounces	1,017	1,124	942	Japan 126; United Arab Emirates 56.
Silver:				
Ore and concentrate value, thousands	$143	--		
Metal including alloys, unwrought and partly wrought thousand troy ounces	1,666	1,356	193	Japan 1,151.
Tin:				
Ore and concentrate	19	--		
Metal including alloys:				
Scrap	66	136	--	All to Japan.
Unwrought	18	13	1	Japan 12.
Titanium:				
Ore and concentrate	54	--		
Oxides	1,796	2,148	5	Japan 1,928; Indonesia 119.
Tungsten:				
Ore and concentrate	859	747	--	Japan 550; Netherlands 90.
Oxides and hydroxides	59	--		
Metal including alloys, all forms	301	364	2	Japan 134; United Kingdom 62.
Zinc:				
Oxides	2,943	3,650	--	Japan 3,194.
Ash and residue containing zinc	9,354	1,754	--	All to Japan.
Metal including alloys, all forms	163	1,216	31	Taiwan 545; Japan 300; Hong Kong 189.

See footnotes at end of table.

Table 2.—Republic of Korea: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Natural, corundum, emery, pumice, etc	73	26	--	All to Japan.
Barite and witherite	350	--		
Cement thousand tons	3,170	2,986	391	Singapore 499; Bangladesh 380.
Clays, crude	78,016	70,418	--	Japan 65,606; Taiwan 4,805.
Feldspar, fluorspar, related materials	23,501	22,746	--	Taiwan 22,696.
Fertilizer materials: Manufactured:				
Nitrogenous	224,191	194,088	--	Thailand 58,588; Philippines 40,915; Nigeria 30,750.
Phosphatic	44,263	20,060	--	Japan 15,680; Fiji 4,380.
Potassic	28,466	27,461	--	Japan 16,250; Malaysia 4,241.
Unspecified and mixed	1,056,591	1,049,240	--	Thailand 255,958; Philippines 211,381; Ethiopia 51,450.
Graphite, natural	39,864	48,353	--	Japan 37,769; Taiwan 7,750.
Gypsum and plaster	24,226	19,034	--	Japan 19,000.
Lime	600	--		
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$3,259	$4,277	$1,532	Japan $2,479.
Synthetic do	$11,887	$11,532	$7,649	Spain $1,057; West Germany $863.
Salt and brine	1,647	6,412	6,339	Japan 10.
Sodium compounds, n.e.s.: Sulfate, manufactured	5	--		
Stone, sand and gravel:				
Dimension stone	196,604	243,444	70	Japan 237,512.
Dolomite, chiefly refractory-grade	92,045	89,100	--	All to Japan.
Gravel and crushed rock	1,199	909	--	Japan 704; Jordan 103.
Quartz and quartzite	18,505	17,764	--	Japan 17,408.
Sand other than metal-bearing	3,056	5,005	--	Japan 5,001.
Sulfur: Elemental: Crude including native and byproduct	2,456	2,953	--	Indonesia 1,148; Burma 652; Costa Rica 325.
Talc, steatite, soapstone, pyrophyllite	40,650	37,987	1,494	Japan 14,900; Thailand 7,537.
Other:				
Crude	253,288	251,374	--	Japan 147,987; Taiwan 94,980.
Slag and dross, not metal-bearing	99,323	126,737	--	All to Japan.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	5,381	11,033	--	Hong Kong 6,430; Sudan 1,500; Japan 687.
Coke and semicoke	21,996	320	--	Thailand 200; Taiwan 70.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	21	--		
Naphtha do	6,238	5,865	443	Japan 3,989.
Gasoline:				
Aviation do	2,228	2,343	659	Japan 1,642.
Motor do	49	2,603	2,600	Taiwan 2.
Kerosene and jet fuel do	1,159	3,274	--	Japan 2,049.
Distillate fuel oil do	4,951	4,613	34	Japan 3,891.
Lubricants do	260	848	12	Taiwan 54; unspecified 438.
Residual fuel oil do	228,470	8,709	2	Japan 6,593.

NA Not available.
[1]Table prepared by Audrey D. Wilkes.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	9,305	9,177	19	Hong Kong 5,688; Guyana 1,657.
Oxides and hydroxides	77,739	77,487	11	Japan 42,134; Australia 31,213.
Metal including alloys:				
Scrap	5,069	5,563	4,377	Japan 709.
Unwrought	143,228	200,389	20,313	Australia 53,018; New Zealand 20,949.
Semimanufactures	29,302	35,345	991	Japan 21,030; Australia 5,669.
Antimony:				
Ore and concentrate	1,250	883	NA	Taiwan 200; Hong Kong 68; unspecified 575.
Oxides	354	337	6	Japan 135; United Kingdom 52.
Metal including alloys, all forms	251	58	NA	Taiwan 22; Hong Kong 14.
Chromium:				
Ore and concentrate	5,027	3,875	--	Philippines 3,328.
Oxides and hydroxides	1,840	1,662	525	Japan 1,030.
Cobalt:				
Oxides and hydroxides	21	8	1	Canada 3; Japan 3.
Metal including alloys, all forms	139	148	4	Zaire 65; Zambia 23.
Copper:				
Ore and concentrate	347,665	355,210	34,361	Chile 66,615; Mexico 49,522.
Matte and speiss including cement copper	25,911	33,127	13,270	Brazil 10,690; Philippines 8,017.
Oxides and hydroxides	284	602	277	West Germany 180; Japan 105.
Ash and residue containing copper	49,950	17,900	--	All from Japan.
Metal including alloys:				
Scrap	32,364	32,592	25,560	Malaysia 2,069; Hong Kong 1,763.
Unwrought	53,966	60,275	5,873	Chile 26,902; Philippines 10,346; Japan 5,236.
Semimanufactures	14,256	11,204	262	Japan 8,824; Taiwan 946.
Gold: Metal including alloys, unwrought and partly wrought, troy ounces	62,807	371,186	318,653	Japan 46,796.
Indium: Metal including alloys, all forms, kilograms	120	229	48	Netherlands 137.
Iron and steel:				
Iron ore and concentrate including roasted pyrite, thousand tons	10,288	12,418	--	Australia 4,752; India 3,202; Brazil 2,860.
Metal:				
Scrap, do.	2,081	2,395	1,909	Australia 127.
Pig iron, cast iron, related materials	206,883	121,553	43	Pakistan 28,632; Brazil 25,231.
Ferroalloys:				
Ferrochromium	6,222	7,529	132	Philippines 2,734; Zimbabwe 1,098; Japan 912.
Ferromanganese	4,084	1,818	NA	Japan 1,560.
Ferromolybdenum	202	313	67	Netherlands 113; United Kingdom 53.
Ferronickel	820	780	--	Japan 700.
Ferrosilicomanganese	213	108	NA	NA.
Ferrosilicon	5,899	9,094	NA	Norway 4,682; Japan 2,792.
Ferrovanadium	81	228	--	Netherlands 81; Belgium-Luxembourg 63; France 40.
Silicon metal	1,424	1,585	6	Norway 410; Italy 218; Hong Kong 161.
Unspecified	3,913	2,879	5	Japan 1,404; France 930.
Steel, primary forms, thousand tons	1,423	1,250	1	Japan 744; Brazil 92; Australia 70.
Semimanufactures, do.	2,078	1,641	16	Japan 1,418.
Lead:				
Oxides	69	34	(2)	Japan 27.
Metal including alloys:				
Scrap	6,534	20,162	4,936	Australia 7,075; United Arab Emirates 3,128.
Unwrought	31,466	63,803	20,771	Australia 9,488; Japan 7,488.
Lithium:				
Oxides and hydroxides	38	43	42	NA.
Metal including alloys, all forms, kilograms	32	10	--	All from Japan.
Magnesium: Metal including alloys, unwrought	661	651	384	France 104; Norway 78.
Manganese:				
Ore and concentrate:				
Battery-grade	5,372	4,391	NA	Singapore 3,612; Japan 422.
Metallurgical-grade	249,992	271,529	NA	Australia 93,405; India 87,538; Gabon 40,169.
Oxides	1,626	1,636	NA	Japan 1,564.

See footnotes at end of table.

Table 3.—Republic of Korea: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Mercury 76-pound flasks	406	411	18	Japan 278; Spain 95.
Molybdenum: Ore and concentrate	179	115	49	Canada 66.
Nickel:				
Oxides and hydroxides	45	33	--	Canada 16; Japan 16.
Metal including alloys:				
Scrap	224	327	10	Canada 317.
Unwrought	2,306	3,471	86	Australia 1,542; Canada 983.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	108,801	12,789	4,538	Japan 3,955; United Kingdom 2,488.
Silver: Metal including alloys, unwrought and partly wrought do	215,313	473,033	76,101	West Germany 158,021; Japan 142,653.
Tin:				
Ore and concentrate	1,749	2,687	NA	Singapore 1,443; Burma 953.
Metal including alloys, all forms	2,496	1,674	82	Indonesia 678; Malaysia 391; Thailand 363.
Titanium:				
Ore and concentrate	44,071	39,570	--	Malaysia 32,952; Australia 6,617.
Oxides	3,089	3,260	41	Japan 2,224; West Germany 908.
Metal including alloys, all forms	361	111	74	Japan 29.
Tungsten: Metal including alloys, all forms	34	34	4	Japan 25.
Uranium and/or thorium: Metal including alloys, all forms	107	108	108	
Zinc:				
Ore and concentrate	103,172	162,946	8,094	Australia 106,615; Canada 18,753.
Ash and residue containing zinc	697	976	40	Saudi Arabia 884.
Metal including alloys:				
Scrap	11,867	10,572	2,730	Japan 5,220; Saudi Arabia 952.
Unwrought	18,703	11,399	12	Australia 3,700; Canada 2,999.
Zirconium: Ore and concentrate	7,097	5,928	NA	Australia 5,260.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	3,783	7,654	629	Japan 6,271.
Artificial:				
Corundum	16,114	18,271	61	Japan 10,426; Brazil 1,990.
Silicon carbide	5,227	5,559	20	Japan 1,769; Norway 1,610; West Germany 918.
Dust and powder of precious and semiprecious stones including diamond kilograms	2,202	268	13	Japan 255.
Grinding and polishing wheels and stones	952	1,078	46	Japan 812; Italy 54.
Asbestos, crude	59,693	57,143	1,154	Canada 24,608; unspecified 31,084.
Barite and witherite	949	1,113	NA	United Kingdom 560; Thailand 516.
Boron materials:				
Crude natural borates	818	1,555	5	Japan 1,242.
Oxides and acids	1,663	1,683	984	Italy 514.
Bromine	319	356	53	Italy 58; Netherlands 29.
Cement	7,688	5,793	192	Japan 4,037; France 1,432.
Chalk	1,942	998	--	All from France.
Clays, crude:				
Bentonite	3,816	5,062	3,793	France 1,152.
Chamotte and dinas earths	8,782	10,909	1,385	Hong Kong 8,180.
Kaolin	36,032	41,979	37,195	Hong Kong 2,100.
Unspecified	35,325	30,794	4,042	Japan 16,198; Hong Kong 9,088.
Cryolite and chiolite	5	22	--	Denmark 15.
Diamond: Natural: Gem, not set or strung value, thousands	$833	$2,227	$220	Belgium-Luxembourg $1,449; Japan $417.
Feldspar, fluorspar, related materials	30,001	46,920	8	Thailand 28,041; Hong Kong 1,818.
Fertilizer materials: Manufactured:				
Ammonia	362,068	418,669	321,661	Indonesia 23,158; Bahrain 7,766.
Nitrogenous	1,958	1,945	NA	Chile 1,270; Japan 153.
Potassic	358,851	489,060	10,255	Canada 337,961; Jordan 57,752.
Unspecified and mixed	48,461	49,178	48,478	Japan 321.
Graphite, natural	1,260	1,084	3	Japan 513; India 34.
Gypsum and plaster	222,205	151,865	29	Thailand 60,988; Australia 48,410; Mexico 42,406.
Iodine	16	13	(2)	Mainly from Japan.
Kyanite and related materials	1,704	3,166	1,050	Australia 136; unspecified 1,921.

See footnotes at end of table.

Table 3.—Republic of Korea: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Magnesium compounds:				
Magnesite, crude	50,060	141	--	All from Japan.
Oxides	4,956	38,003	10	Japan 29,667.
Mica:				
Crude including splittings and waste	569	1,024	259	Malaysia 432; Japan 180.
Worked including agglomerated splittings	83	252	1	Switzerland 147; Japan 62.
Nitrates, crude	3,215	4,249	NA	Chile 4,196.
Phosphates, crude thousand tons	1,652	1,771	1,528	Jordan 162.
Phosphorus, elemental	1,841	1,864	595	Netherlands 489; France 262.
Pigments, mineral:				
Natural, crude	163	148	--	Australia 70; Spain 60.
Iron oxides and hydroxides, processed	4,290	5,178	195	Japan 3,894; West Germany 754.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$2,486	$3,068	$1,100	Brazil $818; Hong Kong $466.
Synthetic do	$9,645	$6,237	$3,072	Taiwan $1,383; Japan $1,362.
Salt and brine	757,954	800,109	3	Australia 695,937; Yemen (Sanaa) 74,703.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	10,498	22,493	14,102	Japan 3,376.
Sulfate, manufactured	13,202	18,544	5,127	Taiwan 4,646; Japan 2,633.
Stone, sand and gravel:				
Dimension stone	29,658	37,259	87	Italy 18,832; Japan 6,801; Finland 4,929.
Dolomite, chiefly refractory-grade	155	347	--	Japan 253; Norway 86.
Gravel and crushed rock	2,291	1,564	122	France 950; Japan 280.
Limestone other than dimension	10,512	10	--	All from Japan.
Quartz and quartzite	613	587	17	Sweden 289; Japan 147.
Sand other than metal-bearing	122,966	140,550	194	Australia 139,415.
Sulfur:				
Elemental:				
Crude including native and by-product	567,836	592,896	5	Canada 478,200; Japan 114,652.
Colloidal, precipitated, sublimed	1,292	1,025	657	Japan 356.
Sulfuric acid	47,029	49,967	681	Japan 49,285.
Talc, steatite, soapstone, pyrophyllite	20,981	29,742	1,384	Australia 20,420; Hong Kong 5,035.
Vermiculite	56	23	NA	Canada 17.
Other:				
Crude	29,683	34,663	128	Japan 19,505; Australia 5,321.
Slag and dross, not metal-bearing	43,663	33,502	--	Japan 32,906.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	26	107	101	Japan 6.
Carbon black	2,985	4,187	1,089	Japan 2,493.
Coal:				
Anthracite thousand tons	819	2,659	500	Australia 98; India 56; unspecified 1,928.
Bituminous do	12,193	17,131	2,623	Australia 7,853; Canada 4,011.
Lignite including briquets	43,558	75,465	NA	Australia 44,000; unspecified 31,465.
Coke and semicoke	150,404	105,778	1,217	Japan 96,937; Australia 7,624.
Petroleum:				
Crude thousand 42-gallon barrels	196,921	203,429	--	United Arab Emirates 26,237; Malaysia 24,717; Indonesia 23,352.
Refinery products:				
Liquefied petroleum gas do	6,124	6,494	(2)	Saudi Arabia 5,487.
Gasoline do	370	297	98	Japan 126; Italy 40.
Naphtha do	3,794	5,343	--	Singapore 1,663; United Arab Emirates 704; Saudi Arabia 567.
Mineral jelly and wax do	82	77	7	Japan 65.
Kerosene and jet fuel do	479	175	67	Italy 81.
Distillate fuel oil do	1,789	2,375	1,296	Bahrain 433; Canada 150.
Lubricants do	1,110	330	35	Japan 220.
Residual fuel oil do	11,858	13,922	6,584	Japan 4,969; Saudi Arabia 1,399.
Petroleum coke do	791	784	777	Japan 6.

NA Not available.
[1]Table prepared by Audrey D. Wilkes.
[2]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aside from tungsten minerals, metal ore mining in the Republic of Korea was insignificant by world standards. By tonnage, the largest output was iron ore. However, the tonnage produced accounted for less than 4% of the pig iron output. The next largest in output was lead-zinc ore containing 37,000 tons of elemental zinc and 12,000 tons of lead. The remainder of metal ore mining is a small amount of molybdenite and sporadic, insignificant amounts of manganese and tin minerals.

Aluminum.—Aluminium of Korea Ltd. (Koralu) operated an 18,000-ton-per-year refinery at Ulsan, the country's sole aluminum refinery. All of the refinery's alumina requirements were imported. The bulk of the nation's demand for aluminum was met by imports of unwrought metal primarily from Australia and New Zealand.

Copper.—Korea Mining & Smelting Co. Ltd. operated the only two copper refineries in the nation: the 40,000-ton-per-year refinery at Changhang and the 120,000-ton-per-year refinery at Onsan. Very small amounts of copper were recovered from domestic lead-zinc mining operations. The feed for the refineries was virtually all from imports of copper concentrates from Canada, Mexico, and the Philippines.

Iron and Steel.—Although the Republic of Korea lacks indigenous resources to support an iron and steel industry, the nation has an annual capacity to produce 13.8 million tons of steel. The industry has to import virtually all of its iron ore, scrap metals, coking coal, and ferroalloying ingredients. Pohang Iron and Steel Co. Ltd. (Posco), a state-run enterprise, is the only integrated iron and steel facility. The remainder of the industry consists of 8 steelmaking enterprises using electric furnaces and 61 rolling enterprises. Posco dominated the industry accounting for all of the ironmaking capacity, 9.1 million tons of the steelmaking capacity, and 8.8 million tons of the steel rolling capacity.

Construction of Posco's second integrated steel mill at Kwangyang Bay was being accelerated. Completion of the first-stage construction of the 2.7-million-ton-per-year facility was expected in May 1987 with subsequent startup in the following month. This would boost Posco's total annual crude steel capacity to 11.8 million tons, making the country the ninth largest steel producer in the world. Second-stage construction at Kwangyang was being planned to increase capacity to 5.4 million tons per year.[5]

The Government designated Posco as the sole domestic producer of stainless hot coil. This was a move to attain self-sufficiency in materials that are now supplied by imports. Posco placed orders for the plant and equipment with firms in the Federal Republic of Germany and the United Kingdom. The 250,000-ton-per-year coil plant was scheduled to be operational by 1989.

The equity shares of Posco held by four South Korean commercial banks was proposed to be offered for public trading in 1991. In 1986, the state-invested Korea Development Bank, 38%; the Government held 33.4% of Posco; the commercial banks, 26.1%; and the state-owned Korea Tungsten Mining Co. Ltd., 2.5%.

The production capacity of specialty steel by small steel producers was expected to increase as a result of the country's expanding automotive and machinery manufacturing industries. Sammi Steel Co. was increasing its annual production capacity of specialty steel from 150,000 tons in 1986 to 300,000 tons in 1987 and to 450,000 tons in 1989. Sammi was to install continuous casting equipment and high-luster stainless steel plate equipment and was to modernize rolling facilities. Projected production capacity of Sammi in the 1990's was 1 million tons per year. Small specialty steel producers such as Poogsan Metal Manufacturing Co. Ltd. and Samyang Metal Co. were planning production expansion programs.

The steel industry imports annually about 2 million tons of ferrous scrap, primarily from the United States. In addition, the Republic of Korea is the second largest shipbreaking country in the world after Taiwan. Of the 169 vessels sold for demolition in 1986, 16% of the total tonnage, or 2.3 million deadweight tons, was taken by the Republic of Korea. The country's small steel mills and rolling mills utilize ferrous scrap generated by the shipbreaking industry.

Lead and Zinc.—Young Poong Corp. operated two lead-zinc mines at Yeonhwa. Lead concentrate from Yeonhwa was shipped to a 15,000-ton-per-year smelter operated by Korea Mining & Smelting at Changhang for the production of metal. Zinc concentrate from Yeonhwa was treated at a 60,000-ton-per-year refinery at Sukpo, operated by Young Poong, and at a 150,000-ton-per-year refinery at Onsan, operated by Korea Zinc Co. Korea Zinc is a subsidiary of Young Poong. Because zinc mine output is insufficient to meet the

production capacity of the refineries, zinc concentrate is imported primarily from Australia.

Tungsten.—Ninety-nine percent of the mine output of scheelite in 1986 was by Korea Tungsten at its operation at Sang Dong. The remainder of the output was from very small operations at Okbing, Ssangjan, and Wol-Ak. Tungsten concentrate was processed at a plant at the mine-site to produce ammonium paratungstate and tungsten oxide. A plant at Daegu converted the intermediary products to ferrotungsten, tungsten metal powder, and tungsten carbide.

INDUSTRIAL MINERALS

Limestone quarrying was the largest industrial minerals sector in the nation. Limestone output in 1986 reached 38 million tons. Ssangyong Cement Industrial Co. Ltd. operated the country's largest quarry at Donghae, producing about 15 million tons of limestone annually. Limestone was used principally in cement manufacture. Although mine output of other industrial minerals is insignificant by world standards, their production is significant to local industries. These minerals included asbestos, barite, diatomaceous earth, feldspar, fluorite, graphite, kaolin, pyrophyllite, silica, and talc.

Lucky Advanced Materials Inc. was constructing a 30,000-ton-per-year titanium dioxide plant at Samilmyon, Yochon, Cholla-namdo. Under a license agreement, Lucky will use the chloride technology process developed by Kerr-McGee Chemical Corp. The titanium dioxide will be used initially for pigment as well as later for metal production. E. I. du Pont de Nemours & Co. Inc. applied for permission to construct a 60,000-ton-per-year titanium dioxide plant at Yochun, 200 miles south of Seoul. However, the Government will have to decide on the acceptability of two competing producing plants in the country.

The fertilizer industry is weak inasmuch as there are no indigenous resources of phosphate rock, potash, sulfur, and fuels except for coal. Furthermore, the industry's competitiveness is challenged by less expensive production from other producers in the region. Production of complex fertilizers in 1986 was 1.9 million tons; urea fertilizers, 0.8 million tons; and ammonium sulfate fertilizers, 0.2 million tons.

The country's annual production capacity for cement was 23.5 million tons by nine companies. Ssangyong Cement was by far the largest producer, accounting for 46% of the total output capacity. Ssangyong Cement has a 2.1-million-ton-per-year plant at Youngwol and a plant at Songhae consisting of two works, one with an annual capacity of 5.6 million tons and the other with 3.2 million tons. Ssangyong Cement has a domestic distribution network consisting of seven forwarding plants, and four cement grinding-forwarding plants. Clinker was transported to four inland milling plants by rail. The company's own bulk carriers transport cement to seven seaside plants situated at the major ports of the South Korean peninsula. The Donghae plant accounted for approximately 80% of the country's export of cement. This plant was near Bukpyong Harbor, which was designed especially for cement export. It was equipped with modern, large-scale loading facilities.

MINERAL FUELS

The only energy sources indigenous to the country were anthracite coal and electricity from hydropower, thermal, and nuclear powerplants. About 25% of the coal produced was by Dai Han Coal Corp., a state-run enterprise. The remainder of the production was by a number of small private companies. To supplement its need for coal, the country imports an equally large amount of anthracite and bituminous coals.

There is no domestic production of oil and natural gas. Even offshore exploration for oil and natural gas has been unsuccessful for commercial finds. The bulk of domestic energy has been from electric energy production by hydropower plants, thermal powerplants, and nuclear powerplants.

Total electric power generation in 1986 was 64.7 billion kilowatt hours. The largest share of electric power was by thermal plants generating 32.4 billion kilowatt hours. The major thermal power stations were at Samchonpo, generating 7.0 billion kilowatt hours; Poryong, 6.5; P'yongt'aek, 5.3; Ulsan, 2.7; Inch'on, 2.4; Yongdong, 1.8; and Seoul, 1.3. Total nuclear power genera-

tion was 28.3 billion kilowatt hours. The remainder of electric power generation was by hydropower totaling 4.0 billion kilowatt hours. The major hydropower generation units were at Soyanggang, 387 million kilowatt hours; Hwach'on, 376; P'altang, 372; Ch'ongpyongyangsu, 326; Ch'ongpyong, 306; and Taech'ong, 298.

Total consumption of electric energy in 1986 was 45.4 billion kilowatt hours. Consumption by the mining sector was 957 million kilowatt hours. In comparison, consumption by other industrial sectors was basic metals, 6.9 billion kilowatt hours; metal products, 5.9; and industrial minerals products, 3.8.

The Republic of Korea's consumption of energy in 1986 was 61.8 million tons of oil equivalence (MMtoe). The consumption was increased to 64.9 MMtoe in 1987 and was to reach 79.1 MMtoe by 1991. Crude oil imports in 1986 totaled 209 million barrels. Currently, the Middle East supplies 66.5% of the Republic of Korea's oil imports. The import configuration of crude oil is approximately Iran, 20%; Saudi Arabia, 18%; Oman, 12%; Asian nations, 19%; and Latin America, 8%. In accordance with the Government's diversification of imported crude oil, the dependency ratio on Middle East oil will be reduced to 60% in 1987.

The consumption of anthracite coal in 1986 was 26.0 million tons. The suppliers of anthracite were the United States, 27%; the Republic of South Africa, 24%; and Asian countries, the remainder. The demand for anthracite was expected to increase modestly to 27.3 million tons in 1991.

There was no domestic production of bituminous coal. Consumption of bituminous coal in 1986 was 15.8 million tons and was to increase to 19.8 million tons in 1991. Australia provided the Republic of Korea with 49% of its requirement for bituminous coal; Canada, 18%; the United States, 13%; and other countries, the remainder. As part of the Government's diversification program, the large domestic companies were to participate in overseas development of coal mines to expand the receipts of bituminous coal. The larger domestic companies have participated in coal mine development in Alaska, the continental United States, Australia, and Canada.

The Republic of Korea has six operational nuclear powerplants and three under construction, which were due to be commissioned by 1989. On June 2, 1986, two twin power stations on the southeastern coast near Pusan were dedicated and placed into operation. The pressurized light water reactors were supplied by Westinghouse Electric Corp. of the United States. With the commissioning of the nation's Kori No. 5 and 6 powerplants, each with a generating capacity of 0.950 million kilowatts, the Republic of Korea's nuclear generating capacity will total 3.81 million kilowatts, accounting for 22% of the country's electric generating capacity.

The first shipment of Indonesian liquefied natural gas (LNG), totaling 57,000 tons, arrived at the newly constructed receiving LNG terminal at Pyongtaek Port, Kyonggi-do, on November 1, 1986. The 154,000-square-meter complex was equipped with vaporization units and four tanks, each with a storage capacity of 100,000 kiloliters of LNG. A 98-kiloliter pipeline links the LNG complex with a thermal power station in Inch'on, 30 kilometers west of Seoul. A pipeline network totaling 108 kilometers will be built to supply LNG to consumers in the metropolitan area. The use of LNG was to help the nation to diversify its sources of energy supplies and to ensure a long-term, stable supply of energy.[6]

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Korean won (W) to U.S. dollars at the rate of W861.1 = US$1.00 for 1986.

[3]Economic Planning Board (Seoul). Monthly Statistics of Korea. V. 4, 1987, p. 79.

[4]The Bank of Korea (Seoul). Economic Statistics Yearbook 1987. June 1987, p. 321.

[5]Korean Business Review (Seoul). Iron and Steel. No. 102, June 1987, pp. 5-6.

[6]———. No. 102, June 1987, p. 42.

The Mineral Industry of Kuwait

By Michael Fenton[1]

The oil sector continued to dominate the Kuwaiti economy; proven reserve estimates ranged from 90 to almost 95 billion barrels, third only to Saudi Arabia and the U.S.S.R. Kuwait's proven natural gas reserves, mostly associated gas, were about 36.6 trillion cubic feet. The nonfuel-mineral-producing sector included cement, clays, lime, chlorine, salt, and caustic soda production. Oil accounted for about 85% of exports; nearly one-half of this was in the form of refined products.

During most of 1986, Kuwait was a principal advocate of the Saudi Arabian-inspired price-war strategy of high production that sent oil prices down to $7 per barrel between December 1985 and August 1986. Kuwait apparently yielded to the view that oil prices should be higher and submitted to a new Organization of Petroleum Exporting Countries' (OPEC) production quota of 900,000 barrels per day (bbl/d) for September-October. The quota was raised to 921,000 bbl/d in November and to 999,000 bbl/d in December, and then stabilized at 948,000 bbl/d at yearend.

Although the average price of oil was one-half that of 1985, total oil revenues declined only about 20% because of increased production. Oil revenues were expected to decline further as production remains in line with Kuwait's quota of 948,000 bbl/d.

PRODUCTION AND TRADE

Production of crude oil by Kuwait and Kuwait's share of offshore production in the Kuwait-Saudi Arabia Divided Zone was an estimated 1.4 million bbl/d, an increase of nearly 40% over that of 1985, from about 360 flowing wells. Maximum sustainable production capacity was 2 million bbl/d, whereas installed capacity was 2.9 million bbl/d. Natural gas production reached 159 billion cubic feet after a record-low level of 147 billion cubic feet in 1985. The increase was attributable to a parallel increase of associated crude oil.

The collapse of oil prices during fiscal year (FY) 1985 (July 1, 1985-June 30, 1986) forced an increase in oil production to a high of 1.75 million bbl/d during July 1986, considerably higher than the average of 980,000 bbl/d throughout 1985. Output fell to 900,000 bbl/d in September 1986, but then increased to as much as 999,000 bbl/d in December. Despite the increase in production, the provisional figure for oil revenue during FY 1985 was $7,570 million compared with $8,977 million for FY 1984, down 18.6%; and total revenue, excluding investment income, was $8,435 million, the lowest level since FY 1973. The budget proposed for FY 1986, based on a price of $15 per barrel of oil, placed oil revenue at $5,962 million, down 27% from that of FY 1985.

Crude oil exports by Kuwait Petroleum Corp. (KPC) in FY 1985 were 194 million barrels, a 42% increase, which included 47.1 million barrels to KPC's Western European refineries and 16.4 million barrels for processing in Italian refineries for KPC. Exports of refined products, including bunkers and sulfur, were 26.78 million tons, an increase of 18.5% over exports in FY 1984 of 22.6 million tons. Exports of crude oil to the United States from Kuwait increased from 4,311 bbl/d in 1985 to 24,097 bbl/d in 1986;

the increase was attributed to a significant decline in the price of oil from $26.52 per barrel to $11.64 per barrel.[2] Exports of liquefied petroleum gas (LPG) in FY 1985 were 17.75 million barrels, a 33% increase from 13.34 million barrels in FY 1984.

Total crude oil throughput at KPC's Shuaiba, Mina Abdullah, and Mina al-Ahmadi refineries during FY 1985 rose 8.3% to 588,300 bbl/d, which exceeded their rated capacity of 570,000 bbl/d. Throughput for each refinery was 186,500 bbl/d at Shuaiba, 76,700 bbl/d at Mina Abdullah, and 325,100 bbl/d at Mina al-Ahmadi. Products production was about 215 million barrels during FY 1985, compared with 199 million barrels in FY 1984. Gas and condensate production during FY 1985 was 207.3 billion cubic feet, a 23% increase from that of FY 1984. Propane and butane production also increased to 23.2 million barrels, 25% greater than that of FY 1984.

KPC maintained its share in the competitive Western European oil products market as its refineries in Rotterdam and Copenhagen operated at full capacity with throughputs of 52,000 and 73,000 bbl/d, respectively. Lubricating oil production at the Dutch Europort refinery was 3,660 bbl/d.

KPC's subsidiary, Petrochemical Industries Co. (PIC), reported a urea production increase of 16% to 687,300 tons in FY 1985, while sales of urea in FY 1985 rose to 680,000 tons, a 17% increase. Although ammonia production increased, sales of liquid ammonia fell 50% to 35,000 tons. Sulfuric acid sales in local and foreign markets were 38,000 tons, compared with only 5,000 tons during FY 1984. PIC plants operated at only 62% of capacity because of the continuing shortage of gas feedstock. Salt, chlorine, and caustic soda production in FY 1985 was 24,000 tons, and sales were 17,700 tons compared with 22,700 tons in FY 1984.

Price fluctuations and the erratic oil market were the causes of a 74% decline in profits in FY 1985 for KPC. Net profit was $192.3 million. Declining profits resulting from lower oil prices were countered by profits derived from the increased use of its refineries and about 2,700 company-owned service stations in Scandinavian and Netherlands countries. PIC also had a net loss for FY 1985 of $37 million, because chemical fertilizer prices declined 20% to 40%.

Imported gas continued to be needed in 1986 for power stations, desalination plants, and petrochemical plants as local associated-gas supplies declined. Kuwait's plan to use a 125,000-cubic-meter liquid natural gas (LNG) tanker, which was converted to handle on-board regasification of LNG from Abu Dhabi or Algeria, was canceled when a better source of gas appeared to be Qatar and Saudi Arabia. However, surpluses from these countries became unavailable and another alternative, gas via pipeline from Iraq, came to fruition in late 1986. Natural gas demand was about 415 million cubic feet per day, but flow was as low as 89 million cubic feet. Every 1 million barrels of crude oil produced about 500 million cubic feet of gas.

Kuwait National Petroleum Co. (KNPC) increased its profits by about $4.6 million in FY 1985 to $222.2 million. Sales were nearly 27.6 million barrels even though local demand for refinery products declined 4.2%. Kuwait Oil Tankers Co. (KOTC) was also able to increase profits by $7.1 million to $24.9 million because of increased oil stockpiling that raised demand and rates for tankers. Nearly 53.6 million barrels of oil, 47.6 million barrels of products, and 13.9 million barrels of LPG were shipped in 3 oil tankers, 14 product tankers, and 5 LPG tankers.

In early 1986, Kuwait and the U.S.S.R. signed an economic cooperation agreement that was to include the construction of oil and gas projects, particularly offshore, in each country, and in unspecified third countries. Oil swapping was arranged whereby Kuwait would supply oil to Soviet clients in Asia and East Africa, and Kuwaiti customers in Europe and North Africa would receive Soviet oil. The two countries also agreed to exchange the Soviet expertise in extraction and processing of heavy crude oil for the Kuwaiti-owned Santa Fe International Corp.'s extensive experience in arctic drilling and pipeline laying. Cooperation was also expected in oil refining, petrochemicals, chemical industries, and banking.

In June 1986, Kuwait supplied Syria with a supertanker cargo of oil in place of Kuwait's annual financial aid to Syria. The oil was to replace oil held back by Iran, which had been selling Syrian cut-rate oil in exchange for support against Iraq.

PIC agreed to a countertrade with India's Minerals and Metals Trading Corp. of India Ltd. for 75,000 tons of urea. About 50% of the import bill will be paid by the supply of Indian agricultural and engineering items.

Table 1.—Kuwait: Production of mineral commodities[1]

Commodity	1982	1983	1984	1985[p]	1986[e]
Cement thousand metric tons	1,553	1,124	1,184	1,193	1,200
Clay products, nonrefractory: Sand-lime bricks cubic meters	419,000	[e]450,000	[e]450,000	336,200	336,000
Gas, natural:[2]					
Gross million cubic feet	162,728	[r]192,000	205,000	147,000	[3]159,000
Marketed do.	145,853	[r]151,000	173,000	120,000	[3]130,000
Lime: Hydrated and quicklime metric tons	10,200	[e]14,000	15,000	52,400	52,400
Natural gas liquids thousand 42-gallon barrels	13,912	[e]20,200	20,075	24,500	25,000
Nitrogen: N content of ammonia metric tons	183,000	[r]313,200	289,800	322,700	[3]440,000
Petroleum:					
Crude[2] thousand 42-gallon barrels	300,220	384,888	424,200	374,000	[3]518,600
Refinery products:					
Gasoline, motor do.	10,196	9,855	8,760	[r e]10,000	11,000
Jet fuel do.	[r]6,205	8,030	5,110	[r e]6,000	6,000
Kerosene do.	7,694	16,425	8,030	[e]10,000	10,000
Distillate fuel oil do.	[r]44,530	47,815	37,960	[r e]45,000	47,000
Residual fuel oil do.	61,320	70,810	66,430	[e]79,000	82,000
Refinery fuel and losses do.	1,095	1,095	5,840	[e]7,000	7,000
Other do.	23,360	27,010	41,975	[e]50,000	52,000
Total do.	[r]154,400	181,040	174,105	[r e]207,000	215,000
Salt metric tons	19,300	[e]20,000	21,000	21,000	21,000
Sodium and potassium compounds: Caustic soda do.	8,700	[e]9,000	9,500	9,800	9,800
Sulfur:					
Elemental, petroleum byproduct do.	140,644	[e]145,000	[e]151,000	[e]198,000	[3]260,000
Sulfuric acid do.	8,900	[e]15,000	[e]4,495	4,600	4,600

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through June 12, 1987.
[2]Includes Kuwait's share of production in the Kuwait-Saudi Arabia Divided Zone.
[3]Reported figure.

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

(Metric tons unless otherwise specified)

Commodity	1984	Destinations	
		United States	Other (principal)
METALS			
Aluminum: Metal including alloys, all forms	380	--	Saudi Arabia 285; Iraq 59.
Copper: Metal including alloys, all forms	292	--	Saudi Arabia 239; Iraq 49.
Iron and steel: Metal:			
Scrap	123,332	--	United Arab Emirates 64,510; Republic of Korea 28,048.
Semimanufactures:			
Bars, rods, angles, shapes, sections	73,974	--	Iraq 67,311; Syria 2,992.
Universals, plates, sheets	7,987	--	Iraq 3,774; Saudi Arabia 1,337.
Wire	220	--	Iraq 152; Jordan 46.
Tubes, pipes, fittings	23,057	2	Saudi Arabia 12,750; West Germany 6,551.
Lead: Metal including alloys, all forms	71	--	Saudi Arabia 67.
Nickel: Metal including alloys, all forms	2	--	All to Iraq.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	97	--	All to United Kingdom.
Silver: Metal including alloys, unwrought and partly wrought do.	3,087	--	Do.
Zinc: Metal including alloys, all forms	120	--	India 69; West Germany 51.
INDUSTRIAL MINERALS			
Abrasives, n.e.s.: Grinding and polishing wheels and stones	20	--	Iraq 11; Saudi Arabia 7.
Asbestos, crude	5	--	All to Saudi Arabia.
Cement	305,852	--	Iraq 301,319.
Clays, crude: Bentonite	3,393	--	Syria 2,765; Saudi Arabia 505.
Diamond: Gem, not set or strung carats	1,010	--	Belgium-Luxembourg 660; United Kingdom 350.
Fertilizer materials: Manufactured:			
Ammonia	787	--	Iraq 570; United Arab Emirates 94.
Phosphatic	631,542	--	India 222,784; China 209,202; Iraq 127,888.
Unspecified and mixed	36,868	--	Hungary 20,329; Sri Lanka 9,350.
Graphite, natural	1	--	All to Iraq.
Gypsum and plaster	50	--	Do.

See footnote at end of table.

Table 2.—Kuwait: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	Destinations	
		United States	Other (principal)
INDUSTRIAL MINERALS —Continued			
Lime	365	--	Iraq 314; Jordan 41.
Precious and semiprecious stones other than diamond: Natural kilograms	21	--	Tunisia 16; Belgium-Luxembourg 5.
Salt and brine	1,738	--	Iraq 1,282; Jordan 350.
Sodium compounds, n.e.s.: Sulfate, manufactured	4,053	--	Iraq 3,801.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	298	--	Iraq 157; Saudi Arabia 130.
Worked	312	--	Saudi Arabia 185; Iraq 83.
Sand other than metal-bearing	6	--	Mainly to Iraq.
Sulfur: Elemental, colloidal, precipitated, sublimed	666,082	--	India 289,746; Romania 78,025; Syria 72,524.
MINERAL FUELS AND RELATED MATERIALS			
Coal: All grades including briquets	18	--	Mainly to Saudi Arabia.
Petroleum:			
Crude thousand 42-gallon barrels	240,801	6,068	Japan 64,825; Netherlands 34,238; Singapore 32,754.
Refinery products:			
Liquefied petroleum gas do	13,684	--	Japan 8,353; Turkey 3,749.
Gasoline, motor do	1,559	--	Pakistan 1,554.
Mineral jelly and wax do	2,825	--	Australia 2,054; Pakistan 771.
Kerosine and jet fuel do	41,349	--	Netherlands 8,135; Italy 4,115; Japan 4,084.
Distillate fuel oil do	35,515	301	Pakistan 9,343; Italy 7,272; West Germany 2,832.
Lubricants do	30,338	--	Iraq 11,466; Saudi Arabia 10,556; United Arab Emirates 2,086.
Residual fuel oil do	69,527	4,268	Italy 25,795; Australia 8,385; United Kingdom 4,517.
Bitumen and other residues do	649	--	Yemen (Sanaa) 330; Yemen (Aden) 165.
Bituminous mixtures do	3,312	--	Qatar 1,539; Iraq 358; Yemen (Aden) 327.

[1]Data for 1983 were not available at the time of publication. Table prepared by Virginia A. Woodson.

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

(Metric tons unless otherwise specified)

Commodity	1984	Sources	
		United States	Other (principal)
METALS			
Aluminum: Metal including alloys, semimanufactures	13,269	271	Bahrain 3,074; Turkey 2,692; Hungary 1,013.
Copper: Metal including alloys, unwrought and semimanufactures	5,273	339	United Kingdom 1,569; West Germany 1,550; Japan 965.
Iron and steel: Metal:			
Scrap	580	--	West Germany 183; Bahrain 95; Japan 88.
Pig iron, cast iron, related materials[2]	43	--	Japan 22; United Kingdom 20.
Semimanufactures:			
Bars, rods, angles, shapes, sections	560,678	17	Japan 331,073; Qatar 109,162; Republic of Korea 41,591.
Universals, plates, sheets	173,438	67	Japan 119,652; West Germany 18,765.
Wire	16,972	4	Saudi Arabia 5,310; Japan 4,254; China 3,056.
Tubes, pipes, fittings	308,459	1,294	Japan 99,305; France 84,932; West Germany 50,152.
Lead: Metal including alloys, all forms	740	--	United Kingdom 533; West Germany 120.
Nickel: Metal including alloys, unwrought and semimanufactures	126	--	Republic of Korea 103; Italy 20.
Tin: Metal including alloys, all forms	3	1	West Germany 2.
Uranium and thorium: Metal including alloys, all forms value, thousands	$35	--	United Kingdom $24; West Germany $5.
Zinc: Metal including alloys, all forms	151	--	West Germany 60; Japan 40; Jordan 32.
Other: Base metals including alloys, all forms	27	--	France 20; West Germany 4.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	Sources	
		United States	Other (principal)
INDUSTRIAL MINERALS			
Abrasives, n.e.s.: Grinding and polishing wheels and stones	521	1	Italy 440; Czechoslovakia 29.
Asbestos, crude	1,299	--	Canada 800; Swaziland 499.
Cement thousand tons	2,477	7	Iraq 1,079; Japan 745; United Arab Emirates 531.
Clays, crude: Bentonite	30,709	12,408	Ireland 10,000; Greece 7,000.
Diamond: Gem, not set or strung carats	11,785	--	India 6,275; Belgium-Luxembourg 5,460.
Fertilizer materials: Manufactured:			
Ammonia	43	--	West Germany 29; Netherlands 13.
Unspecified and mixed	51,470	7	Iraq 50,025.
Graphite, natural	180	--	United Kingdom 150; Republic of Korea 17.
Gypsum and plaster	33,214	1	Saudi Arabia 26,614; Iraq 4,495.
Lime	8,250	--	Lebanon 2,797; United Arab Emirates 2,347; Jordan 1,563.
Precious and semiprecious stones other than diamond: Natural kilograms	163	(3)	Taiwan 106; Tunisia 24.
Salt and brine	7,195	100	Saudi Arabia 5,570; Netherland.. 1,014.
Sodium compounds, n.e.s.:			
Carbonate, manufactured	5,526	5,027	Kenya 210.
Sulfate, manufactured	321	--	Belgium-Luxembourg 109; West Germany 104; United Kingdom 53.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	696,381	--	United Arab Emirates 689,241; Greece 6,500.
Worked	218,318	75	Italy 100,323; Jordan 79,589.
Gravel and crushed rock	192,457	46	Italy 140,826; Iran 21,106; Syria 13,630.
Limestone other than dimension	1,506	--	Belgium-Luxembourg 950; Iraq 456.
Sand other than metal-bearing	9,234	--	Jordan 5,787; Netherlands 1,814.
Sulfur: Elemental, colloidal, precipitated, sublimed	255,238	--	All from Iraq.

[1]Data for 1983 were not available at the time of publication. Table prepared by Virginia A. Woodson.
[2]May include ferroalloys.
[3]Less than 1/2 unit.

COMMODITY REVIEW

INDUSTRIAL MINERALS

Chloride.—The new plant for the production of 75 tons of chlorine per day and 150 tons of salt per day at Shuaiba was scheduled to go on-stream in September 1986.

Fertilizer Materials.—The Turkish-Arab Fertilizer Co. was established in January 1986 for the purpose of constructing a plant at Mersin that would produce 1,500 tons of ammonia and 1,400 tons of diammonium phosphate per day. Feedstock would be Kuwaiti ammonia and Tunisian phosphoric acid. PIC had a 25% interest in this venture.

Sand and Gravel.—The Kuwaiti construction industry had been using about 2 million cubic meters of sand and gravel per year. In an effort to identify local sources of these materials, the Oil and Industry Ministry and the Kuwait Institute for Scientific Research were to begin a 20-month countrywide study of sand and gravel resources.

Sulfur.—KNPC completed test runs of two new 132,000-ton-per-year sulfur recovery units that were part of the further upgrading project at the refinery. Another sulfur recovery unit, with a 270,000-ton-per-year capacity, was scheduled for completion in 1986 at the Mina Abdullah refinery.

The only current source of sulfur in Kuwait is oil refinery gas. However, deposits of native sulfur have recently been found in rocks of the Upper Cretaceous Barkan Group. The sulfur content of the country's sour gas reserves of 720 billion barrels was 2% to 3%, which is a significant sulfur resource.

MINERAL FUELS

Natural Gas.—In September, the Kuwait Oil Co. (KOC) began receiving 200 million cubic feet of associated gas per day by pipeline from Iraq's Rumaila Field. Project manager C. F. Braun and Co. awarded construction contracts to a local subsidiary

of the Lebanese-owned, Athens-based Consolidated Contractors International Co., and pipe-supply contracts to the Kuwait Metal Pipe Industries. The $80 to $100 million pipeline was delivering gas costing $1 per million British thermal units (Btu) at a transportation cost of $10 per million Btu.

KOC was planning to upgrade existing, and to install new, gas-oil separator trains, and to install crude oil desalting and dehydration plants at gas gathering centers 7, 9, 10, 16, and 22.

The pier and pipeline facilities and construction work on land for the Southern Gas Project and the gas treatment plant at al-Zur were completed. Marine facilities were nearly one-half completed by the end of June 1986.

Petroleum.—*Exploration.*—The Kuwait Foreign Petroleum Exploration Co. (KUFPEC) began an exploration program in the Senam area of Indonesia. KUFPEC also relinquished concessions in Tanzania, Oman, Turkey, and the Gulf of Suez after drilling unsuccessfully. Development programs continued in Egypt, Indonesia, and offshore China.

Production.—Production from new deep oilfields producing light crude continued to supplement production of heavy oil from Kuwait's three main fields—Rawdatain, Sabriya, and Burgan. The 38° gravity oil was blended with the heavier Kuwaiti oils to maintain an export product with a gravity of 31.5°. The plan was to produce 100,000 bbl/d by yearend 1986, 150,000 bbl/d by yearend 1987, and 200,000 bbl/d by yearend 1988, which would be 10% of Kuwait's production. Fifteen development wells were completed in the Marat Formation in Magwa Field, and an additional 20 were planned. Four development wells were drilled in the same unit in the Minagish Field, and four more wells were planned. A new deep field was discovered by drilling in the western Abdalya area, and a seismic survey to define the field was scheduled.

Experimentation with steam injection techniques on heavy crude oil deposits at shallow 600- to 800-foot depths in northern Kuwait continued. Production reached 700,000 barrels, and plans were made to use these techniques in the nearby Al-Kazmawi Field. Water injection experiments were also done at the Managish, Sabriya, and Rawdatain Fields.

Refining.—The $2.5 billion modernization program at the Mina al-Ahmadi refinery was completed in February 1986, and the capacity was raised to 270,000 bbl/d. In addition to the new capacity, high-grade sulfur-free petroleum products became available for export and for local consumption.

Modernization of the Mina Abdullah refinery was in progress, with a goal of increasing capacity to 200,000 bbl/d. The refinery was expected to produce naphtha, kerosene, and petroleum coke from a special unit having a capacity of 60,000 bbl/d, and a full range of high-quality products.

The combined capacity at the end of modernization of Kuwait's three refineries, Mina al-Ahmadi, Mina Abdullah, and Shuaiba, was expected to be 650,000 bbl/d.

A sea island was being built for KNPC off Mina Abdullah refinery that would allow tankers to load refined products and bunker fuels at a rate of 70,600 bbl/d. Dale Electric Co. Ltd. of the United Kingdom supplied four generating sets, two of 625 kilovolt-amperes and two of 250 kilovolt-amperes for backup power, while Emco Wheaton UK provided 12 dock-mounted loading arms.

Sabotage was the suspected cause of four explosions at KOC's facilities at al-Ahmadi refinery and at Magwa Oilfield on June 17. The most serious explosion caused a 2-day fire at a tank farm north of Ahmadi. Damage at each location was quickly repaired.

PIC was considering plans for a $200 million plant in China for export ammonia. The plant would be on Hainan Island near an offshore gasfield, currently being worked by Kuwaiti companies, which would supply the required feedstock. PIC also has a 30% share in Sino-Arab Fertilizer Co., which was planning to build a plant at Quinhuangdao, Hebei Province.

C. F. Braun, a subsidiary of KPC, awarded a $40 million contract to Noyes Engineering Co. of Australia to design and build a petroleum coke-handling complex at the Mina Abdullah refinery. The turnkey contract calls for design, procurement, and civil, electrical, mechanical, and structural work at both the refinery and the port. Two traveling crushers, a covered conveyor system, a 70,000-ton storage shed, a 1,000-ton-per-hour traveling ship loader, and dust suppression and collection equipment will be installed.

Transportation.—The possibility of building a 700-kilometer oil export pipeline across Saudi Arabia to Yanbu on the Red Sea was being studied to avoid the risk of cargo loss as a result of air attacks by Iran or Iraq in the Persian Gulf. Two projects

were under consideration: a 42-inch, 500,000-bbl/d crude oil line from Kuwait to pumping station No. 3 on Saudi Arabia's east-west pipeline, and a 36-inch crude oil and products line directly across Saudi Arabia to Yanbu.

KOTC was planning to buy seven new product carriers because of the increased demand for inexpensive oil products. Negotiations were in progress with South Korean shipbuilders for three or four 35,000-deadweight-ton (dwt) carriers and three 120,000-dwt carriers for a total cost of $160 million to $180 million.

KOTC realized $23 million on the sale of three oil tankers to Norwegian and Greek companies. The ships, originally bought to shuttle crude oil to Khor Fakkan off Fujairah, United Arab Emirates, increased in monetary value and were no longer needed by KOTC.

Petrochemicals.—The polypropylene plant that was proposed in 1985 for construction in Shuaiba was upgraded from 62,000 to 75,000 tons per year because of the plan to raise the capacity of the Mina al-Ahmadi fluid catalytic cracking unit, which was to provide propylene. Completion was scheduled for early 1989.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Kuwaiti dinars (KD) to U.S. dollars at the rate of KD0.28=US$1.00.

The Mineral Industry of Liberia

By Michael D. Fenton and David J. Ellis[1]

The Liberian iron ore industry faced imminent decisions about the future, owing to the fact that world supplies of iron ore continued far in excess of demand and because of the forecast of a sharp drop in production from the country's existing mines by 1989. New development was deemed necessary to prevent major revenue loss. Several options were investigated, including an arrangement with the Government of Guinea to exploit the high-grade Mifergui-Nimba deposits in Guinea, using existing Liberian iron ore facilities just across the border.

A hard-rock gold concession was started at Kle Kle with promising returns from initial assay results. Offshore oil drilling yielded negative results, but two onshore wells were started in midyear by Henry Resources Corp. of the United States. Tentative agreements were reached with the Republic of Korea and with China on the investigation of various mineral concerns and possible opening of a cement factory.

PRODUCTION AND TRADE

Liberia, despite its continued open trade policy, struggled to stabilize an economy plagued by the ongoing liquidity crisis, depressed world market for major exports, and rising debt servicing requirements.

The principal mineral resources remained iron ore, gold, and diamonds. Production and exports of iron ore, which constituted about 70% of export revenue, dropped about 4% and 7%, respectively, in response to the oversaturated world iron ore market. As a direct result of the slumping world iron ore market, exports fell about 12% from the 16.3 million tons shipped in 1985. The Federal Republic of Germany, Italy, and the United States were the principal importers of iron ore, purchasing 41%, 24%, and 12%, respectively. Interest in gold mining increased again, with the production level and value of gold exports up considerably from 1985 levels.

Liberia continued to export much of its exploitable mineral resources to Western Europe and the United States. The latter also serviced a majority of Liberia's importing needs. Imports to Liberia fell as a result of the shortage of U.S. dollars in circulation. There were long waits for foreign exchange transfers in 1986, and new investment slowed as investors waited to see results from the return to civilian government in January.

Table 1.—Liberia: Production of mineral commodities

Commodity[1]	1982	1983	1984	1985[p]	1986[e]
Cement, hydraulic thousand metric tons	80	85	84	95	97
Diamond:[e]					
Gem thousand carats	170	[r]132	108	66	63
Industrial do	263	[r]198	132	72	189
Total do	433	[r]330	240	138	252
Gold[e] troy ounces	[2]12,656	[r]15,400	[2]10,500	[2]4,900	[2]20,100
Iron ore thousand metric tons	18,165	14,937	15,100	15,318	15,295

[e]Estimated. [p]Preliminary. [r]Revised.
[1]In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone) were produced, but available information is inadequate to make reliable estimates of output levels.
[2]Based on gold taxed for export and may include gold smuggled in from Guinea and Sierra Leone.

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

(Metric tons unless otherwise specified)

Commodity	1983	1984	Destinations, 1984	
			United States	Other (principal)
Diamond: Industrial stones value, thousands	$17,223	$10,923	$15	Belgium-Luxembourg $7,788; United Kingdom $3,053.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite thousand tons	15,704	16,870	1,380	West Germany 6,468; Italy 3,405; France 1,386.
Metal: Semimanufactures, universals, plates, sheets	1	--		
Petroleum refinery products:				
Kerosene and jet fuel 42-gallon barrels	140	--		
Distillate fuel oil do	6,043	--		
Lubricants do	273	203	--	All to Sierra Leone.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$11	--		
Other: Ores and concentrates	11,662	--		

[1]Table prepared by Virginia A. Woodson.

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

(Metric tons unless otherwise specified)

Commodity	1983	1984	Sources, 1984	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, semimanufactures	645	413	16	Switzerland 201; Belgium-Luxembourg 66.
Iron and steel: Metal:				
Scrap	71	263	--	West Germany 222; Belgium-Luxembourg 31.
Pig iron, cast iron, related materials	12,298	4,847	6	West Germany 4,837.
Steel, primary forms	107	45	1	West Germany 36; Belgium-Luxembourg 8.
Semimanufactures:				
Bars, rods, angles, shapes, sections	4,337	3,606	183	Brazil 1,367; Belgium-Luxembourg 1,084; West Germany 706.
Universals, plates, sheets	6,709	1,878	141	West Germany 804; Belgium-Luxembourg 366; Japan 322.
Hoop and strip	34	21	7	Belgium-Luxembourg 7; United Kingdom 5.
Rails and accessories	875	660	--	West Germany 659.
Wire	66	42	4	Belgium-Luxembourg 32.
Tubes, pipes, fittings	1,336	1,739	209	West Germany 903; Republic of Korea 310.
Castings and forgings, rough	129	115	--	West Germany 111; United Kingdom 2.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1983	1984	Sources, 1984	
			United States	Other (principal)
METALS —Continued				
Lead: Metal including alloys, semimanufactures	37	25	1	West Germany 23.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	--	$5	--	All from West Germany.
Tin: Metal including alloys, all forms	37	20	19	Netherlands 1.
Zinc: Metal including alloys, semimanufactures	102	6	4	West Germany 1; Guinea 1.
Other: Ores and concentrates	--	175	174	NA.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones value, thousands	$342	$57	$2	Denmark $46.
Asbestos, crude	19	5	5	
Cement	62,877	95,706	173	Poland 42,197; West Germany 2,880; Belgium-Luxembourg 2,606.
Clays, crude	24,880	14,732	6,656	West Germany 8,042.
Fertilizer materials:				
Crude, n.e.s	406	380	46	Canada 283; West Germany 50.
Manufactured:				
Nitrogenous	3,914	730	--	Norway 487; West Germany 138.
Phosphatic	29	10	--	All from Canada.
Potassic	5	890	--	All from West Germany.
Unspecified and mixed	61	492	28	Netherlands 318; Belgium-Luxembourg 54.
Gypsum and plaster	--	5,722	--	Norway 5,666.
Lime	59,621	999	--	United Kingdom 696; Denmark 206.
Phosphates, crude	--	150	--	Netherlands 121; West Germany 17.
Salt and brine	4,259	4,420	325	West Germany 3,218; United Kingdom 490.
Sodium compounds, n.e.s.: Carbonate, manufactured	132	164	17	West Germany 54; Norway 53; United Kingdom 26.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	464	597	--	United Kingdom 350; Italy 207.
Worked value, thousands	$80	$37	$5	Italy $32.
Gravel and crushed rock	435	987	--	Italy 876; Spain 111.
Limestone other than dimension	36,587	11,259	--	United Kingdom 5,299; West Germany 4,993.
Sulfur: Elemental, crude including native and byproduct	9	6	--	All from United Kingdom.
Other: Crude	552	68	--	West Germany 60; United Kingdom 6.
MINERAL FUELS AND RELATED MATERIALS				
Coal: All grades including briquets	23	82	82	
Petroleum refinery products:				
Liquefied petroleum gas value, thousands	$74	$282	$141	Ivory Coast $98; West Germany $17.
Gasoline, motor 42-gallon barrels	453,747	396,032	8,084	Ivory Coast 167,127; Netherlands 112,727.
Mineral jelly and wax do.	5,462	4,431	346	West Germany 2,818; Netherlands 457; China 449.
Kerosene and jet fuel do.	169,896	231,353	26	Ivory Coast 227,709.
Distillate fuel oil do.	504,632	669,565	15	Nigeria 226,322; Netherlands 137,346; Spain 105,358.
Lubricants do.	53,620	47,691	9,338	West Germany 10,087; Belgium-Luxembourg 8,498.
Residual fuel oil do.	472,008	301,392	--	Ivory Coast 125,694; Spain 85,801; Netherlands 79,920.
Bitumen and other residues do.	--	49	--	All from West Germany.
Bituminous mixtures do.	333	400	249	United Kingdom 61; Italy 42.
Petroleum coke do.	--	94	94	

NA Not available.

[1]Table prepared by Virginia A. Woodson.

COMMODITY REVIEW

METALS

Gold.—Equinox Resources Ltd., a Canadian company, began a 1,500-meter drill program at a hard-rock site at the Kle Kle gold property about 40 kilometers northwest of Monrovia. Selected assay results on five holes showed grades ranging from 3.57 to 12.86 grams per ton. This is the only hard-rock gold venture in Liberia; the other two current operations are placers. Exports of gold were up over 300% from 1985 values, with an announced shipment of about 20,000 troy ounces. Gold production in Liberia was probably somewhat lower, as the exports were likely to have included a certain quantity of gold smuggled from neighboring Sierra Leone and Guinea.

Iron Ore.—The continued depression of the world iron ore market had an adverse effect on the performance of Liberia's two remaining operations, LAMCO Joint Venture Operating Co. (LJV) and the Bong Mining Co. (BMC).

LJV, faced with the predicted exhaustion of reserves at its mine near Yakepa in Nimba County by 1989, looked at two major alternative measures to continue current levels. The preferred option was the much discussed joint venture agreement with Guinea on the Mifurgui-Nimba iron ore deposit. Representatives from both countries met several times, and at midyear, a new company, the Nimba International Mining Co. consisting of LJV and a consortium of Guinean investors, was tentatively set up to oversee the project. However, a lack of capital investment, conservatively estimated at $125 million, remained the principal stumbling block to the venture.

The second possibility lay in the tapping of lower grade reserves located about 20 kilometers from existing facilities at the LJV mine. This project would involve an estimated $325 million investment in the construction of a 110-kilometer railway to take the lower grade ore to be used as concentrator feed at the Bong concentrator and pellet plant. Owing to the lack of available financing, no decision had been made by yearend, despite feelers from Nigerian sources interested in using the ore in Nigerian steel mills.

Despite the discussion about the future of the Liberian iron industry, LJV expected to show a slight profit, somewhat less than the $5 million posted in 1985. This was mainly the result of ongoing costsaving measures implemented to keep LJV solvent during the period of lower iron ore demand. However, BMC announced an annual loss of $4.7 million.

About 150,000 tons of iron ore from the National Iron Ore Co. (NIOC), which closed in 1985, remained as a stockpile at Monrovia harbor. Financial and legal obstacles stemming from the outstanding debts left by the NIOC prevented any export in 1986. The Government of Liberia was negotiating with potential investors, including the Government of Romania and Langhorne Overseas Corp. (LOC) of Geneva, Switzerland, for a reopening of the mine in Grand Cape Mount County near the border with Sierra Leone.

Scrap.—Third World Shipbreaking Inc., a Liberian concern, started the first shipbreaking venture in Africa at Monrovia. Preliminary plans were to use the Pakistani method of beaching ships for breakup and exporting the scrap.

Other Minerals.—Initial agreements were made between Liberia and the Republic of Korea to begin prospecting for minable deposits of bauxite, manganese, and uranium. At the same time, China pledged to look into the possibility of opening a cement plant. Liberia's cement production rose slightly over that of 1985 and had the capacity for even greater production, but was inhibited by the lack of foreign exchange.

MINERAL FUELS

The Amoco Liberian Oil Co. obtained negative results from the three offshore wells drilled in 1985. A fourth well was scheduled to be drilled by yearend 1986. Exploration costs for the project totaled over $30 million by yearend.

Henry Resources Corp. completed preliminary surveys of its onshore concession east of Monrovia. Two wells were scheduled to be drilled in June on the coast near the cities of Marshall and Buchanan, which lie 50 and 100 kilometers southeast of Monrovia, respectively. The onshore exploration was deemed necessary owing to Amoco's lack of offshore success.

At the beginning of the year, the Government of Liberia put many of its public corporations, including the Liberian Petro-

leum Refining Co. (LPRC), up for privatization. In July, the Government reached an agreement with Gadco Petrol International and C.S. International, consortiums of U.S. based investors, to rehabilitate facilities at LPRC and to import and refine crude oil at the refinery complex in Monrovia. This agreement raised strong objections from the International Bank for Reconstruction and Development (World Bank), which felt the agreement was not in the best economic interests of Liberia. There was a reported threat of closure of the World Bank offices in Monrovia if the agreement was maintained. In September, the agreement was canceled amid continuing controversy about the state of the LPRC. The Government imposed a $1.50 tax on each gallon of gasoline sold since 1983, to be collected by the LPRC and given to the Government as revenue. The tax had been collected, but not returned to the Government. The LPRC claimed the money was being used to cover Government use of gasoline and other products, but such losses were never scheduled as part of the budget.[2]

[1]Physical scientists, Division of International Minerals.
[2]West Africa (London). Petroleum Refining Company Controversy. Nov. 10, 1986, p. 2384.

The Mineral Industry of Libya

By Thomas O. Glover[1]

Libya's economic situation continued to decline rapidly during the year. Crude oil production, accounting for 99% of Libya's foreign exchange earnings, declined slightly and crude oil prices and sales fell dramatically. Another factor adversely affecting the Libyan economy during the year was the United States' imposition of trade, financial, and other sanctions against the country. The sanctions halted sales of approximately 30% of Libyan crude oil production to U.S. companies having equity in Libyan oil.

Libya was Africa's second largest oil producer after Nigeria and has reserves of over 21 billion barrels, most of which are high-quality light crudes. At present rates of production, reserves are in excess of 50 years.

Owing to declining oil revenues, Libya's gross domestic product was $18.6 billion[2] in 1986 compared with an estimated $26 billion in 1985. Per capita income decreased almost 30% between 1985 and 1986, from $7,180 to $5,136. Libya's monetary reserves remained stable near yearend, even with the decline in oil revenues. The stability was maintained because of drastically decreased imports.

The short-term economic outlook for Libya was depressed, and the long-term outlook was not much better. Even though recent oil discoveries were made, much of the increased crude oil production was bartered to other countries, which were pressing Libya for back indebtedness. Libya's response to foreign exchange losses, owing to the slump in oil exports, was to increase productivity in the agricultural and industrial sectors. The agricultural sector and the cement industry, however, were cited for inefficiency and poor production for the year.

The great manmade river (GMR) project, a 600-kilometer twin pipeline extending from artesian fresh water wells in the southwestern desert to northern Libyan agricultural centers near Tripoli, made progress during the year. The cost of the five-phase GMR project was originally estimated to be $25 billion. The first phase, costing $3.3 billion, was under construction, including the building of a residential complex for 1,000 workers, who will produce water pipe at Brega and Sarir, plus a concrete pipe factory at each site that would produce 250,000 pieces of concrete pipe in 4 years. The first phase also included geotechnical investigations and the drilling of 270 artesian wells in the Sarir and Tagerbo waterfields. Contracts for the second phase are to be awarded early in 1988, according to Libyan officials.

PRODUCTION AND TRADE

Libya's principal sources of foreign exchange continued to be its exports of crude oil and petrochemical products. Production of crude oil was estimated at 1.031 million barrels per day (bbl/d). Foreign support and technologies were in heavy demand for Libya's exploration and production of crude oil. Crude oil production, set at 0.99 million bbl/d in 1984 by the Organization of Petroleum Exporting Countries (OPEC), remained the same in 1986.

The quotas applicable to the various producing companies were approximately as follows, in barrels per day:[3]

Waha (formerly Oasis Oil Co. of Libya Inc.) in partnership with the Libya National Oil Co. (LNOC)	360,000
Arabian Gulf Exploration Co. (AGECO), Umm al-Jawab. (LNOC for crudes from the Akmna and Sarir Fields)	250,000
Azienda Generali Italiana Petroli S.p.A. (AGIP) with LNOC	120,000
Zueitina (formerly Occidental Petroleum Corp.) with LNOC	120,000
Sirte Oil Co. (formerly Esso Sirte Oil Co.) with LNOC	80,000
Verba (formerly Mobil Oil Libya Ltd.) with LNOC	50,000
Wintershall	8,000
Aquitaine Group	2,000
Total production	990,000

In April 1986, there was a military exchange between the United States and Libya. After the air raids, existing trade sanctions were extended to ban all U.S. commercial operations in Libya. This led to the departure, in July 1986, of five U.S. oil companies that lifted approximately one-third of all Libyan crude oil. Despite U.S. calls for economic sanctions against Libya, the European Community's imports of Libyan oil increased by 5.6%.

Trade with Libya has become very difficult for many countries. Over $2 billion in unpaid construction bills were piled up. Libya tried to barter oil for many of the delinquent accounts. The bills grew sharply in 1986 owing to the Government's inability to service them. Libya was demanding an official price for its oil that approached 30% over market price. As a result of this maneuvering, many foreign contractors would not take Libyan oil for payment of bills.

After several months of delay, Libya resumed deliveries of crude oil to Turkey to compensate Turkish contractors that were due approximately $400 million. The contract called for Libya to deliver 3 million tons per year of crude oil over a 10-year period.

Libya and Bulgaria signed a new barter agreement in 1986 for increased shipments of Libyan crude oil in exchange for industrial products. Civil and military debt to the U.S.S.R., Libya's leading centrally planned creditor, exceeded $5 billion. Diplomatic reports have shown that a large portion of the 300,000 bbl/d of oil lifting rights relinquished by the U.S. companies were transferred to the U.S.S.R.

Libya agreed to supply North Yemen with 10,000 bbl/d of crude oil, on concessionary terms, to help meet its domestic demand of 30,000 bbl/d.

Table 1.—Libya: Production of mineral commodities[1]

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
Cement, hydraulic[e] thousand metric tons	4,000	5,000	6,000	6,500	6,500
Gas, natural:[e]					
Gross million cubic feet	425,000	258,000	295,000	292,000	292,000
Marketed[3] do	115,000	150,000	150,000	150,000	150,000
Gypsum[e] thousand metric tons	175	180	180	180	180
Iron and steel: Steel, crude[e] metric tons	10,000	10,000	10,000	10,000	10,000
Lime[e] thousand metric tons	225	260	260	260	260
Nitrogen: N content of ammonia do	244	r445	494	411	411
Petroleum:					
Crude thousand 42-gallon barrels	418,000	401,500	390,915	386,535	376,315
Refinery products:[e]					
Naphtha do	4,000	4,000	4,000	6,000	6,000
Gasoline do	4,000	5,000	5,000	7,000	7,000
Kerosene and jet fuel do	5,000	7,000	7,000	11,000	11,000
Distillate fuel oil do	8,000	10,000	10,000	15,000	15,000
Residual fuel oil do	12,500	10,000	10,000	15,000	15,000
Other do	500	600	600	1,000	1,000
Refinery fuel and losses do	1,000	900	900	2,000	2,000
Total do	35,000	37,500	37,500	57,000	57,000
Salt[e] thousand metric tons	10	12	12	12	12
Sulfur, byproduct of petroleum and natural gas[e] do	12	14	14	14	14

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

[1]Table includes data available through May 6, 1987.

[2]In addition to the commodities listed, a variety of construction materials (sand and gravel, crushed stone, brick, and tile) is produced, but available information is inadequate to make reliable estimates of output levels. Natural gas liquids are also produced but are blended with crude petroleum and are reported as part of that total.

[3]Excludes gas reinjected into reservoirs.

COMMODITY REVIEW

METALS

Aluminum.—The Zuwarah aluminum metal plant near Tripoli, initiated in mid-1985 and put on hold status later in 1985, remained on hold owing to Libya's poor economic condition. The proposed $2 billion plant, if constructed, would produce 120,000 tons per year of aluminum metal. The plant would be Government owned and operated.

Iron and Steel.—Libya's largest industrial project, the $6 billion iron and steel complex at Misurata, was near completion in 1986. It was designed to produce 1.3 million tons per year of molten steel. The project was several years behind schedule and faced a difficult future in selling the products from the mill. Project officials reported the project 90% complete in September 1986 and announced that production should commence in 1987. The 16,000-acre plant was located on a coastal site east of Misurata City.

First production will be 60,000 to 70,000 tons per year of bars and rods, amounting to 15% of the unit's design capacity. Low initial production was also expected for other Misurata products. In the latter part of 1987, production was scheduled for angles and flats totaling 30,000 tons per year, one-quarter of design capacity. In 1988, production was scheduled for cold-rolled products totaling 40,000 tons per year, which is 30% of design capacity. Also in 1988, production was scheduled for hot-rolled products totaling 150,000 tons per year, or 37% of design capacity. The plant's commissioning was approximately 3 years late, and was at a time when the demand for its output was falling.

Misurata's problems were predicted by project officials not to end when production begins. Training of personnel to operate the complex was a year behind schedule. A technical staff of 6,000 was projected, but by yearend 1986, only 700 had completed training.

INDUSTRIAL MINERALS

Cement.—The Benghazi-based Libyan Cement Co. was scheduled to sell 3 million tons of cement for making prestressed concrete pipe for the gigantic GMR water project. The factories for making the pipe were to be located at Brega and Sarir. The prestressed concrete pipe was to range from 3.6 centimeters to 4.0 meters in diameter, and in thickness from 20 to 30 centimeters; the sections were to be 7.5 meters long. The Republic of Korea's Dong Ah Construction Industrial Co. ordered 3 million tons of cement to cover a 4-year period.

Gypsum.—Flotech A/S of Denmark was working on an engineering and consulting contract for Libya, on a 200,000- to 300,000-ton-per-year gypsum plant to be located near Tripoli. Cost of the plant by completion date could exceed $50 million. Gypsum will be mined about 70 miles from the plant. Natural gas will be utilized by the plant for energy needs.

MINERAL FUELS

Natural Gas.—Libya produced 4.7 billion cubic meters of natural gas during the year, from a reserve estimate of 601 billion cubic meters. Libya's abundance of natural gas was used for domestic purposes rather than flaring. Domestic usage included petrochemical, power, desalinization, and liquefied natural gas plants. The U.S.S.R. agreed to lay a 105-kilometer natural gas line between Marsa al-Brega and Zuetina. Another gas line, between Marsa al-Brega and Misurata, also built by the U.S.S.R., was to be operational early in 1987.

Petroleum.—*Exploration.*—Libya and Malta have cleared the way for exploration in the disputed area of the Mediterranean Sea between the two countries. Both countries signed the agreement on the location of the demarcation line proposed in 1985 by the International Court of Justice.

Braspetro, the international subsidiary of Brazil's State-owned Petróleo Brasileiro S.A., completed a vast exploration program in block NC-58 in the Murzub Basin, including 8,000 kilometers of seismic surveys and the drilling of six wells. The work showed that the area lacked commercial deposits in the structures tested.

Libya National Oil Corp. (LNOC) announced two discoveries of oil and natural gas in mid-January 1986. The first, a natural gas discovery, was at Aridah in the Sirte Basin. The second find was oil in the Ghadamis Basin in western Libya.

Production.—Crude oil production from Libyan oilfields averaged 1,031,000 bbl/d in 1986, compared with 1,059,000 bbl/d in 1985. This decrease was due in part to the pullout of five U.S. oil companies holding concessions in Libya during the year. The companies were told to leave Libya by June 30, 1986, by the U.S. Government.

The first drilling and loading platform at Libya's offshore Bouri Oilfield was operational in September 1986. The 24,640-ton platform supported two drilling rigs that

were scheduled to drill 30 oil wells 120 kilometers northwest of Tripoli.

A second platform was scheduled for delivery by mid-1987. The platforms, costing $250 million, were manufactured and installed by Bellei Industrie-Meccaniche and Micoperi, both of Italy.

The Bouri Field, located 120 kilometers offshore near the demarcation line with Tunisia, was located in block NC41-B in approximately 140 meters of water. The field was 33 kilometers long and 10 kilometers wide. Production from the field was split between LNOC (81%) and Azienda Generali Italiana Petroli S.p.A. (19%), operators of the field. Development of the field was estimated to cost $2 billion. Production, slated to commence in late 1987, was estimated to be 30,000 to 50,000 bbl/d initially, with an ultimate capacity of 150,000 bbl/d. A new port at Sabrata, costing $150 million, was to be constructed to receive the crude oil from Bouri. Recoverable oil reserves for Bouri Field were calculated to be 500 million barrels.

Refining.—Libya's three refineries had a combined average throughput of 329,400 bbl/d. Catalytic reforming capability was 14,582 bbl/d.

A Libyan state-owned investment bank acquired a majority holding in the Italian refining and marketing company, Tamoil Italiana S.p.A. Tamoil owned a 100,000-bbl/d refinery at Cremona, Italy. Libyan Foreign Investment Co. controlled 70% of Tamoil; the other 30% was owned by two other groups.

Libya negotiated a contract, valued at $40 million, with the Yugoslav firm of Hemijska Industrija Pancevo to run its Ras Lanuf Oil and Gas Processing Co. (Rasco) ethylene complex, scheduled to be commissioned in early 1987. The 2-year contract included the training of a Libyan staff. Rasco was to use outside sources of ethylene during the commissioning period. After startup, the plant would use its own ethylene produced from local naphtha feedstock. Almost all the ethylene produced by the new Ras Lanuf plant will be exported until the downstream units of phase 2 are ready to use it as a feedstock.

A Libyan-Italian venture set up a new company in January 1986 that supplied Italy with one-half of its methanol imports. The new company, Chempetrol, supplied Italian buyers with approximately 200,000 tons of methanol. Chempetrol had exclusive agreements to supply methanol from Libya's Marsa al-Brega plant.

Petrocoke.—The Zuwarah petroleum coke plant construction was delayed again in 1986, owing to a hold put on the Zuwarah aluminum plant construction by Libya. There was also a shortage of foreign exchange and poor economic conditions. Part of the petrocoke was to be used to smelt aluminum at the Zuwarah plant.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Libyan dinars (LD) to U.S. dollars at the rate of LD0.31594=US$1.00.

[3]Middle East Economic Survey (Nicosia, Cyprus). V. 29, No. 48, Sept. 8, 1986, p. A3.

The Mineral Industry of Madagascar

By Kevin Connor[1]

The Government of Madagascar continued economic reform measures throughout the year, based on the country's investment code of 1985, Public Law No. 86-153. Passage of the 1985 code was intended to generate a larger role for the private sector in the economic development of the country, and opportunities for private investment were opened in many sectors, including hydroelectric generation and telecommunications. International trade was expected to steadily increase during the late 1980's with the relaxation of import restrictions and a simplification of import-export procedures. Public Law 86-153 offered both foreign and local investors rights to repatriation of business profits and fair compensation in the event of expropriation. Private investors could operate alone in most areas of the economy, except for the following restricted sectors: banking and insurance; production and distribution of energy; water supply; shipbuilding; mineral exploration, exploitation, and transportation of hydrocarbons; and other mining activities.

In these restricted sectors, private concerns were encouraged to make project and investment proposals to the Government. Proposals in the restricted sectors were to be evaluated on a case-by-case basis with the Government making a final determination on operating rights. The Government reserved the right to retain exclusive control in a restricted sector; enter into a joint venture with a private firm; or assign sole operating rights to the private investor. A number of foreign investors were encouraged by the new code, and in early 1986 QIT-Fer et Titane Inc. (QIT) of Montreal, Canada, signed a joint venture agreement with the Government of Madagascar for development of titanium-bearing beach sands along the island's southeast coastline.

PRODUCTION AND TRADE

The most pronounced change in Madagascar's mineral production and trade sector was the approximate trebling of mica production and doubling of mica exports. However, the industry remained small by world standards, and overall, the mineral sector remained stagnant. Total value of exports of chromite ore, graphite, and mica was estimated at slightly less than $12 million,[2] with graphite receipts leading the way, accounting for over one-half of this figure. Chromite receipts was a close second, while the mica industry was a distant third, or possibly fourth, depending on the outcome of the island's international gem and semigem stone trade for 1986, which was unreported at yearend.

Table 1.—Madagascar: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Bastnasite[e] ____ kilograms	23,000	25,000	25,000	[3]9,000	10,000
Beryllium: Beryl in quartz, concentrates, industrial and ornamental	68	NA	46	[e]50	50
Chromium: Chromite concentrate, gross weight	44,223	45,729	59,765	127,415	[3]82,910
Gold, mine output, Au content[e] ____ troy ounces	110	110	130	130	130
INDUSTRIAL MINERALS					
Abrasives, natural: Garnet (industrial only)[e] kilograms	5,000	7,000	10,000	10,000	10,000
Cement, hydraulic[e]	[3]35,921	35,000	35,000	35,000	35,000
Clays: Kaolin[e]	2,511	2,500	2,500	[3]6,367	6,000
Feldspar[e] ____ kilograms	1,800	1,800	1,800	[3]5,195	5,000
Gem and ornamental stones:					
Agate ____ do	[e]20,000	8,450	9,300	8,042	8,000
Amazonite ____ do	700	8,910	6,162	5,519	5,500
Amethyst:					
Gem ____ do	12	15	10	11	10
Geodes ____ do	4,300	[e]4,300	[e]4,300	8,550	9,000
Apatite (ornamental only) ____ do	[e]30	3	3,500	[e]3,500	3,500
Aragonite	1,101	1,226	809	991	1,000
Calcite (ornamental only)	NA	600	1,584	1,160	1,000
Celestine ____ kilograms	27,000	29,644	[e]30,000	29,974	30,000
Citrine, gem ____ do	[e]30	12	46	372	400
Cordierite ____ do	[e]350	27	10	762	800
Garnet: Gem ____ do	60	1,196	2,603	1,201	1,500
Jasper ____ do	17,100	[e]17,000	16,425	16,300	16,000
Labradorite ____ do	9,200	7,847	2,740	14,821	15,000
Quartz:					
Crystal ____ do	NA	5,283	32,467	[e]32,500	32,500
Rose quartz ____ do	[e]58,850	247,943	139,645	[e]10,500	50,000
Hematoid ____ do	NA	1,885	14,964	[e]15,000	15,000
Geodes ____ do	NA	NA	2,970	[e]3,000	3,000
Other ornamental ____ do	[e]3,500	1,200	6,397	[e]6,500	6,500
Smelting ____ do	NA	771,000	1,058,000	1,334,000	1,000,000
Tourmaline:					
Gem ____ do	[e]750	7	2	2	2
Other ornamental ____ do	NA	5,231	26,558	1,100	NA
Other gem and ornamental[e]	100	125	150	200	250
Graphite, all grades	15,210	13,557	13,973	14,000	[3]16,187
Mica, phlogopite:					
Block	NA	28	26	NA	NA
Splittings and sheet	NA	72	71	NA	NA
Scrap	NA	619	623	NA	NA
Total	1,300	719	720	589	[3]1,594
Quartz, piezoelectric ____ kilograms	55	51	145	[e]150	150
Salt, marine[e]	30,000	30,000	30,000	30,000	30,000
Stone:					
Calcite, industrial[e]	2,000	2,000	2,000	2,000	2,000
Marble:					
Cipoline	13	[r e]100	113	35	110
Other[e]	1,500	2,000	2,500	3,000	3,000
MINERAL FUELS AND RELATED MATERIALS					
Petroleum refinery products:					
Gasoline ____ thousand 42-gallon barrels	466	242	87	454	450
Kerosene and jet fuel ____ do	293	175	49	304	300
Distillate fuel oil ____ do	734	734	129	598	600
Residual fuel oil ____ do	1,026	1,026	142	729	730
Other ____ do	27	13	2	30	30
Total ____ do	2,546	2,190	409	2,115	2,110

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

[1]Table includes data available through July 25, 1987.

[2]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, sand and gravel, and stone) presumably are produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

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

(Metric tons unless otherwise specified)

Commodity	1983	1984	Destinations, 1984	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, semimanufactures value, thousands	$1	--		
Chromium: Ore and concentrate	34,237	26,824	--	East Germany 12,135; Netherlands 10,399.
Copper: Metal including alloys, semimanufactures	--	5	--	All for ship stores.
Iron and steel: Metal, semimanufactures:				
Bars, rods, angles, shapes, sections	1	1	--	All to France.
Universals, plates, sheets	177	189	--	Reunion 107; Belgium-Luxembourg 27; West Germany 25.
Tubes, pipes, fittings	70	2	--	All to Austria.
Lead: Oxides	2	--		
Tungsten: Metal including alloys, all forms value, thousands	--	$5	--	All for ship stores.
Zinc: Metal including alloys, semimanufactures do	--	$1	--	All to Switzerland.
Other: Ores and concentrates	29,774	--		
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc value, thousands	$3	$8	--	All to West Germany.
Artificial: Corundum	--	2	--	All for ship stores.
Grinding and polishing wheels and stones value, thousands	--	$1	--	All to Reunion.
Cement	45	--		
Clays, crude	--	486	--	All to West Germany.
Fertilizer materials: Manufactured, nitrogenous	8	--		
Graphite, natural	10,656	13,180	3,504	United Kingdom 6,181; France 759.
Lime	45	127	--	United Kingdom 63; France 23; Mauritius 22.
Mica:				
Crude including splittings and waste	723	523	55	Belgium-Luxembourg 250; Poland 100.
Worked including agglomerated splittings	1	2	--	France 1; West Germany 1.
Phosphates, crude	8	--		
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$686	$643	$1	West Germany $284; Japan $211; France $66.
Synthetic do	$7	--		
Salt and brine	2,478	8,612	--	Comoros 2,391; Reunion 1,325; ship stores 4,896.
Sodium compounds, n.e.s.: Carbonate, manufactured	164	52	--	United Kingdom 29; France 10; Italy 10.
Stone, sand and gravel:				
Dimension stone, worked	14	--		
Quartz and quartzite	1,368	--		
Sand other than metal-bearing	--	1,348	--	All to Japan.
Sulfur: Sulfuric acid	12	49	--	United Kingdom 26; France 8; Mauritius 8.
Other: Crude	179	385	--	All to Japan.
MINERAL FUELS AND RELATED MATERIALS				
Coal: All grades including briquets	--	69,689	--	Do.
Petroleum:				
Crude 42-gallon barrels	290,743	--		
Refinery products:				
Liquefied petroleum gas do	12	--		
Gasoline, motor do	7,251	9,444	--	Mainly for bunkers.
Kerosene and jet fuel do	12,547	11,160	--	France 2,480; bunkers 6,084.
Distillate fuel oil do	121,009	49,721	--	All for bunkers.
Lubricants do	7,007	728	--	Mainly for bunkers.
Residual fuel oil do	466,706	35,385	--	Do.

[1]Table prepared by Virginia A. Woodson.

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

(Metric tons unless otherwise specified)

Commodity	1983	1984[p]	Sources, 1984	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals, value, thousands	$1	$4	--	All from France.
Aluminum:				
Ore and concentrate	200	197	--	All from China.
Oxides and hydroxides	11	10	--	All from France.
Metal including alloys, semimanufactures	326	187	--	France 183; West Germany 3.
Chromium: Oxides and hydroxides	--	5	--	All from France.
Copper:				
Ore and concentrate	28	--		
Metal including alloys:				
Scrap	3	--		
Unwrought	3	--		
Semimanufactures	48	66	NA	France 62; China 2.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	12	--		
Metal:				
Scrap	7	7	--	All from France.
Pig iron, cast iron, related materials	25	--		
Ferroalloys, ferromanganese	32	60	--	France 53; West Germany 7.
Semimanufactures:				
Bars, rods, angles, shapes, sections	11,160	7,610	15	France 6,015; U.S.S.R. 518.
Universals, plates, sheets	8,763	11,966	159	France 10,438; West Germany 455.
Hoop and strip	162	163	--	France 162.
Rails and accessories	9,310	403	--	France 227; U.S.S.R. 175.
Wire	2,467	2,267	12	France 2,134; Mauritius 78.
Tubes, pipes, fittings	2,517	5,434	446	France 4,661; U.S.S.R. 172.
Lead:				
Oxides	21	12	--	All from France.
Metal including alloys:				
Scrap	1	--		
Unwrought	126	230	--	All from France.
Semimanufactures	6	15	--	France 3; Switzerland 2.
Magnesium: Metal including alloys, semimanufactures, value, thousands	--	$2	--	All from Japan.
Manganese:				
Ore and concentrate: Metallurgical-grade	227	--		
Oxides	170	76	--	West Germany 75; France 1.
Mercury, value, thousands	$2	$1	--	All from France.
Molybdenum: Metal including alloys, all forms	--	1	--	All from Switzerland.
Nickel: Metal including alloys, semimanufactures, value, thousands	$4	$1	--	All from Ireland.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, do.	--	$1	--	All from France.
Silver: Metal including alloys, unwrought and partly wrought, do.	$9	$5	--	Do.
Tin: Metal including alloys, semimanufactures	9	4	--	Do.
Tungsten: Metal including alloys, all forms	NA	3	--	Mainly from France.
Zinc:				
Oxides	6	--		
Metal including alloys, semimanufactures	295	98	--	West Germany 90; France 8.
Other:				
Oxides and hydroxides	270	292	--	All from France.
Base metals including alloys, all forms	13	9	--	Do.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc, value, thousands	$41	$10	--	Do.
Artificial: Corundum, do.	$17	$2	--	Do.
Grinding and polishing wheels and stones	42	58	NA	France 42; Hong Kong 13.
Asbestos, crude	--	70	NA	NA.
Barite and witherite, value, thousands	--	$2	--	All from Japan.
Boron materials:				
Crude natural borates	--	82	--	France 80; Norway 2.
Oxides and acids, value, thousands	--	$3	--	All from France.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1983	1984[p]	Sources, 1984	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Cement	52,448	44,058	2,345	Mozambique 15,652; China 11,086; U.S.S.R. 6,512.
Clays, crude	230	1,071	13	Netherlands 914; France 93.
Diatomite and other infusorial earth	--	800	--	All from Netherlands.
Fertilizer materials: Manufactured:				
Ammonia	6	15	--	All from France.
Nitrogenous	2,565	7,050	--	France 6,685; Belgium-Luxembourg 320.
Phosphatic	1,028	2,429	--	France 1,455; Belgium-Luxembourg 784.
Potassic	8,758	5,742	1,098	Belgium-Luxembourg 2,394; France 2,128.
Unspecified and mixed	3,660	10,288	--	France 5,439; Norway 4,800.
Graphite, natural	--	4	--	All from France.
Gypsum and plaster	5,180	2,002	--	France 2,001; Austria 1.
Lime	766	396	--	France 315; Belgium-Luxembourg 60.
Magnesite, all forms	3	44	--	All from France.
Mica:				
Crude including splittings and waste	--	2	--	Do.
Worked including agglomerated splittings value, thousands	$12	--		
Pigments, mineral: Iron oxides and hydroxides, processed	33	--		
Precious and semiprecious stones other than diamond: Natural value, thousands	$1	$2	$2	
Salt and brine	10	256	--	Netherlands 150; West Germany 100.
Sodium compounds, n.e.s.:				
Carbonate, natural and manufactured	591	813	--	Kenya 792; Netherlands 21.
Sulfate, manufactured	2,501	2,166	--	France 1,071; Netherlands 560.
Stone, sand and gravel:				
Dimension stone, worked	1	9	--	All from France.
Gravel and crushed rock	--	21	--	Do.
Quartz and quartzite	18	--		
Sand other than metal-bearing	36	1	--	NA.
Sulfur:				
Elemental:				
Crude including native and by-product	--	36	--	All from Belgium-Luxembourg.
Colloidal, precipitated, sublimed	5	--		
Sulfuric acid	162	211	1	France 175.
Talc, steatite, soapstone, pyrophyllite	1,000	17	--	All from Canada.
Other: Crude	95	462	94	Belgium-Luxembourg 368.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	250	26	--	Italy 25.
Carbon black	28	71	--	All from West Germany.
Coal:				
Briquets of anthracite and bituminous coal	27,508	--		
Lignite including briquets	61	7,318	NA	NA.
Coke and semicoke value, thousands	$27	$1	--	All from France.
Petroleum:				
Crude thousand 42-gallon barrels	2,749	718	--	Mainly from Saudi Arabia.
Refinery products:				
Liquefied petroleum gas do	7	31	--	Bahrain 12; Saudi Arabia 10.
Gasoline, motor do	138	1,226	--	Qatar 827; Bahrain 178.
Mineral jelly and wax do	42	13	--	China 6; West Germany 5.
Kerosene and jet fuel do	126	323	1	Bahrain 153; Singapore 85.
Distillate fuel oil do	205	682	11	Bahrain 217; Kuwait 182; Yemen (Aden) 126.
Lubricants do	36	116	2	Kenya 58; Saudi Arabia 27; Spain 25.
Residual fuel oil do	2	68	--	All from Singapore.
Bitumen and other residues do	4	12	NA	Mainly from China.

[p]Preliminary. NA Not available.
[1]Table prepared by Virginia A. Woodson.

COMMODITY REVIEW

METALS

Titanium.—Madagascar Minerals, a joint venture company owned 51% by the Government of Madagascar and 49% by QIT, calculated that the perimeter and depth of the titanium-bearing ilmenite ores within their southeastern mineral prospect were substantially larger than originally estimated in 1985. If upon further delineation of the ore reserves the increased estimates are proven correct, the size of the proposed commercial operation could be doubled. The capacity of the operation was initially proposed to be 300,000 tons of 60% titanium dioxide per year. Exploration of the beach sands was being managed by Watts, Griffis and McQuat Ltd. of Toronto, Canada. A pilot plant for preparing wet gravity concentrates of representative sand samples was planned for erection in early 1987. The bulk sample concentrates from the pilot plant were then to be shipped overseas for further downstream pilot plant processing. Other engineering evaluations for mine infrastructure and product load-out facilities were under way. The majority of the ilmenite concentrate was expected to be shipped to QIT's smelter at Sorel, Quebec, Canada where it would be converted to 90% titanium dioxide, suitable for chlorination. The high grade of the ilmenite would also make possible direct sales and use in certain pigment manufacturing operations. Therefore, a small portion of the mine output was expected to be sold directly to the pigment industry.

Other Metals.—Contract negotiations were well under way at yearend for funding by the U.S. Trade and Development Program (USTDP) for further feasibility studies regarding a proposed ferrochrome plant to be built at Moramanga. The expected funding level of the project was $300,000. Also at yearend, a project proposal for platinum exploration was presented to the USTDP by Madagascar's Office Militaire National pour les Industries Strategiques (OMNIS). The platinum proposal would involve exploration in the Andriamena area where the country's chromite mines were located. Interest in this project was also expressed by the French agency, Bureau de Recherches Géologiques et Minières (BRGM). OMNIS was hopeful of eventually forming a joint venture operation with a private enterprise firm to develop any commercial platinum deposits discovered. Plans continued throughout the year for gold dredging in Madagascar by the BRGM. The French agency was conducting exploration in both the Ambatolampy-Andravoravo and Ilea-Ambositra regions. BRGM developed a lightweight dredge specially designed for use in shallow rivers.

INDUSTRIAL MINERALS

Madagascar continued to be an important, although small, producer of graphite. This was due to the high quality of its crystalline flake product. The majority of production was flake in 1986, with the remainder classified as fine flake. There were five producers of graphite in 1986: Société Minière de la Grande Ile (SMGI), Etablissements Gallois, Etablissements R. Izouard, Société Louys, and Etablissements Rostaing. The largest producer was Etablissements Gallois, a private French operation, which produced approximately one-half of the country's graphite from the Gallois Mine at Antsirakambo. The second largest producer was SMGI, a Swedish-owned mining company, which was responsible for about one quarter of the annual production from its mining operations at Ambatomitama. Graphite mining in Madagascar was hindered during the year by poor weather conditions and a continued lack of spare parts for equipment.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Madagascar francs (FMG) to U.S. dollars at the rate of FMG675=US$1.00.

The Mineral Industry of Malaysia

By John C. Wu[1]

The mineral industry of Malaysia expanded considerably because of increased output in the oil and gas industry. However, the tin industry contracted further, and output was at its lowest level since 1947. Mining of other minerals such as copper and iron ore either decreased or remained unchanged because of the low metal prices on the world market. Metal production of steel and tin was at a lower level owing to a weak domestic demand for primary steel and oversupply of tin in the world market. To increase export earnings and Government revenues from oil and gas, the output of crude oil and gas was raised to a new record-high level of 503,000 barrels per day and 1.7 billion cubic feet per day, respectively, in 1986. Production of liquefied natural gas (LNG) reached full capacity at 6 million tons. The existing five production-sharing contractors continued their oil and gas exploration offshore Sabah, Sarawak, and Terengganu. According to Petroleum National Bhd. (Petronas), the state-owned oil and gas company, oil and natural gas reserves as of January 1986 were estimated at 3.1 billion barrels and 52.7 trillion cubic feet, respectively.

The tin mining industry suffered again in 1986 when the open market tin price dropped to $5.40 per kilogram in August from $7.49 per kilogram in February on the Kuala Lumpur Tin Market (KLTM). KLTM was reopened in February as the only physical tin trading market in the world; export control by the International Tin Council officially expired in April. Despite the low prices of tin, other major tin producers, including Indonesia and Thailand, reportedly were selling tin between $5.40 and $6.00 per kilogram during 1986.

As a result of low tin prices, the number of operating tin mines dropped to 174 in July from 235 in January, and the number of workers employed by the tin industry was reduced to 10,500 from 16,000 during the same period. To rescue the tin industry from further deterioration, the Government of Malaysia approved a 1-year, $26.8 million soft loan program and a 15% reduction in electricity cost for tin miners in July. By yearend, about 150 financially troubled tin mining companies reportedly were in the process of applying for a soft loan.

In late 1986, the members of the Association of Tin Producing Countries (ATPC) including Indonesia, Malaysia, and Thailand met in Jakarta to discuss controls of tin production and exports to increase tin prices. A followup meeting of the ATPC reportedly was scheduled to be held in Singapore in January 1987.

In the mineral processing sector, production of hot briquetted iron (HBI) by Sabah Gas Industries Malaysia Sdn. Bhd. (SGIM) on Labuan Island reached full capacity at 60,000 tons per month in April. SGIM's exports of HBI rose significantly owing to increased exports to China and India. Production of iron and steel by Perwaja Terengganu Sdn. Bhd. (PTSB) in Terengganu was disappointing because of high production costs and lack of domestic demand for steel bars. Malaysia brought on-stream its first liquefied petroleum gas (LPG) processing plant in Kerteh, Terengganu. Commission of the LPG plant was part of the first-phase gas utilization project in Peninsular Malaysia. The second-phase gas utilization project to transport gas from offshore Terengganu to west coast Peninsular Malaysia and Singapore reportedly was postponed 1 to 2 years. However, a $29 million management-consulting contract was awarded to a consort-

ium of a Canadian company and a local company in December.

According to Malaysia's Ministry of Finance, the output of the mining and quarrying industry grew 11.5% to an estimated $2.5 billion[2] in 1978 constant dollars compared with $2.3 billion (revised) in 1985. The mining and quarrying industry contributed 10% to Malaysia's gross domestic product (GDP), which was estimated at $20.3 billion in 1978 constant dollars.[3]

The increased output of oil and natural gas was the major factor in the overall growth of the mining industry and a significant contributor to the Malaysian GDP. The Malaysian economy, as measured by the change in GDP, was estimated to have grown 0.5% compared with a negative growth rate of 1.5% (revised) in 1985. The country labor force grew to 6.1 million from 5.9 million while the unemployment rate averaged 8.7% compared with 7.6% in 1985. During 1985-86, the tin mining industry was reduced by over 13,000 workers.

In October, the Government of Malaysia announced new investment rules to encourage more foreign investments in Malaysia. Under the new rules, foreign companies were allowed to hold up to 100% equity of a company incorporated in Malaysia if the company exports more than 50% of its production and sells 50% or more of its production to Malaysian companies in the free trade zone. The new rules are effective from October 1986 to December 1990. According to Government officials, the foreign investment rules regarding work permits for expatriates would also be changed to more favorable terms that would allow five expatriate posts at whatever level if a company has $2 million of foreign investment in equity.[4]

PRODUCTION

The total output of the mining industry increased 11.5% from that of 1985 owing entirely to increased output of oil and gas. The output of bauxite increased slightly because of increased exports. The output of copper concentrates decreased slightly from that of 1985 but the output of tin dropped 21% to its lowest level in 39 years.

Malaysia remained the world's largest tin producer. However, the tin industry continued to shrink as more high-cost tin mines were closed and over 5,000 tin miners were laid off. During 1986, tin output averaged 2,400 tons per month compared with 3,400 tons per month before the October tin market crisis in 1985. The low level of tin output was caused by a further decline in tin prices, which ranged from $5.41 per kilogram to $7.49 per kilogram. The average production costs of tin in Malaysia reportedly was estimated at $6.90 per kilogram in 1986.

In the oil and gas industry, the output of crude petroleum was raised to an average of 503,000 barrels per day from an average of 430,000 barrels per day because of the badly needed oil revenues for the country's economic development projects. The output of natural gas also reached a new record-high level owing to increased gas consumption for the manufacture of LNG, LPG, methanol, and nitrogen fertilizer and for electric power generation and other uses.

In the mineral processing sector, metal production of primary steel and tin was at a lower level than that of 1985 owing to weak domestic demand for steel and low tin prices. The output of crude steel and refined tin represented only 50% of the installed capacities in 1986. Production of LNG reportedly was near capacity at 6 million tons. All LNG output was exported to Japan. A new LPG processing plant in Terengganu was completed and went into operation in 1986.

Table 1.—Malaysia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985	1986[p]
METALS					
Aluminum: Bauxite, gross weight thousand tons	589	502	680	492	566
Antimony, mine output, Sb content (Sarawak)	139	136	17	12	e15
Columbium and tantalum concentrate, gross weight	r7	67	r45	80	e75
Cb content of columbium[e]	1	10	7	12	11
Ta content of tantalum[e]	1	7	3	6	5
Copper, mine output, Cu content (Sabah)	30,086	29,048	28,852	30,507	e28,000
Gold, mine output, Au content:					
Malaya troy ounces	5,788	5,792	7,041	7,115	e8,700
Sabah do.	r84,584	r78,543	82,012	78,818	e80,000
Sarawak do.	23	162	474	4,371	e4,500
Total do.	r90,395	r84,497	89,527	90,304	e93,200
Iron and steel:					
Iron ore and concentrate thousand tons	340	114	194	182	208
Steel, crude do.	210	350	350	550	750
Rare-earth metals: Monazite, gross weight[3]	582	1,051	r4,980	5,808	5,959
Silver, mine output, Ag content (Sabah) thousand troy ounces	r521	r485	470	522	455
Tin:					
Mine output, Sn content	52,342	41,367	41,307	36,884	29,135
Metal, smelter	62,836	53,338	46,911	45,500	43,788
Titanium: Ilmenite concentrate, gross weight[3]	101,202	222,722	234,984	247,219	414,941
Tungsten, mine output, W content	43	31	25	20	e25
Zirconium: Zircon concentrate, gross weight[3]	2,147	2,548	7,614	11,652	12,633
INDUSTRIAL MINERALS					
Barite	25,272	21,434	23,421	23,394	17,677
Cement, hydraulic thousand tons	3,123	r3,231	3,469	3,128	3,176
Clays: Kaolin	44,363	57,432	72,472	82,576	85,052
Nitrogen: N content of ammonia	27,800	28,800	38,900	53,400	e55,000
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural (Sarawak): Gross million cubic feet	NA	150,161	398,700	483,224	e620,500
Petroleum:[4]					
Crude thousand 42-gallon barrels	120,450	139,800	163,082	156,950	e183,595
Refinery products:					
Gasoline do.	7,676	7,608	8,288	e8,300	e8,400
Jet fuel do.	2,657	2,618	2,642	e2,650	e2,700
Kerosene do.	2,152	4,079	4,623	e4,600	e5,200
Distillate fuel oil do.	13,173	14,062	14,351	e14,400	e12,600
Residual fuel oil do.	10,374	11,254	11,585	e11,600	e12,800
Other do.	2,595	3,593	3,929	e4,060	e5,200
Total do.	38,627	43,214	45,418	e45,610	e46,900

eEstimated. pPreliminary. rRevised. NA Not available.

[1]All production is from Peninsular Malaysia (Malaya) unless otherwise specified. Table includes data available through July 19, 1987.

[2]In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone), fertilizers, and salt are produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3]Based on export figures.

[4]Includes production from Malaya, Sabah, and Sarawak.

TRADE

Malaysia's merchandise exports dropped to an estimated $13.5 billion from $14.4 billion (revised) in 1985 while imports also declined to an estimated $10.6 billion from $11.0 billion (revised) in 1985. The continued decline in export earnings was caused by a further drop in export prices of Malaysian crude oil during the first half of 1986 despite an overall increase in export volume of crude oil.

Export earnings of crude oil fell 37% to $2 billion in 1986. However, export earnings of electronic components such as semiconductors and integrated circuits rose 27% to $2.2 billion and displaced crude oil as the leading export commodities. Exports of LNG also fell 17% to $731 million. Exports of refined tin dropped sharply to $249 million compared with $697 million in 1985.

Imports of electrical components, ma-

chinery, petroleum products, and transport equipment remained the major imports. The slight decline in overall imports was due to lower prices of petroleum products. Based on two-way trade, Japan and the United States remained the two major trading partners of Malaysia. Malaysia exported $3.0 billion worth of merchandise to Japan and imported $2.2 billion from Japan. The United States was Malaysia's second largest trade partner, importing $1.4 billion of goods while exporting $1.1 billion to Malaysia. The U.S. share of total Malaysian trade was 17.8% compared with 13.9% (revised) in 1985 and 14.8% in 1984. The other important trade partners of Malaysia were the European Economic Community countries and Singapore.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	522,049	362,100	21,000	Japan 315,300; Taiwan 14,800.
Metal including alloys:				
Scrap	6,366	7,115	--	Japan 6,403; Singapore 613.
Unwrought	70	62	--	Netherlands 31; Australia 20.
Semimanufactures	30,796	7,320	188	Singapore 4,429; China 810.
Antimony: Ore and concentrate	44	20	--	All to Japan.
Columbium and tantalum: Ore and concentrate	81	45	--	Singapore 30; Japan 15.
Copper:				
Ore and concentrate	125,886	125,767	--	Japan 125,765.
Matte and speiss including cement copper	24	95	--	Japan 80.
Metal including alloys:				
Scrap	9,685	12,354	57	Japan 3,194; India 2,882; Republic of Korea 2,243.
Unwrought	118	134	--	Thailand 126.
Semimanufactures	2,299	20,947	11	Singapore 20,398.
Gold:				
Waste and sweepings kilograms	222	231	116	Singapore 85; Japan 24.
Metal including alloys, unwrought and partly wrought troy ounces	53,576	26,172	11,752	Hong Kong 10,126; Singapore 2,140.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	16,636	13,134	--	Singapore 12,924.
Metal:				
Scrap	20,179	21,530	21	Singapore 11,200; Thailand 8,750.
Pig iron, cast iron, related materials	4,987	286,396	--	Japan 115,142; Turkey 49,886; Spain 45,884.
Semimanufactures	85,278	74,562	4,964	Singapore 45,208; Hong Kong 6,974.
Lead: Metal including alloys:				
Unwrought	578	624	--	Indonesia 614.
Semimanufactures	379	70	14	Singapore 34; Japan 13.
Mercury 76-pound flasks	290	406	377	Singapore 29.
Nickel: Metal including alloys:				
Scrap	106	107	26	Singapore 58.
Unwrought	473	106	45	Philippines 28; Japan 19.
Semimanufactures	145	40	7	Singapore 26.
Platinum-group metals: Metals including alloys, unwrought and partly wrought[2] troy ounces	257	66,391	--	Singapore 66,230.
Silver:				
Waste and sweepings[2]	52	1,026	576	Singapore 416.
Metal including alloys, unwrought and partly wrought troy ounces	307,007	124,391	4,533	Singapore 96,677; Thailand 17,297.
Tin: Metal including alloys:				
Scrap	430	495	--	Singapore 345; United Kingdom 78.
Unwrought	39,688	57,481	630	Netherlands 39,993; Japan 10,041.
Semimanufactures	796	892	341	United Kingdom 398.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Titanium:				
Ore and concentrate	224,152	249,625	--	Japan 200,740; Republic of Korea 21,945; France 15,176.
Oxides	57	32	--	All to Singapore.
Metal including alloys, all forms	16	30	--	Taiwan 26.
Tungsten:				
Ore and concentrate	347	30	20	Netherlands 10.
Metal including alloys, all forms	24	4	--	United Kingdom 2.
Uranium and thorium: Ore and concentrate	1,138	2,215	--	France 1,321; Netherlands 810.
Zinc:				
Oxides	207	64	--	Singapore 38; Japan 18.
Metal including alloys:				
Scrap	661	690	--	Japan 310; Singapore 280.
Unwrought	64	20	--	Taiwan 14.
Semimanufactures	300	248	--	Singapore 147; Indonesia 42; Japan 38.
Zirconium: Ore and concentrate	2,344	2,499	--	Japan 1,227; Taiwan 712; Republic of Korea 540.
Other: Ashes and residues	12,487	11,484	--	Singapore 9,391; Japan 693; West Germany 488.
INDUSTRIAL MINERALS				
Asbestos, crude	1	49	--	All to Singapore.
Barite and witherite	10,250	8,155	--	Mainly to Singapore.
Cement	218,056	298,781	--	Singapore 283,366.
Clays, crude:				
Bentonite	531	543	--	All to Singapore.
Kaolin	38,132	36,756	--	Japan 23,732; Taiwan 7,303; Singapore 4,339.
Unspecified	11,361	195	--	Taiwan 77; Japan 72.
Diamond:				
Gem, not set or strung value, thousands	$6,685	$9,606	$1,767	Belgium-Luxembourg $7,066.
Industrial stones do.	$30	$30	--	All to Thailand.
Diatomite and other infusorial earth	12	29	--	Singapore 26.
Fertilizer materials: Manufactured:				
Ammonia	334	7,747	--	Philippines 7,373.
Nitrogenous	2,808	16,330	--	India 15,748.
Phosphatic	1,283	30	--	Mainly to Singapore.
Potassic	159	95	--	Thailand 64; Singapore 31.
Unspecified and mixed	4,705	3,272	--	Singapore 3,066.
Lime	17,602	9,070	--	Mainly to Singapore.
Mica:				
Crude including splittings and waste	246	862	--	Republic of Korea 664; Japan 157.
Worked including agglomerated splittings kilograms	--	95	--	All to Singapore.
Phosphates, crude	1,902	1,978	--	Hong Kong 1,458; Singapore 465.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$334	$754	$3	Belgium-Luxembourg $560.
Synthetic do.	$1,204	$609	--	Mainly to Japan.
Salt and brine	599	604	--	Indonesia 249; Thailand 189; Philippines 101.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	2,208	32	--	Singapore 24.
Sulfate, manufactured	122	52	--	All to Singapore.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	626,808	417,352	--	Mainly to Singapore.
Worked	263	209	--	Singapore 192.
Dolomite, chiefly refractory-grade	11	272	--	Singapore 200.
Gravel and crushed rock	38,445	99,847	--	Brunei 56,777; Singapore 42,953.
Limestone other than dimension	21,898	31,718	--	Singapore 31,640.
Quartz and quartzite	890	1,844	--	Singapore 1,043; Brunei 800.
Sand other than metal-bearing	1,598,421	1,276,611	--	Singapore 1,161,823.
Sulfur:				
Elemental:				
Crude including native and by-product	18	4	--	All to Singapore.
Colloidal, precipitated, sublimed	13	3	2	Japan 1.
Dioxide	12	16	--	All to Singapore.
Sulfuric acid	11	175	--	Do.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS — Continued				
Talc, steatite, soapstone, pyrophyllite	42	20	--	Mainly to Singapore.
Other:				
Crude	90	256	(3)	Japan 86; Singapore 65; France 45.
Slag and dross, not metal-bearing	9,632	4,519	--	Japan 4,055.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	54,284	14,231	--	Singapore 11,813; Indonesia 1,762.
Gas, natural: Liquefied value, thousands	$757,265	$926,167	--	Mainly to Japan.
Petroleum:				
Crude thousand 42-gallon barrels	127,178	120,917	782	Japan 43,662; Singapore 33,106; Republic of Korea 20,381.
Refinery products:				
Liquefied petroleum gas value, thousands	$2	$22,837	--	Mainly to Japan.
Gasoline thousand 42-gallon barrels	2,216	3,061	--	Japan 1,335; Singapore 1,091; Republic of Korea 354.
Kerosene and jet fuel do.	4,443	3,498	--	Singapore 1,636; India 1,165; Iran 581.
Distillate fuel oil do.	2,035	2,085	--	Thailand 1,124; Singapore 677.
Lubricants do.	3	9	--	Singapore 7.
Residual fuel oil do.	3,767	4,910	--	Singapore 3,349; Japan 1,561.

[1]Table prepared by Audrey D. Wilkes. Import data were not available at the time of publication.
[2]May include other precious metals.
[3]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—Production of bauxite increased slightly again to an average rate of 47,200 tons per month from 41,000 tons per month in 1985. The slight increase in output was a direct result of increased exports. However, exports of bauxite to Japan have been declining in the past 2 years because of the overall cutback in Japan's alumina production. According to a Japanese source, Japan's imports of bauxite from Malaysia decreased by 50% from 423,000 tons in 1985.

Copper.—The output of copper concentrate from the Mamut Mine in Sabah declined slightly to 120,000 tons containing 30,000 tons of copper. All copper concentrate was exported to Japan. Since 1976, the Mamut Mine had delivered to Japan a total of 300,000 tons of copper and 25 tons of gold in concentrates. However, the Overseas Mineral Resources Development Sabah Bhd. (OMRDS), the operator of the mine, reportedly had incurred an accumulated loss of over $47 million by the end of 1986 resulting from the prolonged low copper prices during 1984-86.

The OMRDS Sabah Bhd. was owned 51% by OMRDS of Japan and 49% by the Sabah State Government through the State Economic Development Corp. OMRDS of Japan, in turn, was owned 33% by Mitsubishi Metal Corp., 17.5% by Nippon Mining Co. Ltd., 13% by Sumitomo Metal Mining Co. Ltd., 13% by Mitsui Mining & Smelting Co. Ltd., 10.5% by Dowa Mining Co. Ltd., 8% by Furukawa Co. Ltd., and 5% by Nittetsu Mining Co. Ltd. According to a Japanese industry source, OMRDS of Japan reportedly had decided to reduce its majority interest to 49% in the Mamut Mine and transfer mine management to the Sabah State Government while providing financial relief to the OMRDS Sabah by foregoing a large portion of the $80 million loan to offset the amount of accumulated loss.[5]

Gold.—According to an agreement reached in March between Southern Gold Mining Development Sdn. Bhd. and a joint venture firm of Sons of Gwalia NL and ARI Ltd. of Australia, the interest held by the joint venture firm in the Saburban gold mining project in the Bau mining district of Sarawak was reduced to 30% from 45%. However, the joint venture firm would be paid 5% of the gross sales of all metals and minerals from the mining project as a management fee. Initial diamond drilling at the prop-

erty reportedly was started in mid-1986. The estimated ore reserves at the property were between 2.0 and 3.8 million tons, grading between 3.5 and 5.0 grams of gold per ton.

Iron and Steel.—Production of direct-reduced HBI by SGIM, on Labuan Island off Sabah, reached full capacity at 60,000 tons per month in April after a 45-day shutdown for improving the flow in the shaft furnace during February and March. According to industry sources, production of HBI was increased beyond the design capacity to 70,000 tons per month in late 1986 because of increased exports to China. For 8 months ending July 1986, exports of HBI was estimated at 500,000 tons, of which 25% was exported to India, 22% to Japan, 12% to Spain, 10% each to Indonesia and Turkey, 8% to the Republic of Korea, 5% to the Philippines, and the remainder to China and other countries.[e] Increased output of HBI during the second half of 1986 was for exports principally to China and India.

The initial prices of HBI offered and accepted by SGIM reportedly was slightly higher than scrap prices. However, SGIM planned to raise its prices of HBI once the customers began to realize the benefit of its high metallic iron content, low tramp elements, and high-density HBI. The SGIM's direct-reduced iron (DRI) plant used 50% each of lump ore and pellets. The major suppliers of iron ore to the plant included Cía. Vale do Rio Doce of Brazil, Mount Newman Iron Ore Pty. Ltd. of Australia, and Luossavaara Kiirunavaara AB of Sweden.

Production of DRI by PTSB at Telok Kalong industrial estate in Terengganu was far below its 650,000-ton-per-year designed capacity owing to some technical problems with Nippon Steel Corp.'s direct-reduction process. The DRI plant, shut down between January and May for modification, resumed operations at a rate of 1,400 tons per day or 74% capacity. Most DRI output was converted to steel billet. However, 1,300 tons of DRI was sold to domestic steel producer Amalgamated Steel Mills Sdn. Bhd. and Nippon Steel of Japan.

According to industry sources, steel billets produced by PTSB during the first 15 months of operation between February 1985 and April 1986 totaled 90,000 tons against the designed capacity of 560,000 tons per year and only 44,000 tons was sold to two domestic rerolling mills, Southern Iron and Steel Works Sdn. Bhd. and Antara Steel Mills Bhd. Because of weak domestic demand for steel billets, PTSB reportedly planned to build a bloom caster and a 250,000-ton-per-year medium section mill with an estimated cost of $100 million.

Under new regulations that restricted imports of steel billets, a domestic steel mill was to purchase steel billets from PTSB starting in 1985. As a result of weak domestic demand for steel bars and higher prices of domestic steel billets from PTSB, two Malaysian rerollers, Southern Iron and Steel Works and Antara Steel Mills, reportedly were in a difficult financial position.

Because of the depressed steel market and the excess steel capacity, Malaysia's steel industry was operating at less than 50% of its 1.1-million-ton-per-year capacity. In addition to PTSB, two other major steel producers were Amalgamated Steel Mills having an annual crude steel capacity of 350,000 tons and Malayawata Steel Bhd. having an annual crude steel capacity of 190,000 tons.

Tin.—Malaysia's tin industry continued to shrink as numbers of both operating mines and employees decreased to a record-low level since 1947. The direct impact of the October 1985 tin market crisis on Malaysia's tin industry assessed in early 1986 included closing 213 tin mines, some permanently, and laying off 8,763 tin miners including 5,866 from the gravel pumping sector, 1,852 from dredging, 575 from opencast, and 470 from underground mining and other.

On February 3, KLTM reopened its physical tin trading operation limiting daily volume to between 150 and 200 tons and price fluctuations to no more than $0.19 per kilogram. The average tin price on the KLTM in February was $7.49 per kilogram compared with the 10-month average of $11.37 per kilogram before the tin crisis in 1985. The average monthly price on the KLTM began to deteriorate as many shallow markets in various parts of the world were trading tin at lower prices than on the KLTM. Between March and November, average prices on the KLTM were between $5.40 and $7.05 per kilogram. However, the average market price on the KLTM recovered to $6.51 per kilogram in December because of strong Western European demand and tight supplies when major tin consumers began to restock.

The depressed tin prices on the KLTM during the first 7 months of 1986 caused Malaysia's tin industry to contract further.

Between January and the end of July, the number of operating mines dropped from 235 to 174. During the same period, the number of workers in the tin industry decreased to 10,500 from 16,800. As a result, tin production for the first 7 months dropped 27% to 16,882 tons compared with 23,163 tons for the same period in 1985. The 1986 production was about 29,100 tons. Exports of refined tin dropped about 30% to 40,400 tons from 57,500 tons (revised) in 1985. Japan was the single largest buyer accounting for 32% of total exports in 1986.

Following recommendations of the Malaysian Tin Advisory Council in July, the Government approved a 1-year $26.8 million soft loan program to assist the financially troubled tin miners and agreed to cut the electricity rate by 15% to help tin miners reduce production costs. As a result of this action, an estimated 110 operating mines and over 5,000 workers in the tin industry reportedly were saved. Under the soft loan program, the amount of loan that an eligible tin miner could obtain was based on the difference between the prevailing prices at which the miner's output was sold and the so-called reference price of $6.90 per kilogram. The annual interest rate for the soft loan program was 6%. The tin miners were expected to repay the loan when the market price exceeds the reference price. To apply for a loan, the tin miners needed at least 3 years of mineral reserves, a mine operating on mining titles that would be extended for 3 years, an economically viable mine at the reference price, and membership in a Malaysian mining association. By yearend, 147 tin mining companies reportedly were applying for a loan.[7]

In September, the Government of Malaysia officially admitted that an attempt had been made to corner the world tin market during late 1981 and early 1982. According to Malaysian Government officials, the Government was trying to save the tin industry by purchasing forward contracts through a broker to maintain a high price in the market. However, the London Metal Exchange (LME) changed its rules in February 1982 to allow traders who could not deliver on maturity of their contract to pay a limited penalty for nondelivery. As a result, LME's spot prices dropped sharply and the corner attempt failed. The total losses to the Government of Malaysia reportedly amounted to $253 million.[8]

In an effort to raise the trading volume on the KLTM, the Government of Malaysia approved a new trading agreement in September. The agreement, expected to be signed by the Minister of the Primary Industry in early 1987, would allow Thailand Smelting and Refining Co. Ltd. and Peleburan Timah Indonesia to sell their tin metal on the KLTM. However, the active participation in tin trading by the two neighboring producers on the KLTM was uncertain. By yearend, the LME, which suspended tin trading since October 25, 1985, had not resumed tin trading.

Titanium.—Ilmenite recovered as a byproduct of tin mining rose sharply despite a sharp drop in tin production. In Malaysia, ilmenite was produced principally from the residual treatment plants operated by Malaysia Mining Corp. with a combined annual capacity of 180,000 tons in the States of Perak and Selangor and by Harper Gilfillan Sdn. Bhd. with a combined annual capacity of 80,000 tons in Kuala Lumpur, Selangor; Ipoh, Perak; and Prai, Kedah. Output of ilmenite was exported mainly to Japan, the Republic of Korea, Taiwan, and recently to Western European countries. The ore grade of Malaysian ilmenite was between 50% and 59% titanium dioxide, which was being used as raw material for the manufacture of synthetic rutile.[9]

MINERAL FUELS

Natural Gas.—Natural gas production increased further as gas consumption increased at the LNG and nitrogen fertilizer processing plants in Bintulu, Sarawak; the methanol and DRI plants on Labuan Island; and the gas processing plant in Kerteh, Terengganu. For the first 7 months, natural gas output increased 22% to 306 billion cubic feet from that of the same period in 1985.

Natural gas for the Bintulu complex was produced at Gasfields E11 and F23 in the Central Luconia Province offshore Sarawak. In 1986, a new gasfield called F6A was brought on-stream by Sarawak Shell Bhd. All four natural gas compression trains of the LNG plant reportedly were completed, and output reached full capacity of 6 million tons in the town of Tanjung Kidurong in Bintulu, Sarawak.

Natural gas for the methanol plant and DRI plant on Labuan Island was from the Samarang Oilfield offshore Sabah. The associated gas gathered from the oilfield was being consumed as fuel by SGIM's DRI plant and a small powerplant on the island. SGIM was also using the associated gas to produce methanol at its design capacity of 2,000 tons per day. According to an industry

source, SGIM incurred losses of between $150 and $200 million in 1985 resulting from problems in management, marketing, technology, and supply and demand forecasting.[10]

Natural gas production for the first-phase gas utilization project in Peninsular Malaysia was from Duyong Gasfield offshore Terengganu. The first phase gas utilization project, which cost $1.4 billion, included development of the Duyong Gasfield, a gas processing plant, an export terminal, and a 45-kilometer pipeline gas distribution system on the east coast of Peninsular Malaysia. The natural gas in the Duyong Gasfield was produced by Esso Production Malaysia Inc. (EPMI) and the gas processing and distribution system was operated by Petronas Carigali Sdn. Bhd., a subsidiary of the national oil and gas company, Petronas. The principal consumers of Duyong gas were PTSB, which operated a DRI and steel complex at Telok Kalong, Terengganu; an electric powerplant at Paka, Terengganu; and a LPG plant at Kerteh, Terengganu. In mid-1986, natural gas was piped onshore at a rate of 250 million cubic feet per day.

In December, a $29 million management-consultancy, operations, and maintenance contract was awarded by Petronas Gas Sdn. Bhd. to a consortium of Nova Corp. Malaysia of Canada and Sepakata Setia Perunding Sdn. Bhd. of Malaysia. The contract involved $17 million for designing the pipeline system and $12 million for maintaining and operating the pipeline for the second-phase gas utilization project in Peninsular Malaysia to bring natural gas to the Peninsular's west coast and Johor Bahru and Singapore in the south. An agreement between Malaysia and Singapore on the supply of natural gas to Singapore was being discussed at yearend and the $766 million second-phase gas utilization project reportedly was postponed up to 2 years by the Government of Malaysia.[11]

According to Petronas, as of January 1986, Malaysia's natural gas reserves were estimated at 53 trillion cubic feet, of which 10 trillion cubic feet were associated natural gas and 43 trillion cubic feet were nonassociated natural gas.

Petroleum.—Production of crude petroleum rose to an average of 503,000 barrels per day from 430,000 barrels per day in 1985. According to the Government of Malaysia, the increased output of crude petroleum in 1986 was necessary to ensure that the Government has enough revenue to implement the country's economic development projects during the fifth Malaysia Plan (1986-90). Malaysia was forced to cut its prices of Tapis crude four times from $28.65 per barrel to $13.50 per barrel during the first 4 months of 1986. The price was stabilized at $13.80 per barrel in October. As a result, export earnings from crude petroleum fell 39% to $2.0 billion from $3.3 billion in 1985 despite increased output and export volume of crude petroleum in 1986.

Most of the increase in output of crude petroleum was from EPMI's production-sharing contract areas offshore Terengganu on the east coast of Peninsular Malaysia. For the first half of 1986, the output by EPMI averaged 290,497 barrels per day accounting for 58% of the total output; Sarawak Shell operating offshore Sarawak averaged 136,882 barrels per day accounting for 27%; and Sabah Shell Petroleum Co. operating offshore Sabah averaged 69,621 barrels per day accounting for 14%. During the second half of 1986, combined output of the three producers averaged about 510,000 barrels per day.

After Government approval of a new production-sharing contract that offered foreign contractors faster cost recovery, a higher profit split ratio, and nonbonus payments to the Government in 1985, about 86 foreign and local oil and gas exploration companies reportedly submitted bids for three new offshore exploration blocks opened in 1986. An offshore exploration block, Block SKI northwest of Sarawak, which was opened in 1980, reportedly was awarded to a consortium of Idemitsu Oil Development Co. Ltd. of Japan and Pecten Sarawak Co. of the United States in April. The three new offshore exploration blocks were Block PMI in Malacca Straits off the west coast of Peninsular Malaysia, Block SK9 offshore Sarawak, and Block SB2 offshore Sabah. In December, a letter of intent was signed between Petronas and a Japanese consortium of Taiyo Oil Co. and Japan Petroleum Exploration Co. for oil and gas exploration offshore Terengganu in an area 10 kilometers southwest of the Tapis Oilfield.

According to Petronas, Malaysia's oil reserves were estimated at 3 billion barrels in January 1986. During the year, 23 exploratory well were drilled compared with 38 in 1985.[12]

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[1]Economist, Division of International Minerals.

[2]Where necessary, values have been converted from Malaysia ringgits (M$) to U.S. dollars at the rate of M$2.61 = US$1.00 in 1986.

[3]U.S. Embassy, Kuala Lumpur, Malaysia. Economic Trends Report. State Dep. Airgram A-43, Nov. 24, 1986.
[4]The Star (Penang). Oct. 7, 1986, p. 1.
[5]Japan Metal Journal (Tokyo). V. 17, No. 7, Feb. 16, 1987, p. 3.
[6]Metal Bulletin (London). No. 7091, p. 39.
American Metal Market. V. 94, No. 240, Dec. 11, 1986.
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[8]Metal Bulletin (London). No. 7121, Sept. 23, 1986, p. 6.
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[10]Petroleum Economist (London). V. 53, No. 5, May 1986, p. 178.
[11]Far Eastern Economic Review (Hong Kong). V. 134, No. 36, Sept. 4, 1986, p. 49.
———. V. 134, No. 50, Dec. 11, 1986, p. 64.
[12]The Asian Wall St. Journal. V. 11, No. 66, Dec. 1, 1986, p. 4.

The Mineral Industry of Malta

By William F. Keyes[1]

Malta continued to play only a very minor role in world minerals. The most important mineral extracted was limestone for construction; virtually all minerals and metals used were imported.

The completed first stage of the new Marsaxlokk Bay Port on the south side of the island was underutilized during the year. The economy was still struggling to grow, following the loss of the British naval base in 1979, and unemployment was high. Malta ran a trade surplus in 1986, helped by the low U.S. dollar, to which the Maltese lira is tied.

During the year, the Government announced it would reactivate the former Esso Corp. oil terminal to assure bunkering for ships transiting the Mediterranean. An appropriation of $7.1 million was set aside for the purpose.

Malta signed an agreement with Libya confirming the settlement of a disputed area offshore between the two countries. Terms of the settlement had first been proposed in 1985 by the International Court of Justice. The agreement cleared the way for petroleum exploration in the area.

[1]Supervisory physical scientist, Division of International Minerals.

Table 1.—Malta: Production of mineral commodities[1]

Commodity	1982	1983	1984[r e]	1985[e]	1986[e]
Lime—cubic meters	7,500	5,080	5,474	5,500	5,500
Limestone—thousand cubic meters	402	808	652	700	650
Salt—metric tons	103	150	92	100	100

[e]Estimated. [r]Revised.
[1]Table includes data available through Mar. 28, 1987.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destination, 1985	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Scrap	285	177	--	Italy 124; Netherlands 28; United Kingdom 17.
Semimanufactures value, thousands	$99	$34	(2)	Oman $26; Italy $7.
Copper: Metal including alloys, scrap	512	278	--	West Germany 119; Italy 69; Netherlands 33.
Iron and steel: Metal:				
Scrap	12,744	11,798	--	Italy 9,613; Spain 1,500; Netherlands 368.
Semimanufactures value, thousands	$861	$67	--	Belgium-Luxembourg $57; Czechoslovakia $4; United Kingdom $3.
Lead: Metal including alloys:				
Scrap	335	189	--	West Germany 159; United Kingdom 25; Italy 4.
Semimanufactures value, thousands	--	(2)	--	All to Italy.
Magnesium: Metal including alloys, scrap	1	--		
Nickel: Metal including alloys, scrap	5	3	--	All to United Kingdom.
Silver:				
Waste and sweepings value, thousands	--	$2	--	Do.
Metal including alloys, unwrought and partly wrought do.	--	$2	--	All to Libya.
Zinc: Metal including alloys:				
Scrap	48	68	--	West Germany 36; United Kingdom 32.
Semimanufactures value, thousands	--	$1	--	All to Austria.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Dust and powder of precious and semiprecious stones including diamond do.	--	$18	--	All to Yugoslavia.
Grinding and polishing wheels and stones do.	$695	$144	--	Yugoslavia $46; Australia $38; West Germany $38.
Diamond: Gem, not set or strung do.	$4,044	$764	--	All to Belgium-Luxembourg.
Fertilizer materials: Crude, n.e.s.	253	207	--	All to Italy.
Stone, sand and gravel: Dimension stone, worked value, thousands	$18	$2	$1	United Kingdom $1.
Sulfur: Sulfuric acid do.	--	(2)	--	All to bunkers.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum refinery products:				
Lubricants 42-gallon barrels	3,808	2,862	--	Egypt 1; bunkers 2,861.
Bitumen and bitumen and other residues do.	--	64,230	--	Yugoslavia 49,150; Italy 15,080.

[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides, value, thousands	$21	$4	--	West Germany $2; Netherlands $1.
Metal including alloys:				
Unwrought, do	$27	(2)	--	All from United Kingdom.
Semimanufactures, do	$4,827	$1,032	(2)	Italy $806; United Kingdom $94; Switzerland $37.
Chromium: Oxides and hydroxides, do	$7	(2)	--	All from West Germany.
Copper: Metal including alloys:				
Unwrought	1	1	--	Mainly from West Germany.
Semimanufactures, value, thousands	$1,124	$233	$2	United Kingdom $117; France $54; West Germany $32.
Iron and steel:				
Iron ore and concentrate, pyrite, roasted	7	8	--	All from Yugoslavia.
Metal:				
Scrap	190	--		
Pig iron, cast iron, related materials	10,418	3 7,818	17	Greece 5,865; Spain 1,300; Czechoslovakia 419.
Ferroalloys, unspecified	26	20	--	All from United Kingdom.
Steel, primary forms	3 7,802	6,044	--	United Kingdom 3,265; Spain 1,494; Poland 717.
Semimanufactures, value, thousands	$15,143	$3,573	$5	United Kingdom $809; West Germany $580; Romania $508.
Lead:				
Oxides, do	$84	$19	--	United Kingdom $10; West Germany $9.
Metal including alloys:				
Unwrought	61	191	--	United Kingdom 177; Belgium-Luxembourg 14.
Semimanufactures, value, thousands	$37	$8	--	United Kingdom $5; Belgium-Luxembourg $1; Japan $1.
Nickel: Metal including alloys:				
Unwrought	2	8	--	All from United Kingdom.
Semimanufactures, value, thousands	$998	$45	--	West Germany $22; Ireland $18; United Kingdom $3.
Silver: Metal including alloys, unwrought and partly wrought, do	$413	$42	--	United Kingdom $39; West Germany $3.
Tin: Metal including alloys:				
Unwrought, do	$6	$2	--	All from Italy.
Semimanufactures, do	$1,061	$179	--	United Kingdom $102; Italy $65; France $7.
Titanium: Oxides, do	$439	$108	$25	United Kingdom $52; West Germany $23.
Zinc:				
Oxides, do	$51	$10	--	Netherlands $6; Norway $2; United Kingdom $1.
Blue powder	4	2	--	Mainly from West Germany.
Metal including alloys:				
Unwrought	140	134	--	France 59; Belgium-Luxembourg 28; Italy 28.
Semimanufactures, value, thousands	$54	$10	--	United Kingdom $5; Belgium-Luxembourg $2; Italy $2.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc., do	$44	$20	(2)	Italy $7; Greece $6; United Kingdom $5.
Artificial: Corundum, do	$44	$12	--	Yugoslavia $11; West Germany $1.
Dust and powder of precious and semi-precious stones including diamond, do	$16	$18	--	Switzerland $15; Belgium-Luxembourg $2; Ghana $1.
Grinding and polishing wheels and stones, do	$387	$95	$1	Yugoslavia $29; Italy $26; West Germany $17.
Barite and witherite, do	$2	$2	--	United Kingdom $1.
Cement	208,403	187,255	--	Turkey 102,242; U.S.S.R. 68,109; Romania 9,400.
Chalk, value, thousands	$65	$11	--	United Kingdom $6; France $3; Spain $1.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Clays, crude	369	525	--	United Kingdom 350; Italy 174; West Germany 1.
Cryolite and chiolite value, thousands	$12	$3	--	All from Yugoslavia.
Diamond:				
Gem, not set or strung do	$4,985	$705	--	Belgium-Luxembourg $295; Ghana $265; Republic of South Africa $85.
Industrial stones do	$6	$21	--	Belgium-Luxembourg $11; Ghana $10.
Diatomite and other infusorial earth do	$20	$5	(2)	Italy $3; United Kingdom $1.
Fertilizer materials:				
Crude, n.e.s	9	--		
Manufactured:				
Ammonia value, thousands	$27	$5	--	United Kingdom $2; France $1; Italy $1.
Nitrogenous	1,191	2,113	--	Italy 1,369; West Germany 420; Netherlands 306.
Phosphatic	--	55	--	Belgium-Luxembourg 23; Portugal 18; United Kingdom 14.
Potassic	--	4	--	Mainly from Belgium-Luxembourg.
Unspecified and mixed	1,948	639	2	Belgium-Luxembourg 272; Italy 183; West Germany 123.
Gypsum and plaster value, thousands	$44	$10	(2)	Spain $6; United Kingdom $2; West Germany $1.
Lime	377	--		
Pigments, mineral:				
Natural, crude value, thousands	$6	$1	--	All from United Kingdom.
Iron oxides and hydroxides, processed do	$15	$3	--	West Germany $1; United Kingdom $1.
Precious and semiprecious stones other than diamond: Natural do	$7	$25	--	Ghana $23; Austria $1.
Salt and brine do	$120	$27	--	United Kingdom $22; Tunisia $3; Denmark $1.
Sodium compounds, n.e.s.: Carbonate, manufactured	181	18	--	All from Poland.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked value, thousands	$1,351	$248	(2)	Italy $245; Greece $2.
Worked do	$4	$3	--	Italy $2.
Gravel and crushed rock do	$557	$117	--	Italy $113; United Kingdom $2.
Quartz and quartzite do	$7	$3	--	United Kingdom $2; Belgium-Luxembourg $1.
Sand other than metal-bearing	1,095	1,546	--	United Kingdom 878; Italy 439; Belgium-Luxembourg 181.
Sulfur:				
Elemental:				
Crude including native and by-product	109	60	--	All from Italy.
Colloidal, precipitated, sublimed	127	45	--	Italy 43; United Kingdom 2.
Sulfuric acid value, thousands	$93	$9	--	Netherlands $5; United Kingdom $2.
Talc, steatite, soapstone, pyrophyllite do	$32	$8	$1	Italy $2; United Kingdom $2.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	13	4	1	Netherlands 3.
Carbon: Carbon black value, thousands	$411	$58	$7	Italy $28; West Germany $12.
Coal: Anthracite and bituminous	94,405	212,081	--	Spain 148,541; Italy 63,484; United Kingdom 56.
Peat including briquets and litter	207	292	--	Ireland 138; United Kingdom 90; Netherlands 57.
Petroleum refinery products:				
Mineral jelly and wax[3] 42-gallon barrels	3,321	2,404	NA	West Germany 1,369; Hungary 1,015; United Kingdom 18.
Lubricants[3] do	20,384	23,687	102	Belgium-Luxembourg 8,654; United Kingdom 7,981; Italy 5,322.
Bitumen and other residues do	12	25,379	--	Austria 19,459; Spain 5,919.
Bituminous mixtures value, thousands	$88	$26	--	United Kingdom $15; France $8; Italy $2.

NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.
[3]Totals are incomplete owing to unreported quantities.

The Mineral Industry of Mauritania

By Thomas O. Glover[1]

The basis of the Mauritanian economy in 1986 was the sale of iron ore. This pattern had persisted since the first full year of exporting iron ore in 1964. Sale of iron ore to Western European countries accounted for most of Mauritania's export earnings in 1986. The parastatal mining company, Société Nationale Industrielle et Minière (SNIM), owned and operated all of the iron ore mines in Mauritania beginning in 1971.

Mauritania's economic performance in 1986 was somewhat better than that of 1985 in every aspect including agriculture and livestock, as well as mining. The collapse of iron ore prices and rising energy costs, however, still affected the economy. Mauritania was overcome with an unmanageable burden of external debt and an unsustainable balance of payments and fiscal deficits. Even though economic performance had room for improvement, the real growth rate showed a small increase. The increase was attributed to the introduction of the 1985-88 economic recovery program. In early 1986, an International Monetary Fund (IMF) mission reviewed Mauritania's economic performance. The IMF concluded that the Government had met the targets of the 1985 standby program, and a second standby program was approved in April 1986 for $14.4 million.[2] In addition to the second IMF standby program, the Government received two loans from the Arab Monetary Fund.

Mauritania's first deepwater port, at Nouakchott, opened on September 17, 7 months ahead of schedule. The $150 million port, upon which construction was begun in 1980 and which was financed by China, would enable Mauritania to import all its requirements through the facility. Previously, 35% to 40% of the country's imports had been routed through Senegal. The new port's capacity of 500,000 tons per year was 40% more than Mauritania needed, thus allowing for future export expansion. Three 10,000-ton vessels could berth at the new port at the same time.

PRODUCTION AND TRADE

Production of iron ore in 1986 was approximately the same as the 1985 production of 9.2 million tons. Exports of iron ore decreased by 4.3% compared with those of 1985. Sales of iron ore faltered owing to a slowdown of the economy in Western Europe, where 95% of Mauritania's iron ore was processed. The country exported its iron ore to Belgium-Luxembourg, France, the Federal Republic of Germany, Italy, Japan, Spain, the United Kingdom, and others, with most of it going to Belgium-Luxembourg, France, and Italy. Mauritania exported approximately 66,400 tons of iron ore to the United States valued at approximately $1.16 million. SNIM sold controlling interest in a few of its satellite companies and introduced measures to reduce operational costs and improve management, resulting in a small net profit of $5 million on a turnover of $550 million.

Table 1.—Mauritania: Production of mineral commodities[1]

Commodity[2]	1982	1983	1984	1985[p]	1986[p]
Cement, hydraulic metric tons	(3)	(3)	(3)	(3)	
Gypsum do	[e]5,000	[e]4,000	800	5,470	[4]12,642
Iron and steel:					
Iron ore:					
Gross weight[5] thousand metric tons	8,255	7,385	9,527	9,333	8,929
Iron content[e] do	4,750	4,250	5,754	5,600	5,804
Metal:					
Steel, crude metric tons	6,823	NA	NA	NA	NA
Semimanufactures do	10,391	5,454	898	4,481	[4]2,160

[e]Estimated. [p]Preliminary. NA Not available.
[1]Table includes data available through July 17, 1987.
[2]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, sand and gravel, and stone) and salt presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.
[3]Revised to zero.
[4]Reported figure.
[5]Reported figure for iron ore exports.

COMMODITY REVIEW

METALS

Copper.—Mauritania's Société Arabe Minière D'Inchiri continued its planning to rehabilitate the Akjoujt copper mine. Discussions were held with the original equipment suppliers for rehabilitation under a scaled-down investment plan. When contracts are approved, copper production is expected to recommence in 2 years. Total investment in the new plan for the mining portion was estimated at $32 million. An associated project to remove gold from tailings left at the mine prior to 1978 may be undertaken. The investment needed for this project was approximately $8 million, which should produce approximately 1 ton of gold per year valued at $6 to $8 million. The total investment on both projects was $40 million or approximately one-half the original estimate for rehabilitating the mine.

Iron Ore.—SNIM executed a drastic restructuring program in its iron ore industry, which aimed at cutting costs and raising competitiveness. The $92.2 million program was financed by the International Bank for Reconstruction and Development, the Abu Dhabi Fund for Arab Economic Development, and other Western donors. The company was scheduled to lay off more than 20% of its 6,000 workers in 1987. Production capacity was not expected to be affected because production per worker was raised. Although SNIM made a profit of $5 million in 1986, it was projecting a loss in 1987 owing to lower world prices for iron ore and depreciation of the U.S. dollar. Although Mauritania was a small iron ore exporter compared with major world producers, the industry was vitally important in terms of employment and foreign exchange earnings. It was second in foreign exchange earnings only to the fishing industry. Despite a slack world market, the company planned to expand iron ore exports to 10 million tons in 1987 through aggressive marketing techniques. The company hoped to expand exports by developing new markets in Pakistan, Turkey, and the United States. Mauritania exported 8.9 million tons of iron ore in 1986, while producing approximately 9.2 million tons.

Reserves in the Guelbs deposit were estimated at several billion tons, which should provide production at the present rate of output for 100 years. The Guelbs ore had an iron content of 37%, much lower than the Kedia d'Idjill deposit that had an iron content of 64%. The Guelbs ore production costs were higher owing to the need for enrichment. The Guelbs dry ore enrichment process was designed for a nominal capacity of 6 million tons per year. Output from the dry ore plant, however, totaled only 1.5 million tons in 1986. The upward revision of reserves at Kedia d'Idjill had given the company more time to improve the process at the Guelbs enrichment plant. As a result of finding new reserves at Kedia d'Idjill, phase 2 of the Guelbs project involving the development of the Oum Arwagen Mine and the construction of a 9-million-ton-per-year enrichment plant scheduled for completion by 1990 could be delayed by 5 years. Delays in phase 2 allowed the company more time to service the $350 million debt incurred in the first phase of the Guelbs

project before beginning to incur further debt.

Steel.—A steel-rolling minimill in which SNIM owned the controlling interest was sold during 1986 so that the company could streamline its activities and concentrate on iron ore production. SNIM had about $5 million of equity capital in the rolling mill.

INDUSTRIAL MINERALS

Gypsum.—Gypsum mining north of Nouakchott was the subject of a rehabilitation operation that included a plant for gypsum production in Nouakchott. The plant was erected by Société Arabe des Industries Metalliques. Although all gypsum was produced for local markets in 1986, it was likely that it would be exported to Senegal again after the new Nouakchott deepwater port opened in late 1986.

Phosphate.—Exploration efforts seeking to develop a phosphate deposit near Bofal-Loubboira in the Senegal River area were continued. Research had shown the material to be of good quality and the reserves sufficient. Exploitation, however, was dependent on the existence of a market and on solution of the transportation problem, precluding carry-forward of the project in the near future.

MINERAL FUELS

Texaco Inc., a U.S. firm, postponed its drilling commitments in Offshore Block 8 until 1987. The company, however, continued its seismic work on the concession. Texaco Inc. (Mauritania) was sole owner of the exploration rights to Block 8, having acquired Getty Oil Co.'s 40% stake and Atlantic Richfield Co.'s 60% when the two companies decided to pull out. Block 8 covered 1.8 million acres and extended for 80 miles north from the Senegal River.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Mauritanian ouguiya (UM) to U.S. dollars at the rate of UM74.375=US$1.00.

The Mineral Industry of Mexico

By Orlando Martino[1]

The performance of Mexico's mineral industry continued to be affected by the foreign debt crisis and aggravated by the country's economic recession following 2 years of recovery. In addition to lower silver prices, a particularly unfavorable development in the international economy in 1986 was the collapse in oil prices. The impact was serious because of the large role that petroleum plays in the domestic as well as the external economy. Foreign exchange earnings from oil exports were less than one-half of those obtained in 1985. As a result of lower crude oil output, Mexico slipped from fourth place in 1985, well behind the U.S.S.R., the United States, and Saudi Arabia, to sixth place in 1986, just behind the United Kingdom and China. The United States continued to be the most important market for Mexican crude oil exports as well as refinery products. For the third consecutive year, state-owned Petróleos Mexicanos (PEMEX) reported a small reduction of proven reserves of hydrocarbons, as the amount extracted during 1986 exceeded the addition to reserves from new discoveries.

Contrary to the petroleum results, the value of the production of metallic and industrial minerals increased slightly over that of 1985. Nonetheless, Mexico's ability to exploit its large and diversified mineral potential was also affected by weak foreign markets and the country's economic recession. The domestic demand for these commodities was especially affected by the reduced output from the construction and industrial sectors. Overall, the gross domestic product fell by 3.8% in real terms from that of 1985 to an estimated $127 billion[2] in 1986 prices.

For the sixth consecutive year, Mexico's mining industry was impacted by price inflation of its basic inputs of capital, materials, and services. A study of 149 principal materials used by Mexico's mining industry showed that the prices of these inputs increased 126% over those of 1985 while the 1986 inflation rate was 106%. Financial results have also been impacted by restrained domestic and foreign demand caused by substitution by ceramics, nonmetallic fibers, and plastics in applications traditionally reserved for metals.

Mexico maintained its position as the world's leading miner, refiner, and exporter of silver. In 1986, silver was the country's second most important mineral export commodity after crude oil. In 1985, silver accounted for about 28% of the value of nonfuel mineral exports compared with the 35% share in 1984.[3] Mexico was also a major world producer of antimony, natural graphite, fluorspar, natural sodium sulfate, and strontium minerals. In addition, it was a significant world producer of arsenic, bismuth, barite, lead, mercury, molybdenum, sulfur, and zinc. Within the Latin American region, Mexico was the leading producer of barite, bentonite, natural gas, refined lead, mercury, crude oil, selenium, and natural sodium sulfate.

The large private mining groups within the mining sector accounted for about one-half of the sector's output and was dominated by five major companies: Industrias Peñoles S.A. de C.V. (Peñoles), Grupo Industrial Minera México S.A. de C.V. (Grupo IMMSA), Empresas Frisco S.A. de C.V., Corporación Industrial Sanluis S.A. de C.V. (Grupo Sanluis), and Mexicana de Cobre S.A. In 1986, Peñoles celebrated 100 years of operation. Peñoles continued the process of Mexicanization that began in 1961 by

buying the equity interest of Bethlehem Steel International Co. in one of the Peñoles metallurgical plants. During the year, Peñoles started up its Sultepec mining unit while Grupo IMMSA started up its Rosario unit.

The Government's direct role as a mineral producer besides PEMEX was implemented by two autonomous agencies: the Comisión de Fomento Minero (CFM) and the Fideicomiso de Minerales No Metálicos Mexicanos (FNMM). Exploration and mineral evaluation programs were the responsibility of the Consejo de Recursos Minerales (CRM). CRM also publishes annual statistical reports on Mexico's nonfuel mineral production.

Government Policies and Programs.—CFM, FNMM, and CRM were all involved in implementing the $210 million program specifically designed to stimulate and assist Mexico's small- and medium-scale mining group. The program is entitled "Programa Especial Complementario de Apoyo a la Pequeña y Mediana Minería (PECAM)." PECAM was coordinated by a special staff within the Secretary of Energy, Mines and Parastate Industries (SEMIP).

The year 1986 marked the 25th anniversary of the Mining Law of 1961 under Article 27 of Mexico's constitution. The Government was studying a new fiscal stimulant to the mining industry in the form of discounts in the production tax.

An especially notable action by the Government was the announcement regarding the release of 123,200 hectares of land with mineral potential held in the Federal mineral reserve. This release would permit exploration and exploitation by private companies with possible foreign equity participation that would increase from the limit of 34% to 49%.

Since a number of mineral-related facilities in the capital were damaged in the earthquake of 1985, the Government proceeded with plans to relocate certain mineral agencies outside Mexico City. In late October 1986, the Undersecretary of Mines and Basic Parastate Industries in SEMIP signed an agreement with the State Governor of Hidalgo on the construction of a National Mining Center in the State Capital of Pachuca, to be in a traditional mining district active since the colonial period.

PRODUCTION

Within the mineral fuels category, production of crude oil and natural gas decreased while output of run-of-mine coal increased beyond the 10-million-ton level for the first time. Crude oil produced decreased by 7.7% compared with that of 1985 as a result of weak foreign demand and lower domestic demand caused by the economic recession. After establishing a record-high level in 1985, output of refinery products was also lower. Mexico was practically self-sufficient with regard to the variety of refinery products needed by its economy.

Of the important metallic commodities, output of refined silver reached a record-high level of almost 70 million troy ounces while mine output was near the high level of 1984. A number of other metallurgical products also reached record-high levels; namely, refined cadmium, ferroalloys, and refined zinc. Metals that experienced lower output included aluminum, antimony, iron ore pellets, crude steel, and primary refined lead. The sharp downtrend in molybdenum output continued. The steel industry was adversely affected by a 26% reduction in output by the motor industry from that of 1985.

Production of industrial minerals was mostly lower with the notable exception of fluorspar and natural graphite. The decrease in barite output was chiefly due to a weak domestic market while lower salt output responded to reduced foreign demand. Cement production below the record-high level of 1985 reflected the 11% decline in construction activity from 1985 levels, which was not compensated by the rebuilding that took place after the earthquake of September 1985.

Employment in the mining-metallurgical sector in 1985 represented 2.5% of Mexico's industrial labor force. Employment in the sector in 1986 increased over that of 1985 by an estimated 2% to 227,500.

Table 1.—Mexico: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985	1986[p]
METALS					
Aluminum:					
Primary	41,180	39,706	43,988	42,744	37,016
Secondary	25,770	r15,122	r19,636	22,078	13,925
Antimony:					
Mine output, Sb content[3]	1,565	2,519	3,064	4,266	3,337
Metal (in mixed bars and refined)	253	1,782	1,907	2,694	1,955
Arsenic, white[4]	4,740	4,557	5,496	6,312	7,016
Bismuth[5]	606	545	433	925	749
Cadmium:					
Mine output, Cd content	1,444	1,341	1,135	1,140	1,183
Metal, refined	r942	r847	r838	905	1,016
Copper:					
Mine output, Cu content	229,179	195,959	303,523	276,125	285,000
Metal:					
Blister (primary only)	r65,233	r59,543	r70,339	68,182	74,662
Refined:					
Primary[6]	r69,824	r68,490	r78,263	109,565	74,510
Secondary[e]	14,000	15,000	r13,900	14,000	15,000
Total[e]	r83,824	r83,490	r92,163	123,565	89,510
Gold:					
Mine output, Au content ... troy ounces	214,349	198,177	270,998	265,693	250,615
Metal, refined ... do	175,189	177,504	177,118	198,723	189,207
Iron and steel:					
Iron ore, mine output:					
Gross weight[7] ... thousand tons	8,155	8,040	8,317	7,820	7,298
Fe content ... do	5,382	5,306	5,489	5,161	4,817
Metal:					
Pig iron ... do	3,598	3,537	3,926	3,595	3,724
Sponge iron ... do	1,505	1,497	1,448	1,500	1,325
Total ... do	5,103	5,034	5,374	5,095	5,049
Ferroalloys:					
Ferromanganese ... do	135	140	160	154	158
Silicomanganese ... do	32	42	42	39	60
Ferrosilicon ... do	24	24	23	28	17
Ferrochromium ... do	6	3	7	6	3
Other ... do	2	1	2	3	1
Total ... do	199	210	234	230	239
Steel, crude ... do	7,056	6,978	7,560	7,367	7,170
Semimanufactures ... do	r5,671	r5,473	r6,025	6,111	5,483
Lead:					
Mine output, Pb content	170,172	184,261	202,561	197,489	207,000
Metal:					
Smelter:					
Primary	145,382	166,800	174,834	203,036	197,292
Secondary (refined)[e]	34,000	r31,000	r30,000	r31,000	33,000
Total[e]	179,382	r197,800	r204,834	r234,036	230,292
Refined:					
Primary (including lead content of antimonial lead)	137,238	162,461	r163,205	193,525	178,860
Secondary[e]	34,000	r31,000	r30,000	r31,000	33,000
Total	171,238	r193,461	r193,205	224,525	211,860
Manganese ore:					
Gross weight[8]	508,667	350,011	476,158	396,439	458,990
Mn content	183,120	133,004	180,940	150,647	174,416
Mercury, mine output, Hg content ... 76-pound flasks	8,558	6,411	11,140	11,430	10,008
Molybdenum, mine output, Mo content	5,190	5,866	4,054	3,761	3,350
Selenium, mine output, Se content	29	24	44	42	23
Silver:					
Mine output, Ag content ... thousand troy ounces	59,175	63,607	75,340	73,167	75,200
Metallurgical products, Ag content ... do	46,784	58,544	60,021	65,739	69,519
Tin:					
Mine output, Sn content	27	334	416	380	585
Metal, smelter, primary	944	1,216	1,531	1,492	NA

See footnotes at end of table.

Table 1.—Mexico: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985	1986[p]
METALS —Continued					
Tungsten, mine output, W content	194	186	274	282	294
Zinc:					
Mine output, Zn content	242,332	266,292	303,573	291,938	271,350
Metal, smelter, primary	126,953	174,991	167,034	175,353	173,700
Metal, refined, primary	123,509	171,390	162,912	171,388	172,500
INDUSTRIAL MINERALS					
Abrasives, natural[9]	--	192	246	609	[e]600
Barite	363,753	357,043	426,095	467,693	321,186
Cement, hydraulic thousand tons	19,298	17,068	18,436	20,680	19,751
Clays:					
Bentonite	184,918	226,140	267,348	267,695	146,000
Common clay	249,069	213,775	212,758	254,606	NA
Fuller's earth	42,488	41,574	45,697	58,000	[e]45,000
Kaolin	172,390	162,000	130,296	282,337	[e]200,000
Diatomite	56,342	43,967	44,634	45,781	43,633
Feldspar	115,559	117,518	84,791	[e]100,000	[e]100,000
Fluorspar:					
Acid-grade thousand tons	409	407	344	379	398
Ceramic-grade do.	54	46	37	27	9
Metallurgical-grade do.	166	73	213	270	367
Submetallurgical-grade do.	106	79	105	53	54
Total do.	735	605	699	729	828
Graphite, natural:					
Amorphous	34,370	42,669	39,846	33,468	35,942
Crystalline	1,804	1,658	1,683	1,910	1,838
Gypsum and anhydrite, crude (yeso)	2,042,484	2,958,085	2,945,222	2,366,019	2,625,178
Lime, hydrated and quicklime[e] thousand tons	4,000	3,630	4,000	4,000	3,950
Magnesium compounds:					
Magnesia[10]	64,605	66,300	105,701	121,698	99,965
Magnesite	22,492	23,187	30,424	19,299	[e]20,000
Mica, all grades	510	1,560	1,676	1,446	[e]1,400
Nitrogen: N content of ammonia[11]	2,029,800	1,935,500	1,772,610	1,858,778	[e]1,900,000
Perlite	32,425	41,377	31,515	37,261	[e]35,000
Phosphate rock[12]	653,050	785,038	591,519	645,299	660,425
Salt, all types thousand tons	5,561	5,703	6,167	6,467	5,927
Sodium compounds:					
Sodium carbonate (soda ash):					
Natural	178,900	179,700	192,000	200,185	[e]200,000
Synthetic	217,200	217,900	231,008	257,223	[e]250,000
Sulfate, natural (bloedite)[13]	470,751	395,287	413,238	398,836	458,000
Stone, sand and gravel:					
Calcite, common	234,694	344,793	480,986	400,516	NA
Dolomite	353,265	363,575	392,877	330,711	376,223
Limestone[14] thousand tons	40,880	35,276	29,055	30,840	NA
Marble	119,759	149,086	149,220	263,100	NA
Quartz, quartzite, glass sand (silica)	828,187	929,059	936,876	976,173	893,599
Sand and gravel:					
Sand thousand cubic meters	60,339	50,564	[r]52,031	55,063	NA
Gravel do.	39,074	33,018	[r]33,694	35,749	NA
Strontium minerals (celestite)	31,676	37,506	31,991	30,482	24,289
Sulfur, elemental:					
Frasch process thousand tons	1,391	1,225	1,364	1,551	1,588
Byproduct:					
Of metallurgy[e] do.	100	100	[r]160	[r]160	170
Of petroleum and natural gas do.	425	377	[r]462	469	462
Total do.	1,916	1,702	[r]1,986	2,180	2,220
Talc	12,270	11,032	8,900	29,900	[e]20,000
Vermiculite	522	399	505	430	[e]450
Wollastonite	15,599	10,784	9,251	13,512	NA
MINERAL FUELS AND RELATED MATERIALS					
Carbon black (negro de humo)	328,763	381,425	277,197	264,317	208,971
Coal, run-of-mine:					
Metallurgical thousand tons	6,833	7,181	[r]7,173	7,331	7,108
Steam do.	786	1,818	2,215	2,440	3,050
Total do.	7,619	8,999	[r]9,388	9,771	10,158

See footnotes at end of table.

Table 1.—Mexico: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985	1986[p]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Coke:[15]					
Metallurgical thousand tons	[r]2,937	[r]2,960	[r]2,885	2,890	2,594
Imperial do	9	9	35	6	6
Breeze do	[r]40	[r]27	8	5	4
Total do	[r]2,986	[r]2,996	[r]2,928	2,901	2,604
Gas, natural:					
Gross million cubic feet	1,549,921	1,479,560	1,373,457	1,315,337	1,252,352
Marketable do	1,279,398	1,274,465	1,193,929	1,145,297	1,062,296
Natural gas liquids: Field condensate thousand 42-gallon barrels	654	8,300	41,824	26,583	2,647
Petroleum:					
Crude do	1,002,430	972,922	982,517	960,114	886,092
Refinery products:					
Gasoline:					
Aviation do	653	420	436	406	419
Motor, leaded and unleaded do	126,410	129,230	132,199	133,226	134,839
Jet fuel do	11,177	9,998	12,370	12,379	12,625
Kerosene do	16,541	14,258	11,654	11,286	9,798
Distillate fuel oil (diesel) do	84,254	81,745	85,358	89,726	88,521
Residual fuel oil do	127,621	127,819	137,210	145,253	147,974
Lubricants do	2,854	2,402	2,499	2,433	2,328
Liquefied petroleum gas do	55,042	56,539	56,781	60,981	66,912
Asphalt do	7,288	6,185	8,292	8,360	6,054
Unspecified do	7,541	9,430	2,591	2,251	576
Unfinished crude oil[16] do	—	—	14,577	16,954	950
Refinery fuel and losses do	22,478	28,951	37,805	35,649	33,578
Total do	461,859	466,977	501,772	518,904	504,574

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

[1]Table includes data available through Nov. 27, 1987.

[2]In addition to the commodities listed, pumice and additional types of crude construction materials are produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3]Sb content of ores for export plus Sb content of antimonial and impure bars plus refined metals.

[4]Calculated white As equivalent of metallic As content of products reported.

[5]Refined metal plus Bi content of impure smelter products.

[6]Includes cathode copper from the Cia. Minera de Cananea S.A. electrowinning plant started up in 1980 at 327 tons; 1981—5,155 tons; 1982—7,200 tons; 1983—7,536 tons; 1984—9,289 tons; 1985—8,034 tons; and 1986—8,046 tons.

[7]Calculated from reported Fe content on the basis of concentrate and pellets containing 66% iron. Total run-of-mine output in 1986 was just under 15 million tons.

[8]Calculated from reported Mn content of mine production on the basis of ore and nodules averaging 38% manganese.

[9]Based on exports, comprised mostly of pumice stone and emery—a granular impure variety of corundum.

[10]Reported by Industrias Peñoles S.A. de C.V. (Peñoles) as the only major producer.

[11]Beginning in 1981, Petróleos Mexicanos (PEMEX) initiated production of liquid nitrogen. Output was about 47,000 tons in 1986.

[12]Includes only output used to manufacture fertilizers.

[13]Series reflects output reported by Peñoles, Mexico's principal producer, plus an additional estimated 30,000 tons by a smaller operator.

[14]Excluding that for cement production.

[15]Includes coke made from imported metallurgical coal.

[16]Specified by PEMEX as "virgin stock-28" and was processed at its refineries primarily for export. Exports of virgin stock-28 were suspended during 1986 and replaced by refinery products with greater value added.

TRADE

Although exports of petroleum continued to dominate Mexico's mineral trade, they lost their dominant position within the overall export sector. Although exports of crude petroleum and refinery products decreased, nonpetroleum exports increased by 32% over those of 1985 and set a historic record-high level by accounting for about 60% of total exports. In 1982, the value of nonpetroleum exports was only about 21% of total exports. Exports of crude oil and refinery products decreased because of a combination of reduced foreign demand and a collapse in world oil prices. In 1986, the volume of crude oil and refinery products decreased by 10% and 14%, respectively, from 1985 levels, while the value in each case decreased by about 58%.

Total exports of petroleum, including crude oil, refinery products, and a much

smaller amount of petrochemicals, were valued at $6.1 billion compared with $14.6 billion in 1985. This sharp drop in earnings reflects mostly the collapse in average oil prices from $25.33 per barrel in 1985 to $11.84 per barrel in 1986. The drastic change in the relative importance of crude oil exports in Mexico's export sector is shown in the following table:

	1981[r]	1982[r]	1983	1984[r]	1985[r]	1986
Total Mexican merchandise exports value, millions	$19,938	$21,230	$22,312	$24,196	$21,867	$16,031
Crude oil exports do	$13,305	$15,623	$14,821	$14,968	$13,296	$5,572
Crude oil share percent	66.7	73.6	66.4	61.9	60.8	34.8
Mining, metallurgical exports value, millions	$1,206	$823	$1,180	$1,089	$827	$1,018
Mining, metallurgical share percent	6.0	3.9	5.3	4.5	3.8	6.4

[r]Revised.

Note.—The average controlled exchange rate for each year has been used to convert from Mexican pesos to U.S. dollars.

The modest increase in foreign exchange earnings from exports of nonfuel mineral commodities only in small part compensated the large loss in oil export value. Compared with that of 1985, the volume of exports of refined bismuth, cadmium, lead, and zinc were higher while exports of refined silver were lower. Silver earnings, second in importance after crude oil, were also affected by considerably lower world prices. In 1986, Mexico became the chief source of U.S. imports of cement, but U.S. imports of Mexican sulfur were lower.

A major event related to trade was Mexico's accession to the General Assembly on Tariffs and Trade (GATT). Following through on a decision made in late 1985, Mexico became GATT's 92d member on August 24, 1986.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	27	17	(2)	Brazil 16; Peru 1.
Metal including alloys:				
Scrap	3,710	2,483	2,483	
Unwrought	803	112	104	NA.
Semimanufactures	[3]29	[3]101	3	West Germany 46; Colombia 5; unspecified 47.
Antimony:				
Ore and concentrate	3,805	3,291	3,261	NA.
Metal including alloys, all forms	115	185	19	Netherlands 107; Brazil 43.
Arsenic: Oxides and acids	3,287	3,399	3,238	Brazil 146; Argentina 15.
Bismuth:				
Ore and concentrate	--	15	15	
Metal including alloys, all forms	495	496	292	Belgium-Luxembourg 80; Netherlands 71.
Cadmium: Metal including alloys, all forms	373	[4]528	138	Netherlands 293; Belgium-Luxembourg 41.
Copper:				
Ore and concentrate	102,678	102,900	14	West Germany 43,213; Japan 17,913; Spain 16,781.
Metal including alloys:				
Scrap	750	690	548	Japan 105.
Unwrought	14,988	11,205	4,167	Belgium-Luxembourg 4,849; West Germany 1,495.
Semimanufactures	459	73	72	NA.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Iron ore and concentrate	1,764	251	251	
Metal:				
Scrap	15,446	16,698	16,512	France 143; West Germany 31.
Pig iron, cast iron, related materials	r24,756	87	69	France 18.
Ferroalloys thousand tons	57	61	NA	NA.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	360	153	[5]57	NA.
Universals, plates, sheets do	267	107	[5]67	NA.
Tubes, pipes, fittings do	258	162	[5]107	NA.
Castings and forgings, rough do	27	17	17	
Unspecified do	r7	13	NA	NA.
Lead:				
Ore and concentrate	10,980	9,874	3,373	Belgium-Luxembourg 4,823.
Metal including alloys:				
Scrap	3,617	2,122	2,122	
Unwrought	93,496	106,039	30,494	Belgium-Luxembourg 36,296; Italy 10,548.
Semimanufactures	137	189	113	United Kingdom 66.
Manganese:				
Ore and concentrate:				
Battery-grade	15,876	19,679	3,379	Colombia 2,665; Argentina 1,645.
Metallurgical-grade	230,594	110,206	21,584	Venezuela 23,680; Portugal 14,700.
Oxides	([6])	--	--	
Mercury 76-pound flasks	6,664	2,677	--	Brazil 1,585; Argentina 1,052; Colombia 40.
Molybdenum: Ore and concentrate	4,674	4,533	--	West Germany 2,379; United Kingdom 2,054; Netherlands 100.
Nickel: Metal including alloys, unspecified	4	10	10	
Silver: Metal including alloys, unwrought and partly wrought thousand troy ounces	47,386	59,637	55,853	Japan 3,543; Switzerland 241.
Tungsten:				
Ore and concentrate	847	1,073	1,071	NA.
Metal including alloys, unwrought	11	1	1	
Zinc:				
Ore and concentrate	171,863	214,657	15,152	Belgium-Luxembourg 77,216; United Kingdom 18,387; Italy 16,124.
Blue powder	2,481	2,652	2,270	Venezuela 104; Australia 54.
Metal including alloys:				
Scrap	220	191	191	
Unwrought	84,431	69,115	38,756	Japan 9,086; China 2,001.
Semimanufactures	5,980	7,467	559	Brazil 4,570; Uruguay 702.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Natural: Corundum, emery, pumice, etc	609	246	246	
Asbestos, crude	152	49	49	
Barite and witherite	54,043	34,675	34,675	
Clays, crude:				
Bentonite	3,602	7,170	7,167	Chile 3.
Fuller's earth	475	--	--	
Kaolin	2,117	2,527	13	Cuba 2,480; Venezuela 34.
Unspecified	129	129	85	Peru 13; Colombia 7.
Diamond: Gem, not set or strung thousand carats	22,020	--	--	
Diatomite and other infusorial earth	4,081	4,469	238	West Germany 1,339; Argentina 890; Brazil 598.
Feldspar	1,198	6	--	All to Nicaragua.
Fluorspar:				
Acid-grade	386,059	271,557	150,243	Canada 86,936; Italy 8,711.
Other grades including ceramic	321,575	293,065	116,805	Netherlands 69,367; Japan 44,233.
Graphite, natural	21,323	19,298	17,730	Spain 150.
Gypsum and plaster thousand tons	3,912	1,942	1,680	Canada 139; Japan 31.
Magnesite, crude kilograms	575	--	--	
Phosphates, crude	--	353	353	
Precious and semiprecious stones other than diamond: Natural kilograms	23,995	5,441	179	Japan 5,085; Spain 133.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Salt and brine	r4,800	4,612	1,310	Japan 2,883; Canada 338.
Stone, sand and gravel:				
Dimension stone: Crude and partly worked	r1,661	2,427	811	Italy 36; Guatemala 9; unspecified 1,571.
Dolomite, chiefly refractory-grade	921	1,121	571	Panama 55; El Salvador 40.
Gravel and crushed rock	420	1,262	1,262	
Limestone other than dimension	214,186	117,760	117,760	
Quartz and quartzite	9	20	1	Japan 19.
Sand other than metal-bearing	3,965	373	307	NA.
Sand and gravel	34,606	18,223	18,217	NA.
Strontium minerals: Celestite	45,296	40,207	34,934	Japan 5,138; Canada 135.
Sulfur: Elemental:				
Crude including native and byproduct thousand tons	1,520	871	791	United Kingdom 80.
Colloidal, precipitated, sublimed	20	20	20	
Unspecified	13	33	23	NA.
Talc, steatite, soapstone, pyrophyllite	24	18	18	
Vermiculite	276	149	69	Nicaragua 80.
Other: Crude	530	183	10	Brazil 97; Venezuela 66; Colombia 10.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	199,430	193,983	193,827	Honduras 21.
Coal: All grades including briquets	140	123	95	El Salvador 28.
Coke and semicoke	88	94,792	82	NA.
Gas, natural: Gaseous million cubic feet	54,020	--		
Petroleum:				
Crude thousand 42-gallon barrels	556,479	524,943	261,019	Spain 66,143; Japan 57,744.
Refinery products:				
Liquefied petroleum gas do	r2,897	6,635	3,705	NA.
Gasoline:				
Aviation do	159	--		
Motor do	13,162	7,148	2,536	NA.
Kerosene and jet fuel do	1,696	1,947	677	NA.
Distillate fuel oil do	3,948	5,492	3,329	NA.
Residual fuel oil do	4,403	8,983	5,126	NA.
Unfinished crude oil do	14,544	16,954	NA	NA.

rRevised. NA Not available.
[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.
[3]Includes only particles of aluminum dust and powder.
[4]Boletin Informativo. Instituto Mexicano del Zinc, Plomo Coproductos A.C.
[5]U.S. Department of Commerce, Bureau of the Census.
[6]Revised to zero. Reclassified as "Manganese ore and concentrate: Battery-grade."

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	54,312	46,659	23,721	Guyana 12,024; Canada 10,546.
Oxides and hydroxides	188,058	108,372	105,898	Japan 1,081; France 419.
Metal including alloys:				
Scrap	33,835	42,999	42,772	Venezuela 99; Canada 86.
Unwrought	32,933	33,700	25,693	Brazil 3,567; Canada 3,418.
Semimanufactures	--	327	312	West Germany 12; Belgium-Luxembourg 3.
Unspecified	--	1	1	
Arsenic: Metal including alloys, all forms kilograms	907	5,415	415	West Germany 5,000.

See footnote at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Beryllium: Metal including alloys, all forms ____ kilograms	119	55	55	
Bismuth: Metal including alloys, all forms	632	134	134	
Cadmium: Metal including alloys, all forms ____ kilograms	85	1,698	201	Sweden 1,481; France 15.
Chromium: Ore and concentrate	52,714	52,711	32,955	Panama 11,006; Sudan 4,359.
Cobalt: Metal including alloys, all forms	117	124	13	West Germany 97; Belgium-Luxembourg 10.
Copper: Metal including alloys:				
Scrap	17,317	22,500	22,500	
Unwrought	195	27	27	
Semimanufactures	12	80	77	West Germany 2; United Kingdom 1.
Unspecified	r17,242	67,468	47,333	Chile 19,023; Peru 1,040.
Iron and steel:				
Iron ore and concentrate	131	2,137	(2)	Venezuela 858; Brazil 800; Algeria 468.
Metal:				
Scrap	631,182	645,023	640,176	Spain 2,239; Brazil 1,024.
Pig iron, cast iron, related materials	9,250	19,770	15,249	Brazil 2,483; Canada 1,857.
Ferroalloys	8,000	5,000	NA	NA.
Steel, primary forms	258,357	163,076	28,543	West Germany 73,735; France 25,339.
Semimanufactures:				
Bars, rods, angles, shapes, sections	3,693	3,771	2,471	Spain 605; Brazil 307.
Universals, plates, sheets	334,000	276,000	NA	NA.
Rails and accessories	75,522	70,919	69,133	NA.
Tubes, pipes, fittings	284,000	62,000	NA	NA.
Unspecified	80,000	151,000	NA	NA.
Lead: Metal including alloys:				
Scrap	1,204	352	352	
Unwrought	46	23	23	
Semimanufactures ____ kilograms	2	192	192	
Magnesium: Metal including alloys:				
Scrap	18	62	62	
Unwrought	1,534	1,095	1,071	Sweden 24.
Manganese: Ore and concentrate	141,803	24,332	23,308	NA.
Mercury ____ 76-pound flasks	1	99	99	
Molybdenum:				
Ore and concentrate	72	52	52	
Metal including alloys:				
Unwrought	2	15	5	Austria 10.
Unspecified ____ kilograms	2,278	2,559	2,312	France 121; Canada 88.
Nickel:				
Matte and speiss	2,088	3,539	2,524	Canada 965; France 40.
Metal including alloys, semimanufactures	111	55	38	Switzerland 11; Canada 3.
Platinum-group metals: Metals including alloys, unwrought and partly wrought:				
Palladium ____ troy ounces	2,218	1,254	740	Switzerland 514.
Platinum ____ do	161	200	200	
Unspecified ____ do	54	2,565	2,565	
Selenium, elemental	(2)	25	25	
Tin:				
Ore and concentrate	3,553	5,081	4,630	Peru 412; Bolivia 20.
Metal including alloys:				
Scrap	453	156	156	
Unwrought	73	29	29	
Semimanufactures ____ kilograms	396	311	311	
Titanium: Ore and concentrate	r108,640	52,918	13,029	Australia 29,558; Canada 10,330.
Tungsten: Metal including alloys, all forms	59	108	82	Austria 17; West Germany 7.
Zinc:				
Blue powder	397	456	353	Belgium-Luxembourg 103.
Metal including alloys:				
Scrap	3	1,021	1,021	
Unwrought	28	2	2	
Zirconium: Ore and concentrate	4,749	4,574	4,280	Spain 197; Canada 40.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Natural: Corundum, emery, pumice, etc	829	763	615	Brazil 113; Spain 34.
Asbestos, crude	53,567	54,790	14,288	Canada 27,654; United Kingdom 7,612.
Barite and witherite	34	14	11	Switzerland 3.
Boron materials: Crude natural borates	1,582	1,913	1,913	
Clays, crude:				
Bentonite	496	685	683	United Kingdom 2.
Kaolin	84,162	91,219	90,585	United Kingdom 225; Spain 184.
Unspecified	142,586	131,784	130,135	France 896; West Germany 650.
Cryolite and chiolite	90	82	(2)	Denmark 77; West Germany 3; Switzerland 1.
Diatomite and other infusorial earth	190	101	101	
Feldspar, fluorspar, related materials	960	748	601	Canada 110; Switzerland 22.
Fertilizer materials: Manufactured:				
Potassic	209,023	203,774	90,718	Canada 63,024; West Germany 50,032.
Unspecified and mixed	6,309	6,907	6,907	
Graphite, natural	14	46	30	West Germany 9; United Kingdom 6.
Gypsum and plaster	12,830	11,370	11,340	Italy 20.
Magnesite, crude	4	9	8	Switzerland 1.
Mica:				
Crude including splittings and waste	162	132	119	West Germany 9; Belgium-Luxembourg 3.
Worked including agglomerated splittings	1	88	79	Belgium-Luxembourg 5; West Germany 1.
Phosphates, crude thousand tons	1,251	1,038	233	Morocco 780; Togo 25.
Potassium salts, crude	(3)	--		
Precious and semiprecious stones other than diamond: Natural kilograms	322	26,084	26,084	
Quartz crystal, piezoelectric do	228	23,620	23,560	France 32; Japan 28.
Salt and brine	572	584	578	NA.
Stone, sand and gravel:				
Dimension stone, crude and partly worked	59	430	21	Italy 108; Guatemala 28; unspecified 273.
Calcite, common	1,298	1,666	1,619	United Kingdom 25; Italy 18.
Dolomite, chiefly refractory-grade	89	38	38	
Quartz and quartzite	1,017	773	375	Switzerland 160; Spain 101.
Sand other than metal-bearing	86,918	91,469	91,434	Japan 12; West Germany 1.
Sand and gravel	2,858	3,301	3,301	
Sulfur: Elemental:				
Crude including native and byproduct	493	23,215	23,145	Belgium-Luxembourg 56.
Colloidal, precipitated, sublimed	361	139	131	West Germany 8.
Talc, steatite, soapstone, pyrophyllite	102,654	100,281	98,705	Italy 972; Republic of Korea 201.
Vermiculite	98	658	658	
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	631	482	482	
Carbon black	43	209	209	
Coal:				
Lignite including briquets	6,061	6,743	6,738	France 5.
All grades including briquets	366,315	582,991	303,768	Canada 235,478; Colombia 26,948.
Coke and semicoke	79,752	120,946	NA	NA.
Gas, natural: Gaseous million cubic feet	1,862	2,081	NA	NA.
Peat including briquets and litter	164	256	256	
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	10,426	13,524	NA	NA.
Gasoline, motor do	39	23	NA	NA.
Mineral jelly and wax do	45	38	NA	NA.
Kerosene and jet fuel do	445	439	NA	NA.
Lubricants do	1,122	1,099	776	NA.
Residual fuel oil do	3	4,254	NA	NA.
Petroleum coke do	316	753	680	United Kingdom 61; Switzerland 3.

[r]Revised. NA Not available.

[1]Table prepared by H. D. Willis.

[2]Less than 1/2 unit.

[3]Revised to zero. Reclassified and listed under "Fertilizer materials: Manufactured."

COMMODITY REVIEW

METALS

Aluminum.—Mexico's only producer of ingot aluminum from imported alumina, Aluminio S.A. de C.V., continued expansion of the primary capacity of its Veracruz plant from 44,000 tons per year to 66,000 tons per year. The project includes a recycling facility with a capacity of 28,000 tons per year, thus giving the company a total ingot capacity of 94,000 tons per year. Completion of the project was scheduled for early 1987. Aluminio was owned 40% by private Mexican interests, 34% by Alcoa Corp., and 26% by Intercontinental Co. Aluminio's reduced primary aluminum output was just over 37,000 tons. In addition, domestic demand for ingot aluminum was satisfied by about 14,000 tons of secondary metal from scrap and 16,100 tons of imports.

The country's economic recession was reflected in the 35% drop in aluminum consumption compared with that of 1985 to 97,800 tons. Besides imports of ingot aluminum, Mexico also imported 39,700 tons of aluminum products, mostly scrap and sheets. Despite the sharp decrease in consumption, future prospects for the aluminum industry appeared favorable since Mexico consumed only 1.2 kilograms per person in 1986 versus 26 kilograms per person in the United States. Exports were composed mostly of scrap (prohibited until 1982), ingots, sections, and containers totaling 12,100 tons in 1986 compared with 17,100 tons in 1985.

Aluminio imported all of the alumina required by its Veracruz plant because Mexico's known bauxite deposits are too low grade to mine. Most local geologists believe that Mexico does not have suitable geology indicative of commercially viable deposits of bauxite.

The trade association Instituto Mexicano del Aluminio A.C. was comprised of 35 companies, which included Aluminio as the only primary producer and 2 secondary producers: Fundidora Falmex S.A. and Zincalum S.A. with foundries in México State in the municipalities, respectively, of Ecatepec de Morelos and Tlalnepantla.

The other companies were fabricators of a variety of aluminum products that met the demands of the following industry sectors: containers, 24%; electrical, 22%; construction, 17%; transportation, 14%; machinery, 8%; consumption goods, 5%; and other, 10%.

Antimony.—During the year, Peñoles doubled the capacity of its antimony furnace in its lead-silver refinery in the Torreón complex.

Bismuth.—Since 1980, Mexico has contributed about 16% of world output and was the third most important producer until displaced by Japan in 1983. Mexico is a producer and exporter of crude and refined bismuth. Although total output decreased in 1986 by 19% compared with that of 1985, refined output increased 28% to 518 tons. Over the last 5 years, Mexico has exported an average of 93% of its refined output. In 1985, the United States was by far the most important market for Mexico's refined bismuth, while during the period 1982-85, Mexico in turn was the leading U.S. supplier of bismuth, followed by Peru.

Mexico has not been able to fully profit from the increased exports of refined bismuth since 1984 because average prices have decreased from about $5 per pound in 1985 to $3 per pound in 1986.

Cadmium.—Production of refined cadmium reached a record-high level as a result of the recovery of cadmium from the residue of the new electrolytic zinc refinery at San Luis Potosí operated by Grupo IMMSA. This plant has a capacity to produce 900 tons of cadmium per year. Cadmium was also recovered by Peñoles at its zinc refinery in Torreón, Coahuila, with a production of 600 tons in 1986 compared with 485 tons in 1985. The Torreón metallurgical plant processed the zinc-cadmium concentrate produced by the Real de Ángeles silver mine in Zacatecas. The amount of cadmium recovered from this mine fell to 158 tons in 1986. The Instituto Mexicano del Zinc, Plomo y Coproductos A.C., comprised of 22 mineral companies, presents production and trade data on cadmium in its published bulletins.

The economic recession caused a 39% drop in domestic consumption of cadmium to 272 tons—the lowest level of the last 6 years. This was offset by a 42% increase in exports to 751 tons compared with 528 tons in 1985.

Copper.—The most notable development relating to copper was the startup in mid-year of the new 230,000-ton-per-year smelter northwest of La Caridad's surface mine and concentrator plant in Sonora. The

smelter was expected to reach 60% of its capacity by early 1987. During the first partial year of its operation, 10,700 tons of anode copper was produced.

The new La Caridad smelter, installed by the operator Mexicana de Cobre, incorporates an Outokumpu Oy (Finnish) flash furnace operating at about 1,250° C. The 60% copper matte from the flash furnace plus matte from the two electric furnaces are further refined in converters. The final product is 99.6% blister copper, which is cast into anodes for shipment to the electrolytic copper refinery. Next to the smelter, a $50 million acid plant continued under construction during 1986 to remove the sulfur dioxide from the smelter gases. The acid plant will have a design capacity of about 950,000 tons of sulfuric acid per year and is scheduled to be operational in March 1988. The turnkey project was being constructed by Fenco Engineers Inc. of Toronto, Canada. Until the acid plant is ready, waste gases are passed through electrostatic precipitators and up a 942-foot stack, which cost $1.5 million to build. The future market for the acid had not been established.

Another smelter in Sonora, built in 1944, was operated by Cía. Minera de Cananea S.A., Mexico's second largest copper producer from a surface porphyry copper mine. This smelter produced 34,200 tons of blister copper in 1986, below the rated capacity of 45,600 tons per year. An acid plant was not installed to reduce sulfur dioxide emissions. Since Cananea has no plans to increase its smelting capacity, any increase of its output of copper concentrate would be shipped to the nearby La Caridad smelter to the south.

In September, Cananea initiated the first section of ore milling equipment in the new concentrator under construction. Its design capacity of 120,000 tons of copper concentrate per year was to be completed by yearend 1987. Also under construction at Cananea was a second plant to produce copper cathodes using a solvent extraction and electrolytic deposition method. This method was used by Cananea to beneficiate its low-grade ore that varies from 0.15% to 0.45% copper in heap-leaching operations. The richer ore varying from 0.5% to 0.7% copper was treated by the traditional method for sulfide copper ores involving crushing, milling, flotation, and smelting.

It was reported that Cananea can produce copper cathodes from the heap-leaching process for about 30 cents per pound, or about one-half the production cost for copper obtained from traditional methods. When completed in 1988, the 22,000-ton-per-year plant will give Mexico a total capacity of 32,000 tons of copper cathodes per year using the solvent extraction and electrolytic deposition method. The first plant was inaugurated in 1980 at an initial output of 327 tons. Thereafter, cathode output continued to expand, peaking at 9,289 tons in 1984. Cathode output decreased to 8,046 tons in 1986.

As the two main copper producers, La Caridad and Cananea in 1986 produced concentrate with a copper content, respectively, of 111,340 tons and 39,950 tons. The other significant producers of mined copper were Grupo IMMSA and Peñoles with 16,770 tons and 4,050 tons, respectively. Peñoles' copper output increased by 35% compared with that of 1985 while Grupo IMMSA's output decreased.

Mexico's consumption of copper decreased about 42% to 79,120 tons in 1986 compared with that of the peak year of 1981 when 135,330 tons was consumed comprising domestic production and imports. The Mexican Copper Association reported that for the same period copper imports dropped from 77,600 tons in 1981 to 14,500 tons in 1986. Copper imports, primarily of scrap, blister, and powder, were almost all from the United States.

Gold.—Mexico's largest gold producer, Cía. Fresnillo S.A. de C.V., increased its output by 19% over that of 1985 because of higher ore grade and increased production from its several mines of the Guanajuato Group. The data in the table below under "Refinery output" include small amounts of gold contained in the exports of impure metals.

Gold production by Mexico's two largest mining companies is detailed in the following table, in troy ounces:

Company	Refinery location	Refinery output[1]	Mine output
Industrias Peñoles S.A. de C.V. (Peñoles)	Torreón, Coahuila	144,517	[2]68,963
Grupo Industrial Minera México S.A. de C.V.	Monterrey, Nuevo León.	60,122	10,545

[1]Includes ore and concentrate purchased from smaller miners.
[2]Includes output of Cía. Fresnillo S.A. de C.V. owned 60% by Peñoles and 40% by AMAX Inc.

CRM made further progress in the development of the El Barqueño deposit, 150 kilometers west of Guadalajara, State of Jalisco. Five vein systems have been identified in the deposit varying from 4 to 12 meters wide with an average grade of 3 to 4 grams of gold per ton. Extraction at the surface mine was at the rate of 1,000 tons of ore per day. The oxide ore layer of Vein No. 1 was mined out down to the sulfide ore layer. The method of beneficiation includes crushing and cyanide heap leaching. Gold in solution is precipitated out with zinc powder providing a precipitate of 50% gold and 50% zinc. CRM's objective was to produce 1 kilogram of gold per day giving an output of 12,000 troy ounces per year. This production level would make El Barqueño the fifth ranking gold producer in Mexico. A total of 200 persons were employed at the mine.

Iron Ore.—Although iron content was lower, the production of run-of-mine ore actually increased by 8.4% to 14.78 million tons over that of 1985. The six main producing mines with their share of total output included Peña Colorada, 30%; Las Truchas, 27%; La Perla, 17%; Hércules, 12%; El Encino, 10%; and Cerro Mercado, 3%. The remaining 1% of output was produced by a number of small mines. Iron ore output at the Hércules Mine increased by 103% over that of 1985 as it benefited from the new concentrator completed in 1985, while output at Las Truchas rebounded from 1985 depressed levels by increasing 91%. As a consequence of the shutdown during the year of the steel plant of Fundidora de Monterrey S.A., the mine operation of Cerro Mercado and the pellet plant at Monterrey were also closed.

The downtrend in iron ore pellet output continued and was not adequate to meet domestic demand. Two steel companies, Altos Hornos de México S.A. (AHMSA) and Siderúrgica Lázaro Cárdenas-Las Truchas S.A. (SICARTSA), had to import 214,000 tons of pellets from Brazil and Chile. Mexico's pellet plant capacity was reduced by 18.5% to 9.5 million tons because of the closing of the pellet plants at the La Perla Mine and in Monterrey. Pellet output for recent years is detailed in the following table, in thousand metric tons:

Plant and location	1984	1985	1986
Peña Colorada, Colima	2,513	2,468	2,169
Sicartsa, Michoacán	1,510	1,080	1,474
Monclova, Coahuila	635	892	1,270
Hylsa, Monterrey	1,365	1,283	1,042
Fundidora, Monterrey	784	703	281
La Perla, Coahuila	293	173	185
Total	7,100	6,599	6,421

The economics of iron ore and pellet production was seriously affected by the sharp increase in railroad shipping rates, which exceeded the rate of increase of the price of steel and general inflation.

Mexico's iron ore reserves have been estimated at 580 million tons,[4] giving the country self-sufficiency in this basic mineral for the immediate future. Of this amount, 66% was controlled by the parastate sector through the holdings of the Government-owned steel companies grouped under Siderúrgica Mexicana (SIDERMEX). The largest iron ore reserves were at the mines of Peña Colorada and Las Truchas at the level for each of about 185 million tons, followed in importance by the Hércules Mine with 106 million tons.

A symposium was held in March in Monterrey, Nuevo León, with experts from CRM, SIDERMEX, HYLSA S.A., Consorcio Minero Benito Júarez Peña Colorada, and the Mexican National Petroleum Institute. Its purpose was to analyze the results of iron ore exploration over the last 20 years and prospects for the future relating to exploration costs and risks.

Iron and Steel.—The downtrend in crude steel output continued since the record-high level of 7.7 million tons in 1981, just prior to the start of Mexico's economic crisis. This trend was aggravated during the year by the closing in May of Fundidora de Monterrey S.A. (FMSA), one of the five integrated steel companies and one of the three Government companies grouped under SIDERMEX. Before its bankruptcy, FMSA produced 254,000 tons of steel compared with 974,000 tons produced as recently as 1980. The loss of FMSA's nominal capacity

of 1 million tons per year gave Mexico a reduced nominal steel capacity of 11.8 million tons. FMSA was founded in 1900 and was the oldest steel plant in Latin America. Closure resulted in dismissal of 9,000 unionized workers and affected the jobs of 20,000 employees of ancillary enterprises.

Production of steel products was also lower compared with that of 1985, especially flat and seamless tube steel, which decreased by 25% and 29%, respectively. The reduction of PEMEX investments strongly impacted the steel sector. For example, output of steel tubes with seams amounted to 271,000 tons in 1986 compared with 638,000 tons produced in 1981.

Mexico's apparent steel consumption was 6.8 million tons, 17% lower than the 1985 revised level of 8.2 million tons, reflecting the 5% drop in industrial activity. Consumption per person was 84 kilograms per year compared with 500 kilograms in industrialized countries.

Employment in the steel industry was sharply reduced to 71,000 workers compared with almost 90,000 workers in 1984. This resulted from plant shutdowns but also from the incorporation of new technology that was less labor intensive. Savings in labor costs, however, were offset by increases in the costs of basic steel inputs such as natural gas, diesel, electricity, and rail shipping rates that were above the general inflation index. The financial results of the steel companies were adversely affected because steel prices were controlled by the Government.

The Cámara Nacional de la Industria del Hierro y del Acero (CANACERO), in Mexico City, is the industrial chamber for the iron and steel sector. CANACERO prepares statistical data on the performance of this sector and issues an annual report. The Mexican Steel Research Institute in Saltillo, Coahuila, was founded in 1975. The institute trains specialists for the steel industry, serves as an information bank, and does applied research of direct value to the steel industry.

Ferroalloys.—The production and export of ferroalloys reached record-high levels of 239,000 tons and 76,000 tons, respectively. The 30% decrease from that of 1985 in ferroalloy shipments to domestic customers made it possible for Mexico to increase its exports. Especially notable was the 54% increase over that of 1985 in the output of silicomanganese, which was a new high. Mexico's leading ferroalloy producer and the largest single producer of ferroalloys in Latin America, Compañía Minera Autlán S.A. de C.V., accounted for 82% of the country's output. Autlán operated its largest ferroalloy plant (168,560 tons) in Tamós, Veracruz State, and a small plant in Teziutlán, Puebla. Autlán reported that its production costs decreased in real terms by 14% from 1985 levels, giving the company a strong position in international competition.

Lead.—Mine output of lead continued its uptrend since the very depressed level of 1980 and reached its highest level of the last three decades. Most of Mexico's numerous silver mines produced lead as a coproduct or byproduct from complex sulfide ores. According to 1986 company reports, lead output for the leading mining companies is shown in the following table, in thousand metric tons:

Company	Refinery location	Refinery output		Mine output	
		1985	1986	1985	1986
Grupo Industrial Minera México S.A. de C.V	Monterrey, Nuevo León	70.0	61.3	58.4	54.7
Industrias Peñoles S.A. de C.V	Torreón, Coahuila	124.1	123.6	48.8	47.7
Minera Real de Ángeles S.A. de C.V	XX	XX	XX	37.8	47.1
Empresas Frisco S.A. de C.V	XX	XX	XX	17.2	14.8
Other	XX	XX	XX	35.3	e42.7
Total		194.1	184.9	197.5	e207.0

eEstimated. XX Not applicable.

Byproduct output from the Real de Ángeles silver mine in Zacatecas has increased steadily since startup of the new mine in 1982. Lead output from Real de Ángeles has exceeded the projected level of 31,000 tons per year contained in lead-silver concentrate. The lead-silver concentrate was shipped to the Peñoles smelter at Torreón, Coahuila.

Only two companies in Mexico produced primary refined lead, while the majority of battery manufacturers operated plants to recycle secondary or scrap lead. Lower primary output was due to strikes at the two

refineries. Since 1980, the recuperation of refined secondary lead averaged 34,000 tons per year. Secondary output of 33,000 tons was an important part of domestic consumption of about 110,000 tons in 1986.

Exports of primary refined lead in 1985 and 1986 exceeded 100,000 tons for the first time and were, respectively, 110,900 tons and 104,700 tons. This level gave Mexico a new position as the world's third most important lead exporter after Australia and Canada. Mexico exported about 57% of its primary refined lead output.

Manganese.—As part of its diversification efforts, Autlán—Mexico's leading manganese producer—took a 10% equity interest in Industrias Sulfamex S.A. de C.V., which was formed to produce manganese sulfate. The new plant was under construction at Tamós, Veracruz State, near the gulf coast Port of Tampico and was expected to be producing in the latter part of 1987 at the level of 22,000 tons per year of manganese sulfate. Autlán continued to improve the chemical and physical characteristics of the electrolytic manganese dioxide being produced at the pilot plant at its Molango mining unit in Hidalgo State. At its Molango unit, Autlán's production of manganese carbonate ore and manganese oxide nodules was 642,500 tons and 394,300 tons, respectively, considerably above the depressed levels of 1985. Autlán reported a 25% increase in mining productivity over that of 1985 of the carbonate ore and a 13% productivity increase above the 1985 level in the production of nodules, thus improving its competitive cost position. Production of battery-grade manganese ore at the Nonoalco unit also recovered to 31,200 tons.

In its annual company report, Autlán reported a slight increase of proven reserves of manganese carbonate ore to 32 million tons, adequate for 28 years of operation at current production levels. Indicated reserves in the Molango District were calculated to be 200 million tons of manganese ore economically treatable with current metallurgical processes.

Molybdenum.—Continued weakness in international demand led to a further reduction in Mexico's production of molybdenum concentrate since the peak year of 1983. The average price in 1986 also weakened to $3.41 per pound compared with $4.22 per pound in 1983. The major producer, Mexicana de Cobre, produced an estimated 2,200 tons of molybdenum, less than one-half of the 4,600 tons reported in 1983. The other important producer, Minera Cumobabi S.A. de C.V., also operating in Sonora State, reported reduced output of 725 tons compared with 1,206 tons in 1983.

Silver.—Production of silver by most of the major mining companies increased over that of 1985 with the exception of Empresas Frisco. As the country's leading silver producer, Peñoles, in its 1986 annual report, reported mine output of silver of almost 20 million troy ounces, a 5.5% increase over that of 1985. This includes the output of Cía. Fresnillo, Mexico's largest silver producer, owned 60% by Peñoles and 40% by AMAX Inc. of the United States. At yearend, the operations of Fresnillo became consolidated within Peñoles to increase efficiency and to eliminate duplication of certain functions. The equity interest of AMAX in the Fresnillo mines was not affected by the consolidation of the two companies. Prior to the consolidation, Peñoles produced only 5 million troy ounces of silver from its own directly operated mines. In March, Peñoles initiated its Sultepec mining unit in México State to extract ore with gold, lead, silver, and zinc values. Mining is by surface and underground methods. Startup difficulties were encountered with the humid ore and beneficiation process. Peñoles shut down the La Encantada Mine because of exhaustion of the rich silver-lead beds.

Mexico's second largest silver producer was Grupo IMMSA with just over 14 million troy ounces, an 8.2% increase over that of 1985. This improved performance resulted from the startup of the new Rosario mining unit in Rosario municipality, State of Sinaloa, and the new plant at the Charcas unit, San Luis Potosí State, with increased capacity from 1,250 to 3,450 tons per day. The Charcas unit recovers copper, lead, silver, and zinc. The Rosario unit recovered the same metals, with a design beneficiation capacity of 600 tons per day.

In third place, Real de Ángeles continued its extraordinary growth in mining output by an 18% increase over the 1985 output in silver to just under 13 million troy ounces compared with the 22% and 16% increases in 1985 and 1984, respectively. In 1983, the first full year of operation, only 7.8 million troy ounces was produced. Real de Ángeles' improved performance in 1986 was due to increased tonnage processed and better recovery. Of the 26 million tons of material excavated at the surface mine in Zacatecas, 5.2 million tons was sent to the beneficiation plant where increased amounts of cadmium, lead, and zinc were also recovered. Silver-lead and zinc concentrates were shipped to the Peñoles-Torreón complex for refining. Real de Ángeles was owned by the State entity CFM, 33%; Empresas Frisco, 33%; and Placer Development Ltd. of Cana-

da, 34%.

Empresas Frisco reported lower silver output to about 3.5 million troy ounces because torrential rains in August and October caused power outages that resulted in flooding of parts of the Frisco and Clarines Mines.

Mexico refined practically all of its mine output of silver at two locations: the Torreón, Coahuila, metallurgical complex operated by Peñoles and at the Monterrey, Nuevo León, complex operated by Grupo IMMSA. Refined output in 1986 was 43.5 million troy ounces for Peñoles and 25.0 million troy ounces for Grupo IMMSA. CRM data for 1985 show that Mexico exported 86% of its unwrought silver production, most of which went to the United States, 93%; Japan, 6%; and Switzerland, 1%. In 1984, silver was exported additionally to Brazil and France.

The Government of Mexico has taken no measures to restrict silver exports. Silver mining and exports are dominated by private companies in Mexico. The Government sets an official price for silver, which closely reflects world market prices, only for the purpose of assessing taxes due. Companies that mine and refine silver are free to sell it domestically or internationally at any price they negotiate. In 1986, the average silver price fell again to $5.47 per troy ounce as quoted by Handy & Harman in New York City, a price level not seen since 1978. The average price in 1985 was $6.14 per troy ounce.

Mexico continued to allocate part of its refined silver output to the minting of the 1-ounce, 0.999-fine "Libertad" silver bullion coin for collectors and investors. The Libertad coin is the only one in the world that contains 1 ounce of 0.999-fine silver. The 1986 Libertad was issued in June. Although first minted in 1982, the Libertad has only been available in recent years. The Banco de México did not release the 1982 coins until September 1984. Since then, the Government of Mexico has issued Libertads dated 1983, 1984, and 1985 with a mintage of 1 million coins with the exception of the 1985 issue of just over 2 million. Mintage of the 1986 Libertad was not available. A proof version of the 1986 Libertad had a mintage of 30,000 coins.

Tungsten.—Peñoles reported an 87% increase in its recovery of tungsten to a level of 623 tons of concentrate at Fresnillo's Naica unit in Chihuahua. In 1980, Fresnillo initiated recovery of tungsten as a byproduct from its Naica flotation plant for lead-silver ores using a gravity process.

Zinc.—Output of refined zinc was affected by the shutdown in April of the 35,000-ton-per-year zinc refinery in Saltillo, Coahuila, operated by Zincamex S.A., a subsidiary of CFM. The refinery was closed because of large increases in the price of natural gas and air pollution problems. Mexico's capacity to produce refined zinc was reduced to about 220,000 tons per year from two remaining plants operated by Peñoles and Grupo IMMSA. Refined output by Grupo IMMSA did not include production from its old plant in Nueva Rosita, Coahuila, which was permanently closed in 1985. Statistics published by the Instituto Mexicano del Zinc, Plomo y Coproductos show that domestic zinc sales decreased to 85,300 tons while exports increased to 87,400 tons compared with those of 1985. The most important producers of zinc are given in the following table, in thousand metric tons:

Company	Refinery location	Refinery output		Mine output	
		1985	1986	1985	1986
Grupo Industrial Minera México S.A. de C.V	San Luis Potosí[1]	74.4	78.9	144.6	144.7
Industrias Peñoles S.A. de C.V	Torreón, Coahuila[2]	85.3	90.1	57.6	52.3
Zincamex S.A	Saltillo, Coahuila	11.7	4.5	XX	XX
Minera Real de Ángeles S.A. de C.V	XX	XX	XX	30.6	35.9
Empresas Frisco S.A. de C.V	XX	XX	XX	24.4	20.9
Other	XX	XX	XX	34.7	17.6
Total		171.4	173.5	291.9	271.4

XX Not applicable.
[1]Plant capacity is about 115,000 tons per year.
[2]Plant capacity is about 105,000 tons per year.

The complex at Torreón was operated by an affiliated company of Peñoles, Met-Mex Peñoles S.A. de C.V., owned 60% by Peñoles and 40% by Bethlehem Steel. In April, Peñoles purchased the 40% equity of Bethlehem Steel to obtain full control of Met-Mex.

INDUSTRIAL MINERALS

Barite.—Output of barium sulfate was strongly impacted by PEMEX cutback in its oil drilling program. Barite consumption by PEMEX dropped from 398,300 tons in 1984 to 211,900 tons in 1986. Barite exports also dropped from 126,300 tons in 1983 to 33,200 tons in 1986. Purchases by PEMEX constituted from 85% to 95% of the domestic market. Peñoles reported that its La Minita Mine in the Coalcomán District of Michoacán State, operated by the subsidiary company Minera Capela S.A. de C.V., reduced production from 94,300 tons in 1985 to 58,030 tons in 1986. La Minita's flotation plant also produced lead and zinc concentrates with silver content.

Cement.—Mexico gained sixth place as a world cement exporter as a result of a strong uptrend in cement exports. Cement and clinker exports approached 4 million tons compared with 2 million tons exported in 1984. In 1986, Mexico became the chief supplier of cement to the U.S. market, replacing Canada. Mexico had been in third place in 1985 behind Canada and Spain. Mexican cement exports to the United States were 3.85 million tons valued at $133 million compared with 2.27 million exported in 1985 valued at $87 million. Since the United States is a vital market for Mexican cement, several cement producers during 1986 made marketing arrangements with U.S. cement producers to take advantage of established distribution networks. Cementos de Chihuahua S.A. de C.V. formed a joint venture with Blue Circle West Inc. to operate a 500-ton-capacity import terminal in El Paso, Texas. Cementos Mexicanos S.A. de C.V. (Cemex), the largest cement producer in Mexico and in Latin America, entered into a joint venture with Texas-Lehigh Cement Co. to import and sell Cemex cement in the U.S. market. Cemex also formed a joint venture with Southwestern Portland Cement Co. to market cement in Southwestern's distribution area.

According to the 1985 report of the Cámara Nacional del Cemento, Mexico had 30 cement plants under operation by 14 companies with primarily domestic capital. Capacity has grown from 12 million tons in 1974 to about 33 million tons in 1985. In January 1986, Cemex brought on-stream its new cement plant at Huichapán, 145 kilometers north of Mexico City, with a capacity of 1.08 million tons per year.

Clays (Bentonite).—Production of the several types of bentonite was considerably below Mexico's installed capacity of 368,000 tons per year. Durango was the leading producing State from five operators in the Nazas area. The iron and steel sector absorbed 65% of output while the petroleum sector absorbed 29% in 1986.

Diatomite.—Mexico is the largest producer of diatomite in Latin America. The leading producer in Mexico was Conchas Grandes S.A. de C.V. with a plant in Almería, Jalisco State. Its output in 1986 was 28,000 tons, of which 10,000 tons was exported. Conchas Grandes was preparing an investment project to increase output to 48,000 tons per year with 25,000 tons allocated for exports. Compañía Minera Coinsa S.A. was planning to install a plant in Tuxpan, Michoacán, with a capacity of 40,000 tons per year with projected exports of 15,000 tons. The Coinsa project is a joint venture of FNMM, private Mexican investors, and Sidam, a Canadian group. Domestic consumption of diatomite as a filtering material was dominated by Mexico's beer industry, which was expanding output to satisfy growing foreign demand.

Fluorspar.—A decrease in exports, which traditionally go mostly to the United States, to a level of 446,300 tons was compensated by an increase of domestic sales from 222,000 tons in 1985 to 278,000 tons. Exports to the United States decreased to 245,300 tons because of reduced consumption by U.S. steel and aluminum industries. Canada and Western Europe were other important markets for Mexican fluorspar. During 1986, Minera Muzquiz S.A. initiated its operations in Muzquiz, Coahuila, in an 18,000-ton-per-year plant for producing high-quality acid-grade fluorspar. The largest producer, Cía. Minera Las Cuevas S.A., reported a slightly reduced level of output at 300,000 tons at the world's largest fluorspar mine in Zaragoza, San Luis Potosí. Its acid-grade mill was shut down for 4 months to reduce inventories. Las Cuevas was planning to decrease arsenic levels in the beneficiated ore.

As the second-ranked Mexican producer, Peñoles, through its 60%-owned Fluorita de Río Verde S.A. de C.V., produced 130,130 tons composed of increased amounts of acid-grade fluorspar and decreased amounts of metallurgical grade. The Peñoles mine is at

Río Verde, San Luis Potosí, with the plant at Alamos de Martinez. La Domincia S.A. de C.V., 38% owned by Grupo Sanluis, reported increased production of acid- and metallurgical-grade fluorspar at its mine in Pico Etereo, Coahuila, all of which was exported to the United States.

Mexican sources reported a 17% increase over 1985 levels in exports of hydrofluoric acid to the United States amounting to 66,300 tons. Uncertainty developed over future demand for fluorspar to manufacture hydrofluoric acid because of growing concern over the affect of fluorocarbons on the ozone layer of the atmosphere.

Gypsum.—The largest Mexican producer by far was Compañía Occidental Mexicana S.A. de C.V., which operated mines in Isla San Marcos, Baja California Sur. Of the almost 2.2 million tons it produced, exports represented 98%. The second important producer, Yeso Panamericano S.A. de C.V., operated La Borreguita Mine in Villa Juarez, San Luis Potosí, and also exported practically all of its output of 220,000 tons in 1986. The United States was the primary foreign market. During the period 1982-85, Mexico was the second-ranked U.S. supplier after Canada, and accounted for 20% of total U.S. imports of gypsum. The demand for gypsum was closely linked to the construction industry. Certain cement companies produced their own gypsum as an ingredient.

Phosphate Rock.—Reporting on phosphate rock production includes the output of only two companies that mine phosphate deposits for shipments to the manufacturing plants of fertilizers; namely, State-owned Roca Fosfórica Mexicana S.A. de C.V. (ROFOMEX) and Minerales Industriales S.A. de C.V. In 1986, ROFOMEX produced 457,650 tons of concentrates of phosphate rock with a 30.4% phosphorus pentoxide content. Smaller producers marketed lower grade material, which is used as an animal feed supplement or for direct application to the soil. This lower grade product is estimated at 75,000 tons per year. Mexico relied on imports to meet part of its consumption requirements. Consumption in 1985 was 404,000 tons of phosphorus pentoxide.

Strontium Minerals (Celestite).—Mexico continued as the world's largest producer of celestite or strontium sulfate, accounting for about 30% of world output. The country's leading producer was Cía. Minera La Valenciana S.A, privately owned by Mexicans, which operates the world's only underground celestite mine at San Agustín near Torreón, Coahuila. The mill at Marte is also in Coahuila. La Valenciana was building a new process plant to produce strontium carbonate, which was scheduled for startup in March 1987. This plant would require increased mine output of 12,000 tons of celestite per year. Sales y Oxidos S.A. was a small producer of strontium carbonate. The main product lines of this company comprised barium carbonate, plus zinc oxide and zinc dust. In 1985, Church & Dwight Co. Inc., the largest sodium bicarbonate producer in the United States, acquired a 49% interest in Sales y Oxidos. Mexico exported 24,700 tons of celestite in 1986, most of which went to the United States and Japan, in order of importance.

Sulfur.—Mexico recovered increasing amounts of sulfur from its several metallurgical plants in the form of sulfuric acid. Peñoles achieved a new high level in its output of 290,220 tons of sulfuric acid from lead and zinc smelters and refineries at Torreón, Coahuila, with a total capacity in the complex of about 350,000 tons of acid per year. Grupo IMMSA's increased output came from its new zinc refinery in San Luis Potosí with a capacity of 150,000 tons of sulfuric acid per year. When the new acid plant under construction at La Caridad comes on-stream in 1988, Mexico will have an additional capacity of 950,000 tons per year of acid. Mexico's acid capacity was reduced by 50,000 tons per year by the closing of the Zincamex zinc refinery in Saltillo, Coahuila, in 1986.

The new fertilizer complex of Fertilizantes de Méxicanos S.A. (FERTIMEX), at the industrial Port of Lázaro Cárdenas, Michoacán, was expected to reach full production capacity during the year. Facilities include sulfuric acid plants with capacity to produce 1.3 million tons per year, requiring 450,000 tons of sulfur inputs per year. Storage capacity at the port amounted to 28,000 tons of solid sulfur and 60,000 tons of liquid sulfur. The first cargo of Canadian sulfur was shipped to the complex in December 1985. When the Lázaro-Cárdenas complex reaches full capacity, it would supply 20% of Mexico's total fertilizer demand, thus reducing the country's imports of triple superphosphate and diammonium phosphate.

Mexico maintained its position as the leading sulfur producer in Latin America and the fifth most important producer worldwide. According to 1985 CRM data, Mexico exported 39% of its total sulfur output, mostly to the United States plus the

United Kingdom. This compares with the 80% share exported in 1984. Sulfur exports from Mexico to the United States in 1986 again decreased to 726,000 tons compared with 791,000 tons exported in 1985.

Frasch sulfur extracted from the salt domes in the Isthmus of Tehuantepec was the largest Mexican source of sulfur, accounting for 72% of the country's total in 1986. PEMEX recovered significant quantities of sulfur from sour gas and refinery operations, which approached the 500,000-ton-per-year level compared with 60,300 tons recovered in 1970 before PEMEX's surge in oil and gas output. During 1986, PEMEX put into operation two more sulfur plants.

MINERAL FUELS

Coal.—For the first time, Mexico's production of run-of-mine coal exceeded 10 million tons, the major part of which was metallurgical coal with small amounts of steam coal. Mexico's coal output continued to be adequate to satisfy the demand of its steel industry except for about 282,000 tons imported by SICARTSA for its Las Truchas steel complex. Most of the metallurgical or coking coal was produced by mining units of the Government-owned steel companies grouped under SIDERMEX. The only significant private producer of coking coal was Grupo IMMSA, operating in the Nueva Rosita area, Coahuila, through its subsidiary Carbonífera de México S.A. Grupo IMMSA's coking coal production continued in a downtrend to 411,600 tons compared with the company's peak year of 1978 when 1.2 million tons was produced. Grupo IMMSA completed the second phase of its Pasta de Conchos Mine in Coahuila and proceeded with construction of the new mine in San Juan de Sabinas, also in Coahuila.

The SIDERMEX companies and Grupo IMMSA also operated coke plants, which experienced reduced output in response to Mexico's lower steel production. Grupo IMMSA's coke output fell to 159,000 tons, less than one-half of the 351,000 tons of 1978. A notable event during the year was the shutdown of the coke plant operated by Hullera Mexicana S.A. with a loss of national capacity of 690,000 tons of coke per year. Hullera Mexicana was a subsidiary of the bankrupt steel plant, Fundidora de Monterrey.

In May, construction was started on a coal receiving terminal at the Port of Lázaro Cárdenas with a capacity of 2,000 tons per hour. Completion was scheduled for 1990. In 1986, the United States exported 134,000 tons of metallurgical coal to Mexico compared with 303,000 tons exported in 1985.

Practically all of the steam coal was produced by Minera Carbonífera Río Escondido S.A. (MICARE) from Mina I, Mina II, and Tajo I Mines in Nava and Piedras Negras in Coahuila. During the first quarter of 1986, MICARE initiated development work on the new mines of Mina IV and Tajo II with a steam coal capacity, respectively, of 1.5 million tons and 1.2 million tons per year. Completion was planned for the end of the decade. In 1986, MICARE increased steam coal output by 61% to just over 3 million tons to meet increased demand by electrical generating plants.

Natural Gas.—In terms of constant pesos, the Government has more than tripled the price of natural gas since 1982. Nonetheless, the retail price for natural gas in Mexico was less than one-half of the U.S. price. One of the purposes of increasing the price of natural gas was to discourage its consumption. In Mexico, 93% of gas sales went to industrial firms, most of which have the option of using fuel oil. Consequently, gas consumption has fallen by 18% since 1982. On a heating value basis, natural gas is now twice as expensive as fuel oil. As part of its energy conservation program, PEMEX succeeded in reducing the amount of gas flared from the 19% share of production in 1982 to 5% in 1986.

Mexico's natural gas reserves ranked eighth in the world and represented 2% of proven worldwide reserves. At the 1986 rate of extraction, Mexico's 75.8 trillion cubic feet of gas reserves would last 60 years.

Petroleum.—Crude oil production decreased to an average of 2.43 million barrels per day (bbl/d) compared with the 2.63-million-bbl/d average in 1985. Exports of crude oil at the rate of 1.29 million bbl/d was below the record-high rate of 1.54 million bbl/d established in 1983. Exports of petroleum products, chiefly fuel oil and diesel, averaged only 115,657 bbl/d, 14% lower than those of 1985. During 1986, one-half of Mexico's crude oil exports, 90% of the exports of petroleum products, and a small amount of petrochemicals went to the United States. Mexico exported crude oil to a total of 23 countries, but the major share, other than the United States, went to Spain, Japan, France, Israel, the United Kingdom, and the Dominican Republic, in order of importance. In 1986, Mexico was replaced by Saudi Arabia as the leading supplier of crude oil to the United States; Mexico exported 653,000 bbl/d to the Unit-

ed States compared with 685,000 bbl/d exported by Saudi Arabia. Foreign exchange earnings from crude oil exports were affected sharply not only by lower foreign demand but by a 53% drop in the average export price to $11.84 per barrel in 1986.

PEMEX adjusted to its lower income by reducing its drilling program. PEMEX completed 69 exploratory wells and 178 development wells in 1986. The successful exploratory wells defined 10 new hydrocarbon fields. The two new fields, Vech I and Kay I, are offshore and appeared to be promising. The remaining eight new fields are onshore: four in the Mesozoic structures of Tabasco and Chiapas, one in the mountains of Chiapas, one in the Burgos Basin in northeast Mexico, and two in the Sabinas Basin of the north-central area of the country.

Decreased drilling in 1986 explains in part why newly discovered reserves did not compensate for the amount of oil extracted during the year. For the third consecutive year, Mexico's proven reserves declined slightly. At yearend, PEMEX estimated proven reserves of oil at 48 billion barrels, of condensate at 6.8 billion barrels, and of natural gas at 75.8 trillion cubic feet. Mexican oil reserves ranked as the fifth largest in the world after Saudi Arabia, Kuwait, the U.S.S.R., and Venezuela. Mexico was displaced from ranking fourth by Venezuela after the 1986 announcement of Petróleos de Venezuela S.A. that its proven oil reserves had practically doubled to 55.5 billion barrels. Mexican oil reserves represent about 7% of the world's proven reserves. At the 1986 rate of extraction, Mexico's reserves would last 54 years.

PEMEX operated and maintained nearly 52,000 kilometers of pipelines. Over 45% of that total are pipelines that carry hydrocarbons from the wells to the nearest gas separation plants. The remaining 55% are specialized pipelines that transport either natural gas, crude oil, or one of the refined products. PEMEX added 1,420 kilometers of pipeline to its network including a 340-kilometer, 16-inch pipeline that transports U.S. gas from the border town of Naco to the city of Hermosillo. This new pipeline, along with an 8-inch pipeline that transports gas from Naco to the Cananea copper mine and smelter, means that Mexico should import about 6 million cubic feet per day of natural gas from the United States during 1987. PEMEX was planning the construction of a second crude oil pipeline across the Isthmus of Tehuantepec to the Port of Salina Cruz.

Table 4.—Mexico: Salient crude oil statistics[1]

	1982	1983	1984	1985	1986
Production thousand 42-gallon barrels	1,002,430	972,922	982,517	960,114	886,092
Exports:					
Quantity do	544,617	561,005	556,479	524,943	470,704
Value millions	$15,623	$14,821	$14,968	$13,296	[2]$5,572
Share of total Mexican exports percent	74	69	62	61	35
To the United States:[3]					
Total thousand 42-gallon barrels	264,988	279,703	252,454	299,011	238,176
Share of total U.S. imports percent	19	23	19	19	16

[1]Based on annual reports of Petróleos Mexicanos, Memoria de Labores.
[2]In addition, exports of petroleum products and much smaller amounts of petrochemicals were valued at $561 million.
[3]Based on U.S. Department of Commerce import data.

Mexico's petrochemical industry, reportedly the fifth largest in the world, is divided by law into two sectors. The production of 36 "basic" petrochemicals from oil and gas is reserved for PEMEX. The production of "secondary" petrochemical products, except fertilizer, is open to and dominated by private investors. However, foreigners may not own more than 40% of the equity of any petrochemical plant in Mexico. Fertilizer production is reserved for FERTIMEX, a Government monopoly. Up until October 13, 1986, the number of basic petrochemicals reserved for the Government totaled 72. Then the term "basic petrochemicals" was redefined by executive decree to reduce the number reserved for the Government to 36. Reportedly, several private firms were making plans to produce some of those petrochemicals that were previously reserved for PEMEX.

[1]Physical scientist, Division of International Minerals.
[2]Where necessary, values have been converted from Mexican pesos (Mex$) to U.S. dollars at the average annual rate for 1986 of Mex$612=US$1.00. At yearend, the free rate had increased to Mex$992=US$1.00.
[3]Consejo de Recursos Minerales. Anuario Estadístico de la Minería Mexicana—1984 and 1985.
[4]Cámara Minera de México. Report of the General Assembly. 1987, p. 69.

The Mineral Industry of Morocco

By Kevin Connor[1]

The Moroccan economy grew at a healthy rate in 1986, with the estimated growth in the gross domestic product for the year at approximately 5.7%. The upturn was owing mostly to strong performances in the agricultural, tourism, overseas worker remittances, and manufacturing sectors. The collapse in international oil prices early in the year also alleviated Morocco's energy import costs. With only minor known domestic commercial sources of crude oil, petroleum and petroleum products continued to represent Morocco's biggest import commodity. However, import costs for energy were 50% less in 1986 than in 1985, which represented approximately a 15% reduction in the country's total annual imports. Morocco's annual accrued balance of payments deficit decreased from over $1 billion[2] for 1984 to only $250 million for 1986.

Outside of the petroleum exploration sector, involvement by U.S. companies in Morocco's mineral activities remained minor. During 1986, the American Colloid Co. of Chicago, Illinois, was working with Morocco's mining and exploration agency, Bureau de Recherches et de Participations Minières (BRPM), on enlarging the country's sole bentonite processing plant from a capacity of 15,000 tons per year to 50,000 tons per year. Freeport-McMoRan Inc. of New Orleans, Louisiana, was negotiating with Morocco's phosphate monopoly, Office Cherifien des Phosphates (OCP), over possible collaboration for sulfur exploration in Morocco. As of yearend, Morocco had no known commercial deposits of natural sulfur.

From the mid-1960's until 1982, iron sulfides were exploited for their sulfur content at Kettara, northwest of Marrakech, by the Société d'Exploitation de la Pyrrhotine de Kettara. The sulfur was used for sulfuric acid manufacture at Safi. The operation became uneconomical and was shut down in 1982. Morocco's sulfur requirements for its chemical fertilizer industry continued to grow in 1986 and was expected to reach 2.5 million tons annually by 1990, making Morocco one of the world's largest sulfur importers. Although the international market price of sulfur continued to be depressed in 1986, the import costs still represented 42% to 45% of Morocco's manufacturing cost of phosphoric acid.

Manville Projects Corp. of Denver, Colorado, evaluated samples of Moroccan diatomite in 1986 and expressed interest in possible exploration and development activities in the country. Utah International Inc. of San Francisco, California, was involved in discussions with BRPM over possible exploration activities in the precious metals and coal sectors.

Belgium's Tractebel S.A. contracted with the Government's Office National de l'Electricité (ONE) to conduct a preliminary engineering study of a planned four-unit, 300-megawatt-per-unit powerplant to be located at Jorf Lasfar. ONE planned to issue a request for technical and cost proposals for the estimated $170 million first phase of the proposed project, which would install two of the four 300-megawatt units. Jorf Lasfar was chosen because the region's main source of electrical power, the Mohammedia power station, had no further space for expansion. The new powerplant was expected to be fuel convertible, so if necessary, it could run on coal, gas, or fuel oil. However, the plant was expected to be a coal-fired operation at startup. A coal import terminal was also planned for construction at Jorf Lasfar.

Early in 1986, the Government of Spain agreed to the financial terms of a $210 million package for the construction of a

railroad line in northern Morocco. The line was expected to run between Taourirt, at the junction with the railroad line between Fes and Oujda, and Nador on Morocco's north coast. A consortium of Spanish companies was expected to be the main contractor.

PRODUCTION AND TRADE

Overall, 1986 was the first year of improvement for the Moroccan international trade sector since 1983. However, mineral exports in 1986 were disappointing. Mineral trade receipts were approximately 20% less than in 1985. Phosphate rock exports fell approximately 10% during the year to $423 million, and exports of derivative chemical fertilizer products decreased 6%. World prices for phosphates and derivative products remained depressed throughout the year, and the Government continued to evaluate OCP in search of cost-cutting opportunities and to adopt more market-oriented policies to help cope with tougher market conditions.

Increased use of coal at power stations and cement plants more than doubled the imports of coal by Morocco. Both powerplants and cement plants were converted from fuel oil to coal firing during the previous few years. The cement works at Agadir, Asmar, Asment, Cadem, and Lafarge together imported over 300,000 tons of coal, while the power stations of Casablanca and Mohammedia imported approximately another 135,000 tons. However, total import costs of petroleum and other energy fuels decreased by over $500 million, easily offsetting the decrease in mineral exports. Substantial increases in the export of agricultural products, 19%, and manufactured goods, 28%, resulted in a total trade deficit that was 27% less than in 1985. Overall, imports fell 11% and exports increased slightly.

Table 1.—Morocco: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[p]
METALS					
Antimony concentrate:					
Gross weight	2,011	1,008	2,209	1,749	1,468
Sb content	905	454	972	[e]750	617
Cobalt concentrate:					
Gross weight	6,338	--	--	--	--
Co content	792	--	--	--	--
Copper:					
Concentrate, gross weight	64,364	71,020	65,470	61,804	[e]55,000
Matte, gross weight	3,286	2,544	1,361	2,481	[e]2,000
Cu content, concentrates and matte	23,269	25,396	22,093	22,014	[e]22,000
Iron and steel:					
Iron ore:					
Gross weight	223,820	173,010	162,984	190,528	195,600
Fe content	138,768	105,536	101,050	118,000	123,228
Metal:[e]					
Pig iron	12,000	15,000	15,000	15,000	15,000
Steel, crude	6,000	6,000	6,000	6,000	6,000
Lead:					
Concentrate:					
Gross weight	147,959	139,796	143,890	152,549	104,398
Pb content	103,571	97,857	100,723	106,784	76,211
Metal:					
Smelter, primary only[e]	56,500	55,200	46,100	59,500	60,000
Refined:					
Primary	56,533	55,173	46,054	59,470	[e]60,000
Secondary[e]	2,100	2,000	2,000	2,000	2,000
Total[e]	58,633	57,173	48,054	61,470	62,000
Manganese ore, largely chemical-grade	96,529	73,515	56,786	43,690	36,734
Nickel, Ni content of cobalt ore	[e]127	--	--	--	--
Silver, mine output, Ag content thousand troy ounces	2,640	2,850	2,410	2,733	1,600

See footnotes at end of table.

Table 1.—Morocco: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[p]
METALS —Continued					
Zinc concentrate:					
Gross weight	22,442	14,610	21,092	27,153	24,344
Zn content[e]	11,200	7,500	10,900	13,600	13,100
INDUSTRIAL MINERALS					
Barite	515,672	288,414	561,321	500,000	189,881
Cement, hydraulic thousand tons	3,739	3,848	3,588	3,697	[e]3,700
Clays, crude:					
Bentonite	4,457	4,096	1,825	2,877	3,834
Fuller's earth (smectite)	24,604	27,385	33,406	24,425	35,100
Montmorillonite (ghassoul)	4,271	6,037	3,382	4,656	4,313
Feldspar[e]	[3]1,025	1,000	1,000	1,000	1,000
Fluorspar, acid-grade	50,200	60,300	65,900	74,350	83,000
Gypsum[e]	420,000	440,000	450,000	450,000	450,000
Mica	512	[e]500	1,200	1,440	[e]1,500
Mineral water cubic meters	70,575	74,827	[e]70,000	[e]70,000	[e]70,000
Phosphate rock (includes Western Sahara) thousand tons	17,754	20,106	21,245	20,737	21,178
Salt, all types	56,556	69,800	62,740	92,263	96,514
MINERAL FUELS AND RELATED MATERIALS					
Coal, anthracite thousand tons	735	751	838	774	[e]775
Gas, natural:[e]					
Gross million cubic feet	2,900	2,800	2,700	2,600	2,600
Marketed do	2,300	2,200	2,100	2,000	2,000
Petroleum:					
Crude[e] thousand 42-gallon barrels	290	280	270	260	260
Refinery products:					
Gasoline do	2,920	3,285	[e]3,300	[e]3,300	[e]3,300
Jet fuel do	1,460	1,460	[e]1,500	[e]1,500	[e]1,500
Kerosene do	365	730	[e]750	[e]750	[e]750
Distillate fuel oil do	10,950	9,490	[e]9,500	[e]9,500	[e]9,500
Residual fuel oil do	12,045	13,140	[e]13,000	[e]13,000	[e]13,000
Other do	2,190	2,190	[e]2,100	[e]2,100	[e]2,100
Refinery fuel and losses do	1,095	1,460	[e]1,500	[e]1,500	[e]1,500
Total do	31,025	31,755	[e]31,650	[e]31,650	[e]31,650

[e]Estimated. [p]Preliminary.

[1]Includes data available through June 1, 1987.

[2]In addition to the commodities listed, a variety of crude construction materials is produced, but available information is inadequate to make reliable estimates of output levels. Limestone quarried for cement manufacture is substantial; however, information is inadequate to make accurate estimates of output levels.

[3]Reported figure.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Scrap	1,189	931	--	Belgium-Luxembourg 338; France 238; United Kingdom 175.
Semimanufactures	181	--		
Antimony: Ore and concentrate	2,152	--		
Copper:				
Ore and concentrate	72,174	60,615	--	Spain 49,044; East Germany 5,480.
Matte and speiss including cement copper	1,363	2,524	--	All to Belgium-Luxembourg.
Oxides and hydroxides	2	--		
Sulfate	10	--		
Metal including alloys:				
Scrap	2,376	2,361	--	France 684; Belgium-Luxembourg 612; United Kingdom 543.
Semimanufactures	--	3	--	Italy 2; Guinea 1.

See footnote at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	1,300	450	--	All to Spain.
Pyrite, roasted	116,538	161,673	--	Tunisia 50,031; Yugoslavia 43,011; France 41,505.
Metal:				
Scrap	r91,900	80,690	--	Spain 73,806; West Germany 2,100.
Pig iron, cast iron, related materials	--	1,100	--	All to Spain.
Semimanufactures:				
Bars, rods, angles, shapes, sections	24	13	NA	NA.
Universals, plates, sheets	--	17	NA	Guinea 15.
Hoop and strip	--	36	--	All to France.
Wire	5	--		
Tubes, pipes, fittings	67	48	--	Tunisia 26; Senegal 21.
Lead:				
Ore and concentrate	85,272	60,366	--	Spain 18,330; Belgium-Luxembourg 12,126; France 11,311.
Metal including alloys:				
Scrap	--	38	--	All to Belgium-Luxembourg.
Unwrought	46,107	55,893	--	Italy 28,235; Turkey 6,003; Romania 3,450.
Semimanufactures	1	2	--	All to Senegal.
Manganese: Ore and concentrate, metallurgical-grade	69,665	47,012	235	France 19,805; Italy 6,630; West Germany 6,210.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$15,436	$11,669	--	France $7,350; Switzerland $3,896.
Zinc:				
Ore and concentrate	24,072	30,816	--	Belgium-Luxembourg 9,480; West Germany 6,610; France 5,753.
Matte	340	--		
Metal including alloys:				
Scrap	340	6	--	All to France.
Semimanufactures	--	24	--	Do.
Other: Ores and concentrates	--	2,496	--	Yugoslavia 1,468; France 831; United Kingdom 197.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	--	2	--	Mainly to France.
Asbestos, crude	--	297	--	All to Tunisia.
Barite and witherite	570,973	487,982	233,698	Norway 79,212; Netherlands 47,550; Venezuela 27,000.
Cement	105	--		
Chalk	37	--		
Clays, crude	42,678	33,777	--	Spain 18,830; West Germany 7,716; United Kingdom 4,700.
Feldspar, fluorspar, related materials	74,199	64,686	13,500	Canada 27,450; Norway 10,464.
Fertilizer materials: Manufactured:				
Ammonia	65,700	--		
Nitrogenous	--	500	--	All to Guinea.
Phosphatic	479,649	604,720	--	U.S.S.R. 304,513; China 54,700; Burma 53,267.
Potassic	--	500	--	All to Guinea.
Unspecified and mixed	--	170,100	--	Italy 53,840; Turkey 46,400; Spain 28,088.
Gypsum and plaster	127,106	144,856	--	Ivory Coast 34,977; Spain 17,442; Cameroon 17,418.
Lime	107	92	NA	NA.
Mica, crude including splittings and waste	1,434	1,330	--	All to France.
Phosphates, crude thousand tons	14,951	14,790	--	Spain 2,504; France 1,622; Belgium-Luxembourg 1,497.
Precious and semiprecious stones other than diamond, natural value, thousands	$1	--		
Salt and brine	1,587	26,630	--	United Kingdom 26,450.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,977	1,350	(2)	Italy 1,258; West Germany 19.
Worked	--	12	5	France 2; Saudi Arabia 2.
Gravel and crushed rock	47,010	43,239	NA	NA.
Quartz and quartzite	--	2,500	--	All to Italy.
Sand other than metal-bearing	24,908	9,511	NA	NA.
Sulfur:				
Elemental:				
Crude including native and by-product	(2)	5	--	All to Saudi Arabia.
Colloidal, precipitated, sublimed	--	10	--	All to Egypt.
Sulfuric acid	--	104	--	All to Libya.
Other: Crude	--	150	--	All to France.
MINERAL FUELS AND RELATED MATERIALS				
Coal: Anthracite and bituminous	65,940	62,433	--	France 23,864; United Kingdom 23,684; Ireland 8,935.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	58	--		
Gasoline, motor do.	2,582	1,985	--	Netherlands 1,381; Portugal 323.
Kerosene and jet fuel do.	18	308	--	All for ships' stores.
Distillate fuel oil do.	--	14	--	Mainly for ships' stores.
Lubricants do.	(3)	167	--	Tunisia 159; Libya 7.
Residual fuel oil do.	12	19	--	Mainly for ships' stores.

rRevised. NA Not available.
[1]Table prepared by Virginia A. Woodson.
[2]Unreported quantity valued at $1,000.
[3]Less than 1/2 unit.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals value, thousands	$2	$2	--	France $1; West Germany $1.
Aluminum:				
Ore and concentrate	3,200	3,220	--	Guyana 3,200; China 20.
Oxides and hydroxides	2,036	2,149	2	France 2,013; Hungary 60.
Metal including alloys:				
Scrap	27	89	--	All from West Germany.
Unwrought	1,081	1,017	--	Netherlands 731; France 180.
Semimanufactures	6,211	4,527	NA	Spain 1,726; France 1,598; Italy 476.
Chromium: Oxides and hydroxides	11	14	--	United Kingdom 7; West Germany 6.
Columbium and tantalum: Metal including alloys, all forms: Tantalum value, thousands	$3	$1	--	All from France.
Copper:				
Oxides and hydroxides	14	--		
Sulfate	6	--		
Metal including alloys:				
Scrap	--	14	--	France 12; Spain 2.
Unwrought	774	664	--	France 544; Italy 85.
Semimanufactures	9,760	11,666	2	France 5,183; Belgium-Luxembourg 3,064; United Kingdom 1,341.
Iron and steel:				
Ore and concentrate:				
Excluding roasted pyrite	--	75	--	All from West Germany.
Pyrite, roasted	--	12	--	All from Gabon.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal:				
Scrap	896	2,167	--	United Kingdom 1,369; Spain 68.
Pig iron, cast iron, related materials	2,943	1,192	--	France 795; Belgium-Luxembourg 296.
Ferroalloys:				
Ferrochromium	68	NA		
Ferromanganese	133	125	--	Belgium-Luxembourg 60; France 55.
Ferromolybdenum	4	NA		
Ferrosilicochromium	764	NA		
Ferrosilicomanganese	20	NA		
Ferrosilicon	126	NA		
Unspecified	2	274	--	West Germany 126; France 79.
Steel, primary forms	198,262	336,413	--	West Germany 161,731; Spain 90,736; Netherlands 38,191.
Semimanufactures:				
Bars, rods, angles, shapes, sections	294,982	105,442	(2)	Spain 65,007; France 23,106.
Universals, plates, sheets value, thousands	$59,268	$67,432	$2	France $26,151; Spain $11,222; Belgium-Luxembourg $7,353.
Hoop and strip	11,069	13,274	--	France 7,227; Belgium-Luxembourg 1,801; Spain 1,486.
Rails and accessories	26,177	25,127	--	France 24,984.
Wire	22,019	22,782	(2)	Spain 9,627; France 8,537.
Tubes, pipes, fittings	30,586	23,426	12	France 14,218; Spain 4,038; West Germany 2,765.
Castings and forgings, rough	161	96	--	France 69; Belgium-Luxembourg 13.
Lead:				
Ore and concentrate	--	1,650	--	All from Mexico.
Oxides	501	668	--	France 521; Spain 122.
Metal including alloys:				
Unwrought	82	362	--	France 180; Belgium-Luxembourg 100; Netherlands 82.
Semimanufactures	69	75	--	Netherlands 44; Portugal 17.
Magnesium: Metal including alloys:				
Unwrought value, thousands	$2	$2	--	All from France.
Semimanufactures do	$5	$2	--	France $1; West Germany $1.
Manganese:				
Ore and concentrate, metallurgical-grade	286	106	--	Gabon 91; France 15.
Oxides	497	721	--	Ireland 520; Belgium-Luxembourg 140.
Mercury 76-pound flasks	232	319	29	Turkey 290.
Molybdenum: Metal including alloys, all forms value, thousands	$18	$9	--	France $5; Belgium-Luxembourg $2.
Nickel:				
Matte and speiss	3	5	(2)	France 3; Canada 2.
Oxides and hydroxides	1	--		
Metal including alloys:				
Unwrought	271	41	--	West Germany 22; France 11.
Semimanufactures	725	745	--	West Germany 544; Bulgaria 63; Switzerland 55.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	--	$5	--	All from France.
Selenium, elemental	(2)	NA		
Silicon, high-purity	15	NA		
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$82	$100	--	France $50; Belgium-Luxembourg $21; West Germany $13.
Tin: Metal including alloys:				
Unwrought	133	156	--	Thailand 63; Malaysia 30; Netherlands 22.
Semimanufactures	17	12	--	France 4; Belgium-Luxembourg 2; Netherlands 2.
Titanium:				
Ore and concentrate	125	NA		
Oxides	2,296	2,166	10	Spain 1,040; Belgium-Luxembourg 652; France 284.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Tungsten: Metal including alloys, all forms value, thousands	$45	$12	--	Poland $6; Italy $3.
Zinc:				
Oxides	574	564	21	France 339; Portugal 92; United Kingdom 29.
Metal including alloys:				
Unwrought	2,944	3,373	--	Belgium-Luxembourg 1,351; France 1,209; Spain 509.
Semimanufactures	309	261	--	France 150; Belgium-Luxembourg 51.
Other:				
Ores and concentrates	168	268	--	Australia 261.
Base metals including alloys, all forms	--	21	--	Spain 20.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	129	155	--	Italy 76; Spain 20; Greece 11.
Artificial: Corundum	446	297	--	France 210; West Germany 49.
Grinding and polishing wheels and stones	442	290	(2)	France 78; Italy 71; Denmark 42.
Asbestos, crude	4,702	1,110	--	Canada 669; Republic of South Africa 275; Italy 124.
Boron materials:				
Crude natural borates	(2)	61	--	All from France.
Oxides and acids	22	19	--	Turkey 8; Italy 5; France 3.
Cement	46,334	35,119	--	Spain 19,441; France 15,019.
Chalk	833	868	--	France 640; Spain 129.
Clays, crude	14,262	14,247	--	France 6,490; United Kingdom 5,100; Spain 2,156.
Cryolite and chiolite	16	10	--	All from Denmark.
Diamond: Industrial stones value	$61	--		
Diatomite and other infusorial earth	247	53	3	France 22; Spain 19; Italy 9.
Feldspar, fluorspar, related materials	1,798	751	--	France 371; Sweden 200; Spain 180.
Fertilizer materials:				
Crude, n.e.s	36	1,041	--	Bulgaria 1,008.
Manufactured:				
Ammonia	46,663	80,787	3,500	U.S.S.R. 71,383; Libya 5,793.
Nitrogenous	281,497	236,756	3	Romania 58,109; Bulgaria 37,438; West Germany 31,923.
Potassic	84,309	98,216	--	Spain 37,769; U.S.S.R. 28,852; East Germany 15,442.
Unspecified and mixed	735	1,170	1	Belgium-Luxembourg 795; West Germany 262.
Graphite, natural	12	28	--	All from France.
Gypsum and plaster	5	(3)	--	All from Spain.
Iodine	1	--		
Lime	600	--		
Magnesium compounds:				
Magnesite, crude	162	49	--	Austria 20; Spain 18.
Oxides and hydroxides	81	--		
Mica:				
Crude including splittings and waste	19	6	--	All from Norway.
Worked including agglomerated splittings	1	2	--	France 1; Spain 1.
Pigments, mineral: Iron oxides and hydroxides, processed	1,040	1,238	--	West Germany 797; United Kingdom 235; Spain 89.
Pyrite, unroasted	13	NA		
Quartz crystal, piezoelectric kilograms	7	NA		
Salt and brine	45	32	--	France 24; Netherlands 5.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	11,236	NA		
Sulfate, manufactured	5,002	610	--	Spain 600.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	10	59	--	All from Italy.
Worked	2	2,913	--	Italy 2,801.
Dolomite, chiefly refractory-grade	196	139	--	France 87; Spain 34.
Gravel and crushed rock	646	280	--	Belgium-Luxembourg 255; France 19.
Quartz and quartzite	1,076	674	--	Belgium-Luxembourg 653.
Sand other than metal-bearing	19,179	26,698	--	Belgium-Luxembourg 25,362; Portugal 1,110.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Sulfur:				
Elemental, crude including native and byproduct ----- thousand tons--	1,419	1,469	360	Canada 818; Poland 199.
Sulfuric acid ----------	51,031	52,486	--	Spain 45,506; Italy 4,301.
Talc, steatite, soapstone, pyrophyllite --	1,552	1,060	18	France 968.
Other: Crude ----------	18,236	20,114	--	France 9,421; West Germany 5,112; Spain 2,998.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black ----------	4,928	4,846	2	Spain 3,225; Italy 501; France 414.
Coal:				
Anthracite and bituminous -------	155,759	420,743	196,026	United Kingdom 164,464; Belgium-Luxembourg 26,378.
Briquets of anthracite and bituminous coal ----------	4	--		
Coke and semicoke ----------	22,944	30,274	--	All from West Germany.
Peat including briquets and litter -----	42	--		
Petroleum:				
Crude- thousand 42-gallon barrels--	32,985	36,179	--	Saudi Arabia 19,782; Iraq 5,047; U.S.S.R. 4,354.
Refinery products:				
Liquefied petroleum gas ---- do----	1,459	1,930	--	France 912; United Kingdom 503.
Gasoline ---------- do----	61	55	--	Netherlands 34; Belgium-Luxembourg 17.
Mineral jelly and wax -- do----	69	49	--	Hungary 36; West Germany 7.
Kerosene and jet fuel--- do----	1	(2)	--	All from Netherlands.
Distillate fuel oil ----- do----	(2)	(2)	--	All from France.
Lubricants ---------- do----	115	39	(2)	France 18; West Germany 9; Belgium-Luxembourg 4.
Residual fuel oil ------ do----	115	213	98	Saudi Arabia 115.
Bitumen and other residues ---- do----	1	1	--	All from France.
Bituminous mixtures -------	1	(2)	--	Do.
Petroleum coke ------ do----	219	--		

NA Not available.
[1]Table prepared by Virginia A. Woodson.
[2]Less than 1/2 unit.
[3]Unreported quantity valued at $1,000.

COMMODITY REVIEW

METALS

Copper.—A feasibility study for a copper mine and processing complex at Essaouira was commissioned by Société Marocaine de Cuivre. In addition to the copper produced, it was estimated that approximately 140,000 tons per year of sulfuric acid could also be produced.

Silver.—Morocco's largest silver producer, Société Métallurgique d'Imiter, began an expansion program for the Imiter Mine complex, which was expected to approximately triple the operation's output, to 110 tons of silver per year, by 1988. The new installations, if constructed as designed, would be able to process 400 tons per day of ore, with an expected ore grade of 800 grams per ton of silver. The Imiter Mine, located east of the Atlas Mountains near Tinherir, had ore reserves estimated at 5 million tons. The expansion program as estimated would cost $34 million to complete. The Imiter silver deposits were first mined as far back as the 12th century and were rediscovered in 1950 when aerial surveys revealed the workings.

INDUSTRIAL MINERALS

Cement.—Cement production continued to rise in 1986, with nine parastatal companies in operation. Ahead of schedule by 3 months, Ciments d'Agadir's 1,200-ton-per-day plant began operation in June. The kiln almost immediately began operating above expected capacity, allowing the company to

operate its other two smaller kilns only when product demands increased unexpectedly.

Phosphate Fertilizers.—OCP's new phosphate chemical fertilizer complex at Jorf Lasfar was essentially fully operational at yearend. The complex was the largest of its kind in the world with eight identical Rhône-Poulenc S.A. phosphoric acid lines, having a combined capacity of 1.32 million tons per year of phosphoric acid. The lines were split into two groups of four lines each, designated Moroc Phosphore III and IV. Each group had its own control room and operating management. Centralized power, water, and sulfur melting facilities served both groups. A new railroad delivered phosphate rock from Khouribga to four storage halls, each with a capacity of 50,000 tons. There were six sulfuric acid lines, each with a rated capacity of 2,300 tons per day, for supplying acid for digestion, using the Monsanto Enviro-Chem double-absorbtion process. Imported sulfur was melted at a 12,960-ton-per-day plant at the seaport, approximately 3 kilometers from the chemical fertilizer complex. Storage facilities for the melted sulfur included three 15,000-ton tanks at the melting plant and a tank farm halfway between the port and plant with a dozen 18,000-ton tanks.

Four lines existed for production of chemical fertilizers based on technology from Charbonnages de France-AZF. Two of the lines were capable of producing 1,440 tons per day of double ammonium sulfur phosphate or ammonium sulfophosphate, and two were capable of producing 1,440 tons per day of double ammonium phosphate or 1,152 tons per day of triple superphosphate. The products could be bagged or exported as bulk, as requested.

The central powerplant was composed of three 37.6-megawatt generators, one of which was for emergencies. When operating at full capacity, the plant complex consumed 45,000 cubic meters of seawater and 2,500 cubic meters of freshwater per hour. A 5-kilometer-long canal returned seawater to the sea. The fertilizer complex cost approximately $1 billion to build.

The new port at Jorf Lasfar was built independently from the OCP fertilizer project. The port facilities included a sulfur-unloading capability of 1,500 tons per hour, ammonium discharge capacity of 1,200 tons per hour, phosphoric acid unloading capacity of 3,600 tons per hour, and phosphate rock and fertilizer loading capacity of 3,000 tons per hour.

MINERAL FUELS

Coal.—Project bids for construction of a 990-meter shaft at the Jerada Mine were being evaluated in late 1986 as part of a $74 million expansion project for the mine. Charbonnages du Maroc, the mine operator, hoped to double production at the mine to 1.5 million tons per year by 1990. Construction on the shaft was expected to start early in 1987 and take 28 months to complete.

Natural Gas.—Work continued all year on the development of the Meskala Gasfield in Morocco's Essaouria Basin. A turnkey contract was signed in April between Morocco's Office Nationale de Recherches et d'Expoitation des Pétroles (ONAREP) and contractors for building a gas gathering and processing network for the field. The equipment manufacturer was to be A. Herlicq et Fils S.A. of France. The $5.2 million contract was for installation of wellhead separators, a pipeline gathering system, a gas processing plant, and a pipeline spur to develop the gasfield. Williams Bros. Engineering Co. of Tulsa, Oklahoma, was serving as ONAREP's consultant on the project.

The gas zone to be developed was at a depth of approximately 11,500 feet and had an abnormally high bottom hole pressure of 9,000 pounds per square inch. Wells were expected to flow at a surface pressure of 5,000 pounds per square inch. Four completed wells were to supply the gas processing plant initially, with other planned production wells to be drilled. The processing plant was expected to produce 7 million cubic feet of gas and 400 barrels of condensate per day. The field was expected to begin producing at an annual rate of 770,000 barrels of oil equivalent per year in the late spring of 1987. Processed gas was to be piped to Youssoufia, where it would be used for fuel in phosphate calcination plants. The plant's condensate was to be transported by truck to Casablanca, then moved by pipeline to a refinery at Sidi Kacem for further processing. The Meskala plant was to be the Essaouira Basin's third and biggest gas development complex. The Meskala Field was discovered in 1982.

Petroleum and Natural Gas Exploration.—ONAREP obtained the first exploration permit in the disputed Western Sahara region. The concession covered 5,000 square kilometers around Layoun, the Saharan capital. ONAREP had been trying to encourage international companies to explore for hydrocarbons in the territory and hoped its activities there might precipitate other

exploration programs. British Petroleum (BP) of Morocco Inc. began an exploration program on its Dakhla block extending 30 miles off the Western Sahara coastline. In December 1985, BP completed 693 line miles of seismic data on the 1.24-million-acre concession.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Moroccan dirhams (DH) to U.S. dollars at the rate of DH9.20=US$1.00.

The Mineral Industry of Namibia

By George A. Morgan[1]

The Namibian mining industry showed improved output of base metals and diamonds in 1986 while the uranium sector remained unchanged. Uranium was the second most important mineral commodity to the economy after diamond. Several small base metal mines closed owing to depletion of reserves and higher costs of operation. The industry's contribution to the gross domestic product was 36% in 1985, the latest year for which such data was available. In 1986, mining accounted for 20% of the total revenue collected by the Central Revenue Fund, including about $22 million from tax on income from diamond mines and $67.5 million[2] from other mines. The diamond export tax was $17.1 million. The weakness of the rand against major world currencies led to higher sales of local mining industry products.

The Multi-Party Conference, a coalition of six political parties established in 1985 to administer Namibia, was being assigned equity rights or complete ownership in selected sectors. This included private mining companies in the mining sector. Tax legislation was being reviewed with the aim of stimulating employment, particularly as the labor component of the mining sector had declined in recent years.

The National Union of Mineworkers (NUM), a labor union representing predominately black workers in the Republic of South Africa, was prohibited from organizing in Namibia by legislation passed by the Namibian National Assembly. NUM had begun discussion with Consolidated Diamond Mines (Pty.) Ltd. (CDM) for representation at CDM minesites. Mineworkers from five major mines formed the Mineworkers Union of Namibia (MUN) in November. MUN targeted its recruitment campaign at the country's major mining operations. In order to negotiate on behalf of employees, a registered union must enter into a recognition agreement with a company and demonstrate that it has the paidup membership claimed. Overall, the labor force declined by 441 employees to 14,428 owing to rationalization. Basic salaries and wages, excluding fringe benefits, were up by 8% to $72.9 million.

The Government of the Republic of South Africa and the Multi-Party Conference reached agreement on transfer of the South West African Water and Electricity Corp. (SWAWEC) to the Government of Namibia. Shares valued at about $33 million and held in SWAWEC by the Industrial Development Corp. of the Republic of South Africa were transferred to the Multi-Party Conference, and an unspecified amount in loans originally granted to SWAWEC by the Republic of South Africa was to be paid back to the South African Government.

Combined expenditures on exploration by the mining industry in Namibia increased by 40% to $8.1 million compared with those of 1985. The Department of Economic Affairs issued 172 new prospecting licenses, compared with 210 in 1985. New claims registered were 804 in 1986 and 217 in 1985. New prospecting grants were 22, down from 33 in 1985. Of particular interest was marine exploration for diamond and evaluation of the Navachab gold occurrence in the vicinity of Karibib and Usakos, northwest of Windhoek.

PRODUCTION AND TRADE

Output of most major mineral commodities increased slightly in 1986, with CDM and Tsumeb Corp. Ltd. (TCL) being the major contributors to the economy. Output of arsenic, tin, and lithium minerals declined.

TCL, the major nonferrous metal producer in Namibia, experienced a 15% increase in output of ore and concentrate in 1986 compared with 1985, as well as increased production of blister copper and refined lead. Much of the increase was attributed to the phase-in of a new slag reprocessing plant. The cost of ore per ton milled was up 5%. Despite the improvements in plant operations, particularly with startup of the new slag reprocessing plant, gross profits dropped to $7.12 million from $17.9 million in 1985, and total sales were $84.6 million compared with $95.7 million in 1985.

Detailed data on foreign trade for Namibia continued to be unavailable. Namibian trade data are included with that of the Republic of South Africa, which is part of the Customs Union and includes Botswana, Lesotho, and Swaziland. Exports of minerals to the United States were $5.4 million in 1985 and $592,000 in 1986. Total U.S. exports to Namibia were $2.5 million in 1986, of which $2.2 million were mineral related. Trade and loan restrictions were instituted with Namibia as part of legislation limiting relations with the Republic of South Africa.

Table 1.—Namibia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Arsenic, white[3]	1,895	1,126	2,504	2,471	1,936
Cadmium metal, refined	110	51	40	58	50
Columbium and tantalum: Tantalite concentrate, gross weight ---- kilograms	8,900	2,800	6,600	4,600	5,000
Copper:					
Mine output, Cu content of concentrate	49,800	50,447	47,406	48,036	49,594
Metal, blister	49,767	54,238	46,436	43,295	45,688
Gold, Au content of smelter products ---- troy ounces	7,395	7,459	6,302	6,237	6,400
Lead:					
Mine output, Pb content of concentrate	32,900	38,467	33,255	34,640	37,101
Metal, refined	40,590	35,416	28,930	38,511	40,047
Silver: Mine output, Ag content of concentrate ---- thousand troy ounces	2,812	3,535	3,255	3,404	3,148
Tin, mine output, Sn content of concentrate	1,326	e1,400	906	984	710
Uranium, U_3O_8 content of concentrate	4,454	e4,450	4,400	4,400	4,400
Zinc, mine output, Zn content of concentrate	e32,200	33,526	32,195	30,232	35,371
INDUSTRIAL MINERALS					
Diamond:[4]					
Gem[e] ---- thousand carats	963	915	884	865	960
Industrial stones[e] ---- do	51	48	46	45	40
Total ---- do	1,014	963	930	910	[5]1,010
Lime	1,150	600	--	--	--
Limestone and marble	21,400	15,400	23,400	31,600	32,000
Lithium minerals:					
Amblygonite	80	50	60	50	52
Lepidolite	60	30	20	110	52
Petalite	900	700	800	1,800	1,116
Total	1,040	780	880	1,960	1,220
Mica	--	100	90	--	--
Quartz	3,500	150	20	300	851
Salt	184,000	136,900	88,000	152,300	130,000
Sulfur, S content of pyritic concentrate	58,209	80,719	104,454	107,718	133,824
Wollastonite	1,300	1,100	--	--	--

[e]Estimated. [p]Preliminary.

[1]Table includes data available through May 15, 1987.

[2]Data are compiled from the Annual Report of the Chamber of Mines of South West Africa/Namibia and from operating company annual reports as follows: Tsumeb Corp. Ltd. (TCL), South African Iron and Steel Industrial Corp. Ltd. (Iscor), Falconbridge Nickel Mines Ltd., Rio Tinto Zinc Corp. Ltd. (RTZ), and others as available.

[3]White arsenic equivalent of all arsenic products reported as being produced.

[4]Total figures reported by De Beers Consolidated Mines Ltd. in company annual reports for calendar years. Details on gem and industrial diamonds are estimates, assuming output to be 95% gem quality.

[5]Data do not add to total shown because of independent rounding.

COMMODITY REVIEW

METALS

In addition to the mineral commodities listed in table 1, a number of minerals were produced for which there were limited published statistics available. Among these were agate, amethyst, aragonite, beryl, dioptase, gypsum, marble, rose quartz, and tourmaline.

Copper.—The Tsumeb Mine of TCL was the major copper producer with 638,701 tons of ore milled grading 2.92% copper. Both mill throughput and copper recovery increased, and further increases in recovery were expected upon commissioning of a $240,000 gravity plant for retreating flotation plant tailings. Head grades at the Kombat mill decreased but were compensated for by an increase in mill throughput of 8%. The presence of high levels of iron and manganese mineralization in the Asis West ore body did not seriously affect mill processing as recovery reportedly was satisfactory. The Otjihase mill treated an increased portion of higher grade weathered ore derived from pillar recovery at the Otjihase Mine, with lower copper recoveries experienced for most of the year owing to the change in mineralization.

The Klein Aub Mine, owned and operated by Metorex Mining Co. since its purchase from General Mining Union Corp. of the Republic of South Africa in 1985, suffered depressed sales owing to low copper prices and an unfavorable exchange rate in the latter part of the year. The operation reported a loss for 1986, and total output was 3,309 tons of copper in concentrates.

Table 2.—Namibia: Gross weight and elemental content of ore and concentrate produced in 1986, by mine

(Metric tons unless otherwise specified)

Mine or mill	Gross weight	Elemental content				
		Copper	Lead	Zinc	Sulfur	Silver (troy ounces)
Asis East:						
Ore	22,655	458	147	--	NA	21,851
Concentrate:						
Copper	1,215	310	42	--	NA	18,086
Lead	75	6	12	--	NA	217
Asis West:						
Ore	180,374	7,666	2,471	--	NA	185,573
Concentrate:						
Copper	22,435	6,989	1,393	--	NA	163,735
Lead	1,411	149	677	--	NA	4,264
Klein Aub:						
Ore[e]	207,000	4,140	--	--	NA	NA
Concentrate: Copper	7,501	3,309	--	--	--	192,904
Kombat:						
Ore	155,398	4,946	2,191	--	NA	154,881
Concentrate:						
Copper	14,048	4,391	945	--	NA	135,044
Lead	1,997	210	968	--	NA	7,512
Otjihase:						
Ore	867,723	17,528	--	--	176,321	NA
Concentrate:						
Copper	61,331	16,474	--	--	21,214	134,085
Pyrite	189,451	417	--	--	112,610	--
Rosh Pinah:						
Ore[e]	450,000	--	12,600	36,000	NA	NA
Concentrate:						
Lead	15,189	--	6,627	[e]700	NA	385,805
Zinc	60,484	--	[e]4,000	31,919	NA	[e]555,000
Slag mill:						
Ore (slag)	223,887	2,911	NA	NA	NA	NA
Concentrate: Copper	6,441	1,172	393	NA	NA	48,457
Tsumeb:						
Ore	638,701	18,650	27,783	8,175	NA	NA
Concentrate:						
Copper	43,622	11,582	4,463	--	NA	1,155,642
Lead	73,783	4,582	17,974	2,752	NA	671,326
Total:						
Ore	XX	56,299	45,192	44,175	176,321	NA
Concentrate	XX	49,591	37,494	35,371	133,824	3,472,077

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

Metal production at the Tsumeb smelter totaled 50,145 tons, of which 4,457 tons was returned blister from the O'okiep Copper Co. Ltd. in the Republic of South Africa, and 3,452 tons was from other mines, both toll and purchased. The blister returned from O'okiep had been shipped as copper concentrates to that company in 1985 owing to limited smelting capacity at the Tsumeb smelter from operation of only one reverberatory furnace.

A full year of operation of the new slag treatment mill resulted in the processing of nearly 224,000 tons of copper-bearing slag with a head grade of 1.3% copper, considerably higher than the 0.92% copper that had been forecast. Over 6,400 tons of concentrate was produced, grading about 18% copper.

Total copper reserves, which include proved, probable, and possible reserves at the Tsumeb, Kombat, and Otjihase Mines, were 16.9 million tons averaging 2.77% copper. Reserves at the Klein Aub Mine were reportedly vast, but were estimated to grade less than 2.0% copper.

Gold.—The Navachab gold occurrence near Karibib was under evaluation by Anglo American Prospecting Services Namibia (Pty.) Ltd.

Lead.—TCL remained the largest producer of lead from its Tsumeb Mine, followed by the Rosh Pinah Mine of Imcor Zinc (Pty.) Ltd. Nearly 74,000 tons of lead concentrate was produced by TCL from the Tsumeb mill, grading 24.36% lead. Smelter production of lead was 40,047 tons, 25,000 tons of which was from TCL mines and the remainder from other sources. Lead sales were 41,547 tons compared with 37,271 tons in 1985. Reserves, including proved, probable, and possible, averaged 1.46% lead, and were about 245,000 tons.

Tin.—The Tin Tan Mine, a small producer operated by Metorex Mining, was closed at the end of October because of low metal prices.

Zinc.—Output increased from the Rosh Pinah Mine owing to a successful exploration program and an ongoing capacity expansion project. All concentrate output was shipped by road to Aus and then by railroad through Walvis Bay primarily to Far Eastern markets. A study aimed at testing the feasibility of exporting concentrates through the Port of Luderitz showed such an effort to be unsuitable.

INDUSTRIAL MINERALS

Diamond output improved as demand was up worldwide for gem-quality stones, which constituted most of Namibian production. De Beers Consolidated Mines Ltd. indicated that it was reorganizing some of its operations in order to centralize control in Namibia. CDM, which exploited the coastal diamond areas near Oranjemund and was a subsidiary of De Beers, purchased a new bucket-wheel excavator to increase overburden stripping in deeper portions of the deposits. Maximum output of the excavator was 3,500 cubic meters per hour. It removed primarily a sand overburden containing some pebbles and small boulders. Customized hydraulic excavators carrying vacuum cleaning units follow the bucket- wheel excavators to clean most of the diamond-bearing material from the bedrock. Operating capacity of these vacuum units was about 145,000 square meters per year. Final cleaning was by teams of 12 to 18 laborers who manually sweep the bedrock, particularly the cracks and crevices.

CDM commissioned a dredge in May that was designed to remove overburden from under water. Lift height was 15 meters below water level, and a jet pump was used to move the overburden through 500 meters of 400-millimeter-diameter pipeline.

MINERAL FUELS

Namibia was totally dependent upon imports of liquid fuels, having no indigenous production or refining facilities.

Output of uranium from the Rossing Mine remained stable compared with that of 1985. The Rossing Mine continued to fill primarily long-term contracts from previous years to sustain its current output. Prices on these contracts, which account for 90% of all uranium sales worldwide, were generally higher than spot market prices.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from South African rands (R) to U.S. dollars at the rate of R1 = US$0.4564 for 1985 and R1 = US$0.4408 for 1986.

The Mineral Industry of the Netherlands

By George A. Rabchevsky[1]

Income from the Netherland's vast gas reserves compensated for sluggish economic growth over the past decade and financed the country's generous welfare system. Lacking any sizable extractive industry and coal mining having ceased in the mid-1960's, the processing of metals, chemicals, and petroleum products from imported materials were the only other mineral-related industries in the Netherlands. As a major energy producer, the country was affected by declining oil and gas prices and the weak U.S. dollar, in which natural gas is priced. Natural gas accounted for about 14% of the gross national product (GNP). The GNP advanced only 0.5% to 2.5%; the rate of growth was declining.

Unemployment in the Netherlands was one of the highest in the industrialized world, standing at about 710,000 of registered unemployed, or 12.5%, despite the economic recovery that began in 1983.[2]

PRODUCTION

Industrial production rose only 2.5% and was declining at yearend. The slowdown was felt in most sectors of industry, but most noticeably in the chemical industry. In contrast, output of building materials rose 5% during the first half of 1986 against only 1% in 1985. Employment in the gas and petroleum refinery industries fluctuated, but productivity per worker rose by about 1%.

Table 1.—Netherlands: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum:					
Primary	250,925	235,351	249,170	250,603	256,000
Secondary	49,825	58,199	59,894	62,315	64,000
Cadmium metal	497	513	636	598	570
Iron and steel:					
Ore sintered (from imported ore) thousand tons	2,512	2,669	3,516	3,737	3,600
Metal:					
Pig iron do	3,617	[r]3,747	4,926	4,819	4,670
Steel, crude do	4,346	4,477	5,739	5,517	4,900
Semimanufactures do	3,882	4,066	4,928	4,868	4,450
Lead:					
Smelter[e]	2,500	2,500	2,500	3,000	3,000
Refined:					
Primary	4,800	2,000	--	--	--
Secondary	27,700	23,600	33,600	37,300	40,000
Total	32,500	25,600	33,600	37,300	40,000
Tin, refined:					
Primary	2,800	5,398	6,517	6,033	5,000
Secondary[3]	180	180	180	204	200
Zinc (slab), primary	186,022	187,519	209,657	201,712	195,000
INDUSTRIAL MINERALS					
Cement, hydraulic thousand tons	3,102	3,107	3,176	2,911	3,200
Nitrogen: N content of ammonia do	1,655	1,747	2,312	2,386	2,065
Salt, all types do	3,191	3,124	3,674	4,154	3,763
Sand, industrial do	17,359	19,399	[e]19,000	18,994	20,000
Sodium compounds, n.e.s.:[e]					
Carbonate do	420	420	400	380	380
Sulfate, synthetic do	50	50	45	45	45
Sulfur:					
Elemental byproduct:[e]					
Of metallurgy do	100	100	--	--	--
Of petroleum and other forms do	65	105	245	250	250
Total do	165	205	245	250	250
Sulfuric acid, 100% H_2SO_4 do	1,609	1,420	1,609	1,508	[3]1,266
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	82,700	91,200	102,300	103,000	[3]105,100
Coke thousand tons	2,428	2,126	2,726	2,971	[3]2,867
Gas:					
Manufactured, all types[4] million cubic feet	272,739	288,445	298,631	266,056	280,000
Natural, gross do	2,543,844	2,702,792	2,728,041	2,850,581	2,600,000
Natural gas liquids thousand 42-gallon barrels	2,981	3,608	3,818	4,000	3,900
Peat[e] thousand tons	400	400	450	450	400
Petroleum:					
Crude thousand 42-gallon barrels	11,158	17,647	21,143	27,734	27,000
Refinery products:					
Gasoline, motor do	62,008	60,597	56,568	53,049	58,000
Jet fuel do	26,824	28,288	28,968	27,800	31,000
Kerosene do	3,410	4,487	4,487	3,550	4,350
Distillate fuel oil do	101,613	107,461	120,039	111,303	145,000
Residual fuel oil do	89,424	103,743	102,744	85,901	92,500
Lubricants do	3,297	3,423	[e]3,500	5,544	6,000
Liquefied petroleum gas do	17,934	21,912	[e]22,000	22,562	23,000
Naphtha do	56,602	67,737	63,784	50,133	65,000
Bitumen do	4,200	4,375	[e]4,500	4,242	5,000
Total[5] do	365,312	402,023	406,590	364,084	429,850

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

[1]Table includes data available through June 1987.

[2]In addition to the commodities listed, a variety of crude construction materials (clays, gravel, and stone) are also produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Coke oven and blast furnace gas only.

[5]Total of listed products only; refinery fuel and losses included with listed products.

TRADE

Lacking significant natural resources, except offshore gas, and because of the country's own relatively small home market, the Netherlands has in effect turned trading and distribution activities into a natural resource of its own. Exports accounted for over 50% of Netherland's GNP. Rotterdam was the world's largest port, and Amsterdam Schiphol was Europe's fourth largest airport in terms of cargo traffic handled. Rotterdam was geographically well placed to serve the hinterland, the major industrial areas of the Netherlands, the Ruhr in the Federal Republic of Germany, Belgium, and much of France.

As a result of an improvement in the terms of trade, the trade surplus rose to an estimated $6.1 billion.[3] Exports, which increased by 5% in 1985, grew only by 3.5%, owing mainly to a sharp reduction in gas exports in the first quarter. This contributed also to a decline in exports of minerals of more than 25% in volume terms during the last quarter.[4]

The Netherlands remained an important trade and investment partner of the United States. The Netherlands was the second largest source of foreign direct investment in the United States, and the United States recorded its largest bilateral trade surplus with the Netherlands—$1.6 billion—in 1986. Trade with the Netherlands continued to comprise about 2% of total U.S. trade with the world.

Rotterdam, with its exceptionally deep draught and extensive terminal facilities, was a major throughput port for crude oil and refined oil products. There was virtually no major industrial commodity that was not, in some degree, handled at Rotterdam. In 1984, the port handled a total of about 192 million tons of discharged commodities and about 57 million tons of commodities loaded for export. After oil, the largest single category of commodities shipped through Rotterdam was iron ore—an estimated 36.5 million tons in 1985 and 37.5 million tons in 1986. In terms of volume, phosphate rock was the most important fertilizer commodity handled at the port. In 1985, a total of about 2.65 million tons of natural fertilizer, virtually all of its phosphate rock, was discharged by seagoing vessels at the port. Sulfur was another major fertilizer commodity handled at Rotterdam. Total throughput in 1985 was about 400,000 tons of dry bulk and liquid sulfur.

August de Meyer BV, a subsidiary of the worldwide transportation and energy group Nedlloyd Lijnen BV, completed the construction of a new bulk handling and distribution facility at Terneuzen. The new terminal has a storage capacity of approximately 130,000 tons and was designed specifically for the handling of bulk goods, such as phosphates, potash, minerals, and fertilizers.[5]

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	5	2	--	NA.
Alkaline-earth metals	2	--		
Aluminum:				
Ore and concentrate	5,509	5,063	--	United Kingdom 1,575; Belgium-Luxembourg 1,283; France 875.
Oxides and hydroxides	65,039	59,175	1	West Germany 19,423; United Kingdom 12,002; Italy 6,275.
Ash and residue containing aluminum	9,847	11,371	--	West Germany 8,655; Spain 2,200.
Metal including alloys:				
Scrap	93,258	87,062	128	West Germany 52,234; France 15,741; Belgium-Luxembourg 12,959.
Unwrought	279,020	296,767	1,137	Belgium-Luxembourg 123,338; France 90,594.
Semimanufactures	107,343	109,418	6,494	West Germany 45,229; Belgium-Luxembourg 15,644.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Antimony:				
Ore and concentrate	--	1	--	NA.
Oxides	134	243	NA	West Germany 187.
Metal including alloys, all forms	160	59	--	Poland 34; Bulgaria 20.
Arsenic: Oxides and acids	3	10	--	NA.
Beryllium: Metal including alloys, all forms	--	(2)	--	All to Belgium-Luxembourg.
Bismuth: Metal including alloys, all forms	59	12	--	West Germany 4; Belgium-Luxembourg 2.
Cadmium: Metal including alloys, all forms	841	615	NA	France 337; West Germany 101; United Kingdom 85.
Cesium and rubidium: Metal including alloys, all forms	--	(2)	NA	NA.
Chromium:				
Ore and concentrate	21,377	27,379	--	West Germany 9,528; France 8,061; Belgium-Luxembourg 4,843.
Oxides and hydroxides	290	421	2	West Germany 232; United Kingdom 114.
Metal including alloys, all forms	518	2	NA	Belgium-Luxembourg 1.
Cobalt:				
Ore and concentrate	(2)	25	--	NA.
Oxides and hydroxides	60	48	--	West Germany 30; Italy 7.
Metal including alloys, all forms	259	286	NA	Finland 101; France 43.
Columbium and tantalum:				
Ore and concentrate	74	154	--	All to U.S.S.R.
Ash and residue containing columbium and/or tantalum	1,149	1	--	All to West Germany.
Metal including alloys, all forms:				
Columbium (niobium)	(2)	(2)	--	NA.
Tantalum	1	2	--	Austria 1.
Copper:				
Ore and concentrate	1,118	--		
Matte and speiss including cement copper	36	20	--	All to Sweden.
Oxides and hydroxides	163	115	NA	West Germany 50; United Arab Emirates 15.
Sulfate	1,247	2,048	NA	Belgium-Luxembourg 911; West Germany 683.
Ash and residue containing copper	6,548	8,946	13	Belgium-Luxembourg 4,619; West Germany 3,657.
Metal including alloys:				
Scrap	62,443	73,072	3	West Germany 36,446; Belgium-Luxembourg 23,299.
Unwrought	7,535	9,462	27	West Germany 7,654; France 529.
Semimanufactures	59,150	59,723	14,520	West Germany 12,111; United Kingdom 5,571.
Gallium: Metal including alloys, all forms	(2)	--		
Germanium: Metal including alloys, all forms	(2)	1	1	
Gold:				
Waste and sweepings value, thousands	$20,551	$17,161	$871	West Germany $13,503; Spain $1,295.
Metal including alloys, unwrought and partly wrought troy ounces	98,389	62,236	NA	Switzerland 30,348; West Germany 13,790; Denmark 6,683.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	45,316	55,044	18	West Germany 47,288; France 2,762.
Pyrite, roasted	76	159	--	West Germany 136.
Metal:				
Scrap thousand tons	1,684	1,835	(2)	West Germany 493; India 369; Belgium-Luxembourg 337.
Pig iron, cast iron, related materials	8,977	18,451	126	West Germany 14,777; United Kingdom 2,302.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Ferroalloys:				
Ferrochromium	4,087	1,714	--	Belgium-Luxembourg 1,568; West Germany 96.
Ferromanganese	562	154	--	Belgium-Luxembourg 107; West Germany 23.
Ferromolybdenum	83	289	--	West Germany 121; France 118.
Ferronickel	8	92	--	France 64.
Ferrosilicochromium	(2)	--		
Ferrosilicomanganese	115	--		
Ferrosilicon	13	230	--	West Germany 211.
Silicon metal	153	2,052	--	West Germany 1,181; Turkey 500.
Unspecified	203	1,043	--	Sweden 659; West Germany 288.
Steel, primary forms thousand tons	2,319	2,239	253	West Germany 307; Italy 282; Greece 242.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	458	511	11	West Germany 189; Belgium-Luxembourg 118.
Universals, plates, sheets do	1,197	1,712	142	West Germany 381; Belgium-Luxembourg 317.
Hoop and strip do	128	131	(2)	Switzerland 36; Belgium-Luxembourg 11.
Rails and accessories do	28	38	--	Italy 26.
Wire do	71	68	4	Belgium-Luxembourg 14; West Germany 13.
Tubes, pipes, fittings do	446	490	26	West Germany 114; Belgium-Luxembourg 62.
Castings and forgings, rough do	19	18	1	Belgium-Luxembourg 7; West Germany 6.
Lead:				
Oxides	9,109	6,607	--	West Germany 3,668; United Kingdom 721.
Ash and residue containing lead	2,740	7,031	43	France 5,320; Belgium-Luxembourg 894.
Metal including alloys:				
Scrap	30,024	20,213	--	West Germany 9,288; Belgium-Luxembourg 5,340.
Unwrought	15,373	20,051	--	West Germany 13,411; France 3,368; Belgium-Luxembourg 2,196.
Semimanufactures	1,951	2,779	3	Norway 837; West Germany 716.
Lithium: Oxides and hydroxides	14	27	NA	France 16; Belgium-Luxembourg 5.
Magnesium: Metal including alloys:				
Scrap	1,562	1,705	332	Italy 632; West Germany 398.
Unwrought	8,069	4,911	24	West Germany 3,051; United Kingdom 1,607.
Semimanufactures	44	108	(2)	West Germany 96.
Manganese:				
Ore and concentrate, metallurgical-grade	46,597	47,849	--	West Germany 10,473; Republic of South Africa 4,602; Belgium-Luxembourg 196.
Oxides	216	216	--	Belgium-Luxembourg 196.
Metal including alloys, all forms	1,490	1,830	NA	Norway 538; West Germany 484; Yugoslavia 233.
Mercury 76-pound flasks	12,183	725	--	West Germany 290; Belgium-Luxembourg 145.
Molybdenum:				
Ore and concentrate	15,801	18,224	36	United Kingdom 4,121; West Germany 3,538; Austria 2,778.
Oxides and hydroxides	1,631	1,509	NA	Austria 1,146; United Kingdom 184.
Metal including alloys:				
Scrap	27	15	5	West Germany 10.
Unwrought	5	53	--	West Germany 48.
Semimanufactures	90	206	2	Belgium-Luxembourg 85; United Kingdom 51.
Nickel:				
Matte and speiss	2,768	1,693	NA	NA.
Ash and residue containing nickel	2,244	2,491	19	West Germany 481; United Kingdom 478; Austria 461.
Metal including alloys:				
Scrap	3,015	3,196	--	Finland 1,528; West Germany 634.
Unwrought	426	443	--	Belgium-Luxembourg 112; France 91.
Semimanufactures	235	271	3	West Germany 91; France 39.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals:				
Waste and sweepings value, thousands	$16,978	$18,672	--	Belgium-Luxembourg $7,268; France $4,297; West Germany $3,654.
Metals including alloys, unwrought and partly wrought troy ounces	78,346	71,585	2,514	West Germany 44,032; France 6,639; Denmark 3,117.
Rare-earth metals including alloys, all forms	--	(2)	--	Mainly to West Germany.
Rhenium: Metal including alloys, all forms	(2)	(2)	NA	NA.
Selenium, elemental	10	3	--	NA.
Silver:				
Waste and sweepings[3] value, thousands	$9,211	$6,733	--	Spain $3,975; West Germany $1,626.
Metal including alloys, unwrought and partly wrought thousand troy ounces	3,880	4,281	16	West Germany 1,511; Greece 385.
Tellurium, elemental and arsenic	177	89	26	West Germany 20; France 18.
Tin:				
Ore and concentrate	324	--	NA	Belgium-Luxembourg 16.
Oxides	14	20	--	West Germany 796; Belgium-Luxembourg 279.
Ash and residue containing tin	1,762	1,100		
Metal including alloys:				
Scrap	225	224	--	United Kingdom 108; West Germany 71.
Unwrought	4,154	2,128	--	West Germany 931; France 533.
Semimanufactures	928	991	--	West Germany 575; Belgium-Luxembourg 148.
Titanium:				
Ore and concentrate	47,659	30,644	--	Romania 6,425; U.S.S.R. 3,400; West Germany 3,348.
Oxides	4,230	3,536	--	Italy 1,981; Belgium-Luxembourg 331.
Metal including alloys:				
Scrap	99	32	--	West Germany 21.
Unwrought	(2)	5	5	
Semimanufactures	16	36	8	Belgium-Luxembourg 16; West Germany 8.
Tungsten:				
Ore and concentrate	451	1,166	--	West Germany 327; U.S.S.R. 266; Austria 222.
Oxides and hydroxides	23	--	--	
Ash and residue containing tungsten	29	65		West Germany 29; Austria 16.
Metal including alloys:				
Scrap	240	291	172	West Germany 72; Belgium-Luxembourg 23.
Unwrought	112	21	--	France 8; West Germany 6.
Semimanufactures	108	211	17	Belgium-Luxembourg 92; West Germany 62.
Uranium and/or thorium:				
Ore and concentrate	(2)	--		
Metal including alloys, all forms:				
Thorium	(2)	(2)	--	NA.
Vanadium:				
Ash and residue containing vanadium	87	52	--	NA.
Metal including alloys, all forms	1	(2)	--	NA.
Zinc:				
Ore and concentrate	62	--		
Oxides	14,719	NA		
Blue powder	4,449	903	--	Belgium-Luxembourg 281; France 217.
Matte	3,442	3,093	--	West Germany 2,640; Belgium-Luxembourg 265.
Ash and residue containing zinc	9,155	17,599	--	West Germany 6,440; Belgium-Luxembourg 6,204; France 4,757.
Metal including alloys:				
Scrap	11,500	10,544	--	West Germany 5,337; Belgium-Luxembourg 3,538.
Unwrought	186,197	181,400	12,702	West Germany 32,836; United Kingdom 28,055; Belgium-Luxembourg 25,955.
Semimanufactures	5,523	6,091	--	West Germany 3,328; France 1,099.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Zirconium:				
Ore and concentrate	39,582	40,008	--	West Germany 25,136; France 6,907; Belgium-Luxembourg 4,395.
Metal including alloys:				
Scrap	4	19	18	NA.
Semimanufactures	(2)	(2)	--	NA.
Other:				
Ores and concentrates	227	375	--	Turkey 200.
Oxides and hydroxides	27	24	NA	East Germany 20.
Ashes and residues	r2,615	3,242	--	West Germany 594; Belgium-Luxembourg 490; France 376.
Base metals including alloys, all forms	5	2	(2)	Switzerland 1; United Kingdom 1.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	6,721	8,137	60	Belgium-Luxembourg 1,989; Thailand 1,288; United Kingdom 789.
Artificial, corundum	48	131	--	Sweden 39; West Germany 35; Australia 30.
Dust and powder of precious and semiprecious stones including diamond kilograms	91	77	(2)	West Germany 18; Italy 9.
Grinding and polishing wheels and stones	4,699	5,341	18	United Kingdom 1,239; France 799; West Germany 798.
Asbestos, crude	217	50	--	West Germany 25; France 15.
Barite and witherite	59,067	64,442	171	United Kingdom 30,828; Denmark 12,091; West Germany 8,362.
Boron materials:				
Crude natural borates	247,330	37,362	NA	West Germany 2,008; Sweden 1,831; unspecified 28,893.
Oxides and acids	586	731	--	West Germany 222; Belgium-Luxembourg 85; Brazil 75.
Bromine	1,340	2,030	NA	Belgium-Luxembourg 899; France 866.
Cement	709,444	502,736	50	Belgium-Luxembourg 200,507; West Germany 158,975.
Chalk	21,425	21,385	--	Belgium-Luxembourg 20,286; West Germany 867.
Clays, crude:				
Bentonite	23,916	30,572	--	West Germany 7,676; United Kingdom 3,786; Belgium-Luxembourg 2,826.
Chamotte earth	895	2,761	--	Belgium-Luxembourg 2,547.
Kaolin	106,473	119,020	--	Belgium-Luxembourg 84,706; West Germany 27,486.
Unspecified	63,834	103,356	--	West Germany 66,380; Belgium-Luxembourg 32,565.
Cryolite and chiolite	--	2	--	West Germany 1; Spain 1.
Diamond:				
Gem, not set or strung carats	422,181	373,231	155,689	Belgium-Luxembourg 61,408; Switzerland 45,071.
Industrial stones do.	661,750	762,316	100,342	Belgium-Luxembourg 213,222; Hong Kong 124,104.
Diatomite and other infusorial earth	876	1,796	--	Belgium-Luxembourg 1,199; Italy 257.
Feldspar, fluorspar, related materials:				
Feldspar	2,179	1,421	--	West Germany 493; France 406.
Fluorspar	290	224	--	NA.
Unspecified	15,781	18,163	--	West Germany 12,720; Belgium-Luxembourg 2,191.
Fertilizer materials:				
Crude, n.e.s.	84,443	130,153	--	Belgium-Luxembourg 101,690; West Germany 25,862.
Manufactured:				
Ammonia thousand tons	664	1,095	--	Belgium-Luxembourg 442; West Germany 166.
Nitrogenous do.	3,881	3,768	313	France 1,135; West Germany 732.
Phosphatic do.	380	342	--	France 126; United Kingdom 95.
Potassic do.	3	7	(2)	Belgium-Luxembourg 4.
Unspecified and mixed do.	1,339	1,044	--	France 318; West Germany 178; unspecified 266.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Graphite, natural	r253	89	5	West Germany 42; Portugal 20.
Gypsum and plaster	26,891	42,153	20	Belgium-Luxembourg 38,045; West Germany 1,501.
Iodine	17	14	NA	Egypt 5.
Kyanite and related materials	2,171	2,164	--	West Germany 1,376; Belgium-Luxembourg 536.
Lime	6,478	13,163	--	Belgium-Luxembourg 6,825; West Germany 4,949.
Magnesium compounds:				
Magnesite, crude	1,554	1,049	NA	West Germany 599; Belgium-Luxembourg 209.
Orides and hydroxides	25,860	34,042	65	West Germany 17,344; Belgium-Luxembourg 3,724.
Other	4,758	760	--	France 744.
Mica:				
Crude including splittings and waste	773	1,458	--	Egypt 252; Yemen (Sanaa) 230; Norway 112.
Worked including agglomerated splittings	1	4	--	Belgium-Luxembourg 3.
Nitrates, crude	427	424	--	Belgium-Luxembourg 326; West Germany 75.
Phosphates, crude	32,944	57,174	--	West Germany 24,308; Belgium-Luxembourg 15,925; East Germany 7,534.
Pigments, mineral:				
Natural, crude	223	51	--	France 50.
Iron oxides and hydroxides, processed	7,976	6,611	2,125	West Germany 2,310; France 950.
Potassium salts, crude	950	108	--	All to Belgium-Luxembourg.
Precious and semiprecious stones other than diamond:				
Natural kilograms	2,121	2,436	NA	Mainly to Belgium-Luxembourg.
Synthetic do	25	748	NA	Japan 649.
Pyrite, unroasted	7	--		
Quartz crystal, piezoelectric kilograms	--	11	NA	NA.
Salt and brine thousand tons	2,594	2,863	--	Belgium-Luxembourg 737; unspecified 2,113.
Sodium compounds, n.e.s.: Carbonate, manufactured	209,570	162,749	--	West Germany 49,340; Belgium-Luxembourg 20,127; unspecified 73,464.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	12	10	(2)	West Germany 5; Belgium-Luxembourg 3.
Worked do	55	58	(2)	West Germany 30; Belgium-Luxembourg 26.
Dolomite, chiefly refractory-grade do	30	25	--	Belgium-Luxembourg 11; West Germany 8.
Gravel and crushed rock do	3,001	2,634	1	Belgium-Luxembourg 2,380; West Germany 222.
Limestone other than dimension do	2	1	--	Mainly to Belgium-Luxembourg.
Quartz and quartzite do	16	14	(2)	West Germany 10.
Sand other than metal-bearing do	7,256	8,106	(2)	Belgium-Luxembourg 7,527; West Germany 506.
Sulfur:				
Elemental:				
Crude including native and by-product	26,415	22,288	--	Belgium-Luxembourg 19,914; West Germany 1,949.
Colloidal, precipitated, sublimed	3	8	--	Cuba 4; West Germany 2.
Dioxide	701	920	NA	Belgium-Luxembourg 456; France 410.
Sulfuric acid	261,795	158,899	4,728	West Germany 92,769; Belgium-Luxembourg 49,157.
Talc, steatite, soapstone, pyrophyllite	10,791	7,762	--	West Germany 3,500; Belgium-Luxembourg 1,989; Italy 1,163.
Vermiculite, perlite, chlorite	380	371	--	Austria 114.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Other:				
Crude	220,739	268,215	(2)	Belgium-Luxembourg 172,149; West Germany 55,864; France 19,383.
Slag and dross, not metal-bearing	570,300	612,181	2,331	Belgium-Luxembourg 282,636; United Kingdom 152,105.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,717	1,313	--	Belgium-Luxembourg 1,059; France 113.
Carbon:				
Carbon black	r94,983	98,130	24	France 29,836; West Germany 18,975; Belgium-Luxembourg 18,381.
Gas carbon	8	4	--	Belgium-Luxembourg 2.
Coal:				
Anthracite thousand tons	170	322	--	Belgium-Luxembourg 132; United Kingdom 83.
Bituminous do	1,095	1,463	--	Belgium-Luxembourg 424; West Germany 286; United Kingdom 197.
Briquets of anthracite and bituminous coal do	(2)	4	--	Belgium-Luxembourg 2.
Lignite including briquets do	5	5	--	All to Belgium-Luxembourg.
Coke and semicoke do	963	995	--	Belgium-Luxembourg 388; France 380.
Gas, natural: Gaseous million cubic feet	1,398,996	1,412,804	--	West Germany 746,167; France 277,394; Italy 198,964.
Peat including briquets and litter	193,169	281,842	12	Belgium-Luxembourg 91,196; France 89,311; West Germany 64,591.
Petroleum:				
Crude thousand 42-gallon barrels	3,648	9,053	--	Belgium-Luxembourg 6,463; United Kingdom 2,317.
Refinery products:				
Liquefied petroleum gas do	6,488	8,185	(2)	Belgium-Luxembourg 3,450; West Germany 2,575.
Gasoline, motor do	80,617	77,810	8,168	West Germany 45,916; Belgium-Luxembourg 10,164.
Mineral jelly and wax do	468	422	6	West Germany 172; France 39.
Kerosene and jet fuel do	24,792	24,085	--	West Germany 12,272; Denmark 2,492.
Distillate fuel oil do	91,213	112,474	264	West Germany 73,347; Belgium-Luxembourg 20,157.
Lubricants do	5,249	4,793	144	Belgium-Luxembourg 1,055; West Germany 389.
Residual fuel oil do	98,528	89,817	1,052	West Germany 18,881; Belgium-Luxembourg 16,910; bunkers 29,930.
Bitumen and other residues do	2,236	1,531	--	West Germany 459; Belgium-Luxembourg 260; Norway 204.
Bituminous mixtures do	327	229	(2)	West Germany 160.
Petroleum coke do	511	402	--	West Germany 218; Belgium-Luxembourg 122.

rRevised. NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.
[3]May include other precious metals.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	104	138	--	West Germany 103; Sweden 25; France 10.
Alkaline-earth metals	26	22	2	Canada 8; France 7; Austria 3.
Aluminum:				
Ore and concentrate	130,784	162,384	1,370	Greece 151,887; China 3,436; West Germany 2,527.
Oxides and hydroxides	598,105	589,116	465	Suriname 286,705; Greece 98,621; France 82,201.
Ash and residue containing aluminum	10,119	13,073	NA	West Germany 4,696; Belgium-Luxembourg 3,676; East Germany 2,425.
Metal including alloys:				
Scrap	57,473	67,179	3,946	West Germany 20,420; Belgium-Luxembourg 11,700; France 7,014.
Unwrought	132,985	135,210	586	Norway 51,713; West Germany 28,636; U.S.S.R. 13,523.
Semimanufactures	120,499	124,017	1,584	West Germany 44,198; Belgium-Luxembourg 29,976; France 10,347.
Antimony:				
Ore and concentrate	--	5	--	NA.
Oxides	1,131	1,115	NA	Belgium-Luxembourg 511; France 387; United Kingdom 151.
Metal including alloys, all forms	191	99	NA	Belgium-Luxembourg 86; Turkey 10.
Arsenic: Oxides and acids	83	107	--	United Kingdom 99.
Beryllium:				
Oxides and hydroxides	1	(2)	NA	NA.
Metal including alloys, all forms	2	12	(2)	Belgium-Luxembourg 8; West Germany 3; United Kingdom 1.
Bismuth: Metal including alloys, all forms	64	46	--	Italy 20; Belgium-Luxembourg 19.
Cadmium: Metal including alloys, all forms	239	129	NA	West Germany 73; France 48.
Cesium and rubidium: Metal including alloys, all forms	(2)	(2)	NA	NA.
Chromium:				
Ore and concentrate	23,802	40,239	--	Republic of South Africa 39,334; West Germany 846.
Oxides and hydroxides	1,431	1,879	707	West Germany 528; United Kingdom 164.
Metal including alloys, all forms	814	120	NA	France 39; West Germany 25; United Kingdom 25.
Cobalt:				
Ore and concentrate	--	2	--	United Kingdom 1.
Oxides and hydroxides	282	253	21	Belgium-Luxembourg 115; Finland 65; United Kingdom 1.
Metal including alloys, all forms	313	177	12	Republic of South Africa 73; Tanzania 25.
Columbium and tantalum:				
Ore and concentrate	59	93	10	Australia 41; Japan 18; Brazil 13.
Ash and residue containing columbium and/or tantalum	--	1	1	
Metal including alloys, all forms:				
Columbium (niobium)	(2)	2	1	NA.
Tantalum	2	5	(2)	West Germany 2; France 1; United Kingdom 1.
Copper:				
Ore and concentrate	167	236	--	All from Belgium-Luxembourg.
Matte and speiss including cement copper	(2)	26	--	France 23.
Oxides and hydroxides	794	734	--	Italy 301; West Germany 161; United Kingdom 132.
Sulfate	5,367	6,781	NA	Belgium-Luxembourg 2,720; U.S.S.R. 1,303; West Germany 1,193.
Ash and residue containing copper	1,485	4,072	162	West Germany 1,970; Cuba 502; Italy 403.
Metal including alloys:				
Scrap	43,123	62,001	4,962	West Germany 17,500; Belgium-Luxembourg 10,082; France 8,157.
Unwrought	24,929	21,282	696	West Germany 3,996; East Germany 3,322; Belgium-Luxembourg 2,975.
Semimanufactures	89,461	97,448	230	West Germany 39,602; Belgium-Luxembourg 36,428; France 11,093.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Germanium: Metal including alloys, all forms	(2)	(2)	NA	Mainly from Belgium-Luxembourg.
Gold:				
Waste and sweepings value, thousands	$4,774	$8,934	--	Belgium-Luxembourg $3,041; Denmark $2,973; United Kingdom $1,330.
Metal including alloys, unwrought and partly wrought _ troy ounces	151,468	188,688	12,314	United Kingdom 97,900; West Germany 39,128; Switzerland 28,582.
Hafnium: Metal including alloys, all forms	(2)	(2)	NA	NA.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	7,237	8,507	--	Brazil 2,013; Sweden 1,543; Canada 1,485.
Pyrite, roasted	1,205	1,068	--	Belgium-Luxembourg 1,044; Spain 24.
Metal:				
Scrap	479,712	586,431	4,825	West Germany 302,167; Belgium-Luxembourg 158,462; United Kingdom 71,411.
Pig iron, cast iron, related materials	54,074	49,929	287	West Germany 13,825; France 11,493; Brazil 10,055.
Ferroalloys:				
Ferrochromium	5,523	2,798	50	Albania 1,589; West Germany 791; Belgium-Luxembourg 272.
Ferromanganese	26,629	22,664	--	Norway 10,958; France 9,461; West Germany 1,881.
Ferromolybdenum	122	502	--	United Kingdom 336; Italy 43; West Germany 42.
Ferronickel	890	86	NA	Cuba 39; Belgium-Luxembourg 21; Dominican Republic 21.
Ferrosilicochromium	57	61	--	All from West Germany.
Ferrosilicomanganese	6,656	5,737	--	Norway 3,708; West Germany 1,109; France 322.
Ferrosilicon	5,203	5,063	--	West Germany 2,732; Sweden 586; France 578.
Silicon metal	2,376	4,736	--	Norway 2,217; West Germany 1,586; France 377.
Unspecified	940	2,035	NA	U.S.S.R. 828; France 479; United Kingdom 228.
Steel, primary forms	445,714	456,100	--	West Germany 162,568; Italy 74,811; Belgium-Luxembourg 70,490.
Semimanufactures:				
Bars, rods, angles, shapes, sections _ thousand tons	1,211	1,302	(2)	Belgium-Luxembourg 475; West Germany 453; France 110.
Universals, plates, sheets do	1,040	1,120	(2)	Belgium-Luxembourg 483; West Germany 354; France 56.
Hoop and strip do	220	237	(2)	West Germany 144; Belgium-Luxembourg 54.
Rails and accessories do	50	57	--	West Germany 37; France 14; Belgium-Luxembourg 4.
Wire do	110	107	(2)	West Germany 48; Belgium-Luxembourg 40; France 10.
Tubes, pipes, fittings do	693	781	3	West Germany 479; France 74; Belgium-Luxembourg 57.
Castings and forgings, rough do	23	25	(2)	West Germany 13; Belgium-Luxembourg 6; France 1.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Lead:				
Ore and concentrate	7	1	--	All from Austria.
Oxides	5,006	6,165	2	West Germany 4,843; Belgium-Luxembourg 1,025; France 295.
Ash and residue containing lead	2,347	2,529	49	West Germany 953; France 813; Belgium-Luxembourg 409.
Metal including alloys:				
Scrap	22,045	24,593	387	West Germany 11,260; United Kingdom 4,731; Belgium-Luxembourg 2,117.
Unwrought	32,200	35,509	199	Belgium-Luxembourg 15,297; West Germany 8,336; France 4,552.
Semimanufactures	9,212	8,600	1	West Germany 635; United Kingdom 252; France 45.
Lithium:				
Oxides and hydroxides	68	102	33	West Germany 48; U.S.S.R. 15.
Metal including alloys, all forms	21	11	--	NA.
Magnesium: Metal including alloys:				
Scrap	1,494	1,457	14	West Germany 478; France 204; Belgium-Luxembourg 172.
Unwrought	9,800	6,310	4,737	Norway 1,367; France 95.
Semimanufactures	302	308	2	West Germany 94; Norway 78; United Kingdom 71.
Manganese:				
Ore and concentrate, metallurgical-grade	50,386	72,493	--	Belgium-Luxembourg 6,855; France 732; unspecified 64,205.
Oxides	443	160	107	West Germany 41; Belgium-Luxembourg 12.
Metal including alloys, all forms	1,714	2,113	53	Republic of South Africa 1,860; Mozambique 86; China 52.
Mercury 76-pound flasks	4,931	754	--	West Germany 261; Spain 146; United Kingdom 144.
Molybdenum:				
Ore and concentrate	20,741	24,061	19,698	Chile 3,189; Canada 792.
Oxides and hydroxides	9	24	--	United Kingdom 17; West Germany 6.
Metal including alloys:				
Scrap	7	2	--	NA.
Unwrought	130	145	45	West Germany 99.
Semimanufactures	41	39	4	Belgium-Luxembourg 24; Austria 5.
Nickel:				
Ore and concentrate	--	3	--	All from West Germany.
Matte and speiss	NA	2,025	NA	NA.
Oxides and hydroxides	152	314	NA	Albania 166; Argentina 25; unspecified 110.
Ash and residue containing nickel	1,442	1,774	NA	West Germany 936; United Kingdom 290; France 202.
Metal including alloys:				
Scrap	3,737	3,141	386	West Germany 1,248; United Kingdom 551.
Unwrought	1,634	1,771	63	United Kingdom 760; Norway 226; Canada 184.
Semimanufactures	1,006	985	111	West Germany 420; United Kingdom 276.
Platinum-group metals:				
Waste and sweepings value, thousands	$1,293	$1,414	--	Belgium-Luxembourg $1,177; Iran $127; Sweden $86.
Metals including alloys, unwrought and partly wrought troy ounces	92,126	91,186	19,098	Switzerland 22,248; West Germany 17,040.
Rare-earth metals including alloys, all forms	1	11	NA	France 10.
Rhenium: Metal including alloys, all forms	2	11	NA	West Germany 10.
Selenium, elemental	31	10	--	Belgium-Luxembourg 2; United Kingdom 2.
Silicon, high-purity	15	74	--	Norway 26; West Germany 23; Sweden 21.
Silver:				
Waste and sweepings[3] value, thousands	$1,035	$1,656	--	Denmark $863; France $329; Belgium-Luxembourg $222.
Metal including alloys, unwrought and partly wrought thousand troy ounces	4,548	3,771	71	West Germany 1,177; United Kingdom 726; Spain 601.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Tellurium, elemental and arsenic	164	96	--	Sweden 82; Belgium-Luxembourg 14.
Tin:				
Ore and concentrate	12,982	10,677	--	United Kingdom 2,953; Zaire 1,761; Singapore 1,394.
Oxides	149	171	--	United Kingdom 74; Italy 58; France 23.
Ash and residue containing tin	432	891	132	West Germany 195; United Kingdom 131.
Metal including alloys:				
Scrap	368	455	--	West Germany 161; France 156; Switzerland 28.
Unwrought	2,254	3,170	29	Malaysia 576; Thailand 561; United Kingdom 525.
Semimanufactures	328	307	(2)	United Kingdom 204; West Germany 73; France 19.
Titanium:				
Ore and concentrate	51,868	39,830	--	Australia 19,463; Sierra Leone 6,971; Republic of South Africa 6,828.
Oxides	6,849	6,892	405	West Germany 3,340; United Kingdom 1,247; France 699.
Metal including alloys:				
Scrap	109	38	NA	United Kingdom 36.
Unwrought	35	53	11	U.S.S.R. 26; Japan 15.
Semimanufactures	109	124	12	United Kingdom 68; West Germany 38.
Tungsten:				
Ore and concentrate	674	1,145	72	Canada 590; Portugal 201; China 165.
Oxides and hydroxides	1	7	--	West Germany 6; United Kingdom 1.
Ash and residue containing tungsten	14	42	NA	Austria 21.
Metal including alloys:				
Scrap	11	41	--	Sweden 28; Italy 8; France 3.
Unwrought	301	378	347	West Germany 31.
Semimanufactures	30	32	(2)	Belgium-Luxembourg 21; West Germany 3; Austria 2.
Uranium and thorium: Metal including alloys, all forms:				
Uranium	(4)	(3)	--	NA.
Thorium	(3)	(3)	--	NA.
Vanadium:				
Ore and concentrate	(3)	--		
Oxides and hydroxides	10	7	NA	West Germany 4.
Ash and residue containing vanadium	396	1,028	--	All from Belgium-Luxembourg.
Metal including alloys, all forms	15	(3)	--	Mainly from United Kingdom.
Zinc:				
Ore and concentrate	422,732	444,706	3,708	Ireland 117,700; Canada 100,587; Australia 89,639.
Oxides	4,343	3,348	60	West Germany 1,539; France 719; Belgium-Luxembourg 385.
Blue powder	3,505	3,729	--	West Germany 1,704; Belgium-Luxembourg 1,317; Norway 533.
Matte	3,996	4,550	NA	West Germany 2,661; Belgium-Luxembourg 912; France 389.
Ash and residue containing zinc	13,350	20,103	NA	Belgium-Luxembourg 16,944; West Germany 1,506; Cuba 800.
Metal including alloys:				
Scrap	13,764	12,290	18	West Germany 5,900; Belgium-Luxembourg 4,034; United Kingdom 1,224.
Unwrought	20,677	22,229	(2)	Belgium-Luxembourg 7,872; West Germany 7,254; France 4,471.
Semimanufactures	5,078	5,794	--	West Germany 3,617; Belgium-Luxembourg 1,389; Norway 314.
Zirconium:				
Ore and concentrate	45,424	40,856	NA	Australia 25,393; Republic of South Africa 10,910.
Metal including alloys, all forms	13	16	--	France 10; United Kingdom 5.
Other:				
Ores and concentrates	666	117	--	West Germany 66; Italy 24; Belgium-Luxembourg 21.
Oxides and hydroxides	309	180	27	Belgium-Luxembourg 47; Spain 32.
Ashes and residues	r47,131	42,330	207	Canada 36,563; Belgium-Luxembourg 3,683; West Germany 1,133.
Base metals including alloys, all forms	2	1	(2)	Mainly from Belgium-Luxembourg.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	386,495	370,845	5	West Germany 357,905; Turkey 7,820; Belgium-Luxembourg 4,159.
Artificial:				
Corundum	6,454	7,435	7	West Germany 5,535; France 507; Czechoslovakia 441.
Silicon carbide	1,750	1,471	16	West Germany 1,106; Norway 172; Belgium-Luxembourg 156.
Dust and powder of precious and semiprecious stones including diamond kilograms	268	239	2	Belgium-Luxembourg 125; Switzerland 49; Ireland 39.
Grinding and polishing wheels and stones	2,887	3,329	57	West Germany 1,305; France 774; Austria 430.
Asbestos, crude	8,357	5,625	10	Canada 2,983; Italy 1,415; Greece 1,040.
Barite and witherite	88,490	94,843	--	Morocco 48,082; Belgium-Luxembourg 36,764; Ireland 4,213.
Boron materials:				
Crude natural borates	264,917	52,957	30,946	Turkey 11,357; Belgium-Luxembourg 10,549.
Elemental	(2)	(2)	--	NA.
Oxides and acids	2,109	1,988	(2)	France 868; Italy 849; Turkey 188.
Bromine	6,933	8,007	--	Israel 7,965; France 42.
Cement thousand tons	2,983	2,838	(2)	West Germany 1,404; Belgium-Luxembourg 1,401; France 18.
Chalk	100,293	103,313	20	West Germany 45,697; France 40,127; Belgium-Luxembourg 14,240.
Clays, crude:				
Bentonite	90,934	74,619	13,755	Greece 41,498; Spain 10,870.
Chamotte earth	15,955	19,022	4,856	West Germany 9,257; France 4,050.
Kaolin	453,660	454,237	56,606	United Kingdom 175,053; West Germany 82,019.
Unspecified	504,974	471,138	1,133	West Germany 432,388; France 12,295; United Kingdom 12,203.
Cryolite and chiolite	39	33	--	Denmark 15; France 13; West Germany 5.
Diamond:				
Gem, not set or strung carats	595,530	662,107	27,045	United Kingdom 254,403; Switzerland 279,769; Belgium-Luxembourg 95,668.
Industrial stones do	545,383	567,090	168,618	Belgium-Luxembourg 144,267; United Kingdom 125,791.
Diatomite and other infusorial earth	24,376	64,815	2,544	Belgium-Luxembourg 46,116; Denmark 14,347; France 729.
Feldspar, fluorspar, related materials:				
Feldspar	21,609	20,167	--	Norway 11,235; France 4,856; West Germany 2,347.
Fluorspar	18,330	27,152	--	West Germany 8,279; United Kingdom 1,486; France 422.
Unspecified	34,455	44,018	--	Canada 24,666; Norway 18,572; West Germany 613.
Fertilizer materials:				
Crude, n.e.s	120,478	150,117	--	West Germany 126,736; Belgium-Luxembourg 22,154.
Manufactured:				
Ammonia	46,259	95,327	10,785	United Kingdom 16,330; West Germany 3,958.
Nitrogenous	781,023	723,925	1,021	France 223,593; Belgium-Luxembourg 138,130; West Germany 120,800.
Phosphatic	159,527	154,660	--	Belgium-Luxembourg 56,717; Israel 51,558; West Germany 25,879.
Potassic	417,452	432,791	--	West Germany 137,223; U.S.S.R. 68,154; France 58,759.
Unspecified and mixed	242,676	271,522	883	Belgium-Luxembourg 110,521; West Germany 56,168; Israel 55,020.
Graphite, natural	954	636	(2)	West Germany 249; China 235; United Kingdom 74.
Gypsum and plaster	417,563	426,389	16	France 167,757; West Germany 156,323; Belgium-Luxembourg 87,882.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Iodine	367	458	NA	Belgium-Luxembourg 14; Sweden 11; unspecified 429.
Kyanite and related materials	7,773	11,818	156	Republic of South Africa 8,390; West Germany 2,848.
Lime	799,178	882,591	36	Belgium-Luxembourg 613,794; West Germany 268,022.
Magnesium compounds:				
Magnesite, crude	4,408	3,933	--	Greece 2,164; Turkey 820; Italy 768.
Oxides and hydroxides	62,296	77,042	668	China 31,731; Greece 10,584; Spain 8,622.
Other	43,973	36,779	--	West Germany 35,200; Belgium-Luxembourg 801; East Germany 778.
Mica:				
Crude including splittings and waste	1,919	2,600	301	Canada 538; West Germany 439; Finland 401.
Worked including agglomerated splittings	24	50	1	Finland 21; Belgium-Luxembourg 13; Switzerland 9.
Nitrates, crude	21,481	24,634	--	Chile 17,479; Belgium-Luxembourg 7,153.
Phosphates, crude thousand tons	2,366	2,388	564	Morocco 882; Israel 538.
Phosphorus, elemental	50	55	--	West Germany 54.
Pigments, mineral:				
Natural, crude	804	139	--	Cyprus 104.
Iron oxides and hydroxides, processed	13,579	12,137	55	West Germany 10,505; United Kingdom 545; Spain 353.
Potassium salts, crude	2,866	2,708	--	West Germany 2,675; Belgium-Luxembourg 33.
Precious and semiprecious stones other than diamond:				
Natural kilograms	47,874	39,629	13,000	Brazil 15,000; West Germany 6,278.
Synthetic do	5,262	9,482	3,636	Japan 4,845; Belgium-Luxembourg 726.
Pyrite, unroasted	311	204	--	West Germany 182; Belgium-Luxembourg 22.
Salt and brine	222,924	412,093	54	West Germany 153,878; Belgium-Luxembourg 153,073; France 63,947.
Sodium compounds, n.e.s.: Carbonate, manufactured	59,963	65,374	1	West Germany 49,460; France 7,134; Belgium-Luxembourg 5,904.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	2,165	1,489	--	West Germany 782; Belgium-Luxembourg 650; France 18.
Worked do	51	66	(2)	Italy 28; West Germany 16; Belgium-Luxembourg 9.
Dolomite, chiefly refractory-grade do	888	939	--	Belgium-Luxembourg 752; West Germany 55; Norway 49.
Gravel and crushed rock do	17,119	16,740	(2)	West Germany 9,384; Belgium-Luxembourg 5,814; France 1,051.
Limestone other than dimension do	835	476	--	Belgium-Luxembourg 421; West Germany 44; France 11.
Quartz and quartzite do	37	22	(2)	West Germany 12; Norway 7.
Sand other than metal-bearing do	6,949	6,856	3	West Germany 4,943; Belgium-Luxembourg 1,596; Norway 300.
Sulfur:				
Elemental:				
Crude including native and byproduct	373,997	377,044	8,151	West Germany 247,195; Poland 75,169; France 40,683.
Colloidal, precipitated, sublimed	396	603	6	West Germany 253; Poland 230; United Kingdom 108.
Dioxide	9,102	7,526	--	West Germany 6,870; Belgium-Luxembourg 631.
Sulfuric acid	541,713	566,884	1	West Germany 288,902; Belgium-Luxembourg 99,494; Norway 58,772.
Talc, steatite, soapstone, pyrophyllite	40,751	42,241	92	France 8,535; Austria 5,718; West Germany 4,868.
Vermiculite, perlite, chlorite	5,476	9,146	--	Greece 4,722; Republic of South Africa 3,616.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Other:				
Crude thousand tons	664	1,442	1	Belgium-Luxembourg 851; West Germany 559.
Slag and dross, not metal-bearing do	1,077	1,286	--	West Germany 735; Belgium-Luxembourg 546.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	7,802	4,995	559	Belgium-Luxembourg 3,376; West Germany 951.
Carbon:				
Carbon black	r13,791	15,136	157	West Germany 13,188; France 688; United Kingdom 445.
Gas carbon	1,123	1,520	770	West Germany 508; France 165.
Coal:				
Anthracite thousand tons	240	388	25	Republic of South Africa 231; West Germany 123.
Bituminous do	9,825	11,106	5,110	Australia 2,797; Poland 1,336.
Briquets of anthracite and bituminous coal do	7	11	--	East Germany 5; West Germany 5.
Lignite including briquets do	144	150	--	West Germany 130; Belgium-Luxembourg 16.
Coke and semicoke do	813	525	31	West Germany 256; United Kingdom 96; Poland 50.
Gas, natural: Gaseous million cubic feet	120,418	73,840	--	All from West Germany.
Peat including briquets and litter	574,311	746,901	--	West Germany 701,899; Finland 25,076; U.S.S.R. 8,453.
Petroleum:				
Crude thousand 42-gallon barrels	330,916	296,698	276	United Kingdom 75,920; Iran 33,486; Saudi Arabia 24,441.
Refinery products:				
Liquefied petroleum gas do	22,497	24,743	128	United Kingdom 10,922; Algeria 5,208; West Germany 2,276.
Gasoline do	42,280	46,921	155	U.S.S.R. 9,297; Algeria 9,275; Kuwait 4,665.
Mineral jelly and wax do	483	527	1	West Germany 183; France 124; United Kingdom 86.
Kerosene and jet fuel do	1,676	2,457	2	Belgium-Luxembourg 1,314; United Kingdom 372; U.S.S.R. 336.
Distillate fuel oil do	26,117	51,063	1,812	U.S.S.R. 36,364; Kuwait 3,870; Belgium-Luxembourg 2,563.
Lubricants do	2,942	2,318	69	Belgium-Luxembourg 660; United Kingdom 378; France 360.
Residual fuel oil do	27,006	32,189	1,530	U.S.S.R. 13,193; Spain 2,290; Belgium-Luxembourg 1,948.
Bitumen and other residues do	674	668	--	Belgium-Luxembourg 401; West Germany 244; Sweden 23.
Bituminous mixtures do	236	122	3	Belgium-Luxembourg 66; West Germany 38; Italy 6.
Petroleum coke do	2,706	2,516	1,223	West Germany 547; Norway 479.

rRevised. NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.
[3]Includes waste and sweepings of other precious metals.
[4]Revised to zero.

COMMODITY REVIEW

METALS

Aluminum, Lead, and Zinc.—The two primary aluminum smelters continued to operate at near capacity. Hoogovens Groep BV, the Dutch aluminum and steel giant, was considering purchasing Kaiser Aluminium Europe Inc., a subsidiary of Kaiser Aluminum & Chemical Corp. The transaction would make Hoogovens one of the four largest rolled and extruded aluminum products producers in Western Europe, employing some 6,300 workers. Hoogoven's 95,000-ton-capacity primary smelter at Delfzijl, as well as the foil rolling, extrusion, and diecasting operations, employed about 3,600 people, and had sales of about $458.3 million.

Budelco BV, a subsidiary of Billiton International Metals BV and the Australian Mining & Smelting Ltd. (AM&S), was the largest producer of nonferrous metals other than aluminum. Its zinc plant at Budel in southern Netherlands was commissioned in 1973 and produced byproduct sulfuric acid, cadmium metal, and copper- and cobalt-containing residues, as well as zinc. The company also operated two secondary lead smelters, one at Arnhem in the Netherlands and one in the United Kingdom. The production of lead continued to rise at the Arnhem plant. A sharp increase to 33,600 tons in 1984 was mostly due to the first full year of operation of the secondary refining unit, which continued to operate to near capacity since then. Zinc concentrates were imported from about 20 mines worldwide, about 90% of which was delivered by train from docks at Antwerp, and a small quantity directly from the Federal Republic of Germany. Alumina, aluminum, and bauxite constituted Billiton's largest areas of interest overseas; however, important investments have also been made in copper, ferronickel, and zinc. An active exploration program was being concentrated in Australia, Brazil, Canada, Chile, Colombia, Portugal, the Republic of South Africa, Spain, and Suriname.[6]

Iron and Steel.—Hoogovens IJmuiden BV (HI), the only major steel producer in the Netherlands, celebrated its 40th anniversary and produced its hundred-millionth ton of rolled steel in July.[7] The company reported a 45% decrease in its net profits from about $113 million in 1985 to only $63 million in 1986, and forecast another drop for 1987. The lower turnover was attributed primarily to the fall in the value of the U.S. dollar, which, in addition to reducing revenue in guilder terms, had the indirect effect of reducing European selling prices. Despite the losses, however, the company was the most reluctant of the Eurofer members to accept the view that a quota system for steel products was necessary. The company retained its ranking as the 21st world producer in steel. Total installed capacity was 5.6 million tons, all of it in the electric steel process, and HI was generally regarded as one of Western Europe's most efficient integrated steel producers. All raw materials for iron and steel production were imported. The apparent iron ore consumption was at about 8.5 million tons, and ferrous scrap, at 1.5 million tons in 1985.

Of the $235 million of HI's planned investment, $71.5 million was for quality improvements at the steelworks. About $93.7 million was for specific projects, including the installation of a gas recovery system at the No. 2 Linz-Donawitz steel plant, and the modernization of the No. 7 blast furnace. HI also started up a 2.4-million-ton-per-year-capacity continuous caster, built by the West German heavy equipment manufacturer, Demag AG. The two-strand remote-controlled twin caster cost over $122 million. It operated at up to 1.8 meters per minute and was equipped with air-mist cooling and straightening units to improve product quality. In the steel processing division, $27 million was to be invested in quality improvements and $43.5 million in restructuring, including over $20.3 million for the reorganization of the company's tubemaking division at Buizen, which was expected to concentrate on more specialized products.

HI set up a new firm in Utrecht, Hoogovens Handel BV (HH), which combined the activities of four former separate subsidiaries involved in trading steel products, concrete reinforcement, and scrap. The changes were adopted to improve efficiency and adapt the four companies, which previously operated independently, to new market developments.[8]

Molybdenum.—Since 1965, the Climax Molybdenum Div. of AMAX Inc. has operated a molybdenum concentrate roasting and chemicals plant at Rozenburg, west of Rotterdam. The plant treated concentrates from the company's Climax and Henderson Mines in Colorado to produce molybdic oxide for the iron and steel industries, ammonium and sodium molybdates, and pure molybdic oxide for the chemical and molybdenum metal industries. Climax shipped part of the Rozenburg plant's oxide product to its subsidiary in Suffolk, United Kingdom. AMAX Mineral Sales Corp., headquartered in Paris, sold the products of both plants throughout Western Europe.[9]

Tin.—The Netherlands produced about 5,000 tons of tin from imported concentrates. The 7,000-ton plant was at Arnhem, as was a lead smelter, both operated by Hollandse Metallurgische Industrie Billiton BV (HMIB). The smelter operated two rotary furnaces, one used for concentrate smelting and the other for secondary material and other uses, notably secondary lead smelting. The company was installing an oxygen-fuel burner as part of its smelting unit. HMIB produced tin anodes for Hoogovens as well as ingots registered with the

London Metal Exchange (LME). ingots. The production of tinplate was about 550,000 tons, from an installed capacity of 580,000 tons. The Netherlands consumed about 260,000 tons of tinplate.[10]

Tungsten.—HMIB also produced small quantities of wolframite and artificial scheelite at Arnhem chemically as a by-product from partially sorted imported tin-tungsten ores. Most of the production was exported to tool steel and high-grade steel manufacturers. Based on exports, production averaged about 550 tons of tungsten content. Most of the tungsten intermediate products consumed in the Netherlands were used in the manufacture of hard metal and lamp filaments.

Vanadium.—The Exxon Corp. modernized its refinery at Rotterdam at a cost of over $1 billion. The refinery was equipped with a 32,000-barrel-per-day Flexicoking unit, which used thermal cracking rather than traditional catalytic cracking to convert inferior, heavy feedstocks into high-quality liquid and gaseous fuels. The new process, under development by Exxon for more than 15 years, is to produce only a small amount of vanadium and nickel-rich residual coke—roughly 1% of the heavy feedstock instead of the typical 25% residuum. More than 95% of the vanadium and nickel contaminants in the original feedstock are to be concentrated in this coke. The Rotterdam Flexicoking facility and a similar unit in Baytown, Texas, United States, were significant sources of low-cost feed material for the United States and Western European vanadium producers.[11]

INDUSTRIAL MINERALS

Industrial minerals production contributed a significant portion of the Netherland's GNP. Lacking sizable deposits, other than sand and gravel, much of the material was recycled. Over 250,000 tons of glass was recycled, about 85% of it from domestic sources, and 40% was exported. A third recycling mill started operation in the Port of Amsterdam, operated by Eggerding Engineering and Construction BV. The milled products were used in ceramics, paints, fire-resistant materials, and others. The two other mills were reported to have been working at capacity, operated by a staff of 40 workers.[12]

The market for advanced ceramics in the Netherlands was estimated by industry sources to be $240 million, with projections that it could almost double by 1989.

Fertilizer Materials.—The Dutch nitrogen fertilizer industry was at the core of West European fertilizer production. The country had a plentiful supply of natural gas and was at the core of the major fertilizer consumer area of northwest Europe. On a world scale, however, the Netherlands was of minor importance as an ammonia producer. In 1986, it accounted for only 2.4% of total world output. In ammonia trade, the Dutch producers were more significant, shipping 11% of the 8.11 million tons of nitrogen traded internationally in 1985. Three companies dominated the nitrogen industry in 1986, in decreasing order of capacity: Unie Van Kunstmestfabrieken BV (UKF), Nederlandse Stikstoff Maatschappij BV (NSM), and Finland's Kemira Oy. The combined annual capacity of ammonia was 2,687,000 tons of nitrogen content; calcium-ammonium-nitrate, 856,000 tons of nitrogen content; and urea, 747,000 tons of nitrogen content. UKF was the only Dutch-controlled company, and the only one that was not state owned. Production was concentrated at three sites, the largest at Galeen, with 360,000 tons of nitrogen of ammonia content per year. NSM produced ammonia and nitrogen fertilizers at Sluiskil. A single-stream ammonia unit and a nitric acid unit were under construction, to be completed in 1987. Kemira was at Rozenburg and produced nitrogen-based products and was the major supplier of ammonia to the parent company's manufacturing locations in Finland.[13]

The leading Dutch phosphate fertilizer producers were UKF and Windmill Holland BV. UKF's phosphorus pentoxide plants were at Pernis and Geleen, while Windmill's plant was at Vlaardingen.[14]

Magnesia.—Billiton owned the Netherlands' only two magnesia producers, Noordelijke Zoutwinning BV (NZ) and Magnesia International BV (MAGIN). NZ mined magnesium salts by deep solution, and MAGIN manufactured refractory-grade magnesia. Magnesia production totaled about 90,000 tons, all by MAGIN at Veendam, Groningen, in northern Netherlands. The capacity of the plant was 100,000 tons of dead-burned and caustic-calcined magnesia.

MINERAL FUELS

The Netherlands has depended on gas and oil for the bulk of its energy needs for the past 25 years. Prior to the Soviet nucle-

ar disaster at Chernobyl there were plans to build two more nuclear power stations, which have now been delayed for several years. There was only one operating nuclear powerplant, at Borssele in Zeeland, with a capacity of 450 megawatts, and a small experimental reactor at Dodewaard near Nijmegen. In 1986, oil and gas accounted for 71% of electricity generation, coal for 22%, and nuclear power for just 7%. Although coal played an important part in the country's energy program, it was about 16% more expensive than nuclear power, and contributed to air pollution.

Despite the sharp drop in oil prices in 1986, the Government of the Netherlands did not change its energy policies. The Netherlands continued to stress conservation, diversification of energy sources, and the maintenance of indigenous energy production, the latter encouraged by a stable program for oil and gas development.

Exports of traded or processed oil continued to exceed by far total indigenous oil requirements. The Rotterdam market continued to play an important role for the supply of freely traded crude oil and oil products. Substantial investments were made again in refinery upgrading, and offshore oil production, although still modest, increased again.

Natural Gas.—The country's extensive gas reserves continued to meet the rising demand for energy. The Government continued also to honor its gas export contracts with West European countries. Nederlandse Gasunie NV, the national gas distribution company, prepared a plan to export just over 21,200 billion cubic feet of gas during the period 1986-2011. Domestic annual consumption was about 18,000 billion cubic feet, of which industry and power stations used about 14,100 billion cubic feet. The available gas reserves were estimated to be 77,700 billion cubic feet, including 1,600 billion cubic feet of imports contracted from Norway. Exploration companies continued to make small but worthwhile discoveries both onshore and offshore in the Dutch sector of the North Sea, thus preserving the massive Groningen-Slochteren Field as a strategic reserve.[15]

The gas policy had a major influence on Dutch energy, since gas was the main indigenous energy source and an important source of Government revenue. Since 1983, volume restrictions on domestic gas sales have been removed and gas sales have been governed by a system of market prices. About one-half of Dutch gas production was exported.

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[1]Physical scientist, Division of International Minerals.
[2]Algemene Bank Nederland NV (Amsterdam). ABN Econ. Rev., No. 120, Apr. 1987, p. 14.
[3]Where necessary, values have been converted from Netherlands guilder (f.) to U.S. dollars at the rate of f.2.46=US$1.00, the average for 1986.
[4]Algemene Bank Nederland NV (Amsterdam). ABECOR Country Report. Dec. 1986.
[5]Fertilizer International (London). No. 224, Apr. 10 1986, pp. 10-17.
[6]Engineering and Mining Journal (New York). Dec. 1986, pp. 44-45.
[7]Hoogovens Groep BV (IJmuiden). Hoogovens Groep Bulletin. No. 4, 1986.
[8]———. Hoogovens Groep Bulletin. No. 1, 1986.
[9]Work cited in footnote 6.
[10]Tin International (London). V. 59, No. 3, p. 94.
[11]Wilson, W. R. The Lamp. Revamping the Rotterdam Refinery. Exxon Corp. (New York), Summer 1986, pp. 11-16.
[12]Industrial Minerals (London). June 1986, p. 11.
[13]Nitrogen (London). No. 162, July-Aug. 1986, pp. 11-14.
[14]Phosphorus & Potassium (London). No. 142, Mar.-Apr. 1986, p. 23.
[15]Financial Times (London). Oct. 16, 1986, Sec. 4, p. 2.

The Mineral Industry of New Zealand

By Travis Q. Lyday[1]

New Zealand's extractive mineral industry contributed an estimated 1% to the gross national product in 1986; the mineral processing sector contributed an estimated 5%.

Government Policies and Programs.—The New Zealand Government announced at yearend that it will complete the restructuring of New Zealand Steel Ltd. by increasing its shareholding in the company to 90% from its previously held stake of 81.2%. The Government was to take over debts of about $1.5 billion[2] in return for the company issuing a further 314 million shares and redeemable preference shares worth $380 million. The Government of New Zealand acquired its holding in New Zealand Steel at yearend 1985 in return for assuming responsibility for the company's debts of about $2.5 billion.

The Government proposed during the year that the oil industry be deregulated and that the coal and electricity divisions of the Ministry of Energy be "corporatized." The deregulation was planned as a way to bring down fuel prices; primary goals were for a stretch-out in the amortization schedule for the New Zealand Synthetic Fuels Corp. Ltd. fuel plant at Motonui and the Marsden Point oil refinery of New Zealand Refining Co. Ltd. The corporatization plan was to make the Government's coal and electricity divisions more efficient and commercially oriented.

PRODUCTION

The minerals industry consisted mainly of the mining of coal, construction materials (clays, sand and gravel, and stone), limestone and marble for agricultural, chemical and construction uses, and titaniferous magnetite sand (iron sands); recently, gold mining was renewed in the historic goldfield at Martha Hill on the Coromandel Peninsula. Crude mineral production also included natural gas, natural gas liquids, and petroleum (condensate).

The mineral processing sector consisted chiefly of the production of primary aluminum, manufactured fertilizers, petroleum refinery products, and crude steel produced from imported raw materials. Crude petroleum, natural gas, and natural gas liquids production continued to increase.

Table 1.—New Zealand: Production of mineral comodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum metal, smelter:					
Primary	163,420	218,610	242,851	240,835	[2]173,300
Secondary	2,700	[r]3,000	3,700	1,500	[2]1,500
Total	166,120	[r]221,610	246,551	242,335	[2]174,800
Gold, mine output, Au content—troy ounces	7,775	9,667	21,605	45,011	46,000
Iron and steel:					
Iron ore, gross weight[3]	166	156	2,645	[e]2,000	2,000
Iron sand (titaniferous magnetite):					
Gross weight—thousand tons	2,791	2,203	2,414	[e]2,500	2,500
Fe content—do	1,591	1,256	1,376	[e]1,425	1,425
Pig iron (sponge iron)[e]—do	150	155	170	170	200
Steel, crude—do	252	233	274	228	287
Lead, refinery output, secondary[e]	6,000	6,000	6,000	6,000	6,000
Silver, mine output, Ag content—troy ounces	--	31	--	--	--
Tungsten, mine output (scheelite):					
Gross weight	14	11	13	[e]10	10
W content	7	6	6	[e]5	5
INDUSTRIAL MINERALS					
Cement, hydraulic—thousand tons	[r]781	[r]760	823	863	780
Clays:					
Bentonite	6,220	1,958	6,418	[e]6,000	6,000
Kaolin (pottery)	23,957	23,917	25,098	[e]25,000	25,000
For brick and tile	129,924	97,944	146,840	[e]145,000	145,000
Lime[e]	170,000	165,000	150,000	160,000	160,000
Nitrogen: N content of ammonia	--	43,200	58,000	74,000	60,000
Perlite	2,163	1,008	--	--	--
Pumice	50,183	16,799	15,182	[e]20,000	20,000
Salt	70,000	81,000	57,000	[e]60,000	60,000
Sand and gravel:					
Silica sand (glass sand)	160,009	148,357	133,235	[e]50,000	50,000
Other industrial sand	245,349	234,403	387,209	[e]350,000	350,000
For roads and ballast—thousand tons	14,154	15,489	16,501	[e]15,000	15,000
For building aggregate—do	4,169	4,359	5,029	[e]5,000	5,000
Stone:					
Dolomite	14,900	17,033	18,124	[e]18,000	18,000
Greenstone—kilograms	8,100	435	3,052	[e]3,000	3,000
Limestone and marl:					
For agriculture—thousand tons	1,592	1,460	1,524	[e]1,500	1,500
For cement—do	1,483	1,497	1,621	[e]1,500	1,500
For other industrial uses—do	184	207	214	[e]215	215
For roads—do	375	274	359	[e]350	350
Serpentine	45,644	64,055	76,900	[e]75,000	75,000
Unspecified:					
Dimension	22,493	22,585	36,359	[e]35,000	35,000
Rock for harbor work—thousand tons	2,325	2,254	2,520	[e]2,500	2,500
Sulfur	156	1,090	862	[e]1,000	1,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon dioxide, liquefied[e]	[2]9,797	10,000	10,000	10,000	10,000
Coal:					
Anthracite—thousand tons	(4)	2	--	[e](4)	(4)
Bituminous—do	428	496	582	[e]609	600
Subbituminous—do	1,595	1,752	1,709	[e]1,573	1,400
Lignite—do	222	235	235	[e]227	200
Total—do	2,245	2,485	2,526	[e]2,409	2,200
Coke:					
Coke oven	2,263	2,060	[e]2,100	[e]2,000	2,000
Gashouse	7,037	6,129	[e]6,200	[e]6,000	6,000
Total	9,300	8,189	[e]8,300	[e]8,000	8,000
Fuel briquets	6,144	4,453	[e]4,500	[e]5,000	5,000
Gas:					
Manufactured (from gasworks)[e]—million cubic feet	1,168	845	609	517	356
Natural:					
Gross production[e]—do	108,450	105,000	127,200	[r]157,700	188,900
Marketed production—do	94,502	91,465	110,817	137,162	[2]164,283

See footnotes at end of table.

Table 1.—New Zealand: Production of mineral comodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
MINERAL FUELS AND RELATED MATERIALS — Continued					
Natural gas liquids:[e]					
Liquefied petroleum gas _ thousand 42-gallon barrels	315	532	483	[r]910	976
Natural gasoline ---------- do	56	94	85	[r]160	172
Total ---------- do	371	626	568	[r]1,070	[2]1,148
Petroleum:					
Crude ---------- do	5,373	5,268	6,635	8,065	[2]11,833
Refinery products:					
Gasoline ---------- do	9,801	10,668	10,965	6,001	[2]13,150
Distillate fuel oil ---------- do	4,125	4,551	4,588	2,462	[2]4,588
Residual fuel oil ---------- do	2,637	2,331	2,311	1,998	[2]1,512
Other ---------- do	483	784	931	637	[2]679
Refinery fuel and losses ---------- do	735	805	798	525	[2]784
Total ---------- do	17,781	19,139	19,593	11,623	[2]20,713

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through July 14, 1987.
[2]Reported figure.
[3]Not used for manufacture of iron; reportedly consumed for gas purification, preparation of stock licks, and manufacture of brick. Because of these uses, iron content is not reported.
[4]Less than 1/2 unit.

TRADE

Among mineral commodity imports, crude petroleum, partly refined petroleum, and petroleum refinery products dominated. Other mineral commodity imports were alumina, fertilizer materials, and steel semimanufactures. Aluminum ingots continued to be the dominant mineral commodity export, followed by steel products, mainly semimanufactures, and iron ore (iron sands).

Table 2.—New Zealand: Exports and reexports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Scrap ----------	2,540	3,210	--	Japan 2,961.
Unwrought ----------	208,902	235,570	--	Japan 208,816; China 9,259; Republic of Korea 6,128.
Semimanufactures ----------	9,810	9,066	141	Australia 4,329; Indonesia 2,068; Malaysia 664.
Copper: Metal including alloys:				
Scrap ----------	1,340	1,213	--	India 459; Australia 180.
Unwrought and semimanufactures --	3,420	3,197	805	Australia 1,506; India 220.
Iron and steel:				
Iron ore and concentrate, excluding roasted pyrite -- thousand tons --	2,223	2,091	--	All to Japan.
Metal:				
Scrap ----------	3,375	[3]	--	Mainly to Japan.
Steel, primary forms ----------	31,713	37,443	NA	China 34,647; Fiji 2,748.
Semimanufactures:				
Bars, rods, angles, shapes, sections ----------	51,007	40,363	8,155	China 20,703; Fiji 2,744; Papua New Guinea 1,246.
Universals, plates, sheets --	30,177	46,109	17,847	Australia 13,953; Fiji 3,724; Pakistan 2,364.
Hoop and strip ----------	113	79	4	Fiji 30; Australia 26.
Rails and accessories ----------	8	5	--	Fiji 3.
Wire ----------	14,870	11,645	2,166	Australia 5,941; Hong Kong 2,534.
Tubes, pipes, fittings ----------	4,377	3,492	38	Papua New Guinea 1,102; Fiji 610; Australia 551.
Castings and forgings, rough	140	154	18	Australia 118.

See footnotes at end of table.

Table 2.—New Zealand: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Lead: Metal including alloys:				
Scrap	393	171	--	United Kingdom 52; West Germany 34; India 31.
Unwrought and semimanufactures	320	64	--	Fiji 27; Australia 23.
Magnesium: Metal including alloys, scrap	--	1	--	All to Japan.
Nickel: Metal including alloys, semimanufactures -- value, thousands	$2	$6	--	All to Australia.
Platinum-group metals: Metals including alloys, unwrought and partly wrought do	$2,608	$1	--	NA.
Silver:				
Waste and sweepings ---do	$1,574	$835	--	Australia $694; United Kingdom $138.
Metal including alloys, unwrought and partly wrought ---do	$26	$753	--	Australia $736.
Tin: Metal including alloys, all forms	165	306	--	French Polynesia 130; United Kingdom 51; Australia 25.
Tungsten: Ore and concentrate	14	--		
Zinc: Metal including alloys:				
Scrap	531	376	--	Australia 153; India 55; United Kingdom 37.
Unwrought and semimanufactures	75	4	--	Fiji 3.
Other:				
Oxides and hydroxides	r(3)	3	--	Australia 1; Fiji 1.
Ashes and residues	1,710	2,083	--	Japan 884; India 521; Australia 368.
Base metals including alloys, all forms value, thousands	$3	$59	--	Australia $49.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	101	87	--	Australia 85.
Grinding and polishing wheels and stones ---- value, thousands	$5	$77	--	Papua New Guinea $26; Fiji $25.
Barite and witherite	16	10	--	Singapore 6.
Cement	198,510	184,780	--	French Polynesia 55,404; Australia 44,388; Papua New Guinea 32,470.
Chalk	21	1	--	NA.
Clays, crude	14,183	14,903	--	Japan 9,452; Republic of Korea 1,025; United Kingdom 369.
Diamond: Gem, not set or strung value, thousands	$125	$230	$19	Australia $138; United Kingdom $72.
Fertilizer materials:				
Crude, n.e.s	255	537	--	Malaysia 374; Japan 105.
Manufactured:				
Ammonia	3	6	--	Samoa 4.
Nitrogenous	223	53,189	17,505	France 17,000; Australia 14,638.
Phosphatic	440	272	--	Fiji 160; Papua New Guinea 58; Cook Islands 35.
Potassic	231	130	--	Cook Islands 92; Fiji 30.
Unspecified and mixed	(4)	1,217	(5)	Cook Islands 395; Fiji 293; Australia 148.
Gypsum and plaster	867	430	--	Indonesia 256; Vanuatu 110.
Lime	1,155	782	--	Fiji 424; French Polynesia 310.
Phosphates, crude	19	15	--	Singapore 10.
Pigments, mineral: Iron oxides and hydroxides, processed	11	(5)	--	All to Norfolk Island.
Precious and semiprecious stones other than diamond:				
Natural ---- value, thousands	$499	$182	$15	Australia $123; Fiji $29.
Synthetic ---do	$15	$5	--	All to United Kingdom.
Salt and brine	3,331	2,610	--	Australia 1,364; Papua New Guinea 444.
Sodium compounds, n.e.s.: Carbonate, manufactured	1,044	(6)	--	Mainly to Fiji.

See footnotes at end of table.

Table 2.—New Zealand: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	61	88	--	American Samoa 43; Fiji 23.
Worked value, thousands	$60	$73	--	Samoa $20; Cook Islands $18; Fiji $17.
Dolomite, chiefly refractory-grade do	--	$4	--	All to Australia.
Gravel and crushed rock	1,186	990	32	Malaysia 662; Indonesia 102.
Limestone other than dimension	202	279	--	All to New Caledonia.
Quartz and quartzite	10	--		
Sand other than metal-bearing	303	327	--	Australia 248.
Sulfur: Sulfuric acid	209	217	--	Papua New Guinea 98; Fiji 66.
Talc, steatite, soapstone, pyrophyllite	44	207	--	Australia 203.
Other: Crude	395	562	--	Australia 302; Fiji 206.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	124	3	--	All to Samoa.
Coal: Anthracite and bituminous	372,318	415,762	--	Japan 398,108; Republic of Korea 17,252.
Peat including briquets and litter	2,239	(7)	--	Mainly to Australia.
Petroleum refinery products:				
Liquefied petroleum gas value, thousands	$8	$240	--	Australia $192.
Gasoline 42-gallon barrels	178	230	--	Cook Islands 162.
Mineral jelly and wax do	134	275	--	Australia 252.
Kerosene and jet fuel do	1,201	1,163	--	Papua New Guinea 341; Tonga 217; Fiji 178.
Distillate fuel oil do	298	545	--	Singapore 470.
Lubricants value, thousands	$1,260	$1,321	--	Fiji $598; Hong Kong $150; Australia $142.
Residual fuel oil 42-gallon barrels	33	226,500	--	Singapore 168,891; Australia 57,589.
Bitumen and other residues do	54	85	--	All to Solomon Islands.
Bituminous mixtures do	4,842	5,357	--	Cook Islands 2,030; Samoa 1,260; Fiji 654.

[r] Revised. NA Not available.
[1] Table prepared by Audrey D. Wilkes.
[2] Unreported quantity valued at $1,378,000.
[3] Unreported quantity valued at $11,000.
[4] Unreported quantity valued at $338,000.
[5] Less than 1/2 unit.
[6] Unreported quantity valued at $55,000.
[7] Unreported quantity valued at $527,000.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and rare-earth metals value, thousands	$55	$36	$4	Poland $23.
Aluminum:				
Ore and concentrate	1,200	5	--	All from United Kingdom.
Oxides and hydroxides	465,082	503,072	103	Australia 496,096.
Metal including alloys:				
Scrap	31	50	--	United Kingdom 10.
Unwrought	1,690	749	5	Australia 521; United Kingdom 168.
Semimanufactures	4,548	4,895	98	Australia 2,439; Japan 785; Switzerland 538.
Chromium:				
Ore and concentrate	291	161	--	All from Republic of South Africa.
Oxides and hydroxides	263	514	16	United Kingdom 362; West Germany 108.
Cobalt: Oxides and hydroxides	8	23	1	Finland 20.

See footnote at end of table.

Table 3.—New Zealand: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Copper: Metal including alloys:				
Scrap	55	(2)	--	All from Australia.
Unwrought	2,686	2,176	7	West Germany 1,225; Australia 918.
Semimanufactures[3]	16,267	17,272	55	Australia 12,984.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	37	301	--	United Kingdom 231; Australia 70.
Pyrite, roasted	--	14	--	All from Australia.
Metal:				
Scrap	2,898	2,839	--	French Polynesia 1,349; Fiji 646.
Pig iron, cast iron, related materials	1,428	1,652	4	Australia 785; Japan 399; United Kingdom 350.
Ferroalloys:				
Ferromanganese	293	409	--	Australia 203; Japan 143.
Unspecified	3,960	3,578	76	Australia 3,099.
Steel, primary forms	6,745	1,835	(2)	Mainly from Australia.
Semimanufactures:				
Bars, rods, angles, shapes, sections	107,232	108,591	209	Japan 49,431; Australia 46,030.
Universals, plates, sheets	444,659	352,980	1,088	Japan 238,176; Australia 99,140.
Hoop and strip	19,125	18,219	60	Australia 9,161; Japan 6,637.
Rails and accessories	15,291	10,047	9	United Kingdom 7,536; Japan 1,269.
Wire	17,800	20,095	67	Japan 5,782; Australia 5,023; United Kingdom 4,668.
Tubes, pipes, fittings	42,862	35,173	1,607	Japan 18,045; Australia 9,589.
Castings and forgings, rough	189	107	--	Japan 50; United Kingdom 47.
Lead:				
Oxides	109	109	8	United Kingdom 56; Australia 41.
Metal including alloys:				
Scrap	--	18	--	All from Fiji.
Unwrought	5,046	5,002	1	Australia 4,991.
Semimanufactures	188	158	(2)	Australia 140.
Magnesium: Metal including alloys:				
Unwrought value, thousands	$733	$763	$93	Norway $588.
Semimanufactures do	$80	$58	$5	Canada $42.
Manganese:				
Ore and concentrate	69	58	--	Singapore 52.
Oxides	824	966	2	Japan 527; Australia 397.
Mercury value, thousands	$12	$16	--	Japan $8; United Kingdom $6.
Molybdenum: Metal including alloys, all forms do	$90	$131	$10	United Kingdom $83; Austria $35.
Nickel: Metal including alloys:				
Unwrought	171	95	--	West Germany 33; Canada 29.
Semimanufactures	61	168	63	Australia 29; Canada 29; West Germany 24.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$705	$715	$36	United Kingdom $383; Australia $233.
Silver:				
Waste and sweepings[4] do	$225	$37	--	All from Australia.
Metal including alloys, unwrought and partly wrought do	$3,190	$1,758	$8	Australia $1,616.
Tin: Metal including alloys, all forms	217	175	1	Malaysia 95; Australia 71.
Titanium: Oxides	1,877	1,536	101	Finland 640; Australia 342; Japan 244.
Tungsten: Metal including alloys, all forms value, thousands	$378	$467	$27	United Kingdom $347.
Zinc:				
Oxides	39	313	2	Australia 247.
Metal including alloys:				
Unwrought	26,501	20,889	--	Australia 15,484; Canada 5,404.
Semimanufactures[5]	106	59	2	Australia 29; West Germany 17.
Other:				
Ores and concentrates	935	1,141	--	Australia 450; China 346; Japan 271.
Oxides and hydroxides	1,289	3,602	54	Australia 3,455.
Ashes and residues	14	14	--	All from Australia.
Base metals including alloys, all forms value, thousands	$519	$516	$97	Australia $111; China $98; United Kingdom $70.

See footnotes at end of table.

Table 3.—New Zealand: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	244	393	163	Italy 72; Austria 53; Australia 32.
Artificial: Corundum	171	212	51	Australia 74; West Germany 21.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$422	$222	$155	United Kingdom $46.
Grinding and polishing wheels and stones do	$2,113	$2,528	$560	Japan $481; Australia $454; United Kingdom $296.
Asbestos, crude	1,861	1,355	--	All from Canada.
Barite and witherite	3,665	5,202	--	Australia 1,586; India 1,212; Indonesia 821.
Boron materials:				
Crude natural borates value, thousands	$97	$530	$410	Netherlands $104.
Oxides and acids	1,931	1,364	1,294	Italy 54.
Cement	5,184	3,934	6	Singapore 1,156; Australia 980; Japan 684.
Chalk	1,011	842	(2)	United Kingdom 683; Australia 70.
Clays, crude	12,831	13,944	2,850	Australia 8,823; United Kingdom 1,401.
Cryolite and chiolite	13	224	--	All from Denmark.
Diamond:				
Gem, not set or strung value, thousands	$3,251	$3,045	$38	India $2,041; Israel $454.
Industrial stones do	$239	$303	--	Australia $237; Zaire $55.
Diatomite and other infusorial earth	1,109	1,161	849	Australia 282.
Feldspar, fluorspar, related materials	1,169	1,049	--	Canada 497; Norway 343; United Kingdom 116.
Fertilizer materials: Manufactured:				
Ammonia	326	12	(2)	France 10.
Nitrogenous value, thousands	$6,884	$8,592	$1,444	Japan $3,227; West Germany $2,373; Australia $733.
Phosphatic	22,267	43,310	34,314	West Germany 8,979.
Potassic	235,720	165,160	95,617	West Germany 20,877; Canada 20,143; Jordan 16,700.
Unspecified and mixed value, thousands	$17,419	$11,304	$9,262	West Germany $1,433.
Graphite, natural	59	77	2	Sri Lanka 59.
Gypsum and plaster	161,200	129,720	38	Australia 124,580.
Lime	80	21	14	Japan 6.
Magnesium compounds: Magnesite, crude including sintered	6,401	7,618	185	China 5,831; Australia 1,444.
Mica:				
Crude including splittings and waste value, thousands	$178	$147	$5	China $62; India $26.
Worked including agglomerated splittings do	$198	$243	$9	United Kingdom $122; Australia $26.
Nitrates, crude	54	75	--	West Germany 57; Australia 18.
Phosphates, crude	910,279	821,855	123,853	Christmas Island 336,790; Nauru 326,340.
Pigments, mineral: Iron oxides and hydroxides, processed	2,213	1,947	39	West Germany 1,494.
Potassium salts, crude	7,363	--		
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$1,964	$1,840	$26	Thailand $525; Australia $445; Hong Kong $397.
Synthetic do	$736	$201	$148	West Germany $21.
Pyrite, unroasted	--	1	--	All from Australia.
Salt and brine	62,176	64,184	(2)	Netherlands Antilles 34,966; Australia 26,007.
Sodium compounds, n.e.s.: Carbonate, manufactured	29,800	31,537	29,901	Australia 1,146; United Kingdom 421.

See footnotes at end of table.

Table 3.—New Zealand: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	5,331	5,053	17	Republic of South Africa 1,659; China 1,464; India 907.
Worked value, thousands	$546	$1,056	$8	Italy $248; Spain $167; China $146.
Dolomite, chiefly refractory-grade	42	17	--	All from West Germany.
Gravel and crushed rock	103	295	180	United Kingdom 55; France 41.
Quartz and quartzite	170	205	19	Australia 59; China 36; Norway 36.
Sand other than metal-bearing	430	448	52	Australia 255; Japan 61.
Sulfur:				
Elemental:				
Crude including native and by-product	222,011	234,677	54,415	Canada 180,203.
Colloidal, precipitated, sublimed	358	523	(2)	Australia 520.
Sulfuric acid	32	32	2	United Kingdom 27.
Talc, steatite, soapstone, pyrophyllite	2,710	2,609	29	Australia 1,766; China 663.
Other:				
Crude value, thousands	$451	$867	$427	Austria $191; Republic of South Africa $171.
Slag and dross, not metal-bearing	141	207	--	Australia 162; West Germany 40.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	40	1	1	
Carbon black	6,738	6,686	215	Australia 6,092.
Coal:				
Anthracite and bituminous	894	547	--	United Kingdom 390; Australia 157.
Briquets of anthracite and bituminous coal	531	--		
Lignite including briquets	44	--		
Coke and semicoke value, thousands	$367	$351	--	Australia $328.
Petroleum:				
Crude thousand 42-gallon barrels	10,411	6,143	447	Saudi Arabia 2,823; Indonesia 2,542.
Refinery products:				
Liquefied petroleum gas value, thousands	$30	$76	$30	Netherlands $27; Italy $12.
Gasoline do	$171,510	$212,015	$3,592	Singapore $71,851; Australia $39,802; Saudi Arabia $37,385.
Mineral jelly and wax do	$2,802	$2,928	$261	Japan $1,247; Australia $359; China $331.
Kerosene and jet fuel do	$96,863	$95,042	$534	Singapore $59,990; Australia $27,720.
Distillate fuel oil do	$124,474	$164,290	$28,848	Australia $52,355; Singapore $41,049; Saudi Arabia $12,469.
Lubricants do	$27,272	$32,067	$2,955	Australia $19,777; Singapore $6,114.
Residual fuel oil do	$50,082	$31,902	$7,607	Singapore $17,662; Indonesia $4,646.
Bitumen and other residues 42-gallon barrels	3,648	194,865	--	Spain 194,665.
Bituminous mixtures do	1,424	3,430	291	United Kingdom 2,357.
Petroleum coke do	665,055	533,550	526,851	Australia 6,309.

[1]Table prepared by Audrey D. Wilkes.
[2]Less than 1/2 unit.
[3]Excludes unreported quantity valued at $2,793,000 in 1984 and $3,751,000 in 1985.
[4]May include other precious metals.
[5]Excludes unreported quantity valued at $701,000 in 1984 and $681,000 in 1985.

COMMODITY REVIEW

METALS

Aluminum.—The joint venture partners in the Tiwai Point aluminum smelter, Comalco Pty. Ltd. of Australia (79.4%) and Sumitomo Aluminium Smelting Co. Ltd. of Japan (20.6%), filed a legal suit against the Government of New Zealand in the Wellington High Court in the continuing controversy over electricity supply agreements. The Tiwai Point smelter receives its electricity supply from the Manapouri hydroelectric system, which was developed specifically to supply the smelter. In 1977, the agreement was renegotiated under threat of legislation and resulted in a 450% increase in charges. In 1985, a 25% increase in power tariffs raised costs for the 244,000-ton-per-year smelter by $38 million.

Gold and Silver.—Production from existing alluvial dredging operations in South Island has increased over the last several years, but was still small by world standards. However, exploration and development of several epithermal gold prospects in North Island, predominantly by Waihi Gold Co. in the historic goldfield at Martha Hill on the Coromandel Peninsula, continued during the year.

Waihi Gold and its partners have drilled out a near-surface resource at Waihi of 14.6 million tons of ore with an average grade of 3.1 grams of gold per ton (0.09 troy ounce per short ton) plus 30 grams of silver per ton (0.88 troy ounce per short ton). Previous mining at Waihi in the latter part of the last century and earlier in this century produced 35 million troy ounces of bullion containing 8 million troy ounces of gold, which ranked this as one of the largest gold deposits in the Southwest Pacific.

About 20 kilometers northwest of Waihi, Cyprus Minerals Co. drilled out a major extension to the Golden Cross ore zone, also mined in the late 19th and early 20th centuries. In 1986, the company was planning to initially develop an open pit, moving to underground mining of higher grade ore at a later date. Reserves were estimated to be about 20 million tons grading 2 grams of gold per ton (0.06 troy ounce per short ton).

North of Waihi, Spectrum Resources Ltd. filed an application to build a 30,000-ton-per-year gold treatment plant, intending to process ore from several small high-grade vein systems and tailings from earlier operations.

Homestake Gold Ltd. discovered a modest-sized surface mine deposit at Macraes Flat on South Island with resources of about 5 million tons grading 4 grams of gold per ton (0.12 troy ounce per short ton).

If the above gold projects being considered for development all eventually come on stream, New Zealand's annual gold production would rise to about 200,000 troy ounces from the approximate current output of 45,000 troy ounces.

Iron Ore and Iron Sands.—Titaniferous magnetite sands were mined by two companies, New Zealand Steel Mining Ltd. and Waipipi Ironsands Ltd., from deposits along the southwest coast of North Island. New Zealand Steel Mining, a wholly owned subsidiary of New Zealand Steel, operated two mines, Taharoa and North Head, producing iron ore sands both for the export market and for domestic use in the production of steel billets at New Zealand Steel's Glenbrook steelworks. Waipipi Ironsands produced titanomagnetite concentrates for direct export to Japan through offshore bulk-loading facilities from its Waverley placer mining operations.

Minor production of iron ore continued from the Onekaka deposits in the north of South Island and small deposits on the coast of North Island near Auckland for use in gas purification, for preparation of stock licks, and in the brickmaking industry.

Iron and Steel.—New Zealand Steel completed its two-stage expansion program at its North Island Glenbrook steel mill south of Auckland late in the year. The first stage provided for the production of 775,000 tons per year of slab and billets, and the second stage provided hot- and cold-rolling mills and associated facilities to process 550,000 tons of continuously cast slab into a variety of finished flat products for both the domestic and export markets. However, the hot- and cold-rolling strip mills were not commissioned, and production from these was not expected until the second half of 1987 owing to a downturn in the domestic market and weak export revenues owing to the strength of the New Zealand dollar and weak international markets.

The Government announced in December that it would complete its financial restructuring of New Zealand Steel by increasing its shareholding in the company from 81.2% to 90%. The Government be-

came a shareholder in New Zealand Steel at yearend 1985, assuming a 60% interest and responsibility for the company's debts. The interest was increased to 81.2% in mid-1986. The Government planned to sell off its shares as soon as practicable, however.

MINERAL FUELS

Coal and Lignite.—New Zealand continued planning for the biggest coal expansion program ever. The program, a $1.4 billion development for the Waikato Basin, North Island, coal deposits by the year 2000, will boost production fourfold to about 4 million tons per year. The project's principal aim was to ensure an adequate supply of coal for two large domestic consumers, New Zealand Steel's plant at Glenbrook and the Huntly power station in central North Island. The steel plant was expected to increase its consumption from 150,000 to 920,000 tons per year by 1990, and the powerplant was expected to require 1,500,000 million tons by 1991.

New Zealand's Ministry of Energy—State Coal Mines awarded a contract to complete a mining feasibility study on the Kopuku sector of the Maramarua Coalfield, North Island. The project will entail field work, drilling, geological interpretation, and hydrogeological testing through 1987, leading to a final reserve estimate for mine planning studies to be carried out in 1988.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from New Zealand dollars (NZ$) to U.S. dollars at the rate of NZ$0.5263=US$1.00 as of Dec. 31, 1986.

The Mineral Industry of Nigeria

By John R. Lewis[1]

After a growth of 2.4% in 1985, Nigeria's real gross domestic product (GDP) retrenched about 3.3% in 1986. The unexpected sharp drop in crude oil prices during the year was damaging to Nigeria's oil sector economy, which provided 95% of the country's foreign exchange earnings and 70% of the Government's revenue. The industry provided 19% of the GDP, manufacturing contributed 10%, and agricultural output rose slightly and contributed 28%. There had been little to encourage nonfuel mineral mining in recent years, and the contribution to the country's GDP by this sector remained very limited in 1986. For varying reasons, there were further delays in completion of mineral-related industrial projects, such as the Ajaokuta steelworks and a fourth oil refinery at Port Harcourt. On the other hand, the petroleum exploration and production sectors, even in the presence of depressed oil prices, experienced moderate but positive gains.

Government Policies and Programs.—In June, the President announced a comprehensive program to restructure Nigeria's economy. Prior to that date, it had been deteriorating as the price for world oil began to fall. The program, called the Structural Adjustment Program (SAP), sought to release the country's dependence on oil, reduce the fiscal debt to manageable proportions, achieve equilibrium in the balance of payments, and lay a basis for sustainable, noninflationary growth.

From 1971 to 1985, Nigeria's major export was petroleum, which over the years gradually provided up to 95% to 99% of the country's foreign earnings. The money then was obligated by the Government for massive public spending programs on infrastructure, education, public housing, and state-owned capital-intensive industries. But in 1986, world crude oil prices fell sharply, with a parallel fall in Nigeria's export revenues from $12.6 billion[2] in 1985 to $6.8 billion in 1986. Knowing that there were heavy external debt payments falling due in the forthcoming few years, the Government established the SAP in June. This was a series of policy measures designed to reverse the country's dismaying economic fortune. As an alternative to formal currency devaluation, the Secondary Tier Foreign Exchange Market (SFEM) was inaugurated in September. Also, the export licensing system was abolished, as were export licenses. Exporters were allowed to retain their foreign exchange earnings, tariff schedules were revised, subsidies to domestic buyers of petroleum products were reduced, and price controls and certain agricultural controls were abolished. Under SFEM, among other improvements, essential raw materials and spare parts began to appear once again in the country's supply channels.

The first indication of the scope of the Government's new privatization scheme came in late 1986 when the National Planning Ministry was presented a list by an interministerial committee of Federal Government-owned parastatal and public enterprises that were considered to be candidates for full privatization. Included were the Nigerian National Petroleum Corp. (NNPC) and the Nigerian Coal Corp. However, it appeared unlikely that the report's 28 recommendations for implementation would be fully accepted, particularly those involving NNPC.

PRODUCTION AND TRADE

Production of crude oil, by far Nigeria's principal mineral commodity, averaged 1.46 million barrels per day (bbl/d) during the year, compared with 1.49 million bbl/d (revised) in 1985. At the beginning of the year, the crude price was $26 per barrel and production was 1.6 to 1.7 million bbl/d. However, after the Organization of Petroleum Exporting Countries (OPEC), of which Nigeria was a member, chose to defend the market shares concept rather than the price to enforce market discipline on non-OPEC producers, the price of oil fell to $9 per barrel in July but recovered later to $13 to $15 per barrel.[3] Under OPEC's market shares concept, Nigeria's production was pegged at about 1.25 million bbl/d, and income from oil sales was down about 14% from 1985 levels.

U.S. imports from Nigeria totaled $2.7 billion. Petroleum comprised 40% of Nigeria's exports. Imports from the United States amounted to $403 million and were principally wheat, mechanical shovels, and pumps, which amounted to about 8% of Nigeria's total imports. Values of U.S. trade with Nigeria decreased, compared with those of 1985, owing to lower prices for oil and late issuance of Nigerian export licenses and an absence of overseas lines of credit.

Table 1.—Nigeria: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS					
Columbium and tantalum concentrates, gross weight:					
Columbite	180	87	120	100	13
Tantalite	1	1	1	1	--
Iron and steel: Metal: Steel, crude	100,000	140,000	180,000	254,000	200,000
Lead:					
Mine output, Pb content[e]	260	260	[r]200	260	100
Metal, refined, secondary	2,000	2,000	2,000	3,000	3,500
Tin:					
Mine output, cassiterite concentrate:					
Gross weight (73.5% Sn)	2,355	1,560	1,700	990	1,090
Sn content	1,708	1,130	1,340	1,360	800
Metal, smelter	1,800	1,190	1,400	1,020	1,000
Zinc ore and concentrate, Zn content	(2)	(2)	(2)	(2)	(3)
INDUSTRIAL MINERALS					
Cement, hydraulic thousand tons	3,600	3,600	3,600	3,600	3,860
Clays:					
Kaolin	700	700	286	300	(3)
Unspecified	20,900	20,000	20,000	20,000	15,000
Feldspar[e]	5,000	5,000	--	5,000	3,500
Stone:					
Limestone thousand tons	1,400	1,400	1,890	1,800	1,850
Marble	3,300	3,000	1,200	1,200	1,482
Shale thousand tons	140	140	127	120	104
MINERAL FUELS AND RELATED MATERIALS					
Coal do.	NA	NA	76	55	135
Gas, natural:					
Gross million cubic feet	685,000	655,000	174,000	96,000	72,200
Marketed do.	19,000	18,000	18,000	18,000	20,000
Petroleum:					
Crude thousand 42-gallon barrels	472,000	452,000	508,000	544,252	534,165
Refinery products:					
Gasoline do.	22,100	11,100	22,000		31,000
Jet fuel do.	400	400	400		2,400
Kerosene do.	6,432	6,200	6,400		8,200
Distillate fuel oil do.	14,174	14,547	14,547	NA	5,128
Residual fuel oil do.	9,324	9,990	9,990		9,940
Unspecified do.	920	1,048	1,563		4,032
Total do.	53,350	43,285	54,900	NA	60,700

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Includes data available through July 8, 1987.
[2]Revised to less than 1/2 unit.
[3]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Gold.—Nigerian Mining Corp. reported that the recently found alluvial gold deposits at Ilesha, Oyo State, were being efficiently mined and that a substantial amount of gold had been recovered. Other deposits, identified as the Iperendu, Niger, Sokoto, and Tazaro deposits, were scheduled for development on a trial basis. The Tazaro gold prospect was in Plateau State and had been estimated by the company to cover an area of several square miles.

Steel.—Nigeria's youthful steel industry consisted of two Government-owned and only partially operating integrated steel mills, nine variously owned rerolling mills, and two minimills.

Delta Steel Co. Ltd. at Ovwian-Aladja, near Warri in Bendel State, was equipped with two Midrex 600-series direct-reduction units having a combined capacity of 1.02 million tons of iron. Delta Steel supplied billets to regional rerollers in addition to rolling finished products itself, such as bars, flats, angles, tees, and light channels. The plant's main access road, because of lack of money, was in such a state of disrepair at yearend that deliveries from the plant were seriously hampered. There was little indication that repairs were imminent.

Ajaokuta Steel Co. Ltd.'s plant at Ajaokuta City, in Kwara State, continued to experience construction and other types of delay, and indications were that the project would eventually be scaled down. The plant operated only as a reroller, using imported billets, which toward the end of the year fell into short supply. The company had planned the plant to be a fully integrated operation using the traditional blast furnace-Linz-Donawitz converter process to make raw iron and flat steel products for Nigerian fabricators who currently were importing their needs. Problems still unsolved included an insufficiently trained work force, inadequate accommodations for the work force, no viable iron ore beneficiation facility to handle domestic ore, and finally, a lack of financial resources. Contractors were being paid, in some instances, only after crude oil was sold for their account by NNPC and the proceeds turned over to the contractors.

The Ajaokuta complex had a large mechanical repair shop and a power equipment repair shop, both under construction and said to be over two-thirds completed. These facilities were turning out needed steel items for customers, such as automobile brake drums, spare parts, and machine studs.

The Government's Associated Ores Mining Co. iron mine at Itakpe Hill contained a 25- to 35-year supply of low-grade ore. Development of the mine remained behind schedule.

Tin.—Makeri Smelting Co. Ltd.'s smelter at Jos, in Plateau State, operated at very depressed levels because of world oversupply, nearly exhausted placer tin deposits, and sharply curtailed demand. The company demolished one of its two reverberatory furnaces, and the second furnace was rebuilt at about one-half its previous size so that the smelter capacity was 3,000 tons per year compared with the previous 13,500 tons per year. In 1984, the smelter was able to produce 1,363 tons of tin. In 1985, the output was 1,021 tons and in 1986 was about 1,000 tons of tin metal. To seek additional revenue, the company was considering converting to making more solder, or soft and antimonial lead products, up to an annual output of 2,000 tons. This was the only solder-wire plant in West Africa.

Tin exports from Nigeria ceased in late 1985, owing to the unsettled situation in the international tin market, and mined tin began to go into mine and smelter stockpiles. In early 1986, Nigeria's Metallic and Nonmetallic Mine Workers Union called upon the Government to buy the stockpiled material at a cost of $15 million, which would enable an estimated 100,000 miners to continue to work. The alternative appeared to be total shutdown and loss of all jobs.

INDUSTRIAL MINERALS

The large fertilizer complex of National Fertilizer Co. of Nigeria (Nafcon) at Onne, near Port Harcourt in Rivers State, was about 70% complete at yearend. The project first began with a feasibility study in 1976 when income from Nigeria's oil production was readily available for other industrial development. Since then, it survived shifting Government and internal management policies and delays in financing.

Mechanical completion was targeted for late 1986 with an overall completion ex-

pected by Nafcon and its partner, M. W. Kellogg Co. (Kellogg Nigeria Inc.), by the second quarter of 1987. This, however, was contingent upon the Government providing the final segment of committed funding.

NNPC was responsible for laying a 10.5-mile pipeline from a field operated by Shell Oil Co. to bring natural gas feedstock and fuel to the complex. Initially, imported phosphoric acid and potash were also to be used, but studies were under way to determine if phosphate rock in Ogun State and potash in Borno State would be usable as raw materials. The nitrogen compounds project was to save Nigeria an estimated $50 to $75 million in fertilizer imports. Nigeria hoped that eventually the plant would be capable of producing for export.

The facility was projected to produce 400,000 tons of urea per year and 300,000 tons of compound fertilizers per year when fully operational. Initial ammonia output was to be realized late in 1986, and the first batches of urea were to be out by February 1987. Fertilizer industry sources indicated that even with this additional production, Nigeria was likely to remain a net importer of nitrogen fertilizers.

MINERAL FUELS

Petroleum.—The Nigerian petroleum-producing industry was the largest in Africa, based upon daily crude production, and second only to Libya when based upon crude reserves. The country was the ninth largest daily crude petroleum producer in market economy countries.

Reports vary as to the average number of producing wells operating during the year but tend to agree that there were about 1,125 wells that produced about 1,465,000 bbl/d. A total of 10 companies, in varying partnership arrangements with the state's NNPC, produced from 38 offshore fields and 121 onshore fields. The country's three refineries refined about 5,140,000 barrels of crude per month to supply the domestic demand plus exports to neighboring countries and for transiting jet aircraft. Construction of a fourth refinery was delayed.

Early in the year, Nigeria terminated its offshore crude oil processing agreement with Petróleo Brasileiro S.A., Brazil's state oil corporation. Involved was 50,000 bbl/d of Nigerian crude. A new agreement was then made with France's Total S.A. to process 48,000 bbl/d of Nigeria's crude and to send Nigeria sizable volumes of needed kerosene and gasoline while buying any excess product from Nigeria to sell in Total's trade territories.

Exploration.—Seismic crews were active in the offshore and onshore areas throughout the year. From 7 to 12 parties were at work each month. In partnership with NNPC, Shell Petroleum Development Co. of Nigeria Ltd. and Gulf Oil Corp. (Nigeria) Ltd. were the most active.

In July, NNPC and the Nigerian affiliate of Société Nationale Elf Aquitaine (Elf) of France, as the result of Elf's making the high bid among four contenders, signed a joint venture agreement under which Elf was to be the operator for exploration of four blocks of land identified as lease Nos. 93, 95, 96, and 97 and situated in the southeastern part of Nigeria, west of Port Harcourt. Seismic surveys would start promptly as part of the 3-year, $130 million exploration program. Production of oil was not expected by NNPC before 1989.

Production.—Crude production was between 1.6 and 1.7 million bbl/d during the first half of 1986, sparked by Government guarantees of a $2 per barrel margin under all demand circumstances. Demand for Nigeria's crude, in a worldwide oversupply situation, dropped during the second half to about 1.250 million bbl/d, making the average annual production about 1.465 million bbl/d. Nigeria's crude was selling on world markets at only $9.55 per barrel in July 1986, having been in the range of $22 to $25 per barrel at yearend 1985, down from $30 per barrel in mid-September 1985. However, by September 1986, Nigeria's marker crude was bringing $14.20 per barrel, and in October, the price for spot crude ranged from $13.65 to $14.10 per barrel.

Ashland Oil (Nigeria) Co. commissioned a new crude terminal in February, a 2-million-barrel tanker permanently moored 28 miles offshore. It was to handle crude produced from the widely spaced Adanga, Akam, and Ebughu Fields, which had a total of 20 wells. The terminal could process 80,000 bbl/d. Crude was processed to refinery feedstock quality, then stored and offloaded as required. This was only the second terminal of its kind in Africa and the sixth in the world. At the time of the commissioning, Ashland was producing 20,000 bbl/d from the three fields, but under a new production-sharing contract with NNPC, total output was to rise quickly to 50,000 bbl/d.

Refining.—NNPC operated three refineries in Nigeria that had a combined capacity of 250,400 bbl/d. Construction of a fourth plant was to get under way near Port Har-

court late in 1986. Problems of finance delayed this project, but a complex financing package was finalized by mid-summer. Oil consumption began to fall as 1986 drew to a close when price subsidies were removed by the Government, and the fiscal stringency promoted by the economic recovery program began to be felt. The future of the new refinery remained unclear. Designed to process 150,000 bbl/d of Bonny light crude from Shell Petroleum's terminal, this new plant would, if built, bring Nigeria's total refining capacity to 410,000 bbl/d.

[1]Supervisory physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Nigerian naira (N) to U.S. dollars at the rate of N1.00=US$1.00. However, this rate applied only to the 1st and 2d quarters of 1986. In the 3d quarter the rate dropped to N1.00=US$0.74, and in the 4th quarter, due to the Nigerian Government's inauguration on September 26, 1986, of its Second Tier Foreign Exchange Market, there was an immediate depreciation in the naira of 67%, which resulted in a rate of N4.00=US$1.00.

[3]U.S. Embassy, Lagos, Nigeria. Foreign Economic Trends Report for Nigeria. State Dep. Airgram, Feb. 19, 1987, p. 6.

The Mineral Industry of Norway

By Richard H. Singleton[1]

Production of primary aluminum and ferroalloys, both of which are major energy-intensive industries, decreased for the second consecutive year. Two Norwegian aluminum companies merged to form the largest primary aluminum producer in Western Europe, Hydro Aluminium A/S. The new company also became Western Europe's largest producer of aluminum extrusions after acquiring a number of extrusion plants on the European mainland. Productivity improvements and rationalizations continued in both the aluminum and ferroalloys industries. Consolidation by plant acquisitions continued in the ferroalloys industry such that only one larger firm, Elkem A/S, and two smaller companies remained at yearend.

Two iron smelters closed, as did two small iron ore mines. Overseas markets and port facilities were established by the iron ore industry in an attempt to maintain output.

One zinc mine closed and two others were scheduled for closure during 1987. Expansion of Norway's sole zinc smelter and refinery was completed. Construction of a gallium plant began.

Norsk Hydro A/S acquired another Western European fertilizer producer and became Western Europe's largest producer of fertilizer materials. Falling product prices caused financial losses in the fertilizer division, and the company closed and scheduled closures of a number of unprofitable fertilizer plants in Norway and abroad.

The new ilmenite smelter at Tyssedal produced its first titania (TiO_2) slag.

Crude oil production from the North Sea continued to increase as output from the Statfjord Field more than offset decreased output from the Ekofisk Field. Attempts to stem subsidence of the latter field by injecting large volumes of natural gas were unsuccessful, and a mechanical raising of the platform was scheduled for 1987. Production began in one new oilfield, and development of two other fields continued on schedule. No new field developments were initiated, but three new fields, two in the North Sea and one in the Norwegian Sea, were declared commercial, and development plans were being prepared for submission to the Government.

Sales of natural gas, mostly exports to Western Europe, decreased, mainly because of the injection of natural gas into Ekofisk. A long-term contract to supply about 25% of continental Western Europe's gas was approved by the Government. This required development of the very large Troll Field and the large Sleipner Field. Production began at one small gasfield, and Government approval was given for development of another. Approval was also obtained for construction of Norway's first gas-fired electrical power unit on the west coast. Exploratory drillings proved the Haltenbanken area of the Norwegian Sea to be the most promising offshore area, with six new fields having been discovered.

Although growth in the real gross domestic product (GDP) remained strong at 4.4% and unemployment continued to decline to 2.0%, inflation accelerated to 7.2%, real disposable income dropped sharply, and the national debt increased significantly. The krone was devalued in May by 12% to spur exports and decrease imports. However, a $2.05 billion[2] deficit occurred in the balance of trade, compared with a $4.44 billion surplus in 1985, mostly because of decreased oil prices coupled with a significant increase in imports. The net foreign debt increased to 15% of the GDP, compared with 9% in

1985. The 1986 GDP was $70 billion. Austere measures taken by the Government during the year in order to decrease domestic demand began to take effect by yearend.

PRODUCTION

Output of crude steel and ferroalloys decreased significantly. Both production and imports of cement increased in response to demand in the domestic construction industry, including offshore petroleum production platforms. Coal and olivine output increased for the second and third consecutive years, respectively. Ammonia production decreased for the second consecutive year. Output of crude oil continued to increase significantly, but production of natural gas decreased for the second consecutive year.

Table 1.—Norway: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
METALS					
Aluminum:					
Primary	r638,091	713,014	765,083	742,686	712,009
Secondary	r10,804	r4,558	r5,587	6,004	e6,000
Cadmium, smelter	r103	117	150	159	154
Cobalt	r991	879	1,191	1,637	1,580
Copper:					
Mine output, Cu content	27,590	22,568	r25,042	19,252	21,887
Metal, primary plus secondary:					
Smelter	24,358	25,658	36,821	37,828	35,200
Refined	r18,564	r22,705	r30,323	31,074	30,457
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	3,545	3,545	3,837	3,497	3,659
Fe content do	r2,282	r2,307	r2,500	2,321	e2,400
Metal:					
Pig iron do	456	565	546	596	564
Ferroalloys:					
Ferrochromium[e]	10,000	4,000	(2)	--	--
Ferromanganese	203,256	283,492	285,169	267,670	204,728
Ferrosilicochromium[e]	1,000	400	(2)	--	--
Ferrosilicomanganese	215,732	194,784	280,953	256,457	245,427
Ferrosilicon (75% basis)	296,071	368,817	437,164	397,776	352,572
Other[e]	4,170	4,630	(2)	--	--
Total	730,229	856,123	r1,003,286	921,903	802,727
Steel, crude thousand tons	r779	895	r920	958	836
Semimanufactures, rolled do	496	561	615	664	687
Lead, mine ouput, Pb content	3,985	4,309	3,967	3,597	e3,500
Magnesium, primary	35,923	29,844	r49,301	54,704	56,522
Nickel:					
Mine output, Ni content	r405	360	r325	425	438
Metal, primary	25,833	28,619	35,548	37,513	38,209
Platinum-group metals[3] troy ounces	33,180	40,832	44,529	44,079	e45,000
Silicon metal	64,882	76,856	89,398	105,552	e100,000
Vanadium, mine output, V content	110	--	--	--	--
Zinc:					
Mine output, Zn content	r31,860	r32,356	r28,513	27,352	27,000
Metal, primary	r72,016	90,668	94,248	92,762	90,397
INDUSTRIAL MINERALS					
Cement, hydraulic thousand tons	1,786	1,666	1,547	1,343	1,750
Feldspar	62,812	57,960	67,820	80,095	e75,000
Graphite	7,451	8,063	10,067	2,684	--
Lime, hydrated, and quicklime[e] thousand tons	130	130	130	100	100
Nepheline syenite do	212	220	226	227	227
Nitrogen: N content of ammonia do	525	513	636	458	300
Olivine sand do	1,376	1,354	r1,772	1,989	2,332
Pyrite do	425	357	428	395	380

See footnotes at end of table.

Table 1.—Norway: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
INDUSTRIAL MINERALS —Continued					
Stone, crushed:					
Dolomite thousand tons	547	422	534	555	[e]550
Limestone do	4,515	4,303	3,995	3,827	[e]4,000
Quartz and quartzite do	624	582	828	775	[e]800
Sulfur:					
Pyrite, S content do	213	179	[r]203	193	181
Byproduct of:					
Metallurgy do	[e]83	[e]95	[r]62	60	67
Petroleum do	8	8	8	10	[e]13
Total do	304	282	[r]273	263	261
Talc, soapstone, steatite[e] do	100	100	[4]113	100	100
Titania:					
Ilmenite concentrate do	552	556	652	736	804
TiO_2 content do	245	247	289	327	357
MINERAL FUELS AND RELATED MATERIALS					
Coal, all grades do	440	502	451	507	580
Coke, all grades do	341	314	[r]337	315	313
Gas:					
Manufactured million cubic feet	268	171	73	--	--
Natural:					
Gross billion cubic feet	933	[r e]1,000	1,144	1,202	1,119
Marketable[5] do	925	[r]932	964	983	973
Marketed[6] do	[r]901	[r]912	[r]944	898	829
Peat:[e]					
For agriculture thousand tons	30	30	30	30	30
For fuel do	1	1	1	1	1
Petroleum:					
Crude[7] thousand 42-gallon barrels	[r]173,200	[r]217,900	[r]251,500	275,400	304,300
Natural gas liquids do	13,270	15,590	14,730	16,580	21,720
Refinery products:					
Naphtha do	[r]3,681	[r]4,311	[r]3,429	3,897	3,618
Gasoline do	9,648	10,124	[r]11,849	11,322	10,574
Kerosene do	[r]3,704	[r]4,526	[r]4,687	6,603	5,479
Distillate fuel oil do	23,171	25,110	[r]24,767	26,886	27,139
Residual fuel oil do	7,080	5,641	[r]6,693	5,381	5,428
Other do	[r]3,713	[r]3,568	[r]3,972	4,379	3,678
Refinery fuel and losses do	[r]2,975	[r]3,074	[r]3,642	3,175	4,734
Total do	[r]53,972	[r]56,354	[r]59,039	61,643	60,650

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available Sept. 15, 1987.
[2]Revised to zero.
[3]Data represent exports, part of which may be derived from imported materials.
[4]Reported figure.
[5]Gross less gas reinjected and flared.
[6]Marketable less gas used as fuel during production for 1982 and 1983. Reported as total methane sales after 1983.
[7]Excluding natural gas liquids. The crude oil entry in 1985 Norway chapter included natural gas liquids content.

TRADE

Total exports of North Sea crude oil and natural gas decreased in value by 38% to $7.2 billion in response to a near halving of the average price of oil and an approximately 20% decrease by yearend in the price of gas. Total exports decreased by 8% to $18.2 billion, and total imports increased by 32% to $20.3 billion. Total U.S. exports to Norway, which included petroleum coke, increased by 26% to $1.4 billion, and Norwegian exports to the United States, which included fertilizers, metals, and crude oil, decreased slightly to $1.0 billion.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	220	915	--	Sweden 890; Denmark 23; West Germany 2.
Metal including alloys:				
Scrap	27,138	28,725	--	West Germany 10,901; Sweden 7,583; Finland 4,044.
Unwrought	638,675	643,790	7,940	West Germany 203,207; Netherlands 103,853; United Kingdom 101,506.
Semimanufactures	82,360	82,445	7,507	Netherlands 18,920; Sweden 9,052; West Germany 8,658.
Antimony: Metal including alloys, all forms	5	NA		
Beryllium: Metal including alloys, all forms	(2)	3	--	All to Belgium-Luxembourg.
Cadmium: Metal including alloys, all forms	137	NA		
Chromium:				
Oxides and hydroxides	8	5	--	All to Sweden.
Metal including alloys, all forms	(2)	NA		
Cobalt:				
Oxides and hydroxides	(2)	--		
Metal including alloys, all forms	1,270	NA		
Copper:				
Ore and concentrate	72,619	82,851	--	Finland 31,843; West Germany 30,946; Sweden 20,062.
Oxides and hydroxides	4,689	NA		
Sulfate	375	NA		
Ash and residue containing copper	2,525	NA		
Metal including alloys:				
Scrap	5,761	5,257	--	West Germany 1,973; Belgium-Luxembourg 1,287; Sweden 1,180.
Unwrought	35,384	34,308	690	West Germany 11,102; United Kingdom 7,512; Sweden 5,194.
Semimanufactures	3,727	3,853	4	Sweden 1,653; West Germany 563; United Kingdom 510.
Gold:				
Waste and sweepings value, thousands	$1,408	NA		
Metal including alloys, unwrought and partly wrought troy ounces	13,921	NA		
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	3,083	2,578	--	West Germany 991; United Kingdom 658; France 444.
Pyrite, roasted do	136	107	--	West Germany 55; United Kingdom 24; Denmark 19.
Metal:				
Scrap	21,305	9,301	11	West Germany 4,152; Sweden 2,991; Denmark 2,068.
Pig iron, cast iron, related materials	27,873	32,201	--	United Kingdom 16,906; Denmark 7,707; Sweden 5,011.
Ferroalloys:				
Ferromanganese	204,540	180,018	2,842	West Germany 55,290; United Kingdom 20,560; Sweden 18,903.
Unspecified	r657,098	607,846	32,580	West Germany 164,290; Japan 93,710; United Kingdom 87,418.
Steel, primary forms	199,149	143,803	--	Netherlands 73,242; China 55,289; United Kingdom 8,788.
Semimanufactures:				
Bars, rods, angles, shapes, sections	306,628	354,015	70,770	West Germany 69,515; Sweden 37,064.
Universals, plates, sheets	154,856	173,210	11,141	Denmark 36,915; United Kingdom 33,764; Sweden 31,923.
Hoop and strip	16,146	13,971	(2)	Sweden 12,610; Denmark 1,106; Republic of South Africa 219.
Rails and accessories	1,153	879	--	Sweden 851; Iceland 25; Denmark 2.
Wire	9,128	8,683	2,350	West Germany 909; United Kingdom 762.
Tubes, pipes, fittings	51,655	65,641	4,513	Sweden 27,149; United Kingdom 10,718; Netherlands 6,239.
Castings and forgings, rough	4,797	4,602	2	Sweden 3,904; Denmark 239; Ireland 117.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Lead:				
Ore and concentrate	6,732	6,686	--	West Germany 4,583; United Kingdom 2,102.
Oxides	56	3	--	Denmark 1; Saudi Arabia 1.
Metal including alloys:				
Scrap	8,159	6,475	--	Sweden 5,942; Denmark 232; West Germany 141.
Unwrought	28	44	--	Sweden 37; Finland 5; Austria 2.
Semimanufactures	7	1	NA	NA.
Magnesium: Metal including alloys:				
Scrap	23	22	--	All to West Germany.
Unwrought value, thousands	$120,942	$136,476	NA	NA.
Semimanufactures	113	30	--	West Germany 18; Sweden 12.
Manganese:				
Ore and concentrate, metallurgical-grade	5	--		
Metal including alloys, all forms	1	NA		
Mercury 76-pound flasks	1,653	1,653	--	Spain 1,624; Sweden 29.
Molybdenum: Metal including alloys, all forms	--	1	--	Mainly to West Germany.
Nickel:				
Ore and concentrate	8,231	10,843	--	All to Finland.
Metal including alloys:				
Scrap	49	143	46	West Germany 90; United Kingdom 6.
Unwrought	37,812	35,666	19,174	Netherlands 6,577; Japan 2,000.
Semimanufactures	15	17	--	Finland 5; Denmark 4; United Kingdom 4.
Platinum-group metals:				
Waste and sweepings value, thousands	$5,990	NA		
Metals including alloys, unwrought and partly wrought ---do---	$10,921	$11,622	$339	West Germany $7,369; Sweden $1,829; Netherlands $931.
Silver:				
Waste and sweepings[3] ---do---	--	$1,949	--	West Germany $1,459; United Kingdom $358; Denmark $63.
Metal including alloys, unwrought and partly wrought ---do---	$5,909	$4,969	$95	Sweden $2,206; West Germany $794; Denmark $628.
Tin: Metal including alloys:				
Scrap	30	21	--	Sweden 14; United Kingdom 6; West Germany 1.
Unwrought	17	9	--	Sweden 5; United Kingdom 3; Denmark 1.
Semimanufactures	5	13	--	West Germany 12; Sweden 1.
Titanium:				
Ore and concentrate	599,214	NA		
Oxides	2,474	3,245	1,613	Sweden 860; Denmark 352.
Tungsten, metal including alloys, all forms	(2)	3	--	United Kingdom 2; Denmark 1.
Zinc:				
Ore and concentrate	10,989	10,959	--	All to West Germany.
Oxides	2,817	3,133	--	United Kingdom 1,574; West Germany 896; Denmark 254.
Blue powder	5,785	NA		
Ash and residue containing zinc	832	NA		
Metal including alloys:				
Scrap	395	308	--	Sweden 208; West Germany 51; Netherlands 38.
Unwrought	81,891	78,639	12,241	West Germany 17,223; Sweden 15,895; United Kingdom 15,597.
Semimanufactures	100	6,547	--	West Germany 1,005; Netherlands 940; Denmark 649.
Other:				
Ores and concentrates	--	641,910	--	West Germany 272,731; United Kingdom 101,880; Czechoslovakia 73,720.
Oxides and hydroxides	1	NA		
Ashes and residues	15,510	15,289	--	United Kingdom 4,132; Sweden 2,854; Denmark 2,742.
Base metals including alloys, all forms	56	1,681	791	Netherlands 455; Japan 162.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	9	70	--	Sweden 30; Iceland 22; Netherlands 8.
Artificial:				
Corundum	7	10	--	Jamaica 6; Denmark 1; Sweden 1.
Silicon carbide	69,640	NA		
Grinding and polishing wheels and stones	956	878	28	Sweden 272; Finland 165; France 124.
Asbestos, crude	7	--		
Barite and witherite	3,515	8,801	--	Denmark 8,016; Portugal 91; United Kingdom 60.
Boron materials: Oxides and acids	2	7	--	All to Denmark.
Cement	80,722	35,632	NA	NA.
Chalk	12	--		
Clays, crude	714	437	1	Portugal 227; Denmark 168; Sweden 40.
Cryolite and chiolite	6	2	--	All to Sweden.
Diamond: Gem, not set or strung value, thousands	$165	$546	--	West Germany $349; Switzerland $178; United Kingdom $11.
Diatomite and other infusorial earth	35	2	--	All to Italy.
Feldspar, fluorspar, related materials	312,783	316,662	--	Netherlands 103,967; United Kingdom 63,124; West Germany 46,879.
Fertilizer materials:				
Crude, n.e.s	10	6	--	All to United Kingdom.
Manufactured:				
Ammonia value, thousands	$15,133	4,619	NA	NA.
Nitrogenous do	$91,204	$87,194	NA	NA.
Potassic	1,790	--		
Unspecified and mixed value, thousands	$169,896	$148,906	NA	NA.
Graphite, natural	8,888	6,161	NA	NA.
Gypsum and plaster	2,380	36	--	All to Sweden.
Kyanite and related materials	16	NA		
Lime	7,073	822	--	Denmark 617; Sweden 205.
Magnesium compounds	9,870	10,271	NA	NA.
Mica:				
Crude including splittings and waste	2,009	1,934	--	Netherlands 846; West Germany 442; Sweden 135.
Worked including agglomerated splittings	3	(2)	--	All to Iceland.
Phosphates, crude	(2)	51	--	All to Sweden.
Pigments, mineral: Iron oxides and hydroxides, processed	66	18	--	Sweden 13; Malaysia 4.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$165	$160	$20	Switzerland $46; Belgium-Luxembourg $45; West Germany $33.
Synthetic	$30	$44	--	Switzerland $11; United Kingdom $10; Denmark $9.
Pyrite, unroasted	167,974	169,308	--	West Germany 70,496; Italy 66,615; Sweden 19,117.
Salt and brine	4,091	2,413	--	West Germany 1,229; Sweden 870; Spain 115.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	5	11	--	All to Denmark.
Sulfate, manufactured	48	NA		

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	98	212	1	Finland 53; West Germany 44; France 32.
Worked do	14	12	(2)	Netherlands 10.
Dolomite, chiefly refractory-grade do	149	168	NA	NA.
Gravel and crushed rock do	3,067	3,490	79	West Germany 1,319; United Kingdom 488; Denmark 423.
Limestone other than dimension do	14	9	--	Sweden 3; United Kingdom 3; Denmark 2.
Quartz and quartzite do	100	93	--	Iceland 82; Sweden 7; West Germany 1.
Sand other than metal-bearing do	4	2	--	Mainly to United Arab Emirates.
Sulfur:				
Elemental:				
Crude including native and by-product	4,307	3,722	--	United Kingdom 2,007; Sweden 859; West Germany 856.
Colloidal, precipated, sublimed	1,904	1,317	--	All to Sweden.
Dioxide	7,446	NA		
Sulfuric acid value, thousands	$4,624	$7,045	NA	NA.
Talc, steatite, soapstone, pyrophyllite	48,830	44,435	--	United Kingdom 10,562; Netherlands 9,243; West Germany 8,136.
Other:				
Crude	52	68	--	West Germany 30; Sweden 19; Finland 17.
Slag and dross, not metal-bearing	4,058	6,508	--	Denmark 2,858; Sweden 1,651; Finland 1,138.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,509	6	--	United Kingdom 4; West Germany 2.
Carbon black	47	37	--	Iceland 21; West Germany 12; Sweden 2.
Coal:				
Anthracite and bituminous	187,835	NA		
Briquets of anthracite and bituminous coal	2,645	--		
Lignite including briquets	2,235	--		
Coke and semicoke	123,566	122,270	--	Sweden 31,696; Iceland 27,882; West Germany 18,301.
Gas, natural: Gaseous million cubic feet	926,658	NA		
Peat including briquets and litter	--	33	--	All to Sweden.
Petroleum:				
Crude thousand 42-gallon barrels	223,119	240,790	7,191	United Kingdom 151,724; France 23,354; Netherlands 23,143.
Refinery products:				
Liquefied petroleum gas do	1,156	NA		
Gasoline do	5,386	5,463	--	United Kingdom 2,233; Netherlands 1,200; Sweden 811.
Mineral jelly and wax do	7	2	--	All to Sweden.
Kerosene and jet fuel do	1,097	1,667	--	Denmark 958; West Germany 177; Sweden 161.
Distillate fuel oil do	42,301	5,171	--	Denmark 2,368; West Germany 1,053; Sweden 823.
Lubricants do	50	40	(2)	Sweden 18; Netherlands 13; Denmark 4.
Residual fuel oil do	6,479	7,631	668	Netherlands 2,020; France 1,420; Sweden 1,179.
Bitumen and other residues do	50	1	--	Mainly to Iceland.
Bituminous mixtures do	5	(2)	--	Mainly to Sweden.
Petroleum coke do	579	464	--	Netherlands 296; Yugoslavia 85; United Kingdom 51.

r Revised. NA Not available.
[1] Table prepared by Jozef Plachy.
[2] Less than 1/2 unit.
[3] May include other precious metals.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	5,420	5,590	680	Greece 2,895; Denmark 2,015.
Oxides and hydroxides thousand tons	1,492	1,479	50	Australia 401; Suriname 373; Venezuela 274.
Metal including alloys:				
Scrap	2,874	2,127	--	Denmark 1,841; Finland 111; Sweden 103.
Unwrought	31,511	34,679	9	U.S.S.R. 7,934; Venezuela 6,751; Sweden 6,405.
Semimanufactures	46,581	47,535	221	West Germany 23,282; Sweden 6,484; Belgium-Luxembourg 3,193.
Antimony: Metal including alloys, all forms	71	NA		
Beryllium: Metal including alloys, all forms	47	--		
Chromium:				
Ore and concentrate	538	110	--	Finland 109.
Oxides and hydroxides	101	87	--	West Germany 60; Italy 20; Sweden 7.
Metal including alloys, all forms	10	NA		
Cobalt:				
Oxides and hydroxides	11	9	--	Netherlands 6; Belgium-Luxembourg 1; West Germany 1.
Metal including alloys, all forms	2,290	NA		
Columbium and tantalum: Metal including alloys, all forms, tantalum	(2)	(2)	(2)	Mainly from Sweden.
Copper:				
Ore and concentrate	--	1,972	--	All from Spain.
Matte and speiss including cement copper	3,604	2,488	--	Finland 2,228; Zimbabwe 259; West Germany 1.
Oxides and hydroxides	11	NA		
Sulfate	541	NA		
Metal including alloys:				
Scrap	92	526	456	Sweden 29; Finland 21.
Unwrought	2,042	2,717	--	Sweden 1,147; United Kingdom 807; Belgium-Luxembourg 336.
Semimanufactures	27,356	28,773	120	West Germany 10,618; Sweden 7,150; Belgium-Luxembourg 5,700.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	18,712	NA		
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	39,813	230,175	--	Sweden 230,125; Netherlands 50.
Metal:				
Scrap	12,887	10,831	79	United Kingdom 7,627; Denmark 1,969; Sweden 576.
Pig iron, cast iron, related materials	8,249	8,671	(2)	Canada 3,471; Sweden 2,365; United Kingdom 808.
Ferroalloys:				
Ferromanganese	(2)	(2)	--	NA.
Unspecified	r1,287	2,844	191	United Kingdom 959; Sweden 840; West Germany 556.
Steel, primary forms	144,095	142,511	69	Netherlands 89,321; West Germany 25,095; France 8,944.
Semimanufactures:				
Bars, rods, angles, shapes, sections	237,381	226,030	11	Sweden 56,050; West Germany 47,535; Belgium-Luxembourg 32,135.
Universals, plates, sheets	493,823	540,243	67	Sweden 118,265; West Germany 89,609; Belgium-Luxembourg 76,789.
Hoop and strip	30,245	36,515	4	West Germany 12,589; Sweden 7,587; Austria 3,706.
Rails and accessories	19,199	17,402	--	Sweden 14,382; West Germany 998; United Kingdom 978.
Wire	19,703	18,372	93	Belgium-Luxembourg 7,120; Sweden 5,480; France 1,909.
Tubes, pipes, fittings	203,799	192,656	1,288	West Germany 54,809; Japan 29,291; United Kingdom 27,415.
Castings and forgings, rough	2,677	3,634	33	Denmark 1,529; Sweden 855; West Germany 390.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides	533	412	3	West Germany 299; United Kingdom 82; Sweden 24.
Metal including alloys:				
Scrap	79	104	--	Sweden 31; Finland 26; Belgium-Luxembourg 25.
Unwrought	14,150	13,790	(2)	Sweden 10,985; United Kingdom 2,005; Denmark 578.
Semimanufactures	1,477	2,593	1	Belgium-Luxembourg 855; Netherlands 826; West Germany 467.
Magnesium: Metal including alloys:				
Scrap	21	22	--	Sweden 17; United Kingdom 5.
Unwrought	195	280	165	Canada 26; Switzerland 26.
Semimanufactures	32	17	1	West Germany 10; Sweden 3; Switzerland 3.
Manganese:				
Ore and concentrate, metallurgical-grade	737,061	703,794	--	Republic of South Africa 324,614; Gabon 162,777; Brazil 55,336.
Oxides	796	972	--	Netherlands 827; Belgium-Luxembourg 82; Sweden 63.
Metal including alloys, all forms	1,121	NA		
Mercury 76-pound flasks	261	377	NA	Spain 290; West Germany 58.
Molybdenum: Metal including alloys, all forms	1	1	(2)	Mainly from United Kingdom.
Nickel:				
Matte and speiss	93,459	102,449	3,094	Canada 84,787; Republic of South Africa 12,640.
Metal including alloys:				
Scrap	73	3	--	All from United Kingdom.
Unwrought	146	189	112	Canada 43; United Kingdom 15.
Semimanufactures	281	250	36	United Kingdom 106; West Germany 68.
Platinum-group metals: Metal including alloys, unwrought and partly wrought value, thousands	$6,293	$4,980	$174	West Germany $1,760; Switzerland $1,017; Sweden $879.
Silver:				
Ore and concentrate[3] do.	$6	--		
Waste and sweepings[3] do.	$1,776	$2,283	--	Sweden $1,708; Turkey $251; Finland $155.
Metal including alloys, unwrought and partly wrought do.	$9,884	$9,634	$12	West Germany $4,803; Switzerland $2,613; United Kingdom $1,411.
Tin: Metal including alloys:				
Unwrought	472	482	--	United Kingdom 284; Sweden 106; Malaysia 25.
Semimanufactures	202	153	(2)	West Germany 55; United Kingdom 45; Sweden 24.
Titanium: Oxides	452	1,334	10	West Germany 931; France 174; Belgium-Luxembourg 96.
Tungsten: Metal including alloys, all forms	3	2	(2)	West Germany 1; United Kingdom 1.
Uranium and thorium: Metal including alloys, all forms value, thousands	$9	$6	$4	Sweden $1.
Zinc:				
Ore and concentrate	115,477	104,461	--	Sweden 82,667; Canada 12,950; Ireland 4,997.
Oxides	1,777	2,296	--	East Germany 1,771; West Germany 324; Netherlands 133.
Blue powder	21	NA		
Ash and residue containing zinc	24,375	NA		
Metal including alloys:				
Scrap	5,278	5,551	--	Denmark 2,489; Sweden 1,587; Finland 1,425.
Unwrought	928	819	23	Finland 283; United Kingdom 225; Netherlands 133.
Semimanufactures	662	900	1	West Germany 252; France 246; Netherlands 212.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Other:				
Ores and concentrates	361	276	--	Sweden 188; Finland 29; Czechoslovakia 21.
Oxides and hydroxides	169	NA		
Ashes and residues	213,023	255,911	--	West Germany 211,046; Sweden 22,100; East Germany 21,708.
Base metals including alloys, all forms	178	2,289	155	Netherlands 591; United Kingdom 424; Belgium-Luxembourg 290.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	18,610	10,807	28	Iceland 10,143; West Germany 333; France 188.
Artificial:				
Corundum	914	999	(2)	West Germany 825; Austria 124; United Kingdom 26.
Silicon carbide	83	NA		
Dust and powder of precious and semi-precious stones including diamond value, thousands	$4	$7	$3	Netherlands $3.
Grinding and polishing wheels and stones	885	1,044	17	Austria 271; West Germany 266; Sweden 195.
Asbestos, crude	(2)	1	--	All from West Germany.
Barite and witherite	107,994	124,048	--	Morocco 72,759; Ireland 35,615; Belgium-Luxembourg 11,153.
Boron materials:				
Crude natural borates	4,333	16	--	Finland 11; Netherlands 5.
Oxides and acids	221	266	(2)	France 171; Sweden 29; West Germany 26.
Cement	65,928	243,326	33	Belgium-Luxembourg 113,430; West Germany 56,772; Poland 33,545.
Chalk	7,985	8,352	24	Denmark 5,065; Sweden 2,544; France 453.
Clays, crude	136,505	144,932	7,967	United Kingdom 77,017; Greece 14,907; Italy 12,798.
Cryolite and chiolite	3,665	4,002	--	Greenland 1,750; Denmark 1,452; Italy 500.
Diamond:				
Gem, not set or strung value, thousands	$2,854	$2,008	--	Japan $1,368; Switzerland $425; West Germany $86.
Industrial stones do	$4	$28	--	All from Switzerland.
Diatomite and other infusorial earth	1,640	2,177	116	Iceland 1,151; Denmark 571; Spain 156.
Feldspar, fluorspar, related materials	44,052	47,320	--	Spain 29,415; East Germany 7,211; Morocco 5,787.
Fertilizer materials:				
Crude, n.e.s	223	38	(2)	Pakistan 18; Denmark 11; Sweden 8.
Manufactured:				
Ammonia	30,191	114,816	20,517	Netherlands 50,513; U.S.S.R. 15,991.
Nitrogenous	3,979	4,126	(2)	Netherlands 2,283; West Germany 1,125; Sweden 260.
Phosphatic	4,291	2,838	(2)	Sweden 2,556; Netherlands 205; West Germany 30.
Potassic	375,652	343,693	8	West Germany 85,266; France 69,505; East Germany 63,975.
Unspecified and mixed	43,501	39,208	4	Belgium-Luxembourg 22,771; West Germany 7,047; Sweden 4,225.
Graphite, natural	573	495	3	Sweden 408; United Kingdom 80.
Gypsum and plaster	179,210	209,567	--	Spain 95,616; France 90,428; Sweden 19,290.
Kyanite and related materials	915	NA		
Lime	56,430	41,071	7	Denmark 25,257; Sweden 13,563; United Kingdom 1,059.
Magnesium compounds	88,941	7,947	1	China 2,820; Austria 1,888; North Korea 1,149.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Mica:				
Crude including splittings and waste	2,291	4,044	55	India 3,841; Austria 66; Netherlands 63.
Worked including agglomerated splittings	74	63	--	Switzerland 40; Belgium-Luxembourg 10; United Kingdom 9.
Nitrates, crude	137	83	--	All from West Germany.
Phosphates, crude	507,213	452,112	--	Sweden 164,956; Togo 87,593; U.S.S.R. 72,284.
Pigments, mineral: Iron oxides and hydroxides, processed	2,553	2,726	(2)	West Germany 2,666; Sweden 20; Netherlands 18.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$2,854	$2,870	--	Belgium-Luxembourg $1,368; United Kingdom $516; Sweden $282.
Synthetic do.	$406	$270	$9	West Germany $88; United Kingdom $36; Switzerland $19.
Salt and brine	554,410	561,314	5	Netherlands 360,413; Spain 70,690; United Kingdom 43,700.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	40,384	49,982	--	Poland 17,899; West Germany 13,518; Netherlands 10,882.
Sulfate, manufactured	9,216	NA		
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	11,099	9,726	--	Sweden 3,454; Portugal 1,850; Finland 1,431.
Worked	12,114	17,738	(2)	Poland 10,171; Sweden 3,043; Italy 1,628.
Dolomite, chiefly refractory-grade	9,531	11,342	1	United Kingdom 7,674; Sweden 3,134; West Germany 529.
Gravel and crushed rock	83,155	109,711	46	Sweden 103,226; Denmark 2,582; Italy 1,640.
Limestone other than dimension	210,200	244,954	--	United Kingdom 220,540; Denmark 20,192; Sweden 3,757.
Quartz and quartzite	674,663	655,831	1	Sweden 397,012; Spain 243,326; Greece 2,832.
Sand other than metal-bearing	224,552	242,166	5,318	Belgium-Luxembourg 151,073; Sweden 54,914; Denmark 15,974.
Sulfur:				
Elemental:				
Crude including native and by-product	5,599	4,117	--	Sweden 3,733; Denmark 209; West Germany 108.
Colloidal, precipitated, sublimed	420	61	--	West Germany 60.
Dioxide	2,099	NA		
Sulfuric acid	156	120	2	Denmark 82; Netherlands 20; West Germany 11.
Talc, steatite, soapstone, pyrophyllite	8,127	8,046	30	India 4,576; Finland 2,447; Sweden 295.
Other:				
Crude	13,385	85,086	(2)	West Germany 69,167; East Germany 8,493; Sweden 6,259.
Slag and dross, not metal-bearing	120,904	160,363	10,654	Denmark 116,950; Sweden 16,634.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	103	234	234	
Carbon black	6,039	5,532	37	Sweden 2,937; Netherlands 1,402; United Kingdom 753.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coal:				
Anthracite and bituminous	768,191	913,054	223,260	Poland 275,039; West Germany 98,254.
Briquets of anthracite and bituminous coal	3,476	730	(2)	Netherlands 223; Sweden 6.
Lignite including briquets	--	3,639	--	Australia 2,512; West Germany 1,103; Denmark 24.
Coke and semicoke	624,030	700,176	47	United Kingdom 293,597; West Germany 145,860; France 88,587.
Peat including briquets and litter	16,622	17,949	--	Sweden 14,927; West Germany 1,544; Finland 1,098.
Petroleum:				
Crude thousand 42-gallon barrels	14,787	11,000	--	United Kingdom 6,392; U.S.S.R. 3,036; Saudi Arabia 1,233.
Refinery products:				
Liquefied petroleum gas value, thousands	$177,264	$151,918	$2	United Kingdom $170; West Germany $114; unspecified $151,594.
Gasoline thousand 42-gallon barrels	3,855	4,820	103	Sweden 2,605; United Kingdom 938; West Germany 253.
Mineral jelly and wax do	80	77	(2)	West Germany 54; United Kingdom 10; Hungary 6.
Kerosene and jet fuel do	930	1,031	(2)	Sweden 522; United Kingdom 325; Netherlands 127.
Distillate fuel oil do	6,604	6,036	137	East Germany 1,819; Sweden 1,148; United Kingdom 646.
Lubricants do	641	746	21	United Kingdom 206; Sweden 199; Denmark 100.
Residual fuel oil do	6,048	4,816	(2)	East Germany 1,566; U.S.S.R. 1,044; Sweden 581.
Bitumen and other residues do	976	1,197	65	Sweden 763; Netherlands 220; Finland 132.
Bituminous mixtures do	161	111	1	Sweden 102; Netherlands 4; United Kingdom 2.
Petroleum coke do	2,099	2,100	1,465	United Kingdom 326; Argentina 119.

[r]Revised. NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.
[3]May include other precious metals.

COMMODITY REVIEW

METALS

Aluminum.—Årdal og Sunndal Verk A/S, the largest producer of primary aluminum in Norway, was merged with the aluminum division of Norsk Hydro effective September 1, 1986. The new company, Hydro Aluminium, headquartered in Oslo, was owned 70% by Norsk Hydro and 30% by the Government. Norsk Hydro had an option to purchase another 20.1% over a 5-year period beginning January 1, 1988. Hydro Aluminium was the largest producer of primary aluminum in Western Europe with an annual capacity at yearend of 615,000 tons. Production was 521,000 tons in 1986. Annual capacities of the new company's four primary aluminum plants were Karmöy Fabrikker, 220,000 tons; Årdal Verk, 185,000 tons; Sunndal Verk, 140,000 tons; and Hoyanger Verk, 70,000 tons. The company was divided into three major sections, the Metal Group, which produced primary aluminum, the Extrusion Group, and the Fabrication Group. The Extrusion Group was headquartered in Lausanne, Switzerland. Total operating revenue during 1986 was $1.2 billion.

Expansion of the Karmöy aluminum smelter, Karmöy Farbrikker, was essentially completed by yearend. The new rated capacity was 220,000 tons per year. Two old

potlines, representing about 50% of capacity, were of the Soderberg design; the remaining cells, totally enclosed to prevent excessive fume emission, used prebaked anodes in accordance with a modified Pechiney design.

The Extrusion Group of Hydro Aluminium owned 18 extrusion plants at yearend, 3 in Norway, 1 in Rockledge, Florida, and the remainder in Western Europe. Five of these plants, purchased in late 1986 from Aluminum Co. of Canada Ltd., included two in France and one each in Belgium, the Federal Republic of Germany, and Italy. The company thus became Western Europe's leading aluminum extruder with an annual capacity of about 200,000 tons. Hydro Aluminium's aluminum sheet-rolling facilities consisted of the newly enlarged hot mill at Holmestrand, 90,000 tons per year; and cold mills at Holmestrand and Karmöy, 55,000 and 30,000 tons per year, respectively.

Three other aluminum smelters, in addition to Hydro Aluminium's four units, continued operating in Norway. These were the two plants at Mosjoen and Lista, each owned by Elkem, 55%, and the Aluminum Co. of America, 45%, and the 66,000-ton-per-year plant at Husnes owned by Sör-Norge Aluminium A/S. During 1986, Hydro Aluminium increased its share in the latter company from 25.1% to 49.8% by purchasing shares from the other owner, Swiss Aluminium Ltd. Norway's total primary aluminum production capacity was approximately 850,000 tons per year at yearend; of this, about 15% was converted into aluminum products in Norway and 85% was exported, primarily to Western Europe.

Ferroalloys.—A restructuring and consolidation occurred among the Norwegian ferrosilicon producers as a result of continuing price reductions in the world market caused by overcapacity and reduced demand coupled with high taxes on electrical power in Norway. Elkem acquired Orkla Metal A/S in January, including its sole 60,000-ton-per-year Thamshavn ferrosilicon plant at Orkanger as well as its controlling 52% interest in the 60,000-ton-per-year Bjolvefossen plant at Alvik. These acquisitions brought Elkem's total annual ferrosilicon production capacity in Norway to approximately 200,000 tons, or about 50% of the country's capacity. Fesil A/S, the so-called Fesil Group, acquired, in November, control of Finnfjord Smelteverk A/S including its sole ferrosilicon smelter. This brought Fesil's total annual ferrosilicon capacity to approximately 200,000 tons. Tinfos Jernverk A/S closed its sole 75,000-ton-per-year ferrosilicon plant at Notodden in November. Consequently, only two ferrosilicon producers remained, Elkem and Fesil, each with an approximately equal share of Norway's production capacity.

Total ferrosilicon production decreased by about 11% compared with that of 1985. Production of ferromanganese, including ferrosilicomanganese, by the two producers, Elkem and Tinfos, decreased by about 14%. Elkem owned most of this production capacity.

Gallium.—Elkem began construction of a 5-ton-per-year crude 99.95% gallium metal plant on its Bremenger ferrosilicon smelter site in Norway at a projected cost of $2.3 million. The plant was expected to supply material to Western European and Japanese gallium refineries beginning in 1987. The company was developing its own patented gallium refining process at its newly acquired plant, Crystalox Ltd., of the United Kingdom, which specializes in advanced refining equipment and crystal growth technology. The refined material is used to manufacture gallium arsenide for use in semiconductors.

Iron Ore.—A/S Sydvaranger closed one of its two pellet plants in the far north Sor-Varanger area in July and was converting it to metallurgical coke production. Savings were to be attained by using byproduct gases from the coke operation to fuel the one remaining pelletizer, which was being upgraded. Although company production decreased somewhat to about 1.7 million tons of good-quality iron ore concentrate in pellet form, Sydvaranger remained the largest producer. Mining ceased in the nearby Bjornfjell and Fisketind deposits because of ore depletion. The Tverrdalen deposit remained the most productive with nearly one-half of the company's output. Most of the remainder of Sydvaranger's 1986 iron ore production came from the Bjornevatn North deposit.

The iron ore operations of A/S Norsk Jernverk (NJ) in the Mo i Rana area on the northwest coast showed an approximate 10% increase in production to about 1.4 million tons of concentrate. The yearend closure of NJ's two largest electric iron smelting furnaces at the Mo i Rana steel works, together with the ore pelletizing plant, caused the company to increase its overseas iron ore market, mostly to West-

ern Europe. A new $7 million shipping terminal was constructed on the Ranen Fjord capable of handling vessels up to 80,000 tons. The first ship was loaded with iron concentrate in August. Annual exports of up to 1 million tons were anticipated.

The other remaining Norwegian iron ore producer, a private firm, was the smaller Fosdalens Bergverks A/S.

Magnesium.—Norsk Hydro decided in the fall to construct a 60,000-ton-per-year primary magnesium plant at an estimated cost of $400 million at Becancour on the St. Lawrence River in the Canadian Province of Quebec. The electrolytic cell design was to conform with the large proprietary enclosed units developed by the company at its plant at Porsgrunn. Magnesium chloride cell feed material was to be made from dolomite, seawater, and chlorine, initially using dolomite from Norway and eventually using dolomite from Quebec. Site selection was based on the availability of low-cost electrical power, good port and transportation facilities, and geographic location with respect to the North American markets. The plant was projected to be on-stream by the spring of 1989 and at full capacity by 1991.

Steel.—NJ, Norway's major steel producer, closed its two largest electric iron smelting furnaces at Mo i Rana at yearend because of low prices for its semifinished products. Crude steel production by NJ decreased about 10% to 662,000 tons, mostly by reduction of that portion (23%) that was produced in electric arc furnaces that were being modernized. The balance of this crude steel was oxygen-produced metal.

Zinc.—Sydvaranger's 75-year-old Killingdal Mine closed permanently during the first quarter of 1986 for economic reasons. Sydvaranger's other two zinc mines continued operating, but the company planned to permanently close its Bergverkselskapet Mine by mid-1987 because of ore depletion. The company's total production of concentrate during 1986 decreased by 11% to approximately 21,000 tons containing about 11,000 tons of zinc. The remainder of Norway's concentrate, about 60% of output, was produced by Orkla-Borregard A/S at its three minesites. One of these, the Lokken Gruber Mine, was scheduled to close by mid-1987 because it was unprofitable. The five zinc mines operating in Norway at yearend were of approximately equal size.

Norzink A/S completed the initial expansion of its Eitrheim smelter at Odda in October, including the cell house and the foundry, at a total cost during 1986 of $52 million. Annual capacity was increased by 20% to 110,000 tons of zinc metal, and both productivity and environmental control were improved significantly. The company operated at a loss during 1986 because of low zinc prices and a work force lockout in April caused by an industrial dispute. Total metal production decreased slightly.

INDUSTRIAL MINERALS

Cement.—A/S Norcem, Norway's only cement producer, merged with Aker Med Versted A/S to form A/S Aker-Norcem, Norway's largest privately owned industrial group and its largest offshore petroleum construction and contracting company. Cement production and imports each increased significantly.

Feldspar and Nepheline Syenite.—Norfloat A/S was one of Western Europe's major suppliers of feldspar and continued to account for at least 80% of Norway's production. Its pegmatite quarries and beneficiation plant were near Lillesand about 20 miles east of Kristiansand in southern Norway. Mined and comminuted raw material is processed into its mineral components, sodium feldspar, potassium feldspar, quartz, and byproduct mica, by flotation and magnetic separation. Reserves are large. Production, mostly for export to Western Europe's glass and ceramic industries, was 35,000 tons of sodium feldspar and 28,000 tons of potash feldspar.

Norsk Nefelin, a mining entity owned by Elkem, completed its first quarter century of operation at its efficient underground mine on the island of Stjernoy in the Alta Fjord in the Norwegian Arctic. The comminuted and screened ore was purified by magnetic separation. As Western Europe's only producer of nepheline syenite, the company was the major supplier of the product to the glass and ceramics industries of Western Europe, especially in the Federal Republic of Germany, the United Kingdom, France, and Benelux, in order of volume. The glass industry was the major user. Reserves were major. The operation remained profitable. A new product, micronized nepheline syenite, received a positive response in the paint filler market.

Fertilizer Materials.—In February, Norsk Hydro acquired an 80% interest in Compagnie Française de l'Azote et Produits Chimiques S.A., France's largest fertilizer producer, which included about 90% of

Nederlandse Stickstoff Maatschappij BV with large fertilizer production facilities in Rotterdam, the Netherlands. Significant financial losses were incurred in the Fertilizers Div. during the second half of 1986, brought about by product prices falling more rapidly than costs. Norsk Hydro stated in its 1986 annual report that the falling prices were exacerbated by the falling dollar, by a worldwide capacity surplus, with dumping by Eastern European countries and Canadian firms into Western European markets, and by the late spring in Europe. Prices of the three elemental fertilizer components, nitrogen, phosphate, and potassium, all fell.

Construction of the Porsgrunn fertilizer complex in Norway continued on schedule. Accidents and operational problems occurred in the ammonia plants at Porsgrunn and Brunsbuttel, and ammonia production in Norway decreased significantly for the second successive year. Closure of obsolete and unprofitable overseas plants continued. The urea plant in Porsgrunn was scheduled for closure in 1987.

Titania.—The new $170 million TiO_2-slag plant at Tyssedal tapped the first product from its electric smelting furnace in October. Full operation was expected during early 1987. The newly formed company, K/S Ilmenittsmelteverket A/S (KSI), was both owner and operator of the plant. The plant had been designed by Elkem to produce 108,000 tons per year of high-purity pig iron in addition to 200,000 tons per year of 75% TiO_2 slag. Feed material was to be a 44% TiO_2 ilmenite concentrate mined and beneficiated by U.S.-owned Titania A/S in southern Norway. The slag produced from this concentrate can be converted to TiO_2 pigment only by the sulfate process and is not suitable for conversion by the more environmentally acceptable chloride process. KSI and Titania, a minority owner of KSI, sponsored research at the University of Trondheim to overcome this problem associated with Titania's ore.

MINERAL FUELS

Production of crude oil from the North Sea continued to rise significantly, having increased by 73% since 1981, and this trend was expected to continue until about the mid-1990's. After peaking in 1984, sales of natural gas decreased for the second consecutive year, primarily because of injection of large quantities of gas into the Ekofisk Oilfield in an attempt to decrease sea floor subsidence. Government income from petroleum industry taxes and levies decreased 65% in 1986 to $2.4 billion because of lower crude prices. The Government revised its tax scheme, the first such modification since 1980, in an attempt to promote private industry interest in field development, particularly in the face of lower prices. Nevertheless, the tax on petroleum industry profits remained the highest among the European oil-producing countries. Private companies indicated that more easing of the tax burden was necessary to encourage development of the Haltenbanken area of the Norwegian Sea as well as certain marginal fields in the North Sea and to realize a profit in the large long-term contract for sales to Western Europe of gas from the Troll and Sleipner Fields. Another factor limiting offshore petroleum field development was the need to establish a larger market for natural gas. Flaring was not permitted by the Government. Capital expenditures by petroleum producers decreased 30% to 50% in 1986. Government-owned Det Norske Stats Oljeselskap A/S (Statoil) continued to increase its share of Norway's petroleum-producing industry. Statoil had been granted ownership of nearly one-half of Norway's petroleum industry by yearend.

The Government decreased exports of crude oil by 10% during November and December in support of efforts toward higher and more stable world prices. Nevertheless, total 1986 exports increased by 13% to 267 million barrels. The unsold oil was refined by Statoil, and the products were stored in the Government's permanent emergency reserve, which was nearly filled thereby.

Proven North Sea crude oil reserve estimates were increased by 9% to 10.0 billion barrels including natural gas liquids (NGL), and reserve estimates of North Sea natural gas were increased slightly to 81 trillion cubic feet. About 60% of the North Sea oil reserves were in the Statfjord, Gullfaks, Oseberg, Snorre, and Ekofisk Fields, in order of volume. Discovered resources in the Haltenbanken area of the Norwegian Sea northwest of Trondheim were estimated to be 2.3 billion barrels of oil and NGL and 10.9 trillion cubic feet of gas. Resources in the Tromsoflaket area of the far northern Arctic coast were estimated to be 8.2 trillion cubic feet. Total Norwegian gas resources appeared sufficient to last at least to the middle of the 21st century. The Norwegian Government reported that oil reserves were

limited such that a decline in production was forecast by the late 1990's unless significant new reserves were discovered.

Statfjord, the largest producing oilfield in Europe, accounted for 69% of Norway's crude output in 1986 as its production increased by 17%. The Government designated Statoil the field operator effective January 1, 1987, thereby replacing Mobil Exploration Norway Inc. Primary interests in the 84% of the field held by Norway were Statoil, 42.0%; Mobil, 12.6%; Norske Conoco A/S, 8.4%; Esso Norge A/S, 8.4%; and A/S Norske Shell, 8.4%.

Production from Ekofisk, Norway's second largest producing oilfield, continued to decline and accounted for 23% of total crude production. Field subsidence continued, and no significant decrease in the rate of subsidence was achieved despite the injection of a total of 108 billion cubic feet of natural gas into the field during 1985 and 1986. The injection project was terminated in October as total subsidence reached 12.5 feet. Production continued, and a decision was made by the operator, Phillips Petroleum Co. Norway A/S, to mechanically raise the platform during the summer of 1987. Primary interests in the field were held by Phillips, 37%; Norsk Fina A/S, 30%; Norsk Agip A/S, 13%; Elf Aquitaine Norge A/S, 8.1%; and Norsk Hydro Produksjon A/S, 6.7%.

The Ula Field began oil production ahead of schedule in October and produced an average of about 15,000 barrels per day during the remainder of the year. The operator, BP Petroleum Development of Norway A/S, expected production to peak in 1987 at 74,000 barrels per day. The oil was transported via Ekofisk center to Teeside, the United Kingdom. The gas byproduct was transported to Emden, the Federal Republic of Germany, via the Cod Field, the Ekofisk center, and the Statpipe-Norpipe system. Estimated reserves were 210 million barrels of oil, 50 billion cubic feet of gas, and 16 million barrels of natural gas liquids. Interest in Ula was held by BP, 57.5%; Svenska Petroleum Exploration A/S, 15.0%; Statoil, 12.5%; Conoco, 10.0%; and A/S Pelican K/S, 5.0%.

Reduced crude prices slowed oilfield development and, uncharacteristically, no new developments were begun. Construction of the drilling platform and the production platform for development of the Oseberg Field continued on schedule. Estimated reserves were 1.3 billion barrels of oil and 2.5 trillion cubic feet of gas. Government permission was granted to the field operator, Norsk Hydro, to enhance oil production by injection of natural gas from five gas wells especially drilled by Norsk Hydro in the Troll Field for transport to Oseberg through a 30-mile pipeline to be especially built by Norsk Hydro. The wells and the pipeline were projected for completion by 1991 at a total cost of $500 million. The first long-term production trial began on a small scale in September using an especially constructed production ship, *Petrojarl I*, which had a production capacity of 30,000 barrels per day and a storage capacity of 190,000 barrels. Shuttle tankers moved the crude to the Norwegian mainland. Major interests in the field were held by Statoil, 50%; Elf Aquitaine, 13.3%; Norsk Hydro, 12.5%; and Mobil, 10.0%.

Statoil's development of the Gullfaks Field proceeded on schedule. Platform A, an integrated drilling and producing unit with a daily capacity of 250,000 barrels of oil, was towed to the site and placed in 450 feet of water in May. It was expected to be on-stream by mid-1987. Platform B, a drilling and water injection unit, was to be installed in 450 feet of water in 1988 and was scheduled to go on-stream by yearend 1988. Platform C, the second production unit, was to be placed in 700 feet of water in 1989. Total field production capacity, 485,000 barrels per day, was expected to be in place by the early 1990's. Oil was to be loaded into tankers, and the gas was to be sent through the Statpipe system via the Statfjord C platform. Interests in the development were held by Statoil, 85%; Norsk Hydro, 9%; and Saga Petroleum A/S, 6%. Conoco was being retained as technical assistant during the development phase.

Three offshore petroleum fields were declared commercial during the year by their operators. Development proposals were expected to be submitted to the Government during 1987. The Gyda Field, 16 miles south of the Ula Field and north of Ekofisk center in the North Sea, was declared commercial in October by its operator, BP. It contained reserves of 190 million barrels of oil and 210 billion cubic feet of gas. Startup was planned for 1991, and daily output was expected to subsequently peak at 60,000 barrels of oil and 38 million cubic feet of gas. The Heidrun Field, largest in the Haltenbanken area of the Norwegian Sea, with reserves of 800 million barrels of oil and 1,400 billion cubic feet of gas, was

declared commercial at yearend by its operator, Conoco. It would be the first field in the Norwegian Sea to be developed. A novel platform design was required to accommodate the great water depth, 1,150 feet, and the rocky and rugged sea floor. The estimated startup date was August 1993 with a peak daily production of 200,000 barrels of oil, which would be loaded into tankers. Alternate plans for disposition of the gas included reinjection or transportation to the Norwegian mainland via a planned pipeline, and then possibly to a gas-fired electrical power station. Statoil declared its Veslefrick Field, 90 miles west of Bergen in the North Sea, commercial near yearend. Reserves were 230 million barrels of oil and 150 billion cubic feet of gas. Startup was scheduled for September 1989 after a total estimated development cost of $750 million. Peak oil production was expected to be 65,000 barrels per day, and the product was to be delivered to the Oseberg platform. The gas was expected to be either injected into the Oseberg Field or transported into the Statpipe system.

Sales of North Sea natural gas, 85% of which was from the Frigg and Ekofisk Fields, decreased primarily because of a one-third decrease in sales from Ekofisk. Most of the lost Ekofisk output was offset by significantly increased production from the Statfjord Field, which accounted for 13% of total sales during 1986 compared with 2% in 1985. Nearly all of the gas was delivered by pipeline to the following Western European countries: the United Kingdom, 50%; the Republic of Germany, 23%; France, 13%; the Netherlands, 7%; and Belgium, 7%. Reserves in Norway's 61% share of the producing Frigg area, about 1,700 billion cubic feet, were sufficient for only 3 or 4 years of full production. In response to this, production from the Frigg Field was reduced, effective October 1, and development of the much smaller East Frigg Field, with estimated reserves of 460 billion cubic feet, was begun with initial production scheduled for late 1988. Elf Aquitaine was the operator of the Norwegian portion of the Frigg Field, which accounted for 54% of Norway's total sales. Natural gas deliveries from the Ekofisk Field were increased on October 1 by 200 million cubic feet per day, or by about 30%, because injection of natural gas into the field as a means of preventing subsidence was abandoned.

Wet natural gas from the Statfjord Field was transported through the new Statpipe system to the Norwegian terminal at Karsto where it was dried; the gas was then sent to the Ekofisk center via another Statpipe leg, where it was joined by gas from the Ekofisk Field and the Murchison Field, and was then transported to Emden, the Federal Republic of Germany, via the Norpipe system. About one-half of this gas was subsequently transported, in order of volume, to France, the Netherlands, and Belgium. The remainder of Norway's production, nearly all from the Frigg Field, was pipelined to St. Fergus, Scotland.

The Norwegian Parliament approved at yearend a long-term contract for delivery of North Sea natural gas to continental Western Europe from the huge undeveloped Troll Field and the large undeveloped Sleipner Field. In addition to field development, including well drilling and construction of platforms and associated infrastructure, a major pipeline (Zeepipe) was required to transport the gas from the fields to a terminal at Zeebrugge, Belgium. Total estimated development costs were $8 billion. Initial deliveries of nearly 400 million cubic feet of gas per day were contracted to begin in 1993 after initial development of Sleipner, which had estimated reserves of 6,300 billion cubic feet. Deliveries from the much larger, 29,000-billion-cubic-foot, Troll Field were contracted to begin in 1996, with total deliveries from both fields reaching 1,940 million cubic feet per day by the year 2002. Deliveries were to be maintained at this level until 2020 and were estimated to account for about 25% of the Western European supply. Gas prices for the contract were not revealed, but it was known that they would fluctuate with the price of crude oil and other factors. Recipients were to be Gaz de France, with 30% of total deliveries; a Federal Republic of Germany consortium headed by Ruhrgas AG; Nederlandse Gasunie NV of the Netherlands; and Distrigaz S.A. of Belgium. Portions of the pipeline were likely to be delayed or canceled because of expected excess capacity in the Statpipe and Norpipe systems and in the Gasunie North Sea pipeline network. The latter was expected to be increasingly underutilized because of depletion of reserves of Netherlands' North Sea natural gas. A final Government decision on the timing of the pipeline construction was delayed until 1990.

The $3.7 billion development of the Troll Field required a novel platform design, probably using reinforced concrete instead

of steel, because of the great water depth (approximately 1,000 feet) and the soft sea bottom. The Government decided near year-end that Shell, Statoil, and Norsk Hydro would share responsibility for operation of the Troll and Sleipner Fields during their development. Interests in the Troll Field development were Statoil, 50%; Shell, 35%; Conoco, 5%; Mobil, 5%; and Norsk Hydro, 5%. Estimated cost of the Sleipner development project was $1.9 billion. Sleipner East, which contained about 25% of the total Sleipner reserves, was to be developed first. Much of the gas in other parts of the field contained carbon dioxide. Interests in this development were Statoil, 50%; Esso, 40%; and Norsk Hydro, 10%.

A 27-year contract to deliver 35 billion cubic feet of natural gas per year to Austria beginning in 1993 was signed in November.

Statoil signed a 25-year contract in October to deliver 35 billion cubic feet of natural gas per year to a gas-fired 700-megawatt power station to be built by Statkraft, the Norwegian state power generation firm, near the Statpipe gas terminal at Karsto. Station startup, scheduled for 1991, would increase Norway's electric generating capacity by about 5%. This was to be Norway's first gas-fired power station. The need for more such plants to supplement hydropower development was recognized; the extent of development was partly contingent upon how much gas would be discovered in the Haltenbanken area of the Norwegian Sea.

The Heimdal Gasfield began production early in the year with Elf Aquitaine as the operator. Eleven wells were producing at yearend after a total investment of about $1.25 billion. Estimated reserves were 1,200 billion cubic feet. The gas was being transported to Emden via Statpipe and Norpipe. Condensate was being piped to Cruden Bay, Scotland. The major production licensees were Statoil, 40%; Marathon Petroleum Norge A/S, 24%; and Elf Aquitaine, 10%.

Government approval was given in the spring to develop the Tommelitin Field in the Ekofisk area. The operator, Statoil, had declared it to be commercial in December 1985. Estimated reserves were 800 billion cubic feet of gas and 40 million barrels of oil. The field had been allocated for development in 1976 with Statoil as operator, but other partners had been reluctant to participate because of its marginal economic viability. Phillips withdrew from the operation in 1986. Interests in the field were then held by Statoil, 71%; Fina, 20%; and Agip, 9%. Start of production was scheduled for 1990.

A total of 36 exploratory wells were drilled in offshore Norway compared with 50 in 1985. Only 12 of these were spudded during the second half of 1986. About one-half were drilled in the North Sea, and most of the rest were in the Haltenbanken area of the Norwegian Sea; only a very few were in the far north Tromsoflaket area. Ten of the thirty-six wells were drilled for appraisal purposes. The most promising area was Haltenbanken, where significant discoveries were made in Block 6406/3 by Statoil, and Block 6407/7 by Norsk Hydro. A total of six fields with significant petroleum resources had been discovered in Haltenbanken. These were the Heidrun Field with large oil and gas reserves, the Draugen Oilfield, and four gas-condensate fields, Midgard, Smorbukk, Block 65012/12 Beta, and Tyrihans, in order of size. No infrastructure had been built in Haltenbanken. A number of smaller oil and gas finds, some near established fields, were made in the North Sea. A significant gas discovery was made by Saga Petroleum in Block 25/6 near the Heimdal Field. The minimal drilling in the Tromsoflaket area gave mostly negative results. Esso determined a well in Block 7121/1 to be dry after an expenditure of $40 million.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values were converted from Norwegian kroner (NKr) to U.S. dollars at the rate of NKr7.40 = U.S. $1.00, the average for 1986.

The Mineral Industry of Pakistan

By Charles L. Kimbell[1]

The year 1986 was one of growth for most major components of Pakistan's modest mineral industry. A one-fifth increase in crude oil production, this following a near doubling of output between 1984 and 1985, coupled with a 7% growth in natural gas production, a nearly 5% increase in coal output, and significantly higher hydroelectric power generation, reflected continued commitment to a policy of maximizing energy material self-sufficiency. Other keystones of the country's mineral industry—the relatively new integrated steel plant, fertilizer and cement plants, and salt producers—all registered performance increases over the levels of 1985, and expansion of facilities was an evident pattern.

The Geological Survey of Pakistan (GSP) reportedly was placing increased emphasis on economic evaluation of deposits of metallic minerals and coal. Almost 18,000 square kilometers were mapped using photo interpretation methods, and 18 projects, mainly evaluations of lead and zinc, gold, silver, tin, tungsten, and other base metals, were being evaluated by 27 geologists and geochemists. The GSP planned to add 55 additional professionals in these disciplines in 1987.

PRODUCTION

There was a general upturn in the levels of production of most commodities; not only did Pakistan's steel, cement, fertilizer, salt, and mineral fuel producers register substantial gains in output, but so too did mining operations for a number of lesser commodities, including barite, celestite, chromite, feldspar, fluorspar, and kaolin. Only in the production of crude construction materials (sand and gravel, and stone) was there evidence of significant production cutbacks. Although mineral commodity imports remained a significant component of overall total commodity imports, the additions to production of cement, fertilizer, fuels, and steel clearly contributed to the effort to minimize imports, and increased output of a number of other items provided a potential at least for expanding exports.

Table 1.—Pakistan: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum: Bauxite, gross weight	4,187	3,161	2,720	1,759	2,500
Antimony ore:					
Gross weight	--	--	6	24	--
Sb content[e]	--	--	1	4	--
Chromium:					
Chromite, gross weight	3,425	5,959	2,997	5,188	11,000
Cr content[e]	1,071	1,966	989	r1,712	3,600

See footnotes at end of table.

Table 1.—Pakistan: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS —Continued					
Iron and steel:					
Pig iron thousand tons	430	472	566	[2]803	890
Steel, crude do	350	550	610	700	800
Lead, refined, secondary[e]	1,000	1,000	1,000	1,000	1,000
Manganese ore:					
Gross weight	--	--	8	135	60
Mn content[e]	--	--	2	[r]41	20
INDUSTRIAL MINERALS					
Abrasives, natural: Emery	429	1,689	1,393	4,630	5,700
Barite	22,196	26,018	27,230	29,932	45,000
Cement, hydraulic thousand tons	3,698	4,938	4,697	4,798	[2]5,219
Chalk	1,796	2,217	1,360	2,082	2,000
Clays:					
Bentonite	1,426	667	1,740	1,611	1,900
Fire clay	67,095	87,740	79,528	68,537	80,000
Fuller's earth	13,794	21,136	19,139	10,647	9,900
Kaolin (china clay)	44,849	12,834	11,711	6,644	29,000
Other	149,000	87,000	130,000	285,000	440,000
Feldspar	[r]7,713	5,280	5,468	5,633	12,600
Fluorspar	814	336	2,724	3,175	6,400
Gypsum, crude	331,000	318,000	375,000	409,000	410,000
Magnesite, crude	1,158	1,998	4,153	2,113	3,600
Nitrogen: N content of ammonia	936,700	1,098,400	1,127,700	1,106,800	[2]1,154,400
Phosphate rock	--	--	--	--	50,000
Pigments, mineral, natural: Ocher	411	1,077	1,046	553	650
Salt:					
Rock thousand tons	539	571	598	583	570
Marine do	223	[e]189	[e]180	269	[2]346
Total do	762	760	778	852	916
Sand and gravel:					
Gravel	223,000	234,000	74,000	16,000	--
Sand:					
Bajri and common	449,916	[e]131,000	294,397	352,496	130,000
Glass	111,000	90,000	100,000	202,000	110,000
Sodium compounds, n.e.s.:					
Caustic soda	42,456	40,096	38,238	44,030	[2]42,853
Soda ash, manufactured	[r]99,103	102,000	[e]121,000	118,087	[2]30,894
Stone:					
Aragonite and marble	108,000	116,000	80,000	62,000	160,000
Dolomite	[r]94,634	92,874	121,750	121,578	130,000
Limestone thousand tons	[r]3,434	4,194	5,184	6,685	6,700
Other (reported as "ordinary stone") do	3,833	[e]385	525	366	680
Strontium minerals: Celestite	465	135	564	718	1,100
Sulfur:					
Native	768	628	926	877	900
Byproduct, all sources[e]	19,000	25,700	26,000	26,000	36,000
Total	19,768	26,328	26,926	26,877	36,900
Talc and related materials: Soapstone	20,565	15,956	15,568	20,183	21,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, all grades thousand tons	1,735	1,859	2,134	2,199	2,300
Coke[e] do	358	345	533	[2]556	635
Gas, natural:					
Gross production million cubic feet	345,023	343,504	352,933	366,282	392,000
Marketed production (sales) do	308,198	328,000	331,108	350,000	375,000
Natural gas liquids[e] thousand 42-gallon barrels	40	45	45	55	60
Petroleum:					
Crude do	4,217	4,954	6,534	12,522	15,130
Refinery products:[3]					
Gasoline do	3,320	4,608	5,205	5,814	5,900
Jet fuel do	4,041	3,748	3,796	[e]6,200	7,300
Kerosene do	1,959	2,076	2,228		
Distillate fuel oil do	9,573	10,010	10,001	11,854	12,800
Residual fuel oil do	11,117	9,718	10,219	11,295	11,300
Lubricants do	1,640	1,660	1,641	[e]1,800	1,900
Other do	2,067	1,883	1,526	[e]1,700	1,800
Total do	33,717	33,703	34,616	[e]38,663	41,000

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

[1]Table includes data available through June 18, 1987.

[2]Reported figure.

[3]Refinery fuel and losses apparently are distributed among listed products.

TRADE

In 1985, the most recent year for which comprehensive trade data are available, Pakistan recorded a net foreign trade deficit of $3,152 million,[2] $129 million less than its 1984 total deficit of $3,281 million (a figure substantially revised upward from that reported in the previous edition of this chapter). Corresponding figures for mineral commodities only were $1,788 million in 1985 and $1,895 million in 1984, for a reduction of $107 million. Although the reduction in the net outflow of funds resulting from the overall trade imbalance was quite modest, and much less than anticipated for crude oil imports, it is significant nevertheless that changes in trade levels in mineral commodities were equivalent to a very large part of the reduction in the overall imbalance.

Among the mineral commodities, those having the greatest impact were manufactured fertilizer, where the value of imports was reduced by $17.5 million between 1984 and 1985, and where the value of exports was increased by $39.9 million at the same time, for a $57.4 million overall reduction in the net trade deficit. A similar $35.7 million reduction was noted for energy materials; in this case as well as in the instance of the fertilizer materials, exports were increased and imports decreased.

The following tabulation summarizes the value of mineral commodity trade for 1984 and 1985, and provides data on the value of total commodity trade for comparison in million U.S. dollars:

	1984	1985
Mineral commodities:		
Exports	r$119.0	$160.6
Reexports	2.2	.3
Total	r121.2	160.9
Imports	r2,016.3	1,948.4
All commodities:		
Exports	2,556.2	2,707.6
Reexports	35.8	31.1
Total	2,592.0	2,738.7
Imports	r5,873.1	5,890.4

rRevised.

Mineral fuel imports, chiefly those of crude oil and its products, but also including some coal, remained the dominant single component of total 1985 Pakistani commodity imports, representing nearly 74% of mineral commodity imports and over 24% of total commodity imports; corresponding figures for 1984 were 72% and 25% (the latter figure revised). Thus, although there was a reduction of $21.4 million in the value of mineral fuel imports between 1984 and 1985, this reduction, far less than that anticipated, was not as great as the declines in total commodity imports and in total mineral commodity imports, with the result that the mineral fuels commodities' share of the total advanced.

The gains made in manufactured fertilizer exports between 1984 and 1985 were eroded in 1986 according to Pakistani authorities, who indicated that rising internal demand in 1986 consumed much of the material that had been an exportable surplus in 1985.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Scrap	103	61	--	Japan 59.
Unwrought	--	2	--	All to Japan.
Semimanufactures	44	--		
Chromium: Ore and concentrate	19,104	10,264	--	Bulgaria 5,060; Netherlands 2,704; China 2,500.
Copper:				
Ore and concentrate	32	--		
Metal including alloys:				
Scrap	(2)	8,607	--	Belgium-Luxembourg 3,225; United Arab Emirates 3,141; Japan 1,839.
Semimanufactures	75	46	--	All to China.
Iron and steel: Metal:				
Scrap	(3)	1,718	--	Japan 1,481.
Pig iron, cast iron, related materials	255,137	144,170	--	China 57,574; Republic of Korea 31,500; Bangladesh 30,166.
Ferroalloys	131	--		
Steel, primary forms	1,320	--		
Semimanufactures	4,586	2,598	--	Sri Lanka 2,253.
Lead: Oxides	2	--		
Nickel: Metal including alloys, scrap	622	106	--	All to Japan.
Silver: Ore and concentrate value, thousands	$1,141	--		
Tin: Metal including alloys, scrap	35	--		
Tungsten: Metal including alloys, all forms value, thousands	$4	--		
Zinc: Metal including alloys, scrap	10	41	--	All to China.
Other:				
Ores and concentrates	241	5,785	--	Do.
Ores and hydroxides	22	13	--	All to Saudi Arabia.
Ashes and residues	78	250	--	All to United Arab Emirates.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc value, thousands	$6	--		
Grinding and polishing wheels and stones	1	1	--	Mainly to Bangladesh.
Barite and witherite	34	50	--	All to India.
Clays, crude	12	131	--	Bangladesh 120.
Fertilizer materials: Manufactured, nitrogenous	237,213	507,203	--	China 248,290; Bangladesh 133,010; Sri Lanka 43,392.
Gypsum and plaster	--	1,500	--	All to Saudi Arabia.
Mica:				
Crude including splittings and waste	10	--		
Worked including agglomerated splittings	5	--		
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$1,510	$1,105	$140	Hong Kong $590; Thailand $93.
Synthetic do	--	$20	--	All to Saudi Arabia.
Salt and brine	(4)	9,417	--	India 6,637; Afghanistan 770.
Sodium compounds, n.e.s.: Carbonate, manufactured	1	--		
Stone, sand and gravel:				
Dimension stone: Crude and partly worked	8,823	7,106	139	Japan 1,199; Italy 1,163; Singapore 908.
Dolomite, chiefly refractory-grade	50,000	--		
Gravel and crushed rock	95	313	--	Bangladesh 258.
Sulfur: Sulfuric acid	99	83	--	All to Afghanistan.
Other: Crude	--	1,087	--	Bulgaria 1,050.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	275	1,204	--	Sri Lanka 1,192.
Coke and semicoke	410	--		
Petroleum:				
Crude 42-gallon barrels	365	--		
Refinery products:				
Liquefied petroleum gas do	12	--		
Lubricants do	7	--		
Residual fuel oil thousand 42-gallon barrels	714	1,090	--	Yemen (Aden) 477; United Arab Emirates 240; Sri Lanka 100.

[1]Table prepared by Audrey D. Wilkes.
[2]Unreported quantity valued at $2,017,000.
[3]Unreported quantity valued at $946,000.
[4]Unreported quantity valued at $839,000.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	5	1	1	
Aluminum:				
Oxides and hydroxides	2,041	1,815	57	China 712; Japan 626; West Germany 267.
Metal including alloys:				
Scrap	14,694	13,560	37	United Arab Emirates 2,653; West Germany 2,210; Kuwait 2,209.
Unwrought	1,756	7,359	28	Switzerland 4,201; Bahrain 846; United Arab Emirates 522.
Semimanufactures	12,863	7,441	93	Canada 2,105; Switzerland 1,131; Brazil 877.
Chromium:				
Ore and concentrate	36	--		
Oxides and hydroxides	63	57	4	China 23; Switzerland 13.
Cobalt: Oxides and hydroxides	7	3	--	Netherlands 2.
Columbium and tantalum: Metal including alloys, all forms, tantalum value, thousands	$1	--		
Copper: Metal including alloys:				
Scrap	210	115	--	Saudi Arabia 89.
Unwrought	251	329	5	Japan 178; West Germany 71; Belgium-Luxembourg 58.
Semimanufactures	9,155	8,327	39	Japan 3,424; United Kingdom 1,058; West Germany 982.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	921,557	1,243,394	--	Brazil 339,156; Liberia 265,660; Canada 241,804.
Pyrite, roasted	43	11	--	Republic of Korea 8.
Metal:				
Scrap	121,987	150,415	93,202	United Arab Emirates 17,408; United Kingdom 15,366; West Germany 9,241.
Pig iron, cast iron, related materials	7,221	763	1	Canada 471; West Germany 170; Sweden 62.
Ferroalloys:				
Ferromanganese	4,697	5,847	--	Switzerland 3,516; France 1,312; China 532.
Unspecified	(2)	3,078	--	Japan 710; United Kingdom 610; U.S.S.R. 496.
Steel, primary forms	21,597	3,498	100	West Germany 940; Japan 584; Australia 550.
Semimanufactures:				
Bars, rods, angles, shapes, sections	41,036	38,442	586	Japan 18,927; West Germany 8,674; France 2,465.
Universals, plates, sheets	661,599	474,852	35,271	Japan 101,143; West Germany 83,544; Belgium-Luxembourg 71,414.
Hoop and strip	21,629	23,649	--	Japan 20,903; West Germany 1,233.
Rails and accessories	83	17,162	--	United Kingdom 11,100; Bulgaria 5,924.
Wire	18,363	18,686	--	Republic of Korea 9,014; Japan 4,068; China 3,543.
Tubes, pipes, fittings	35,205	74,611	855	Japan 26,603; France 14,338; Republic of Korea 14,161.
Castings and forgings, rough	1,460	840	--	France 288; Turkey 275; United Kingdom 198.
Lead:				
Ore and concentrate	291	368	--	Morocco 367.
Oxides	851	859	4	West Germany 426; China 332.
Metal including alloys:				
Scrap	844	221	--	West Germany 123; United Kingdom 98.
Unwrought	2,447	1,613	234	United Kingdom 442; U.S.S.R. 373; West Germany 240.
Semimanufactures	3 24	37	--	United Kingdom 35.
Magnesium: Metal including alloys, all forms	13	6	NA	Mainly from United Kingdom.
Manganese:				
Ore and concentrate	25,112	33,184	--	Australia 32,958.
Oxides	258	1,532	--	Singapore 895; Japan 437.
Mercury 76-pound flasks	1,624	1,044	--	China 493; Algeria 290.
Molybdenum: Metal including alloys, all forms value, thousands	$64	$60	--	Netherlands $21; Sweden $12; West Germany $10.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Nickel:				
Ore and concentrate	9	8	--	All from Belgium-Luxembourg.
Matte and speiss	59	101	--	United Arab Emirates 48; United Kingdom 32.
Metal including alloys, all forms	260	344	1	United Kingdom 112; West Germany 78; France 65.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$11	$103	--	West Germany $102.
Silver:				
Ore and concentrate[4] do	$58	$21	--	All from Japan.
Metal including alloys, unwrought and partly wrought do	$159	$97	--	West Germany $80.
Tin:				
Ore and concentrate	25	48	--	All from China.
Metal including alloys, all forms	384	161	9	Malaysia 146.
Titanium: Oxides	2,064	2,505	88	United Kingdom 1,150; Australia 510; Japan 130.
Tungsten: Metal including alloys, all forms value, thousands	$674	$568	--	Netherlands $367; Hungary $108.
Uranium and thorium:				
Ore and concentrate do	$157	$132	--	Australia $113.
Metal including alloys, all forms do	$26	$14	--	All from China.
Zinc:				
Ore and concentrate	6	1	--	All from Hong Kong.
Oxides	301	302	7	France 174; China 46; West Germany 32.
Metal including alloys:				
Scrap	185	1,115	--	Spain 547; Zambia 336; Belgium-Luxembourg 130.
Unwrought	12,417	10,291	50	United Kingdom 3,316; Spain 2,924; Australia 1,052.
Semimanufactures	6	18	--	West Germany 13.
Other:				
Ores and concentrates	268	178	--	Australia 155.
Oxides and hydroxides	154	248	33	China 81; West Germany 50.
Base metals including alloys, all forms	43	100	1	China 66.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1,005	788	118	Netherlands 496; China 75.
Artificial: Corundum	174	159	--	France 141.
Dust and powder of precious and semi-precious stones excluding diamond value, thousands	--	$7	--	All from West Germany.
Grinding and polishing wheels and stones	608	484	8	China 145; West Germany 103; Japan 74.
Asbestos, crude	2,381	3,349	50	Canada 2,740; Republic of South Africa 375.
Barite and witherite	48	113	--	West Germany 71; China 42.
Boron materials:				
Crude natural borates value, thousands	$20	--		
Oxides and acids	262	348	--	China 311.
Cement thousand tons	720	555	4	Japan 205; U.S.S.R. 131; Republic of Korea 78.
Chalk	9,093	6,192	--	Belgium-Luxembourg 5,071; United Kingdom 638.
Clays, crude	79,314	35,837	7,208	United Kingdom 24,379.
Cryolite and chiolite	2	2	--	All from Denmark.
Diamond: Gem, not set or strung value, thousands	$54	--		
Diatomite and other infusorial earth	17,652	213	155	Netherlands 29; West Germany 28.
Feldspar, fluorspar, related materials	152	226	--	Italy 61; France 60; Spain 40.
Fertilizer materials: Manufactured:				
Ammonia	241	14	--	United Kingdom 8; West Germany 6.
Phosphatic	410,010	428,247	320,557	Norway 30,188; Jordan 28,750; Japan 27,752.
Unspecified and mixed	107,358	37,012	--	Turkey 17,000; Finland 10,012; West Germany 10,000.
Graphite, natural	1,526	1,238	16	Sri Lanka 655; China 379.
Gypsum and plaster	427	182	63	United Kingdom 100.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Lime	(5)	2	--	Japan 1; United Kingdom 1.
Magnesium compounds: Magnesite, crude	1,459	942	86	China 375; Singapore 150; Austria 144.
Mica: Worked including agglomerated splittings	6	5	--	Japan 2.
Phosphates, crude	276,260	200,843	--	Jordan 178,453.
Pigments, mineral: Iron oxides and hydroxides, processed	2,657	2,025	6	China 997; West Germany 919.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$305	$160	--	Switzerland $76; United Kingdom $46.
Synthetic do	$21	$6	--	Switzerland $3; West Germany $2.
Pyrite, unroasted	54	117	--	All from Belgium-Luxembourg.
Salt and brine	16,669	143	1	West Germany 141.
Sodium compounds, n.e.s.: Carbonate, manufactured	136	113	11	United Kingdom 72; China 12.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	952	3,069	--	India 1,639; Greece 1,074.
Worked	11,029	1,171	--	Italy 1,151.
Dolomite, chiefly refractory-grade	1,378	769	4	Italy 356; Norway 351.
Gravel and crushed rock	11	97	--	Netherlands 85.
Limestone other than dimension	9	--		
Quartz and quartzite	14	--		
Sand other than metal-bearing	77	339	--	United Arab Emirates 136; Australia 95.
Sulfur:				
Elemental, all forms	26,956	42,134	1,106	Kuwait 22,396; Afghanistan 5,551; Bahrain 4,750.
Sulfuric acid	19	22	--	West Germany 11; Netherlands 8.
Talc, steatite, soapstone, pyrophyllite	56,449	876	--	China 769.
Other:				
Crude	179,262	13,895	(6)	Jordan 11,600; Singapore 962.
Slag and dross, not metal-bearing	525	65	--	All from United Arab Emirates.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	18,427	11,804	124	Hungary 6,725; West Germany 4,870.
Carbon black	944	681	4	China 330; West Germany 144; Singapore 92.
Coal: Anthracite and bituminous	554,076	770,141	107,378	Australia 477,939; Canada 178,019.
Coke and semicoke	--	5	--	All from United Kingdom.
Peat including briquets and litter	--	9	--	All from West Germany.
Petroleum:				
Crude thousand 42-gallon barrels	29,975	31,055	--	Saudi Arabia 19,341; United Arab Emirates 6,687; Iran 4,562.
Refinery products:				
Liquefied petroleum gas value, thousands	$3	$5	--	All from Sri Lanka.
Gasoline thousand 42-gallon barrels	1,194	855	--	Kuwait 845.
Mineral jelly and wax do	65	75	--	China 48; Iraq 14.
Kerosene and jet fuel do	3,439	3,931	--	Kuwait 3,926.
Distillate fuel oil do	9,826	10,449	(6)	Mainly from Kuwait.
Lubricants do	276	159	--	Singapore 40; Spain 33; Japan 19.
Residual fuel oil do	184	7	--	China 6.
Bitumen and other residues do	(7)	21	--	All from Hungary.
Bituminous mixtures do	5	(6)	(6)	Mainly from United Kingdom.

NA Not available.
[1]Table prepared by Audrey D. Wilkes.
[2]Unreported quantity valued at $6,607,000.
[3]Excludes unreported quantity valued at $287,000 mainly imported from Romania.
[4]May include platinum-group metals.
[5]Unreported quantity value at $4,000.
[6]Less than 1/2 unit.
[7]Unreported quantity valued at $3,163,000.

COMMODITY REVIEW

METALS

Chromite.—The Sarhad Development Authority (SDA) made plans to survey and explore chromite deposits in the Malakand and Kohistan areas, as a part of ongoing efforts to maintain production levels of this commodity. At yearend, SDA was awaiting Provincial government approval for this project. There was a substantial upturn in chromite production in 1986, following several years in which output ranged from about 1,500 tons to 6,000 tons per year.

Copper.—Pakistan's Resource Development Corp. (RDC) received an implementation plan for the Saindak copper venture from its contract consultants, A. H. Ross & Associates of Tucson, Arizona. Under this plan, used equipment would be purchased in the United States and Canada, equipment adequate to permit the production of 18,500 tons of blister copper annually that would contain almost 50,000 troy ounces of gold and 72,000 troy ounces of silver. The initial investment would be $250 million, including $113 million in local currency, and the Government of Pakistan has authorized RDC to proceed with financing the project, which will be guaranteed by the Government. Under the proposed plan, the project reportedly can be implemented within 24 months. The consulting firm's report indicated that the break-even point would be at a copper price of $0.66 per pound for copper with gold at $345 per ounce, levels already exceeded. The Government of Pakistan further has assured its support for a major portion of the infrastructure cost, and actual development was reportedly expected to be approved during 1987.

Iron and Steel.—Pakistan's single integrated steel plant, the Bin Qasim steelworks of Pakistan Steel Mills Corp., reported sales to be 4.3% above the planned target for the first quarter of its fiscal year that began July 1, 1986, and thus, that its overall losses were declining at a somewhat more rapid rate than had been expected. Production is carefully geared to meet, but not exceed, demand, thereby avoiding surpluses that would depress local markets or necessitate export sales. As a result, actual operating levels of the plant purposefully have been kept below capacity until local market demand rises sufficiently to absorb all production. However, the plant is not expected to reach the break-even point financially until output reaches 85% of capacity, hence operating losses may continue for an indefinite period. Annual capacities of the integrated plant are pig iron, 1,230,000 tons; crude steel, 1,100,000 tons; and finished steel, 1,015,000 tons.

In addition to the single integrated plant, the country had 19 other steel companies (including some that are subsidiary operations) with an aggregate annual capacity of 93,000 tons of crude steel and nearly 200,000 tons of finished steel shapes. The leading firms were Karachi Rolling Mills Ltd., with 35,000 tons of crude steel capacity under its own name, and 32,000 tons of finished steel capacity in three subsidiaries, all in Karachi; and Special Steels of Pakistan with 33,000 tons of crude steel capacity and 20,000 tons of finished steel capacity in its Karachi plant.

One rather unusual feature of Pakistan's overall steel industry is its reliance for a part of its raw material supply on what has heretofore been a growing shipbreaking industry. This industry, centered at Gaddani, about 50 kilometers from Karachi, had its modest beginning in the late 1960's and early 1970's, but by 1978 imported 80 vessels valued at $30 million. Thereafter a slump set in, but there was a marked recovery in 1983 when 155 vessels, valued at nearly $70 million were brought in. In 1984, 173 vessels were imported, with a value of $51 million, and in 1985, the number of vessels declined to 132, but the value increased to $61 million. Exactly comparable figures on tonnages are not available, but in the fiscal year, beginning July 1, 1985, 165 vessels with an aggregate weight of 699,514 deadweight tons were imported for shipbreaking, including 6 tankers at 76,023 tons and 159 other ships at 623,491 tons. For calendar year 1986 (overlapping the preceding figures), the receipt of tankers and combination carriers totaled nine vessels weighing 271,376 tons (with no reporting on other vessels). It should be stressed that only a part of the total weight of each vessel becomes scrap to be handled in the conventional way by steel plants. Much of the machinery from the vessels is removed and sold "as is," including generators, electric motors, lathes, and other ship equipment.

Additionally, nonferrous metals are removed and sold at prices considerably below

those for imports of the metals such as, brass, for example, selling at one-half the prices that would be charged for regular brass imports. Finally, some of the steel is sold directly without remelting. With these and other subtractions, the chairman of the Gaddani Zone Shipbreakers Association indicated that only about 20% of the total weight of ships broken is delivered to steel melting facilities—about 150,000 to 200,000 tons per year.

The chairman also reported on the role of the industry in the national economy and on the difficulties that it faced in 1986. The chairman claimed that the industry has ensured a foreign exchange saving of at least $100 million annually, while employing 30,000 workers and making a substantial contribution to the treasury in the forms of customs duty, income tax, and license fees. The industry's problems center on four factors: (1) depreciation of the Pakistani rupee with respect to the U.S. dollar; (2) price increases in the international market for scrap ships; (3) reduction in billet prices by Pakistan Steel; and (4) increase in the customs duty on scrap ships from 50% for the year beginning July 1, 1982, to 85% for the year 1983-84 and thereafter. During the same time, the customs duty on scrap was maintained at 30%.

Lead and Zinc.—Efforts to detect economically viable lead-zinc deposits in Pakistan continued in 1986, with SDA seeking approval of the Provincial government for a project at the Kohistan occurrence in Besham, where lead and zinc sulfide mineral together with other sulfide mineralization has been reported.

INDUSTRIAL MINERALS

Cement.—In October 1986, Pakistan's President participated in the formal inauguration of the country's 14th cement plant, the 2,200-ton-per-day facility of Attock Cement Ltd. near Hub Chowki, Lasbela, in Baluchistan Province. Trial production evidently started as early as March 1986, for beginning in that month, official national production statistics indicated that 14 plants were operational. The new facility, a private sector venture, is a subsidiary of Pharoah Holdings Ltd., an international company that also has interest in other mineral industry operations in Pakistan—Pakistan Oil Fields Ltd., Attock Refinery Ltd., and Attock Chemicals Ltd. The plant has provided jobs for 350 persons directly, and for numerous others in its distributor-dealer network. The plant was built with technical assistance from Romania and funding from a Saudi Arabian investor.

At yearend, there were reportedly five additional private sector, or largely private sector, cement plants projected for Pakistan, all awaiting Government clearances before construction could begin. These included (1) the 300,000-ton-per-year Fateh Jang plant to be built at Wah in Attock District; (2) the 300,000-ton-per-year Kotdiji plant in the Khairpur District of Sind Province proposed by Khairpur Cement Industries Ltd.; (3) the 1-million-ton-per-year plant proposed for Khushab in Punjab Province by Pak Land Cement Ltd.; (4) the 128,000-ton-per-year plant proposed by Neelum Cement Ltd. for a site in Muzaffarabad, Azad Kashmir; and (5) the 120,000-ton-per-year plant proposed by Nayab Cement for Jabbi, Khushab District, Purjab Province.

The addition of the nearly 1.85 million tons of capacity for these five projects would be a substantial increase in Pakistan's cement capacity, but even if all of them were to be immediately approved and construction started promptly and completed in a reasonable time, the capacity addition would only be adequate to meet demand levels projected for 1987 or 1988, and a growth rate for demand of 8% per year has been forecast by Pakistan authorities through 1995. Thus, if growth in demand increased as planned, imports will continue to be necessary.

Cement stocks in Pakistan, although slightly higher than in 1985, remained quite small relative to total demand; on December 31, 1985, they totaled only 100,000 tons and through 1986 fluctuated between a low of 92,000 tons (March 31) and a high of 150,000 tons (August 31).

Fertilizer Materials.—Pakistan's first phosphate mine, the Kakul operation, came into operation in 1986. Output, at the rate of about 200 tons per day, was delivered to the National Fertilizer Corp. Ltd. The SDA was seeking approval of the Provincial government for another operation, the Lagarbau phosphate mine. The Kakul Mine will serve to modestly reduce Pakistan's dependence upon imported phosphate materials, which have included about a quarter of a million tons of phosphate rock and over 400,000 tons of phosphatic fertilizer annually.

Pakistan's nine chemical fertilizer plants in aggregate recorded increases in production in 1986 for three of the five commodities for which output is reported on a

monthly basis. Output figures, in tons, for these commodities were as follows, with results for calendar year 1985 in parentheses: ammonium of nitrate, 405,808 (395,841); ammonium sulfate, 92,127 (86,495); nitrophosphate, 316,802 (323,743); superphosphate, 105,880 (107,051); and urea 1,888,450 (1,792,930).

Fertilizer plant developments reported under way include a 90,000-ton-per-year granulated single superphosphate facility of Hazara Phosphate Fertilizers (Pvt.) Ltd. at Haripur, which is planned for commissioning in the first half of 1988. Much of the design and fabrication of this facility reportedly will be accomplished in Pakistan, and its raw material source reportedly will be the Kakul Mine. A pilot plant for production of phosphoric acid was already in place on this site, built with technological assistance from a Tunisian firm. At the Multan plant of Pakarab Fertilizers (Pvt.) Ltd., where 1986 annual capacity included 304,500 tons of nitrophosphate, 450,000 tons of ammonium nitrate, and 89,000 tons of urea, a rehabilitation-modernization program was under way for the urea plant and the nitric acid facilities, with completion planned for mid-1987.

On a more modest scale, production facilities for zinc sulfate, a micronutrient fertilizer found to be extremely useful for increasing rice output, were being expanded from 600 tons per year to 1,000 tons per year at one of Lyallpur Chemicals & Fertilizers (Pvt.) Ltd.'s two plants. The firm's Faisalabad works in 1986 had a capacity of about 22,000 tons per year of single superphosphate, and its Jaranwala plant had 72,000 tons per year of rated capacity for the same product.

Miscellaneous Industrial Minerals.—The Baluchistan Development Authority was engaged in evaluation of vermiculite deposits in the Chagai District and of brucite, hydromagnesite, and crysotile asbestos deposits in the Zhob District, and the SDA was seeking Provincial government approval for feasibility studies of nepheline syenite deposits at Koga. These various exploration efforts illustrated the interest in establishing raw material bases for mineral commodities not heretofore mined in Pakistan, an interest reflected with increasing frequency in editorials and other elements of the general press in Pakistan.

MINERAL FUELS

In 1986, natural gas accounted for about 69% of Pakistan's total primary energy production of 17.1 million metric tons, standard coal equivalent (SCE), far ahead of the 13% accounted for by petroleum, the 10% provided by nuclear and hydropower, and the 8% accounted for by solid fuels. The 1986 level of primary energy production was 8.7% higher than that of 1985 and 18.6% above the 1984 level, when natural gas provided 73% of the total; petroleum, 7%; nuclear and hydropower, 11%; and solid fuels, 8%. In 1984, the latest year for which comprehensive figures on energy trade are available, domestic primary energy output was equal to 67.6% of total energy consumption (excluding bunker loadings) of 21.3 million tons, SCE thus, for all practical purposes, domestic energy production net slightly over two-thirds of needs, the balance being supplied by imports.

Coal.—As a part of efforts to permit industrialization projects to go forward and at the same time to reduce dependence on imported fuels, Pakistan has pursued a course of maximizing utilization of domestic coal resources. This policy was reflected in the joint sponsorship of Pakistan's First Coal Conference by two Federal cabinet-level agencies, the Ministry of Planning and Development and the Ministry of Petroleum and Natural Resources. The conference, conducted in cooperation with the U.S. Agency for International Development, was held in Karachi in February 1986, and involved over 400 participants from over 20 countries, and touched on technical, economic, and policy matters. Pakistan's coal reserves are far from completely assessed, but total national reserves have been estimated at 1.2 billion tons, ranging in quality from lignite to subbituminous, with a volatile matter content of 26% to 45%, a sulfur content of 3% to 6%, an ash content of 3% to 38%, and calorific values of 5,000 to 12,000 British thermal units (Btu). Of total coal reserves, the Lakhra Coalfield, in the Dadu District of Sind Province, northwest of Hyderabad City, accounted for only one-fourth, but this figure includes 80% of the country's proven reserves, or about 80 million tons. Additional reserves credited to the Lakhra Field include 20 million tons of probable reserves and 200 million tons of

possible reserves, all in an area of about 200 square kilometers. The Lakhra coal has been described as a high-grade lignite bordering on subbituminous, with an average proximate analysis of 26.9% fixed carbon, 28.8% volatile matter, 25.0% moisture, 19.3% ash, and 5.9% sulfur, with a calorific value of 6,330 Btu per pound.

The Lakhra Coalfield figures prominently in plans to expand coal production, but such expansion is tied to the construction of thermal powerplants that are to consume the coal. The Pakistan Water and Power Development Authority (WAPDA) has published plans calling for the installation of two 300-megawatt plants as a part of the early stages of the Lakhra coal mine and power station project, one for completion by September 1991 and the other by December 1992. These plants will require about 4.3 million tons of coal annually when in operation; this coal is to come from two large surface mines and one small underground mine, all in the Lakhra Field. By way of comparison, 1986 coal consumption for all of Pakistan presumably totaled only slightly over 3 million tons, of which about three-quarters was produced indigenously and the balance, generally higher ranked coals including coking coals, was imported.

An additional substantial coal reserve in Pakistan is that of the Sonda coal basin, 35 kilometers from the city of Thatta in Sind Province. Here, preliminary studies by the Geological Survey of Pakistan have led to an estimated reserves of 500 million tons, of a quality of coal described as better than that of the Lakhra Field, and with a sulfur content of only 2%.

In a project most closely related to coal, it has been reported that a facility is planned to manufacture high-energy charcoal and a "manufactured coal" from agricultural wastes such as rice and wheat stalks and grass, together with silica sand, coal waste dust, and vinyl acetate. This project, sponsored with equity participation from a U.S. firm specializing in producing microorganic fuels, is slated for installation at the Nouriabad Industrial Estate in Dadu District of Sind Province, the same general area as the Lakhra Coalfield and thermal powerplants. The product could be used as a substitute for coal cake briquets, kerosene, and fuel oils.

Natural Gas.—The Sui Gasfield remained unquestionably Pakistan's leading producer through 1986, although its share of total production in July 1986 fell to only 59% of the national total of 1,117 million cubic feet. Mari Field, with a 25% share of the July 1986 total, ranked second, followed by Pirkoh Field with 8%, and with the Meyal, Toot, and Dhurnol Fields, all producers of both oil and gas, together accounting for the remaining 8%. Overall, there was a 7% gain in gross natural gas production, a markedly greater growth than that reported between 1984-85, and the increase was evidently the result of greater gas use in powerplant and other industries.

Petroleum.—Although the 1986 production increase of 20.8% could hardly be regarded as rivaling the leap of 91.6% registered between 1984-85, it nevertheless was indicative of the efforts to lessen import dependence. Moreover, an increase of 20% was expected for 1987, according to the Minister of Petroleum and Natural Resources.

Official Government statistics detailing oil production by fields were released on a monthly basis beginning in January 1987, covering July 1985, January 1986, and July 1986. Thirteen oilfields were listed, of which 12 were in production in July 1986, headed by the Dhurnol Field, with 40.1% of the 1986 monthly total. Other significant producers and their share of July's production were Leghari 20.7%; Khaskeli and Tando Alam, 10.1% each; Meyal, 8.6%; Toot, 4.5%; Dhabi, 4.4%; and Khuar, Dhulian, Joyamir, Balkassar, and Finkassar, 1.5%. One field, Adhi, which accounted for 3.2% of output in January 1986, was not in production in July of that year. The Mazari, Mazari South, Nari, Tajedi, and Turk Fields had not yet been brought into production.

Oil exploration activities were being conducted by the Pakistani Government's Oil and Gas Development Corp. (OGDC) and by eight foreign companies during 1986, according to the Minister of Petroleum and Natural Resources. The chairman of the OGDC in early October reported two successful oil discoveries by his organization in the year 1985-86, one at Chak Nowrang and the other at Chotana, near Hyderabad. Complete details on these discoveries were not available, as evaluation was still being conducted, but preliminary reports described the oil at Chak Norwang as a heavy crude, highly suitable for production of diesel oil but did not access its production rate. The Ghotana discovery was yielding over 400 barrels per day and was limited to this level by availability of storage capacity.

In November, the Minister of Petroleum

and Natural Resources noted the discovery of oil at Liari, Tando Muhammad Khan Taluka in the Hyderabad District, and that preliminary estimates indicated a potential to produce 1,700 barrels per day from this property. It was also reported that evaluation work was continuing on a possible commercial oil find at Zindapir, but this could not yet be assessed as definitely economic.

Near yearend, the OGDC was reported to own nine operational drilling rigs, none of which were assessed as mobile, but there were plans to add two more, one a workover rig and the other a mobile rig capable of drilling to 3,000 meters. Three additional rigs were being operated for the company, two owned by contractors and one owned by Canada.

Uranium.—The Pakistan Atomic Energy Commission conducted drilling operations totaling 40,000 meters to evaluate sedimentary uranium deposits in D G Khan and adjoining areas during the year.

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[1]Senior foreign mineral specialist, Division of International Minerals.

[2]Where necessary, values have been converted from Pakistani rupees (PRs) to U.S. dollars at the rate of PRs16.648=US$1.00.

The Mineral Industry of Peru

By Doris M. Hyde[1]

The minerals sector suffered through another year of low international metal prices. The industry also faced rising operational costs, labor problems, terrorism, inflation, fixed official and financial market rates of foreign exchange, and an insufficient percentage of the value of its exports that a company could receive at the financial market exchange rate. International metal prices for 1986 were generally at the lowest level in at least 7 years. Lead was an exception as prices averaged slightly above the 1985 average but only because of last-quarter gains. Labor strikes—especially against Peru's two largest mineral-producing companies, state-owned Empresa Minera del Centro del Perú S.A. (Centromín Perú) and privately owned Southern Peru Copper Corp. (SPCC)—reduced mineral volumes available for export and damaged Peru's foreign exchange earnings capability.

Peru's economy grew by an estimated 8.5% in 1986. This growth was spurred largely by domestic consumption allowed by wage increases and sustained by the 10% limitation placed on using foreign exchange earnings to pay foreign debts. Instead, Peru used its foreign exchange to import materials to boost idled industrial capacity. A series of complex economic measures were undertaken that resulted in visible economic growth, a reduction of inflation, and the creation of new jobs. However, although industrial productivity increased, there appeared to be a lack of new domestic investment and a flight of foreign currency abroad.

In 1986, there was a $50 million negative trade balance, the first time in 4 years that Peru failed to have a $1 billion[2] surplus. Peru's overall economy could be described as turbulent during 1986 as new investment incentive measures, tax modifications, and other financial changes were enacted or advocated and debated. There are an array of economic information groups that provide analyses and reviews of trends and events in Peru. The available information sources were effectively described in The Andean Report, which is prominent in its own reporting on all facets of Peruvian economics.[3]

Government Policies and Programs.—Mining was one of the few sectors that failed to prosper during Peru's substantial economic growth. Some relief to this sector was included in the various Government financial packages, but on the whole, this industry did not benefit to the extent of manufacturing.

In February, the small- and medium-sized mining sectors were declared in a state of emergency for a year. Under certain circumstances, companies could request a rescheduling of debts with Banco Minero del Perú (Banco Minero) and Minero Perú Comercial S.A. (Minpeco) and were allowed to exchange 10% of their export earnings at the financial, or parallel rate. This percentage was gradually increased, and by August, it had reached 35%. The large-sized mining companies remained restricted to the 10% limit of exchanging export earnings at the financial rate. However, all imports for the mining sector were transferred from the official exchange rate to the financial rate, which effectively increased the cost of imported goods by 25%.

The dissatisfied mining sector launched a public campaign for Government assistance. In late 1986, partly because of a growing foreign exchange shortage, the Government announced a 2.2%-per-month currency devaluation effective January 1987. The small- and medium-sized mining companies were made eligible to receive 55% of their export sales at the financial exchange rate, but the mining community did not believe this to be sufficient to

compensate for their increased operational costs and low international mineral prices.

At the end of December, the Government established, by Legislative Decree No. 400, certain income tax exonerations for industries situated outside of the metropolitan Lima-Callao area. The tax exoneration decree included new small- and medium-sized mining projects and expansions. It also excepted these mining companies from payment of the general sales tax on imported new or used capital goods, materials, and spare parts not manufactured in Peru. The small-sized mining companies were further exonerated from paying import duties. Medium-sized companies would pay the import duties, but without interest or surcharges.

Drafts of the new mining and hydrocarbon laws were placed before the Peruvian Congress, but final passage was delayed. This could affect new crude oil and natural gas development planning by foreign companies.

PRODUCTION

Labor strikes at Centromín Perú and SPCC's mining and processing facilities were primarily responsible for a disappointing performance from the minerals sector. SPCC's 10% decrease in copper production from that of 1985 was most important because it represented a much larger amount proportionately of total copper production. It was Empresa Minera Especial Tintaya S.A. (Tintaya), ending its first full year of operation with a 157% increase in copper production, that enabled large-sized mining operations to end 1986 with the same 92% contribution to total copper output as it had in 1985. Centromín Perú's labor problems caused its copper production to drop 12%; lead, 11%; zinc, 10%; and silver, 1%.

The medium-sized mining companies also suffered from labor disruptions and ended the year with a mixed performance. Their contribution to total copper production was 5%, down 27% from that of 1985, while their share of lead output was 54%, a decrease of 6% from that of 1985. On the other hand, zinc production rose 3% to a 56% contribution, and silver increased 1% over that of 1985 to a 59% share of total production.

Even though crude oil output lagged behind 1985, late 1986 discoveries, some market indications of increased prices, and the prospect for the enactment of a new hydrocarbons law, all contributed to an optimistic outlook by the Government for future production and reserves increases.

Table 1 has been revised to conform with data published in 1986 by the Ministerio de Energía y Minas.[4] These data were presented in terms of recoverable metal content.

Table 1.—Peru: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS					
Antimony:					
Mine output, Sb content	738	713	672	594	670
Metal	[r]394	[r]323	372	377	[2]356
Arsenic, white[3]	[r]1,910	[r]1,009	1,090	1,257	[2]1,210
Bismuth:					
Mine output, Bi content	[r]760	[r]678	650	785	680
Metal	604	526	651	738	[2]605
Cadmium:					
Mine output, Cd content	[r]776	[r]897	674	579	549
Metal	421	451	390	420	387
Copper:					
Mine output, Cu content	[r]353,779	[r]318,780	353,927	391,332	[2]385,444
Sulfate (Cu content)	[r]2,367	[r]2,491	2,535	2,539	[2]2,232
Metal:					
Smelter	294,412	258,305	298,806	326,621	297,700
Refined	[r]190,906	[r]161,369	188,571	203,031	[2]197,744
Electrowon	33,907	33,008	31,450	27,434	[2]27,533
Gold:					
Mine output, Au content	troy ounces [r]134,647	[r]168,534	187,406	212,870	[2]215,862
Metal	do [r]68,867	[r]72,789	79,734	84,653	82,300
Indium	kilograms [r]3,636	[r]2,704	2,903	3,863	[2]3,333

See footnotes at end of table.

Table 1.—Peru: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS —Continued					
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	5,774	r4,357	4,076	5,104	5,005
Fe content do	r3,839	r2,900	2,731	3,413	3,343
Metal:					
Pig iron[4] do	161	113	--	163	2217
Ferroalloys	--	320	--	(5)	--
Steel ingots and castings thousand tons	273	299	342	411	2484
Lead:					
Mine output, Pb content	r197,598	r207,350	193,652	201,460	194,378
Metal	r68,829	r67,662	70,192	81,809	266,258
Manganese, mine output, Mn content	--	--	273	e308	2119
Molybdenum, mine output, Mo content	r2,915	r2,642	2,974	4,036	23,484
Selenium metal, refined kilograms	r23,973	r19,514	20,758	14,506	212,012
Silver:					
Mine output, Ag content thousand troy ounces	r41,957	r50,477	53,080	58,230	261,920
Metal, refined do	r27,345	r24,814	26,885	24,334	220,869
Tellurium metal kilograms	r19,565	r15,806	14,066	15,007	29,815
Tin, mine output, Sn content	1,672	r2,808	3,314	3,779	24,817
Tungsten, mine output, W content	r682	r762	699	723	2593
Zinc:					
Mine output, Zn content	r460,101	r491,668	465,890	523,434	2597,576
Metal	r160,232	r153,966	148,372	169,746	2156,020
INDUSTRIAL MINERALS					
Barite	375,000	111,117	46,323	21,661	30,000
Boron materials, crude (borates)[e]	14,000	10,000	10,000	10,000	10,000
Cement, hydraulic[e] thousand tons	r2,487	r1,965	r1,869	r2,000	2,200
Chalk[e]	470,000	470,000	470,000	470,000	470,000
Clays:					
Bentonite	r20,000	r15,110	12,971	2,017	5,000
Fire clay	r e6,000	4,448	5,601	4,305	5,000
Kaolin	r e2,000	586	r e1,000	210	300
Common clay	r e500,000	225,917	269,123	115,588	120,000
Diatomite	e7,300	13,698	7,471	14,854	15,000
Feldspar	r e10,000	2,509	3,225	(5)	--
Gypsum, crude	e350,000	77,143	66,722	28,640	30,000
Lime[e]	35,000	35,000	35,000	35,000	35,000
Mica[e]	550	550	550	550	550
Nitrogen: N content of ammonia	84,700	e85,000	e85,000	85,000	85,000
Phosphates, crude	29,101	2,510	12,694	12,216	--
Salt, all types	485,000	149,832	253,027	204,992	205,000
Stone, sand and gravel:					
Dimension stone:					
Marble	e3,000	6,179	5,396	1,550	2,000
Slate[e]	18,000	18,000	18,000	18,000	18,000
Crushed and broken stone:					
Dolomite	e4,200	11,900	4,565	1,635	2,000
Limestone thousand tons	2,590	r1,276	1,906	2,031	2,100
Quartz and quartzite	e2,000	2,303	2,465	2,150	2,200
Silica sand thousand tons	20	r52	53	2	5
Sand and gravel do	2,850	2,583	2,421	1,902	2,000
Sulfur:					
Elemental:					
Native[e]	100	100	100	100	100
Byproduct of metallurgy	72,604	64,709	64,256	68,145	66,300
Sulfuric acid, gross weight	r225,435	r200,359	199,431	210,754	207,190
Talc and related materials:					
Talc	e1,100	195	510	500	500
Pyrophyllite	e7,500	5,037	8,728	(5)	500
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	5,976	2,154	5,329	5,949	6,000
Coal: Anthracite, run-of-mine	e120,000	120,000	84,000	80,000	90,000
Coke, all types[e]	10,000	10,000	10,000	10,000	10,000
Gas, natural:					
Gross million cubic feet	51,800	42,100	45,484	45,000	45,000
Marketed[e] do	21,000	22,000	22,000	22,000	23,000
Natural gas liquids:					
Natural gasoline and other[6] thousand 42-gallon barrels	320	53	190	249	300
Propane do	59	6	49	81	95
Butane do	9	3	6	6	5
Total do	388	62	245	336	400

See footnotes at end of table.

Table 1.—Peru: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum:					
Crude ------ thousand 42-gallon barrels	71,197	62,454	67,374	68,788	65,300
Refinery products:					
Gasoline, motor ---------- do	13,069	10,835	11,539	11,627	12,000
Jet fuel ---------- do	2,891	2,718	2,654	2,377	3,000
Kerosene ---------- do	7,111	6,024	6,220	6,353	6,000
Distillate fuel oil ---------- do	12,177	9,591	12,020	12,389	12,000
Residual fuel oil ---------- do	18,866	21,637	26,617	25,652	27,000
Lubricants ---------- do	148	57	63	58	50
Liquefied petroleum gas ---------- do	1,525	1,170	1,429	1,407	1,400
Asphalt ---------- do	313	178	212	271	200
Refinery fuel and losses ---------- do	93	596	386	538	100
Unspecified ---------- do	1,292	2,090	1,074	1,645	1,250
Total ---------- do	57,485	54,896	62,214	62,317	63,000

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

[1]Table includes data available through Aug. 28, 1987. Where appropriate, data have been revised to conform with that reported in Anuario de la Minería Perú, 1977-85, Ministerio de Energía y Minas, Lima, 1986, 167 tables. Production figures for 1986 do not necessarily reflect recoverable metal content as do those for prior years.

[2]Reported figure.

[3]Output reported by Empresa Minera del Centro del Perú S.A.

[4]Excludes sponge iron production as follows, in tons: 1982—42,853; 1983—27,024; 1984—62,121 (revised); 1985—44,341 (revised); and 1986—56,000.

[5]Revised to zero.

[6]Includes hexane.

TRADE

The export volumes of all major metals except zinc declined from 1985 levels. The total $1,076 million value of nonfuel mineral exports decreased 15% from the amount received in 1985 and represented the lowest point so far in this decade. Nonfuel minerals accounted for 43% of the total value of exports, about the same as that of 1985, because of the reduced value of total exports. Petroleum exports decreased 19% in volume to about 22 million barrels, but their value fell by 63% from about $646 million in 1985 to just under $236 million, indicating a unit price of less than $11 per barrel. Petroleum represented only 9% of the total value of exports in 1986 compared with its more than 21% share in 1985.

Because of the dramatic drop in petroleum values, copper regained its former position as the leading traditional export earner with a total value of $436 million for 341,045 tons. Zinc, at about $245 million for 490,880 tons, was the third largest traditional export earner. This was a 6% gain in volume but a 9% loss in total value from that of 1985. Lead exports, including silver content, were valued at $164 million for 130,016 tons and represented a 24% decrease in volume and an 18% decline in total value from that of 1985.

About 19.5 million troy ounces of refined silver was exported at a value of more than $110 million. This was 13% less than the volume shipped in 1985 and a 21% decline in value. Because of the restrictions placed on gold sales starting in February, exports dropped 88% from the 1985 level to 21,286 troy ounces valued at about $7.5 million. Minor metals exported in 1986 were valued at over $53 million, a slight decrease in quantity from that of 1985.

Iron exports totaled over 4.2 million tons valued at $58.5 million and represented a 16% reduction in volume and a 20% decrease in value from that of 1985. The Republic of Korea remained the primary importer at 1.6 million tons, but this was 17% less than the 1985 volume. Japan imported 1.2 million tons, a 13% decline. Other iron ore and concentrate exports in 1986 went to the Netherlands, 641,000 tons; Yugoslavia, 262,000 tons; Argentina, 209,000 tons; the United States, 87,000 tons; and Czechoslovakia, 30,000 tons. Shipments went to seven countries in 1986, two less than in 1985.

Peru supplied over 85% of the tin concentrate imported by the United States.

At the end of December, 21,000 tons of anthracite coal was shipped from the mines of Cía. Carbonera Rio Negro S.A. in Ancash Department to Sunkyong Ltd. of the Republic of Korea. Two more shipments were

scheduled to be made. Sunkyong reportedly planned to manufacture charcoal from the anthracite and to continue purchasing Peruvian coal after the initial 69,000-ton contract was fulfilled.

Although Peru had lacked diplomatic relations with North Korea, in 1986 an agreement was signed whereby in the period 1987 to 1991, Peru would ship lead and copper concentrates to the Korea Daesong Trading Corp. on a cash basis. Annual shipments were to be between 25,000 and 50,000 tons of lead concentrates and 25,000 tons of copper concentrates.

COMMODITY REVIEW

METALS

Copper.—Strike activity caused copper production at SPCC's Toquepala and Cuajone Mines and at its Ilo smelter to fall to about 242,160 tons, or 10% below that of 1985. The Government granted SPCC an additional year, until October 1987, for recovering the original Cuajone investment under the special tax regime. Under this new 1986 contract, SPCC would enjoy a 6-year period of tax stability after the investment recovery period.

Centromín Perú's 1986 refined copper production, at 47,057 tons, also fell significantly from that of 1985 because of strike activity at its mining units and at the La Oroya metallurgical complex.

Tintaya completed its first full year of operation with production of copper in concentrates at about 52,570 tons, a 188% gain over that of 1985 when technical problems interfered with operations. In late December, a concentrate shipment from Tintaya was sent to SPCC's Ilo smelter for tests on the possibility of processing it within Peru. Even though the SPCC smelter is normally working at near capacity, ore from the Toquepala Mine was expected to decrease unless a substantial investment is made, which may not be practical until the market price of copper rises significantly.

Empresa Minera del Perú S.A.'s (Minero Perú) Ilo copper refinery was scheduled for a 16% increase of its 150,000-ton-per-year capacity. The refinery, which produces copper cathodes on a toll basis using about 55% of SPCC's blister, could receive an increased percentage of the smelter's output. Or, if Tintaya's concentrates can be processed at the SPCC smelter, this volume could then be added to feed the refinery's increased capacity. Technical studies were carried out on the recovery of nickel sulfate from the electrolytic process. This recovery program was expected to begin in 1987.

At Cerro Verde, Minero Perú began treating the copper sulfide ore underlying the nearly depleted oxide ore through ferric acid lixiviation and bacterial leaching. Production from the electrowinning plant reached 27,533 tons, of which 33% came from the leached secondary copper sulfide ore. In 1987, about 50% of production was expected to come from the sulfide ore.

Most of the medium-sized producers managed to maintain production levels at about the 1985 levels. As in recent years, it was cost reduction efforts and associated metals production that allowed companies to avoid closures.

The large-sized mining operations accounted for 92% of total copper production, the medium-sized companies contributed 5%, and the small-sized mines increased their usual 1% share of production to 3%.

Gold.—Estimated gold production by source, in troy ounces, is shown below, and was determined from information on total production as provided by the Ministerio de Energía y Minas. Placer production was based on purchases by the Banco Minero.

	1984[r]	1985[r]	1986[e]
In ores and concentrates	23,116	47,519	59,125
Refined	79,734	84,653	84,087
In placer gravels	84,556	80,152	70,892
In blister	--	547	1,758
Total	187,406	212,871	215,862

[e]Estimated. [r]Revised.

The difficulty in determining a reasonably accurate estimate of total gold production was accentuated in 1986 when the Statistical Division of the Ministry of Energy and Mines began requiring that producers declare the gold content in their concentrates on a monthly reporting basis rather than annually. The number of companies reporting to the Statistical Division in 1986 was considerably higher than those that reported in prior years. The reports indicated that gold contained in ore and concentrates reached 130,062 troy ounces as opposed to the 59,125 troy ounces cited in the above table. This latter figure was determined by subtracting alluvial gold

purchases by the Banco Minero and refined gold production from a total gold production figure provided by the Ministerio de Energía y Minas. At this time, it is not known whether or not the 130,062 troy ounces attributed to ores and concentrates included some gold that was later refined and also counted in that category. Certainly, a clarification is needed on this possibility. Because of the new reporting requirements, data in future years may more accurately reflect total gold production.

The Banco Minero exported 21,300 troy ounces of refined gold valued at about $7.5 million, which represented exports made prior to the February 1986 suspension of gold sales by the Banco Central de Reservas. Gold contained in ores and concentrates was not included in the export ban.

Servico Industrial de la Marina (SIMA), the Peruvian navy industrial service, began negotiations for the construction of a 25-meter dredge to be placed at Minero Perú's Pampa Blanca zone of the San Antonio de Poto concession in Puno Department. The most attractive bid reportedly came from an Argentinian group that would finance the project through an existing trade agreement, whereby a Swiss company would join in the construction of the dredge, and SIMA would move it from Argentina to the concession site where assembly would take place. Minero Perú estimated it could be in production 24 months after contracts were signed. The dredge was to be capable of treating 10,000 cubic meters of material per day and yield about 35,400 troy ounces of gold per year. Originally, financing for the dredge project was to come mostly, if not entirely, from Corporación Financiera de Desarrollo (Cofide).

At the end of 1986, Minero Perú offered for international bid a 1-square-kilometer area in the Arequipa Pampa section of San Antonio de Poto. This was considered the second-best prospect within the whole deposit area.

Cía. Aurifera Inambari S.A., a subsidiary of South American Placers Inc. (SAPI), and Aurifera Sur Oriente S.A. (Ausorsa) began operating a pilot plant at their Madre de Dios concession in the areas of the Caichive and Huepetue Rivers. This project is part of the second stage of an investigation in the area that originally began in 1983. The first stage occurred during 1980-82 when tests were run by Ausorsa in association with Rio Tinto Zinc Corp. Ltd. (RTZ). At that time, production cost averaged $344 per troy ounce of gold. Financing arrangements for this $24 million gold project had mostly been obtained, and infrastructural work was under way. Full production was expected to be about 30,000 troy ounces of gold per year. In 1986, production was approximately 2,500 troy ounces.

Early in 1986, the Banco Minero began paying alluvial gold producers 10% above the international quotation, free of all discounts. This amounted to about 18% above the quoted official Peruvian price. The Banco Minero expected that this would encourage increased placer gold production and also reduce producer hoarding and incidences of contraband and illicit gold marketing. Initially, at least, the increased payment did not appear to be successful because alluvial gold purchases by the Banco Minero decreased slightly.

Lead and Zinc.—Even though many of the medium-sized lead and zinc producers increased production, Peru's total output fell because these gains could not compensate for the losses resulting from the prolonged labor strike at Centromín Perú operations. Because of this 7-week strike, production from Centromín Perú's mining units decreased in 1986 to about 67,542 tons of lead and 208,577 tons of zinc. Refined lead and zinc output from the La Oroya metallurgical complex was also adversely affected by the strike. Centromín Perú expected the Andaychaqua silver-lead-zinc mine unit to reach its capacity production of about 900 tons per day in mid-1987, at which time lead production should approach 2,400 tons per year; zinc, 15,500 tons; and silver, 1,200,000 troy ounces.

The Fundición de Concentrados S.A. (Fundeconsa) $3 million lead smelter in Sayan began initial testing in September and was expected to begin actual production by yearend. Until 1989, feedstock was to consist mostly of lead-silver concentrate processed under a toll agreement with Minpeco. The plant's capacity was increased to 17,000 tons of lead per year, 3.3 million troy ounces of refined silver in bars, and 8,400 troy ounces of gold.

The Cajamarquilla zinc refinery produced 96,045 tons of zinc, as well as 1,741 tons of copper cement, 249 tons of cadmium, lead-silver residues, and 174,645 tons of sulfuric acid. These increases over 1985 production were despite labor problems and electric power interruptions caused by terrorist attacks.

Minero Perú undertook several studies

for projects to be developed at the Cajamarquilla refinery. One study involved using a centrifuge to increase the silver content of the lead-silver residuals. Minero Perú was also considering the construction of a plant to treat 300,000 tons of jarosite scrap in storage at the Cajamarquilla refinery. The jarosite would be used to produce cadmium- and selenium-based pigments for industrial use. The $200,000 plant would produce about 54 tons of pigments per year, or slightly more than import requirements.

San Ignacio de Morococha S.A., the largest private zinc producer, received financing from the U.S. International Development Agency for a $550,000 technical and economic feasibility study by Fluor Engineers Inc. on the planned zinc refinery project near its San Vicente Mine at San Ramon in the Chanchamayo Valley. If favorable, the estimated $107 million integral development program would be financed through the International Finance Corp. The company continued with the $16 million expansion of its San Vicente Mine from 800 tons to 3,000 tons per day. By the end of 1986, concentrator plant capacity had reached 2,200 tons per day.

St. Joe International Corp. sold its interest in Cía. Minera del Madrigal S.A. and Cía. Minerales Santander Inc. to a U.S., West German, and Peruvian group called Docarb S.A. St. Joe had scheduled the Madrigal Mine for closure because of reduced reserves. Production figures were not reported for the Madrigal Mine during the latter part of 1986. The mine reportedly closed in May for repairs and exploration, and then reopened on a trial basis toward the end of 1986. Santander, Peru's sixth largest zinc producer, was one of the few medium-sized zinc companies whose production decreased in 1986. An exploration program at the Santander concession found new reserves in areas near the concentrator.

The Izcay Cruz copper-lead-zinc deposit at Oyon, Cajatambo Province, Lima Department, was under active exploration by the Instituto Geológico Minero y Metalúrgico and the Japanese International Cooperation Agency. The Izcay Cruz project was then assigned to Minero Perú, and it obtained $1.5 million in financing from Cofide to continue explorations and conduct a feasibility study. It was estimated that the development cost for the mine and a 1,000-ton-per-day concentrator plant would be $38 million, and the project could be brought on-stream by 1989. Concentrates would be sent to Minero Perú's Cajamarquilla zinc refinery. Ore reserves were estimated at 3.3 million tons averaging 19% zinc, 1.95% lead, and 1.5 troy ounces of silver per ton.

Manganese.—Ceaco S.A. mined a manganese deposit north of Lima in Ancash Department. Operational problems in the mine caused production to decrease in 1986. Most of the output was sold to the Cajamarquilla zinc refinery, and a small amount was used as a microelement in the preparation of bird feed.

Molybdenum.—Tintaya undertook a basic engineering study on a project to construct a molybdenum concentrate plant at the Tintaya copper mine in Cuzco Department. The study should be concluded by July 1987, and if it confirms the recoverable molybdenite content calculated in 1986 for Tintaya, the plant could be operational early in 1988. SPCC, the only molybdenite producer operating in Peru in 1986, assisted in the technical aspects of the project.

Silver.—Because of strike activity, refined silver production by Centromín Perú at La Oroya dropped 15% from that of 1985 to 19.5 million troy ounces. At Centromín Perú's own mining units, silver contained in concentrates only decreased slightly from that of 1985 to slightly more than 13 million troy ounces. By the end of 1987, Peru's refined silver capacity could increase to 30.5 million troy ounces owing to almost 3.3 million troy ounces of capacity at the Fundeconsa lead smelter and about 1.4 million troy ounces of capacity at Minero Perú's anode slimes plant at Ilo. Centromín Perú's Andaychagua project at the San Cristobal mining unit should be operating at its 900-ton-per-day capacity by mid-1987. This unit was expected to add 1.2 million troy ounces of silver to Centromín Perú's total silver production.

The expansion projects of other silver producers, such as at Cía. Minera Volcán S.A., Cía. Minera Huarón S.A., Cía. Minera Santa Luisa S.A., and Cía. de Minas Orcopampa S.A., and the discovery of new reserves at Cía. de Minas Buenaventura S.A.'s Uchucchacua Mine, were expected to maintain the growth trend in Peru's silver production. Buenaventura contracted for a prefeasibility study on leaching concentrates from its own mines and from Orcopampa to produce silver and gold bars.

The contribution by the large-sized mining sector to total silver production dropped to 28% in 1986, a slight decrease from that

of 1985. Gains and losses recorded by various members of the medium-sized mining sector balanced out and kept them at about the same 59% contribution to total production made in 1985. The small-sized mining sector increased its share of total silver production slightly to 13%.

Despite a 6% drop in output from that of 1985, Buenaventura remained the largest private producer of silver with 5.35 million troy ounces, followed by Cía. Minera Arcata S.A. where output increased by 13% over that of 1985 to about 3.99 million troy ounces. Orcopampa, a Buenaventura subsidiary, showed a 33% gain over that of 1985 with 3.76 million troy ounces produced. Cía. Minera Huarón had a 16% gain over that of 1985 to 3.12 million troy ounces owing to the mining of higher grade ore. Cía. Minera Milpo S.A., with production at 2.6 million troy ounces, almost equaled its 1985 level, but SPCC dropped 9% below that of 1985 to about 2.56 million troy ounces. Corp. Minera Nor Peru S.A. estimated a 22% increase over 1985 levels as silver production reached 2.52 million troy ounces, primarily because of higher ore grades.

If all of Tintaya's copper concentrate is amenable to smelting and refining at the Ilo facilities, an estimated 300,000 troy ounces of contained silver per year would be refined out instead of sold in the concentrate at a lesser value.

Tin.—In mid-1986, Minsur S.A. agreed to have a portion of its tin concentrates toll refined by the Associated Metals & Minerals Co. smelter at Texas City, Texas. The agreement expires in March 1987. Minsur, Peru's only tin producer, employs about 80 workers at its San Rafael underground mine in Melgar Province, Puno Department. In 1986, output averaged more than 800 tons per month of concentrate averaging 42% to 44% tin. Minsur also has an agreement for toll refining at RTZ's Capper Pass smelter in the United Kingdom. Both the Texas City and Capper Pass smelters wanted an increased share of the concentrate. Minsur had long-range plans under study for building its own smelter.

Tungsten.—A sharp drop in tungsten prices motivated Fermin Málaga Santolalla e Hijos Negociacion Minera S.A. to restrict active mining operations to the higher grade sections of the Málaga and Pasto Bueno Mines in Ancash Department. During the first 6 months of 1986, the company endured a prolonged strike over increased wages. The company canceled its project to double treatment capacity to 1,000 tons of ore per day at Pasto Bueno. By yearend, the company, still suffering from labor problems and low prices, requested permission for a temporary cessation of all mining pending improved market conditions. Authorization was granted to stop operations for 1 year starting January 1, 1987.

Tungsten production by company was as follows, in metric tons of WO_3 content:

	1983	1984	1985	1986
Málaga Santolalla	475	533	590	428
Sociedad Minera Anonima Regina S.A.	196	263	360	276
Sociedad Minera Puquio Cocha S.A.	83	69	60	35
Centromín Perú	158	88	87	9
Total	912	953	1,097	748

INDUSTRIAL MINERALS

Fletcher Challenge Ltd. of New Zealand reportedly agreed to invest $16 million toward the construction of infrastructure for the joint mining venture at Minero Perú's Area 1 concession in the Bayóvar phosphate deposits in Sechura. The 400,000-ton-per-year mining project cost was estimated at $58 million, with the investment to be spread over a 3-year period. A pilot plant has been operating in this area for several years. Minero Perú did not mine phosphate rock in 1986 but used stockpiled material to accommodate domestic sales.

Meanwhile, Empresa Promotora de Bayóvar S.A. (Probayóvar) sought to be transformed into a regional mining company called Empresa Minera Regional Bayóvar S.A., with main offices in Piura. Probayóvar's objective was to exploit the phosphate deposits by transferring to the new company Minero Perú's special rights to the deposit, including Area 1. Minero Perú, the principal shareholder of Probayóvar, had earlier sought to dissolve the phosphate promotion company. Probayóvar officials did not believe Minero Perú's Area 1 project was viable or compatible with its own plans to develop a 1.5-million-ton-per-year project with Norsk Hydro A/S and Société des Charbonnages de la Luena, or others.

MINERAL FUELS

Occidental Petroleum Corp. began development drilling under the new risk services contract in its combined Block 1-AB. The first well, Shiviyacu 20 near the Ecuadorean border, began test production in late

September at 11,200 barrels per day of 240 API gravity crude oil. It formed an important development extension to the Shiviyacu Field that was first discovered in 1973. The Shiviyacu 21 development well was expected to be completed in January 1987. Occidental began drilling an exploratory well, the Carmen Central 5, in Block 1-AB in September 1986. In December, this wildcat tested at the rate of 4,150 barrels per day. Neither of Occidental's Shiviyacu 20 nor Carmen Central 5 wells were expected to sustain their rates of initial production. Occidental also began preliminary exploration studies in Block 36 and started to survey as yet unassigned jungle blocks should initial exploration in Block 36 find further investment unjustified. Some areas in the eastern foothills of the Andes Mountains appeared to be similar to those where the Llanos and Cano Limon crude oil discoveries were made in Colombia. Unresolved issues, such as the fee scale Petróleos del Perú (Petroperú) would pay Occidental for any oil produced, may delay seismic work on Block 36. This fee negotiation process awaited Government approval of the new hydrocarbons law.

The Petroperú subsidiary, Petróleos del Mar S.A., drilled a successful well offshore of Talara on the northern coast in the Lobitos area. The well, the LO-13, was reported to have an initial production of as much as 13,000 barrels per day of 34° API gravity crude oil. A broken pipe and collapsed casing caused problems at first, but after repairs, production was expected to stabilize at about 4,500 barrels per day.

Phillips Petroleum Co. withdrew from its 30% participation in the Cía. Exploradora y Productora Shell del Perú BV exploration venture in Blocks 38 and 42 in the central southern jungle. Because Phillips' withdrawal placed Shell's concessions over the allowable legislated maximum acreage, the company expected to reduce concession size in Blocks 49 and 51. Shell continued to find natural gas in the wildcats it drilled in Block 42. In December, the Cashiari well in the Ucayali Basin tested between 20 million and 30 million cubic feet of natural gas and 600 barrels to 900 barrels of condensate per day. Shell planned other wells in the same structure. The company expected to do step-out drilling because of a postulated oil rim around the gas-condensate structure. Shell's 30-year risk exploration-development contract with Peru only concerns crude oil discoveries, with a proviso for further negotiations on gas development terms. The ultimate commercial development possibilities were unresolved at year-end.

Even though proven crude oil reserves were estimated as low as 510 million barrels at the end of 1986, the results of drilling by Occidental, Petromar, and Shell were encouraging, and Peru expected that the falling level of reserves would at last begin to reverse as these new discoveries were further defined and evaluated.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Peruvian intis (I/) to U.S. dollars at the official rate of I/13.91=US$1.00. During 1986, the financial rate of exchange was I/17.40=US$1.00. Beginning in January 1987, both the official and financial rates were subject to increase at the rate of 2.2% per month.

[3]The Andean Report, Andean Air Mail and Peruvian Times (Lima). V. 14, No. 1, Jan. 1987, pp. 8-10.

[4]Oficina General de Estadistica, Ministerio de Energía y Minas. Anuario de la Ministerio del Peru, 1977-85. Lima, Peru, 1986, 167 tables.

The Mineral Industry of the Philippines

By John C. Wu[1]

The mineral industry continued to suffer from low metal prices and weak world demand for most minerals produced in the Philippines. However, gold production reached a record-high level in 1986 owing to increased production of primary gold producers and small-scale gold panners induced by improvement in the gold price during the second half of 1986. Chromite, copper, and nickel mining remained depressed because of low metal prices, lack of operating capital, and mounting corporate debt. During 1986, Batong Buhay Gold Mines Inc., one of the major copper producers, and Nonoc Mining and Industrial Corp. (NMIC), the largest nickel producer, suspended operations because of financial difficulties. Malayan Wood Products Inc., one of the major chromite producers, also suspended operations for an unspecified reason.

According to industry sources, during 1984-86, most major mining companies posted declining sales and suffered greater losses. Philex Mining Corp. was the only financially sound and consistently profit-making copper producer in the Philippines owing to its efficient operations, good management, and high gold content of its copper ore. Philex Mining was undertaking a $14.8 million[2] expansion project to raise the milling capacity to 32,000 tons per day of ore at its Santo Tomas Mine in Tuba, Benguet. On the contrary, Atlas Consolidated Mining and Development Corp., the largest copper producer, continuously suffered from low copper prices and high production costs because of high interest charges on heavy debt. Atlas was negotiating with Bond Corp. Holdings Ltd. of Australia for equity participation and other financial aids.

Benguet Corp., the largest gold producer, which suffered losses in 1985, improved its earnings in 1986 because of increased gold prices and gold production from its Dizon Mine. Benguet Corp. was undertaking a $20 million gold development project at its Paracale gold property in Jose Panganiban, Camarines Norte. Two gold projects were completed by the South Seas Natural Resources Inc. in Sison, Surigao del Norte, and by Benguet Exploration Inc. in Pantukan, Davao del Norte. NMIC suspended its Surigao nickel operation on Nonoc Island in March and was unable to resume operations because of labor disputes and lack of fresh capital.

Table 1.—Philippines: Financial performance of major metal mining companies

(Million U.S. dollars)

Company	Revenues		Net income		Major products
	1984	1985	1984	1985	
Atlas Consolidated Mining and Development Corp	253.9	144.2	-41.7	-82.6	Copper and gold.
Benquet Corp	166.2	138.5	8.5	-6.9	Copper, gold, chromite.
Philex Mining Corp	84.3	83.5	17.8	18.1	Copper and gold.
Marcopper Mining Corp	41.2	37.8	-6.8	-10.1	Do.
Lepanto Consolidated Mining Co. Inc	55.3	35.9	4.9	.5	Do.
North Davao Mining Corp	40.1	23.6	-92.3	-74.6	Do.
Rio Tuba Nickel Mining Corp	10.5	12.2	1.3	-.2	Nickel.
Surigao Consolidated Mining Co	6.2	11.7	.2	.3	Gold.
Apex Mining Co. Inc	11.8	10.1	1.3	.6	Do.
Benguet Exploration Inc	5.8	7.7	.5	.02	Copper and gold.
Acoje Mining Co. Inc	7.6	6.7	-.2	-1.3	Chromite.
Itogon-Suyoc Mines Inc	4.7	4.5	.2	-.05	Gold.
Hinatuan Mining Corp	3.1	3.3	-.3	.1	Nickel.
Manila Mining Corp	2.1	3.1	-.9	-.2	Gold.

Source: American Metal Market. V. 94, No. 136, July 15, 1986, p. 5.

In the mineral processing sector, production of refined copper by the Philippine Associated Smelting and Refining Corp. (PASAR) at Isabel, Leyte, was near full capacity. However, PASAR experienced cash-flow problems owing to reduced smelting charges to the local copper producers and difficulties in marketing its copper cathodes in the world market. PASAR was seeking an overseas toll smelting contract but no contract agreement was reached by yearend. Production of ferrochromium by Ferrochrome Philippines Inc. at Tagoloan in northern Mindanao rose to a new record-high level. Most ferrochromium was marketed successfully to Japan, the United States, and other Asian countries. The Philippine cement industry contracted its operating capacity by closing the plants of five companies resulting from low domestic and overseas demand. Following the Government's new policy of privatizing the state-owned enterprises, the Government equity ownership in Philippines Phosphate Fertilizer Corp. (Philphos) would be reduced to 40% from 60% while the Government of Nauru reportedly had agreed to hold 60%. In April, a $25 million joint venture agreement was reached between International Consultex Inc. of the Philippines and Sulfex Corp. of the United States to produce high-grade sulfur in Iba, Zambales.

In the mineral fuels sector, coal production rose slightly, but coal demand dropped considerably because of reduced consumption by the cement industry. The Government banned imports of coal during the last quarter of 1986 to protect the local coal miners. Output of crude petroleum dropped to under 7,000 barrels per day. To reduce operating costs and prolong production, Alcorn International Inc., the operator of Nido Oilfield, acquired two other oilfields and was to spend $5 million for construction of a pipeline to connect the Cadlao and Matinloc Oilfields offshore Palawan Island.

According to the Philippine Ministry of Trade and Industry, the Government approved a plan to sell 30 state-owned companies to the private sector. Of the 30 companies controlled by the Government through the state-owned National Development Corp. (NDC), 2 companies in the mineral industry were in-line for privatization. NDC owned 60% of PASAR and 60% of Philphos. In April, NDC had agreed to reduce its ownership in Philphos to 40%. Further sale of ownership of both companies to the private sector through the stock market was expected in coming years.

According to the National Economic and Development Authority (NEDA), the Philippine economy, as measured by a real change in gross domestic product (GDP), was estimated to have grown 0.18% in 1986 compared with a negative growth rate of 4% (revised) in 1985. In 1986, the agricultural sector posted a real growth rate of 3.3% while the industrial sector registered a negative growth rate of 3.7%. The overall drop in the output of the industrial sector was caused by a 28.3% decline in the output of the construction industry and a 9.6% drop in the output of the mining and quarrying industry. However, the manufacturing industry managed to record a

1.2% growth in its output owing to increased production of textiles, electrical machinery, footwear, garments, and paper products. The output of the mining and quarrying industry was estimated at $78.7 million in 1972 constant dollars and accounted for 1.8% of the Philippine GDP in 1972 constant dollars, which was estimated at $4.5 billion in 1986. In 1986 dollars, the output of the mining and quarry industry and the country's GDP was estimated at $615.7 million and $30.5 billion, respectively.

Merchandise export earnings rose 4.6% to $4.8 billion while merchandise imports dropped 1.3% to $5.0 billion. As a result, the Philippine merchandise trade deficit improved from $482 million to $203 million. However, the country's total external debt increased to $26.5 billion and its annual debt-service ratio (principal and interest payments as a percent of export and service receipts), after rescheduling was 36.8% at the end of June 1986. According to Philippine Government statistics, inflation, as measured by the change in the Consumer Price Index, was reduced to 1.5% compared with 23.1% (revised) in 1985 and 50.3% (revised) in 1984. The unemployment rate rose from 6.5% in 1985 to 11.8% in 1986 reflecting 2.6 million umemployed in a labor force of 21.8 million. Of the unemployed persons, 59% reportedly were in the country's urban areas.[3]

Government Policies and Programs.— Under the new Philippine Government, the Philippines Bureau of Mines and Geo-Sciences (BOMG) and the Chamber of Mines of the Philippines were to jointly draft mining laws and regulations to replace the country's previous laws and regulations scattered in Commonwealth Acts, Republic Acts, Presidential decrees, executive orders, and letters of instructions. Under a reorganization plan, BOMG was to be separated into two agencies, the Bureau of Mines and the Bureau of Geological Survey. The previous functions of the Bureau regarding the administration of mineral lands and regulations of the mining industry would be transferred to 12 regional and 74 Provincial offices.[4]

PRODUCTION

Philippine production of most minerals continued to decline except for gold. Because of higher gold prices and increased production by small-scale gold panners, Philippine gold production reached a new record-high level of 1.3 million troy ounces in 1986. Mine production of chromite, nickel, silver, and other metallic minerals was at a lower level than that of 1985 owing to low metal prices and the poor financial health of most major mining companies. The sharp decline in nickel production was a direct result of a 10-month shutdown of the Surigao nickel operations on Nonoc Island by NMIC because of labor disputes and lack of funds for operation. Mine production of industrial minerals was also at a lower level than that of 1985 owing to a further slowdown in construction activity and the country's poor economic condition.

In mineral processing, production of ferrochromium by Ferrochrome Philippines reached another record high owing to increased overseas demand while production of refined copper by PASAR also reached a new record-high level at near capacity. However, production of cement continued to increase slightly because of further cutbacks in the Government construction expenditures and private housing projects. During 1985-86, five cement companies were forced to shut down their plants resulting from weak demand for cement and cash-flow problems.

In the mineral fuels sector, coal production was below the planned output target owing to a considerable decline in demand for coal by the cement and metal smelting industries. The output of crude petroleum from the three existing oilfields dropped further to 6,850 barrels per day compared with 7,918 barrels per day in 1985.

Table 2.—Philippines: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Arsenic: White (equivalent of arsenic acid)[e]	--	--	--	5,000	5,000
Chromium: Chromite, gross weight:					
Metallurgical-grade	142,186	136,347	123,015	122,359	[3]85,271
Chemical-grade	--	--	5,369	15,038	[3]16,109
Refractory-grade	179,680	130,562	132,505	134,634	[3]72,850
Total	321,866	266,909	260,889	272,031	174,230
Cobalt, mine output, Co content	466	165	64	911	[3]92
Copper:					
Mine output, Cu content	292,086	271,403	233,359	226,157	[3]222,644
Metal, primary	--	38,800	99,230	130,227	[3]134,547
Gold, mine output, Au content troy ounces	834,431	816,536	827,149	1,062,997	[3]1,296,367
Iron and steel:					
Iron ore and concentrate thousand tons	6	3	--	--	--
Ferroalloys:					
Electric-furnace ferrosilicon[e]	29,000	20,000	18,400	20,000	20,000
Electric-furnace ferrochromium	[e]12,000	26,901	48,049	50,815	55,000
Steel, crude thousand tons	350	200	250	250	[3]250
Manganese ore and concentrate, gross weight	1,556	2,242	615	387	[3]232
Molybdenum, mine output, Mo content	80	40	--	--	--
Nickel:					
Mine output, Ni content	19,634	13,900	13,601	28,158	[3]12,790
Metal, smelter	11,223	6,097	3,528	16,993	[3]1,153
Silver, mine output, Ag content thousand troy ounces	1,984	1,823	1,574	1,685	[3]1,677
Zinc, mine output, Zn content	3,003	2,275	2,189	1,880	[3]1,573
INDUSTRIAL MINERALS					
Barite	8,697	1,201	581	--	--
Cement, hydraulic thousand tons	4,350	4,383	3,651	3,080	[3]3,457
Clays:					
Bentonite	4,671	670	38,249	24,971	20,000
Red	400	532	200	([4])	300
White	6,632	19,990	8,618	6,093	7,000
Rock	390	--	--	--	--
Other	579,229	397,903	372,111	344,921	350,000
Feldspar	15,213	6,524	11,486	5,412	6,000
Gypsum and anhydrite:					
Natural	202	500	600	300	200
Synthetic[e]	110,000	110,000	112,000	112,000	112,000
Lime	66,349	50,675	50,711	47,427	45,000
Magnesite	--	620	625	676	650
Nitrogen: N content of ammonia	14,800	20,300	16,200	[r e]17,000	17,000
Perlite	3,582	2,020	15,641	3,883	3,500
Phosphate:					
Guano	15,259	610	552	1,229	1,000
Phosphate rock	5,944	4,135	7,488	6,392	6,000
Pyrite and pyrrhotite (including cuprous) gross weight	64,555	62,864	82,806	167,337	[3]244,023
Salt, marine	364,420	381,912	401,008	421,058	[3]785,354
Sand and gravel:					
Alumina sand	65,213	--	--	--	--
Silica sand thousand tons	480	408	432	317	400
Other[5] thousand cubic meters	14,902	15,132	14,695	11,235	13,000
Stone:					
Andesite	334,915	--	--	--	--
Basalt cubic meters	737,365	--	--	--	--
Dacite	54,555	32,448	--	--	--
Diorite	56,215	47,895	--	--	--
Dolomite	353,342	336,043	368,052	362,101	360,000
Limestone[6] thousand tons	7,208	6,686	4,074	3,521	4,000
Marble (dimension), unfinished cubic meters	6,797	6,117	4,919	4,010	5,000
Volcanic cinder do.	1,100	482	--	6,630	1,000
Sandstone	32,616	47,234	5,340	([4])	--
Serpentine	515	--	--	--	--
Tuff	81,008	117,772	29,269	19,505	20,000
Quartz	84,866	74,515	79,536	93,735	80,000
Crushed, broken, other[7] thousand cubic meters	1,031	1,857	600	701	1,000
Sulfur: S content of pyrite	30,018	29,232	38,505	77,812	78,000
Talc	1,008	878	927	345	1,000

See footnotes at end of table.

Table 2.—Philippines: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
MINERAL FUELS AND RELATED MATERIALS					
Coal, all grades	556,755	1,019,594	1,216,388	1,257,881	[3]1,128,449
Petroleum:					
Crude ------ thousand 42-gallon barrels	3,000	4,654	3,890	3,285	[3]2,190
Refinery products:					
Gasoline ------ do	9,242	9,349	8,124	[e]9,000	9,200
Jet fuel ------ do	2,858	3,007	3,322	[e]3,000	3,000
Kerosene ------ do	3,142	3,441	2,382	[e]2,500	2,700
Distillate fuel oil ------ do	16,362	17,540	17,027	[e]17,000	17,300
Residual fuel oil ------ do	24,462	21,670	18,544	[e]19,000	20,000
Other ------ do	8,737	5,097	4,027	[e]4,500	4,800
Refinery fuel and losses ------ do	3,197	14,555	NA	NA	NA
Total ------ do	68,000	74,659	53,426	[e]55,000	57,000

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

[1]Table includes data available through June 23, 1987.

[2]In addition to the commodities listed, the Philippines produces platinum-group metals as byproducts of other metals, but output is not reported quantitatively, and no basis is available to make reliable estimates of output levels.

[3]Reported figure.

[4]Revised to zero.

[5]Includes "pebbles" and "soil" not further described.

[6]Excludes limestone for road construction. Reported figures are as follows, in cubic meters: 1982—30,697; 1983—84,742; 1984—17,722; 1985—1,914; and 1986—not available.

[7]Includes materials described as rock, crushed or broken; stones, cobbles, and boulders; rock aggregates; and broken adobe.

TRADE

According to Foreign Trade Statistics published by the Philippine National Census and Statistics Office, the Philippine merchandise trade deficit improved to $203 million from $482 million in 1985 owing to a 4.6% increase in exports and a 1.3% decline in imports. Total merchandise exports increased to $4.8 billion from $4.6 billion in 1985. The increased exports of garments and textiles by 21% contributed most to the overall increase in exports. However, most other export commodities including mineral products posted small declines. Total imports decreased to $5.0 billion from $5.1 billion in 1985 despite a 9% increase in capital goods and a 24% increase in raw and intermediate goods. The decline in total imports was caused mainly by a 44% drop in import bills of crude petroleum and petroleum products, that were valued at $792 million compared with $1.4 billion in 1985. Imports of consumer goods also posted an 11% drop from $393 million in 1985.

According to BOMG, the values of Philippine mineral exports in 1985 were as follows, in million U.S. dollars: refined copper, 187; copper concentrate, 114.5; gold, 75.1; nickel, 69; cobalt, 16.3; chromite ore and concentrate, 14.1; nickel ore, 14.0; cement, 4.2; silver, 3.8; dolomite, 1.8; and zinc concentrate, 0.8. Copper concentrate and gold and silver contained in copper concentrate were exported principally to Japan, the Republic of Korea, Taiwan, and Switzerland; cobalt to Japan; nickel metal to Japan, the Netherlands, and the United States; refined copper to China, Italy, Japan, and Taiwan; metallurgical-grade chromite to Japan; chemical-grade chromite to the Federal Republic of Germany; refractory-grade chromite to Canada, Japan, and the United States; nickel ore, zinc concentrate, and dolomite to Japan; and cement to Bangladesh and India.

In 1986, imports of mineral fuels and lubricants totaled $871 million accounting for 17% of total imports. China, Kuwait, Malaysia, and Saudi Arabia remained the principal suppliers of imported crude petroleum while Australia was the dominant supplier of coal to the Philippines. Japan and the United States were the major trade partners of the Philippines. According to the latest statistics published by the Central Bank of the Philippines, the United States accounted for 35.7% of Philippine merchandise exports and 25.1% of Philippine imports, followed by Japan accounting for 18.9% of Philippine exports and 14.4% of imports.

Table 3.—Philippines: Exports and reexports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1895	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	388	28	3	Japan 22.
Arsenic: Oxides and acids	197	1,449	207	Malaysia 586; Australia 563.
Chromium: Ore and concentrate	244,028	159,435	37,373	Japan 64,370; China 14,257.
Copper:				
Ore and concentrate	450,438	344,201	--	Japan 277,499; Republic of Korea 26,112; Taiwan 17,956.
Matte and speiss including cement copper	33	7,004	--	All to Japan.
Metal including alloys:				
Scrap	9,313	6,915	20	Republic of Korea 3,300; Japan 2,205.
Unwrought	80,631	129,901	--	Japan 56,390; Taiwan 23,431; Republic of Korea 14,838.
Semimanufactures	2,216	2,797	--	Singapore 1,110; Hong Kong 871; Taiwan 487.
Gold: Metal contained in copper concentrates ---troy ounces	295,453	322,808	--	Japan 201,516; France 47,458; West Germany 35,939.
Iron and steel:				
Iron ore and concentrate, pyrite, roasted	13,709	11,751	--	Taiwan 9,792; Japan 1,959.
Metal:				
Scrap	844	952	--	Japan 943.
Ferroalloys:				
Ferromanganese	25	--	--	All to Malaysia.
Ferrosilicon	20,856	22,428	--	Japan 20,211.
Unspecified	45,389	50,379	5,800	Japan 34,425; Australia 3,862; Sweden 3,000.
Semimanufactures:				
Bars, rods, angles, shapes, sections	1	84	34	Singapore 21.
Universals, plates, sheets	14	118	--	Australia 113.
Hoop and strip	43	(2)	--	All to Thailand.
Tubes, pipes, fittings	239	3,249	3,099	Australia 82.
Castings and forgings, rough	733	497	235	Australia 209.
Nickel:				
Ore and concentrate	527,205	616,455	--	All to Japan.
Metal including alloys:				
Scrap	69	--		
Unwrought	2,344	11,284	984	Switzerland 4,400; Netherlands 4,135; Japan 1,280.
Semimanufactures	608	2,652	852	Japan 1,800.
Silver: Metal including alloys, unwrought and partly wrought ---troy ounces	95,563	494,348	16,675	France 191,974; West Germany 126,669; Hong Kong 76,193.
Zinc:				
Ore and concentrate	5,258	4,487	--	All to Japan.
Metal including alloys, all forms	123	9	6	United Kingdom 3.
INDUSTRIAL MINERALS				
Cement	125,166	370,828	--	Bangladesh 255,290; China 93,768.
Clays, crude	18,057	40,901	--	Mainly to Malaysia.
Diamond: Industrial stones--- carats	8,494	--		
Feldspar, fluorspar, related materials	--	536	--	All to Taiwan.
Fertilizer materials:				
Crude, n.e.s	2,084	1,627	--	Japan 918; Taiwan 654.
Manufactured:				
Nitrogenous	4,537	3,170	--	Indonesia 1,653; Thailand 1,100.
Phosphatic	--	158,304	--	Thailand 59,344; Iran 30,750; China 29,210.
Unspecified and mixed	279	31,004	--	China 20,537; Thailand 10,450.
Salt and brine	242	(2)	(2)	Canada (2).

See footnotes at end of table.

Table 3.—Philippines: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1895	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	4,481	4,161	28	Japan 3,623; Taiwan 407.
Worked	4,587	3,345	890	Japan 1,006; Australia 400.
Dolomite, chiefly refractory-grade	354,466	327,230	--	All to Japan.
Gravel and crushed rock	7,221	12,668	--	Japan 9,032; Hong Kong 2,945.
Limestone other than dimension	1,700	3,750	--	All to Malaysia.
Sand other than metal-bearing	2,436	2,113	624	Japan 501; Hong Kong 263.
Sulfur: Sulfuric acid	151,529	20,214	--	Thailand 2,731; unspecified 17,483.
Other:				
Crude	6,713	233	--	India 215.
Slag and dross, not metal-bearing	2,683	1,222	--	Japan 1,097.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	886	1,372	--	Thailand 903; Indonesia 268; Taiwan 162.
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	303,305	655,504	--	Hong Kong 572,240; Malaysia 54,207.
Gasoline do	343,794	--		
Naphtha including white spirit do	957,364	580,644	--	Japan 456,790; Singapore 123,854.
Kerosene and jet fuel do	557,985	--		
Distillate fuel oil do	25,573	--		
Lubricants do	17,822	10,333	20	Republic of Korea 3,956; Thailand 1,630; Singapore 1,167.
Residual fuel oil do	252,434	--		

[1]Table prepared by Audrey D. Wilkes.
[2]Less than 1/2 unit.

Table 4.—Philippines: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals kilograms	630	3,463	--	Mainly from United Kingdom.
Aluminum:				
Ore and concentrate	3,953	5,005	6	Malaysia 4,953.
Oxides and hydroxides	2,766	3,532	345	Japan 2,271; United Kingdom 522.
Metal including alloys:				
Scrap	19	144	--	Hong Kong 131.
Unwrought	6,613	4,881	613	Iceland 1,116; Australia 1,065.
Semimanufactures	7,355	6,419	74	Japan 1,628; Republic of Korea 1,444; Norway 1,249.
Arsenic: Oxides and acids	118	14	--	United Kingdom 10.
Chromium:				
Ore and concentrate	24,410	29,947	--	Zimbabwe 11,552; Turkey 11,000.
Oxides and hydroxides	47	76	10	West Germany 35; Italy 18.
Copper:				
Sulfate	147	95	--	Taiwan 54; United Kingdom 22.
Metal including alloys:				
Unwrought	151	5	2	Japan 3.
Semimanufactures	2,489	2,615	299	Japan 1,332; France 332.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	9,939	8,583	5,107	West Germany 2,860.

See footnotes at end of table.

Table 4.—Philippines: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel: Metal:				
Scrap	1,568	751	399	West Germany 352.
Pig iron, cast iron, related materials	516	329	20	Sweden 186; Japan 95.
Ferroalloys:				
Ferromanganese	894	591	--	France 428.
Unspecified	452	68	1	Netherlands 18; United Kingdom 16; Japan 12.
Steel, primary forms	351,818	238,542	--	Republic of Korea 125,425; Brazil 61,737.
Semimanufactures:				
Bars, rods, angles, shapes, sections	28,944	35,944	84	Japan 18,366; Taiwan 13,553.
Universals, plates, sheets	161,962	97,058	612	Japan 92,288.
Hoop and strip	4,854	4,403	214	Japan 3,954.
Rails and accessories	1,198	1,301	(2)	Japan 795; Australia 250; United Kingdom 235.
Wire	6,979	5,981	83	Republic of Korea 2,283; Japan 1,984.
Tubes, pipes, fittings	8,667	13,518	322	Japan 9,934; Republic of Korea 1,493.
Lead:				
Oxides	47	12	3	Australia 8.
Metal including alloys:				
Scrap	--	3,600	--	Mainly from Australia.
Unwrought	2,756	2,984	45	Australia 2,127.
Semimanufactures	246	189	(2)	Australia 106; Japan 32.
Magnesium: Metal including alloys, all forms	12	69	13	Japan 56.
Manganese:				
Ore and concentrate: Metallurgical-grade	3,438	2,669	--	Singapore 2,451.
Oxides	912	916	--	Japan 784; Belgium-Luxembourg 46.
Mercury 76-pound flasks	489	886	5	Hong Kong 331; China 238; Japan 195.
Molybdenum:				
Ore and concentrate	11	--		
Metal including alloys, all forms	20	20	1	Spain 19.
Nickel: Metal including alloys:				
Unwrought	12	28	3	Japan 18.
Semimanufactures	33	160	2	Japan 129.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	436,073	801	800	West Germany 1.
Silver: Metal including alloys, unwrought and partly wrought do	20,336	1,291	1,128	United Kingdom 162.
Tin:				
Oxides kilograms	300	95	--	All from Singapore.
Metal including alloys, all forms	693	362	1	Indonesia 325.
Titanium:				
Ore and concentrate	713	487	--	Australia 453.
Oxides	1,409	794	64	Australia 225; Japan 175; United Kingdom 130.
Tungsten: Metal including alloys, all forms	4	11	1	Belgium-Luxembourg 10.
Uranium and/or thorium: Oxides and other compounds kilograms	2,001	500	--	All from Japan.
Zinc:				
Oxides	659	399	20	Taiwan 156; Hong Kong 44; Australia 43.
Blue powder	215	189	151	Australia 37.
Metal including alloys:				
Scrap	1	--		
Unwrought	17,933	13,000	291	Japan 7,183; Canada 2,790; Australia 2,401.
Semimanufactures	106	31	24	Japan 4.
Zirconium: Ore and concentrate	241	22	--	All from Japan.
Other: Ashes and residues	63,238	79,791	91	Japan 79,687.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	653	338	17	China 175; Netherlands 127.
Artificial:				
Corundum	68	27	--	Austria 18; Japan 9.
Silicon carbide	89	126	10	Hong Kong 91; West Germany 18.
Dust and powder of precious and semi-precious stones including diamond kilograms	1	(2)	--	All from West Germany.
Grinding and polishing wheels and stones	472	520	9	Hong Kong 175; Japan 68; West Germany 58.

See footnotes at end of table.

Table 4.—Philippines: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Asbestos, crude	1,663	1,190	164	Canada 1,014.
Barite and witherite	44	1,247	17	Singapore 1,184.
Boron materials: Oxides and acids	359	124	53	France 50.
Cement	1,267	736	715	France 18.
Chalk	20	31	--	West Germany 22.
Clays, crude	18,447	19,924	7,442	Thailand 2,650; Japan 2,106; Taiwan 2,043.
Diamond: Industrial stones:				
Natural carats	150,867	178,802	--	Belgium-Luxembourg 173,047.
Synthetic do	3,500	--		
Diatomite and other infusorial earth	473	148	47	Japan 100.
Feldspar, fluorspar, related materials	2,667	1,633	68	India 472; Thailand 428; Japan 225.
Fertilizer materials: Manufactured:				
Ammonia	34,704	184,311	34,986	Indonesia 67,104; U.S.S.R. 49,334.
Nitrogenous	378,461	377,141	185,910	Indonesia 106,441; Republic of Korea 53,820.
Phosphatic	15,087	4,196	1,626	Republic of Korea 1,500.
Potassic	51,414	58,268	12,313	Japan 25,862; Canada 13,642; West Germany 4,040.
Unspecified and mixed	141,975	206,909	2	Republic of Korea 202,718.
Graphite, natural	199	73	--	Taiwan 44; Republic of Korea 17.
Gypsum and plaster	71,866	130,627	120	Japan 76,389; Thailand 48,425.
Lime	270	330	255	United Kingdom 75.
Magnesium compounds: Magnesite, crude and calcined	6,039	5,651	16	China 2,757; Japan 2,640.
Mica, all forms	75	31	15	Japan 7; India 2.
Phosphates, crude	13,574	306,130	--	Nauru 204,161; Morocco 99,994.
Pigments, mineral:				
Natural, crude	2,103	1,843	30	India 1,159.
Iron oxides and hydroxides, processed	532	696	3	West Germany 493; Spain 108.
Salt and brine	65,420	71,130	17	Australia 61,579; China 5,540.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	104,643	66,833	42,469	Kenya 16,650; Japan 7,415.
Sulfate, manufactured	11,364	9,519	160	Taiwan 4,594; China 2,668; Belgium-Luxembourg 1,022.
Stone, sand and gravel	11,165	8,806	150	Australia 4,961; Japan 877; United Kingdom 609.
Sulfur:				
Elemental:				
Crude including native and by-product	917	309	16	Australia 120; Japan 69; Taiwan 61.
Colloidal, precipitated, sublimed	16,245	20,382	10,360	Canada 5,775; Japan 3,127.
Dioxide	29	1	--	All from Netherlands.
Sulfuric acid	1,024	30,392	(2)	Japan 30,361.
Talc, steatite, soapstone, pyrophyllite	5,011	5,620	362	Republic of Korea 3,584; China 662.
Other:				
Crude	589	257	--	Japan 119; Australia 115.
Slag and dross, not metal-bearing	75,474	54,357	(2)	India 54,351.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1	98	24	Japan 53.
Carbon black	r9,090	14,306	14,046	Singapore 76.
Coal, all grades including briquets	504,825	1,152,747	102	Australia 775,008; China 217,429.
Coke and semicoke	352,966	86,926	--	Japan 86,696.
Petroleum:				
Crude thousand 42-gallon barrels	52,570	47,472	--	Malaysia 11,352; Saudi Arabia 9,534; Kuwait 8,087.
Refinery products:				
Liquefied petroleum gas do	262	595	(2)	Indonesia 299; Singapore 122; Australia 118.
Gasoline do	21	26	(2)	Italy 25.
Mineral jelly and wax do	67	57	4	China 45.
Distillate fuel oil do	4,521	4,459	--	Republic of Korea 2,056; Singapore 1,477; Taiwan 655.
Lubricants do	62	51	15	Netherlands Antilles 13; Singapore 13.
Residual fuel oil do	20	38	(2)	Mainly from Singapore.

rRevised.
[1]Table prepared by Audrey D. Wilkes.
[2]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Chromium.—The overall production of chromite was at a lower level than that of 1985 owing mainly to a substantial drop in the output of refractory-grade chromite concentrate and direct-shipping metallurgical-grade chromite lump ore. The decline in the production of refractory-grade chromite concentrate was caused by a 50% cutback by Benguet Corp. at its Masinloc Mine in Zambales because of low market prices. The sharp decline in the output of direct-shipping metallurgical-grade chromite lump ore was caused by the suspended operations of Malayan Wood Products on Dinagat Island in Surigao del Norte. However, the output of metallurgical-grade chromite concentrate from Dinagat Island by Acoje Mining Co. Inc. increased slightly.

During 1985-86, two producers started their chromite operations. Caschrome Inc. (operator of chromite mines in Isabela of the Cagayan Valley region, Cagayan de Oro of Misamis Oriental in the northern Mindanao region, and in Camarines Sur of the Bicol region) produced 12,482 tons of metallurgical-grade chromite concentrate in 1985 and 20,988 tons in 1986. Caschrome, one of the major suppliers of metallurgical-grade chromite to the ferrochromium plant of Ferrochrome Philippines, reportedly was expanding its operations in Palawan. In late 1984, Alamag Processing Corp., a joint venture of Rio Chico Mining Corp. and Bayer AG of the Federal Republic of Germany, began production of chemical-grade chromite in Llorente and Hernani in Eastern Samar. According to the BOMG, Alamag Processing produced 5,369 tons of chemical-grade chromite in 1984, 15,038 tons in 1985, and about 16,000 tons in 1986. Exports of chemical-grade chromite, all to the Federal Republic of Germany, totaled 11,718 tons and were valued at $762,000 in 1985.

Acoje Mining and Benguet Corp. remained the top producers of metallurgical- and refractory-grade chromite, respectively, in 1986. Philchrome Mining Corp., a producer of both metallurgical- and refractory-grade chromite, temporarily suspended operations in September 1985 while Amerasia Mining and Development Corp. shut down its operations between March and November 1985 because of bad weather conditions and equipment breakdowns. According to statistics published by BOMG, production of small-scale mines contributed about 9% to the output of metallurgical-grade chromite in 1985.[5]

Exports of metallurgical-grade chromite ore and concentrate, all to Japan, totaled 47,364 tons and were valued at $3.6 million in 1985. Exports of refractory-grade chromite, principally to the United States, Japan, and Canada, totaled 102,610 tons and were valued at $9.8 million. Other major buyers of Philippines refractory-grade chromite in 1985 were Australia, Brazil, the Netherlands, Peru, and Thailand.

Ferrochrome Philippines, which operates the 60,000-ton-per-year ferrochromium plant at Tagoloan near Cagayan de Oro in northern Mindanao, reportedly was expected to produce 55,000 tons of ferrochromium in 1986. According to the company's report, ferrochromium production was 26,901 tons in 1983, 48,049 tons in 1984, and 50,815 tons in 1985. In 1983-84, the raw material for the plant was supplied by Acoje Mining. However, Ferrochrome Philippines began taking chromite fines from Caschrome and local lump ore as well as imported chromite fines from India and New Caledonia to supplement its raw material requirements. The company has 230 employees of whom 15 were in Manila headquarters and 215 were at the plant. The company also employed about 40 contractural or occasional workers at the plant.[6] According to industry sources, the company exported about 40,000 tons of ferrochromium to Japan and planned to market 10,000 to 12,000 tons to the United States, Europe, and other Asian countries.

Copper.—Despite a substantial increase in copper output from the Sipalay Mine operated by Maricalum Mining Corp. on Negros Island, mine production of copper increased slightly from that of 1985. The overall increase in production was effected mainly by a sharp drop in copper output of Atlas Consolidated Mining and Development Corp. because of its workers' work slowdown in February and a strike in March. Atlas also has reduced 58% of its operating capacity by temporarily closing two open pits and two concentrators in Cebu earlier in 1985. Because of the low copper prices and high production costs, the copper industry remained depressed in 1986. The average production costs of copper in the Philippines was estimated at

$0.68 per pound and the average price of copper in the world market was between $0.60 and $0.65 per pound in 1986. As a result, most copper producers except Philex Mining continued to suffer from losses in 1986.

The industry's output in 1986 was equivalent to about 56% of its annual capacity. According to the Chamber of Mines of the Philippines, production of copper by company during 1985-86 was as follows in tons of copper:

Company	1985	1986
Atlas Consolidated Mining and Development Corp	91,535	69,660
Maricalum Mining Corp	12,039	42,210
Marcopper Mining Corp	33,148	28,851
Philex Mining Corp	24,482	27,482
Benguet Corp	23,957	23,151
North Davao Mining Corp	20,399	16,863
Lepanto Consolidated Mining Co. Inc	13,604	13,011
Batong Buhay Gold Mines Inc.[1]	5,369	--
Benguet Exploration Inc.[2]	1,624	1,416
Total	226,157	222,644

[1]Shut down production since Nov. 1985.
[2]Copper production from the Copper Shield project was shut down in Sept. 1986.

Atlas, the country's largest but financially troubled copper producer, reportedly was negotiating with Bond Corp. of Australia on an agreement for Bond Corp. to (1) assume Atlas' existing loans from its lenders in exchange for repayment in gold, (2) acquire equity in Atlas, and (3) extend a development loan to Atlas for further exploration and development of its Masbate gold mine on Masbate Island. Atlas, reportedly, had suffered losses of $41.7 million in 1984, $82.6 million in 1985, and $34.9 million for the first 9 months of 1986. The total debt of the company was estimated at $255 million. According to a report, 72% of Atlas' revenues was from copper; 27%, from gold; and the remainder, from silver and pyrite sales. Its production cost of copper was $1.30 per pound while the average selling price was $0.63 per pound in 1985.[7]

Maricalum Mining, which reopened its Sipalay Mine in July 1985 with a $15 million loan from Marubeni Corp. of Japan, displaced Marcopper Mining Corp. as the second largest copper producer. Its output of copper reached 42,200 tons or 74% of its production capacity. Under the loan agreement signed with Marubeni earlier in 1985, Maricalum Mining was expected to deliver 90% of its output to Japan and ship the remainder to the domestic copper smelter, PASAR. Beginning in the fourth quarter of 1986, the daily milled ore rate reportedly was raised to 35,000 tons from 28,000 tons, and the output of copper contained in concentrate rose to 4,000 tons per month by December.

Philex Mining, the only consistent profitmaking copper producer in the Philippines, reportedly was undertaking a $14.8 million expansion program to raise its mining and milling capacity by 14% to 32,000 tons per day of ore at the Santo Tomas Mine in Tuba, Benguet. The expansion project, which was financed by the company's retained earnings, involved construction of a cable conveyor system capable of transporting 1,800 tons per hour of ore from the mine to the mill and a new tunnel as well as further mine development and expansion of mill capacity.[8] Philex Mining was expected to earn a net income of $23 million in 1986 compared with $18.1 million in 1985 and $17.8 million in 1984. The company's consistent earning power was derived from efficient operations, good management, and high gold content of its copper ore.

Production of refined copper by PASAR at Isabel in Southern Leyte reached 134,500 tons or 98% of capacity. According to a report by the Chamber of Mines of the Philippines, PASAR's smelter and refinery operated at 102% and 95% of capacity, respectively, and produced 170,445 tons of anode and 130,227 tons of copper cathode, respectively, in 1985. Despite an increase in production of copper cathode in 1986, PASAR reportedly was experiencing cashflow problems owing to a further 5.5% cut in smelting charges to local copper concentrate suppliers and reduced exports of copper cathode. In August, the company held a tender to begin toll smelting and refining up to 210,000 tons of overseas copper concentrate in 1987 for 1 to 3 years. In October, PASAR reportedly asked three Japanese trading companies including Marubeni, Sumitomo Corp., and C. Itoh & Co. Ltd. for extending loans to resolve its cash-flow problems.[9]

The construction of the $248 million copper fabrication plant at Isabel in Leyte under the ASEAN Industrial Complement Program suffered a setback owing to lack of support from some Association of Southeast Asian Nation (ASEAN) members. The Government, reportedly, planned to scale down the originally planned 80,000-ton-per-year capacity to 30,000 tons per year and reduce the project cost to $80 million.

Gold.—Mine production of gold increased substantially from that of 1985 owing to increased output of gold by major primary gold producers, such as Benguet Corp., Apex Mining Co. Inc., and Itogon-Suyoc Mines Inc. as well as byproduct producers, such as Philex Mining and Maricalum Mining, reflecting improvements in prices of gold in the world market. During 1985-86, a considerable amount of gold was produced by small-scale gold panners. According to the statistics published by the Philippine BOMG, the output of gold by these small-scale gold panners accounted for 5% of Philippine gold production in 1984 and 24% in 1985.

In 1986, according to the Government gold-buying station operated by the Central Bank of the Philippines, the estimated gold production by small-scale gold panners in Davao del Norte and the other areas of Mindanao reportedly was 482,000 troy ounces or 37% of the total gold production, about the amount of gold produced by all major copper producers who recovered gold as byproduct of their copper operations. In 1986, the output of gold produced by the primary gold producers accounted for 24% of the total gold production. According to the Chamber of Mines and BOMG, gold production by companies and small-scale gold panners during 1985-86 was as follows, in troy ounces of gold:

Company	1985	1986
Benguet Corp. (primary and byproduct)	241,915	246,100
Philex Mining Corp. (byproduct)	188,075	214,786
Atlas Consolidated Mining and Development Corp. (primary and byproduct)	160,002	139,415
Lepanto Consolidated Mining Co. Inc. (byproduct)	58,375	60,996
Apex Mining Co. Inc. (primary)	33,436	43,476
Surigao Consolidated Mining Co. (primary)	34,988	34,717
Marcopper Mining Corp. (byproduct)	25,828	18,775
Itogon-Suyoc Mines Inc. (primary)	13,452	15,640
North Davao Mining Corp.[1] (byproduct)	21,250	11,828
Benguet Exploration Inc. (primary and byproduct)	13,209	10,837
Maricalum Mining Corp. (byproduct)	3,163	9,908
Manila Mining Corp. (primary)	9,767	7,628
Batong Buhay Gold Mines Inc.[2] (byproduct)	6,275	--
Small-scale gold panners	259,937	e482,300
Total	1,069,672	1,296,406

eEstimated.
[1]Gold production from the Hijo gold project was shut down in Aug. 1985.
[2]Shut down production in Nov. 1985.

Based on a survey conducted by the Ministry of Natural Resources (MNR), the number of workers employed by the small-scale gold mining companies was over 200,000 or 78% of the work force in the Philippine mining industry. Most of these miners worked in the Davao region of south Mindanao. In 1986, as a result of several discoveries of small gold deposits in the Provinces of Negros Occidental, Southern Leyte, Bohol, Cebu, Iloilo, Capiz, and Eastern Samar, about 14,000 small mine workers joined the work force of the gold mining industry. According to MNR, an additional 3,000 small gold panners, reportedly were illegally panning gold in Tanay of Rizal, and Gen. Nakar of Quezon.

In 1986, two new gold projects reportedly were completed. In October, a 500-ton-per-day gold mill was completed by the South Seas in Sison, Surigao del Norte. The gold mill was expected to start operation at the initial rate of 200 tons per day of ore using straight cyanidation process in 1987. The South Seas was owned and managed by the Cabarrus Group Co. In November, another gold project was completed by Benguet Exploration at its Kingking gold mine in Pantukan, Davao del Norte. The mill at the Kingking Mine was expected to begin production of copper and gold at the rate of 100 tons per day in January 1987. In 1985, Benguet Exploration started gold production in Panaon, Leyte, at the initial rate of 150 ounces per month.[10]

Benguet Corp., the largest gold producer in the Philippines, reportedly was undertaking development of its Paracale gold project at Barrio Sta. Rosa in Jose Panganiban, Camarines Norte. The project was expected to start gold production at the rate of 500 tons per day of ore using carbon-in-pulp leaching process in October 1987. Benguet Corp. reportedly had spent $12 million for exploration and development of the mine, and was expected to spend an additional $7 million for construction and installation of the mill. The estimated production costs of the Paracale gold project would be under $250 per ounce when the mill operates at 1,000 tons per day of ore.

Nickel.—Mine production of nickel dropped sharply from that of 1985 owing to the continuing shutdown of the Surigao nickel mine and refinery on Nonoc Island because of a workers' strike and shortage of fresh capital to cover operating losses and restart the refinery. Rio Tuba Nickel Mining Corp., however, increased its output of nickel ore to 400,550 tons from 364,780 tons in 1985 while the output of Hinatuan Min-

ing Corp. decline slightly to 104,325 tons from 119,032 tons in 1985. The average ore grade of Rio Tuba and Hinatuan was 2.2% and 2.4% nickel, respectively.

NMIC, the operator of the Surigao Mine and refinery, reportedly was seeking a capital loan of $20 million to reopen its nickel operations. The Nonoc nickel operation had been shut down since March because of a strike by its workers demanding back payment of wages and other benefits as well as a complete change in management. By yearend, the Surigao nickel mine and refinery remained shut down despite the new Government approval of a $20 million loan and guaranteed 50% of the amount through the national treasury. According to an industry source, to restart the Nonoc operations, NMIC needs at least $20 million including $2.3 million for back payment of wages and trade payables, $2.7 million for a cable belt installation, $5 million for spare parts and refinery rehabilitation, and $10 million for rebuilding inventory.[11]

Steel.—The Philippines National Steel Corp., the largest steel producer in the country, reportedly had completed an expansion program at its billet plant in Iligan City to 300,000 tons per year in 1984 and produced 140,000 tons of billet in 1985. For past years, imports of steel billets accounted for 78% of Philippine billet requirements. Despite the low capacity utilization because of weak domestic demand, the increased output of steel billet by National Steel had reduced billet imports substantially. In late 1986, National Steel was expected to start operation of a cold-rolling strip mill purchased from Blaw-Knox Crop Co. of the United States.

INDUSTRIAL MINERALS

Cement.—The cement industry, which had suffered from the slump in the construction sector and reduced exports since 1984, remained depressed. As a result of further reduction in Government construction expenditures and private housing projects, the cement industry reportedly incurred heavy losses with a total debt of about $325 million by the end of 1985.

During 1985, under the industry's rationalization plan, five cement producers, Continental Cement Corp., Filipinos Cement Corp., Mindanao Portland Cement Corp., Northern Consolidated Corp., and Universal Cement Corp., reportedly had been closed. The combined clinker capacity of the five cement producers was about 1.4 million tons per year. During 1986, Island Cement Corp. and Floro Cement Corp. were forced to shut down their cement plants in July because of failure to repay the debt to their major creditor, the Development Bank of the Philippines.[12]

During 1985-86, exports of cement remained at a low level because of intensive price competition in the Southeast Asian market. Exports of cement were 388,000 tons in 1985 compared with 141,000 tons in 1984.

Feldspar.—Feldspar was produced mainly in the Provinces of Ilocos Norte in northwest Luzon. The output of feldspar had dropped from 15,000 tons in 1982 to 5,500 tons in 1985 owing to stopped production of feldspar at Porac, Pampanga, by Nin Bay Mining Co. The feldspar producers operating in Iloco Norte were Pansian Minerals, a subsidiary of Currimao Construction Supply, at Pasaleng in Pagudpud; Ilocos Norte Feldspar Development at Pasuquin; and Alfredo M. Layaoen Feldspar Mines at Sitio Desorit, Pasuquin. Feldspar was also produced in the Provinces of Misamis Oriental and Cebu by several small operators.

Most feldspar produced in the Philippines was for domestic consumption for the manufacture of glass. The major consumer was Republic Glass Corp., which operated a feldspar processing plant at Pasig in Metro Manila.

Fertilizer Materials.—Nauru Phosphate Corp. (NPC) of Nauru, which owned 40% of Philphos, reportedly agreed to invest an additional $12 million in the joint venture phosphate fertilizer complex at Isabel in Southern Leyte. The additional investment would raise the stake of NPC in Philphos to 60% while the equity holdings of the Philippine Government, through the state-owned NDC, would be reduced to 40%. The action was part of the effort to privatize several major state-owned enterprises by the new Philippine Government. According to the Philphos official, the fertilizer plant was operating at a positive cash-flow position.[13]

Sulfur.—A $25 million sulfur joint venture agreement was signed between International Consultex Inc. of the Philippines and Sulfex in April. The joint venture project called for the development of a sulfur deposit and construction of a processing plant in Iba, Zambales. Under the agreement, the sulfur production would be for domestic consumption by the manufacturers of fertilizer and steel as well as for exports to India, Japan, the Republic of

Korea, and Taiwan. The process plant would have a capacity of 2,000 to 3,000 tons per day of fine sulfur and was expected to employ 5,000 workers.[14]

MINERAL FUELS

Coal.—Domestic coal production remained at about the same level as that of 1985. However, because of reduced coal consumption by the cement industry and the nickel smelter on Nonoc Island, consumption of coal reportedly dropped 23% from that of 1985. As a result of weak domestic demand and higher prices of domestic coal, the producers' coal inventories reportedly rose to 2 million tons at the end of 1986 from 1.2 million in 1985.

Owing to lower prices of oil in the world market, the imported price of high-grade coal (10,000-British-thermal-unit grade) was about $41 per ton compared with $46 per ton for the same grade of domestic coal. In an effort to reduce the level of producers' inventories, the Philippine Government banned imports of coal during the fourth quarter of 1986.

According to the Philippine Ministry of Energy, contribution of domestic coal to the country's energy requirements had risen to 4.7% in 1985 from 0.8% in 1979. Contribution of imported coal to total energy requirements was 4.2% in 1985.

Petroleum.—Crude petroleum production from three oilfields averaged 7,848 barrels per day for the first 6 months of 1986. The total output dropped further during the second half to 5,900 barrels per day owing to a 50% reduction in output from the Nido Oilfield. In June, Alcorn International, which operated three wells in the Nido Oilfield offshore Palawan Island, reportedly acquired the field interest of Cadlao and Matinloc Oilfields from Amoco Philippines Petroleum Co., and Philippines Cities Service Inc. then changed its name to Alcorn (Production) Philippines Inc. According to industry sources, Alcorn Philippines was expected to invest $5 million for construction of a 14-mile pipeline interconnecting the Cadlao and Matinloc Oilfields offshore Palawan Island to reduce operating costs and prolong production life.[15]

According to the Ministry of Energy, the contribution of domestic oil production to the country's energy requirements had dropped to 2.9% in 1985 from 7.4% in 1979 when the output of crude oil from the Nido Oilfield was at its peak of 40,000 barrels per day. However, the share of imported crude oil also dropped to 50.7% in 1985 from 70.5% in 1979 owing to the country's energy conservation program and increased production of other indigenous energy sources, such as agricultural wastes, coal, geothermal, and hydropower.

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[1]Economist, Division of International Minerals.

[2]Where necessary, values have been converted from the Philippine peso (P) to U.S. dollars at the rate of P16.70=US$1.00 in 1984, P18.61=US$1.00 in 1985, and P20.31=US$1.00 in 1986.

[3]Chamber of Mines of the Philippines (Manila). CMP Newsletter. V. 11 No. 2, Feb. 1986, p. 1; v. 11, No. 4, Apr. 1986, p. 1.

[4]Business Day (Quezon). Feb. 26, 1987, p. 3.

[5]Bureau of Mines and Geo-Sciences (Manila). Minerals News Service. No. 81, June 1986, pp. 5, 25.

[6]Bräuer, F., and W. Weber. Ferrochrome Production at Ferrochrome Philippines Inc. in INFACON 1986 Proceedings.

[7]Far Eastern Economic Review (Hong Kong). V. 134, No. 48, Nov. 27, 1986, p. 68.

[8]Chamber of Mines of the Philippines (Manila). CMP Newsletter. V. 11, No. 4, Apr. 1986, p. 1; v. 11, No. 12, Dec. 1986, p. 4.

[9]Japan Metal Journal (Tokyo). V. 16, No. 14, Oct. 13, 1986, p. 4.

Metal Bulletin (London). No. 7120, Sept. 19, 1986, p. 10.

[10]Chamber of Mines of the Philippines (Manila). CMP Newsletter. V. 11, No. 10. Oct. 1986, p. 1; v. 11, No. 11, Nov. 1986, p. 3.

[11]Mining Journal (London). V. 307, No. 7881. Sept. 5, 1986, pp. 160-61.

[12]Visayan Herald (Cebu). Sept. 22, 1986, p. 1.

[13]The New Philippines Daily Express (Manila). Apr. 8, 1986, p. 9.

[14]Ang Pahayagang Malaya (Quezon). Apr. 15, 1986, p. 7.

[15]Petroleum Economist (London). V. 53, No. 7, July 1986, p. 269.

The Mineral Industry of Poland

By Walter G. Steblez[1]

Poland remained a major world producer of bituminous coal, copper, silver, and sulfur, and an important European producer of cadmium, lead, salt, and zinc. The country's economy continued to emerge from the depression of the early and mid-1980's. In 1986, national income rose by about 5% compared with that of 1985 and industrial production increased by 4.4%. Within the mineral industry, output of the mining and extracting sectors, which accounted for about 7.2% of total industrial output, rose by 0.4%. Investment projects completed in 1986 added new capacities for the additional annual production of 1,900,000 tons of bituminous coal, 9,200,000 tons of lignite, 500,000 tons of sulfuric acid, and 40,000 tons of pig iron. Also, 88 kilometers of gas pipeline was added to the country's gas mainline network. Projects that were not completed on schedule included a 1.52-million-ton-per-year coking unit and a 15.5-billion-cubic-foot-per-year coke oven gas plant at the Katowice steelworks. Early in the year, Poland announced plans to develop a fourth underground copper mine and concentrator at Sieroszowic in the Legnica-Glogów Basin. The mine would become operational in 1990.

In February, a miners' work stoppage was reported at the Polkowice copper mine owing to the Government's failure to implement a 1982 resolution to extend benefits granted to coal miners to other underground miners. Coal miners received a 12% wage increase on December 1, 1985, which was not granted to workers in copper mines. The Government maintained that since copper mining was not subsidized, as was coal mining, wages in the copper industry must be worked out according to the principles of Poland's economic reforms. Reportedly, during 1986, negotiations were conducted between the miners' federation and the management of the copper mining enterprise to resolve the wage dispute. In other developments, the Polish miners' union demanded concessions from the Government making Saturday work only voluntary in all underground mining operations. Compulsory work on Saturdays had been restored in the mines with the declaration of martial law in 1981. The compulsory Saturday work law expired in 1985 but was extended in February 1986 until 1990. Reportedly, the number of mining accidents in 1986 declined by about 4% compared with that of 1985, and the number of fatalities dropped to 147 from 160. Although the number of cave-ins increased during the year, explosions of methane gas and coal dust were not recorded owing to the introduction of early warning systems in the mines.

Government Policies and Programs.—The Government's central plan for economic development for the 1986-90 period set goals of 16% to 19% growth in national income and 20% to 25% in that of industrial production. The planned output of bituminous coal by the end of the 5-year plan was to be about 195 million tons. The production of aluminum, copper, and steel was to increase by 3%, 1.6%, and 5.2%, respectively, compared with that of 1985. Deliveries of natural gas from the Soviet Union would increase by 49 billion cubic feet. In 1987, industrial production was to increase by 3.0% to 3.4% compared with that of 1986; the mineral industry was planned to grow by about 4.0%. Plans were

also drawn to raise the proportion of specialty steels to 18% of total steel output and to modernize facilities in the nonferrous metals sector to increase extraction of main and associated components of copper and lead and zinc ores.[2]

PRODUCTION

Poland's centrally planned mineral industry showed production increases for most mineral commodities and fuels in 1986. Production declined slightly, however, for commodities such as natural gas and zinc. The country's overall central economic plan was fulfilled by 101.4%, and productivity in terms of marketable output rose by 4.3% compared with that of 1985.

Table 1.—Poland: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum metal, primary	42,700	44,400	45,900	47,000	47,500
Cadmium metal, primary[e]	[3]570	570	570	600	620
Copper:					
Mine output, Cu content, recoverable	376,000	402,300	431,000	[e]431,000	431,000
Metal:					
Smelter, including secondary[e]	351,000	362,000	375,000	390,000	400,000
Refined, including secondary	348,000	360,000	372,300	387,000	388,000
Gold:[e]					
Mine output, Au content, recoverable thousand troy ounces	970	1,040	1,110	1,110	1,110
Metal, smelter[4] troy ounces	5,800	5,800	5,800	5,800	5,800
Iron and steel:					
Iron ore and concentrate, gross weight thousand tons	49	10	11	11	9
Pig iron do	8,523	9,716	9,981	9,807	[3]10,574
Ferroalloys:					
Blast furnace do	91	88	94	[e]83	[3]83
Electric furnace do	128	175	174	[e]177	[3]176
Steel:					
Crude do	14,795	16,236	16,533	16,126	[3]17,144
Semimanufactures:					
Rolled excluding pipe do	10,477	11,731	12,195	11,845	12,000
Pipe do	940	995	1,010	[e]1,100	1,200
Lead:					
Mine output, Pb content, recoverable	45,300	47,000	52,800	[e]53,000	53,500
Metal, smelter	89,800	81,000	83,400	87,300	88,300
Nickel:[e]					
Mine output, Ni content, recoverable	2,100	2,100	2,100	2,000	2,000
Metal, smelter	2,100	2,100	2,100	2,000	1,900
Silver, mine output, Ag content, recoverable thousand troy ounces	21,123	21,798	23,920	26,717	[3]26,653
Zinc:					
Mine output, Zn content	183,500	189,000	190,700	[e]187,000	185,000
Metal, refined, including secondary	165,400	170,300	176,000	180,000	[3]179,000
INDUSTRIAL MINERALS					
Barite	90,600	81,000	91,000	91,000	98,000
Cement, hydraulic thousand tons	16,100	16,200	16,700	15,000	[3]15,831
Clays and clay products:					
Crude:					
Bentonite[e] do	70	70	70	75	75
Fire clay do	1,075	1,001	[e]1,000	895	[3]971
Kaolin do	46	49	[e]50	48	[3]49
Products[e] do	600	600	600	550	600
Feldspar[e] do	80	80	80	80	80
Gypsum and anhydrite, crude[e 5] do	[3]1,300	1,300	1,300	1,350	1,300
Lime, hydrated and quicklime do	4,061	4,121	4,251	4,124	4,200
Magnesite, crude	17,000	16,100	21,000	19,000	20,900
Nitrogen: N content of ammonia thousand tons	[r]1,683	[r]1,739	1,822	1,812	1,800
Salt:					
Rock do	1,338	1,131	1,185	1,198	[3]1,221
Other do	2,518	[e]2,500	3,526	3,660	[3]4,200
Sodium compounds, n.e.s.:					
Sodium carbonate (soda ash) do	746	825	918	939	940
Caustic soda (96% NaOH) do	378	408	395	384	400

See footnotes at end of table.

Table 1.—Poland: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
INDUSTRIAL MINERALS —Continued					
Stone: Dolomite ---------- thousand tons	2,804	2,996	3,227	3,025	[3]3,333
Sulfur:					
Native:					
Frasch[e] ---------- do	4,428	4,460	4,500	[3]4,353	[3]4,330
Other than Frasch[e] ---------- do	492	500	490	[3]523	[3]563
Total ---------- do	4,920	4,960	4,990	4,876	[3]4,893
Byproduct:[e]					
From metallurgy ---------- do	160	170	170	170	170
From petroleum ---------- do	30	30	30	30	30
Total ---------- do	190	200	200	200	200
From gypsum[e] ---------- do	20	20	20	20	20
Total sulfur ---------- do	5,130	5,180	5,210	5,096	5,113
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Bituminous ---------- do	189,300	191,100	191,592	191,642	[3]192,080
Lignite and brown ---------- do	37,600	42,500	50,400	57,800	[3]67,257
Total ---------- do	226,900	233,600	241,992	249,442	[3]259,337
Coke:					
Coke oven ---------- do	17,300	17,100	16,200	16,000	[3]16,398
Gashouse[e] ---------- do	600	600	600	620	610
Total[e] ---------- do	17,900	17,700	16,800	16,620	17,008
Fuel briquets, all grades ---------- do	1,575	[e]1,500	719	1,010	[3]1,309
Gas:					
Manufactured:[e]					
Town gas ---------- million cubic feet	[3]11,500	11,500	11,000	10,500	11,000
Coke oven gas ---------- do	200,000	200,000	200,000	200,000	200,000
Natural, marketed ---------- do	195,370	193,230	214,430	225,024	205,708
Natural gas liquids:[e]					
Natural gasoline thousand 42-gallon barrels	80	80	80	75	80
Propane and butane ---------- do	53	53	53	50	60
Peat: Fuel and agricultural[e] ----------	200,000	200,000	200,000	200,000	200,000
Petroleum:					
Crude:					
As reported ---------- thousand tons	241	[e]210	189	194	[3]167
Converted - thousand 42-gallon barrels	1,780	1,558	1,401	1,439	1,239
Refinery products[6] ---------- do	99,288	95,501	95,529	98,469	[3]100,086

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

[1]Table includes data available through Aug. 7, 1986.

[2]In addition to the commodities listed, antimony, cobalt, germanium, a variety of crude nonmetallic construction materials, and carbon black are also produced, but available information is inadequate to make reliable estimates of output levels. Poland may also produce alumina in small quantities, but details of such an operation, if it exists, are not available.

[3]Reported figure.

[4]Based on official Polish estimates.

[5]Includes building gypsum, as well as an estimate for gypsum used in production of cement.

[6]Includes virtually all major products; excludes some minor products as well as refinery fuel and losses.

TRADE

In 1986, Poland met and exceeded its central plan for foreign trade, both in terms of soft currency ruble trade within the Council for Mutual Economic Assistance (CMEA) and in terms of hard currency trade with market economy countries. Compared with that of 1985, the value of Poland's exports to CMEA countries in constant prices grew by 8.5%, and that of its imports, by 5.1%, while the value of exports to market economy countries grew at a slightly lower rate than that of imports. Owing to greater domestic consumption, the quantity of Poland's export of bituminous coal was 5.2% less than in 1985. Although Poland's foreign trade position has gradual-

ly improved since 1984, the country's hard currency surpluses were insufficient to service a $31.3 billion debt, which resulted in payment rescheduling with official and commercial creditors. In June, Poland rejoined both the International Bank of Reconstruction and Development and the International Monetary Fund (IMF). Polish sources indicated that although immediate benefits to the Polish economy would not be forthcoming, Poland's membership in the IMF would ease the country's rescheduling of payments on its foreign debt.[3]

Poland remained a major European exporter of minerals and mineral fuels, including coal, copper, silver, and sulfur. Most of Poland's mineral import requirements were met by Soviet deliveries of natural gas and petroleum as well as by substantial shipments of chromite, iron ore, and manganese.

Table 2.—Poland: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	115	NA		
Oxides and hydroxides	82	41	--	Netherlands 24; United Kingdom 17.
Ash and residue containing aluminum	1,226	577	--	All to West Germany.
Metal including alloys:				
Scrap	1,357	199	--	Italy 141; West Germany 44; Sweden 13.
Unwrought[2]	3,166	2,980	--	Czechoslovakia 2,439; Italy 501; West Germany 40.
Semimanufactures	874	777	--	West Germany 538; Austria 168; Sweden 38.
Chromium: Oxides and hydroxides[2]	1,422	1,516	16	Sweden 672; Switzerland 295; Yugoslavia 161.
Cobalt: Metal including alloys, all forms	--	2	--	All to United Kingdom.
Columbium and tantalum: Metal including alloys, all forms, tantalum	--	6	--	All to West Germany.
Copper:				
Ore and concentrate	150,757	39,561	--	Japan 21,476; Sweden 10,000; Canada 8,085.
Matte and speiss including cement copper	--	20	--	All to Greece.
Sulfate	2,246	1,805	--	West Germany 1,152; Netherlands 553; Austria 100.
Metal including alloys:				
Scrap	[2]9,577	698	--	West Germany 439; France 121; Austria 62.
Unwrought[2]	179,970	181,948	--	West Germany 72,976; United Kingdom 48,564; Belgium-Luxembourg 16,188.
Semimanufactures[2]	59,035	62,354	334	Czechoslovakia 16,026; U.S.S.R. 11,451; Yugoslavia 8,194.
Gold: Metal including alloys, unwrought and partly wrought value, thousands	--	$783	--	All to Italy.
Iron and steel: Metal:				
Scrap[2]	176,150	79,993	--	Switzerland 33,714; Yugoslavia 23,059; West Germany 14,637.
Pig iron, cast iron, related materials	--	1,652	--	Cyprus 1,554; Italy 98.
Ferroalloys:				
Ferrochromium	698	37	--	All to West Germany.
Ferrosilicon	5,169	657	--	Do.
Silicon metal	--	1	--	All to Yugoslavia.
Unspecified	131	1,393	--	Austria 1,163; Belgium-Luxembourg 187; West Germany 43.
Steel, primary forms	160,000	101,000	36	Yugoslavia 81,409.
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	1,383	1,389	24	West Germany 144; Hungary 14; unspecified 1,135.
Universals, plates, sheets do	409	356	36	West Germany 40; United Kingdom 23; unspecified 144.
Hoop and strip do	136	114	--	Yugoslavia 38; Sweden 5; unspecified 68.
Rails and accessories do	132	93	--	Egypt 20; West Germany 4; unspecified 66.
Wire do	37	42	([3])	Canada 4; Yugoslavia 4; unspecified 28.
Tubes, pipes, fittings do	83	34	1	East Germany 20; West Germany 7; Canada 5.
Castings and forgings, rough do	4	4	--	West Germany 3.

See footnotes at end of table.

Table 2.—Poland: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Lead:				
Ash and residue containing lead	--	1,342	--	United Kingdom 793; West Germany 549.
Metal including alloys, scrap	--	40	--	All to West Germany.
Manganese: Ore and concentrate, metallurgical-grade	20,685	NA		
Nickel: Oxides and hydroxides	--	1	--	All to United Kingdom.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	--	1,768	--	All to West Germany.
Silver:				
Ore and concentrate[4] value, thousands	--	$791	--	All to Canada.
Waste and sweepings do.	[4]$361	$441	--	All to West Germany.
Metal including alloys, unwrought and partly wrought[2] thousand troy ounces	15,368	17,651	3,054	United Kingdom 7,363; West Germany 4,147.
Tin: Ore and concentrate[2]	16,360	NA		
Titanium: Oxides	103	293	--	All to Yugoslavia.
Zinc:				
Ore and concentrate	600	[2]17,718	--	Bulgaria 13,921; France 3,797.
Oxides	806	906	--	All to West Germany.
Metal including alloys:				
Scrap	--	146	--	Do.
Unwrought[2]	26,838	28,050	652	Hungary 10,537; United Kingdom 7,789; Yugoslavia 3,320.
Semimanufactures[2]	3,671	3,603	34	Czechoslovakia 1,248; U.S.S.R. 1,148; West Germany 760.
Other:				
Ores and concentrates	--	6	--	All to Austria.
Oxides and hydroxides	3	NA		
Ashes and residues	7,132	2,888	--	Austria 2,730; United Kingdom 94; West Germany 64.
Base metals including alloys, all forms	1,123	1,682	--	Czechoslovakia 1,159; Romania 523.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	284	155	--	Yugoslavia 135; Austria 20.
Artificial:				
Corundum	5,957	5,660	--	West Germany 3,999; Yugoslavia 709; Austria 708.
Silicon carbide	1,011	416	--	West Germany 341; Austria 75.
Grinding and polishing wheels and stones	148	284	1	Yugoslavia 117; Italy 99; Thailand 19.
Cement[2] thousand tons	762	1,264	--	U.S.S.R. 629; Sweden 218; Algeria 145.
Clays, crude:				
Chamotte earth[2]	13,384	12,636	--	Hungary 12,432.
Fire clay[2]	NA	11,476	--	Yugoslavia 8,778; Hungary 1,214; Austria 689.
Kaolin	--	5	--	All to Italy.
Unspecified	20,974	125	--	Sweden 83; Netherlands 22; Denmark 20.
Diamond:				
Gem, not set or strung value, thousands	--	$380	$380	
Industrial stones do.	$165	$167	--	Belgium-Luxembourg $165; Austria $1; Netherlands $1.
Diatomite and other infusorial earth	91	367	--	All to Greece.
Fertilizer materials:				
Crude, n.e.s	20	NA		
Manufactured:				
Ammonia[2]	15,148	70,775	--	West Germany 20,716; Sweden 18,183; Austria 17,815.
Nitrogenous[2]	339,959	243,032	--	West Germany 61,942; Greece 37,000; Yugoslavia 34,200.
Phosphatic	5,501	4,176	--	All to West Germany.
Potassic	824	NA		
Unspecified and mixed	21,925	1,307	--	All to West Germany.
Graphite, natural	--	25	--	All to Italy.
Gypsum and plaster[2]	66,163	50,596	--	Hungary 30,821; Finland 19,775.
Kyanite and related materials	50	NA		
Lime[2]	38,908	51,155	--	All to West Germany.
Magnesium compounds	1,299	6	--	Do.

See footnotes at end of table.

Table 2.—Poland: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Precious and semiprecious stones other than diamond:				
Natural ____ value, thousands__	$3	$2	--	All to Japan.
Synthetic ____do____	$198	$227	--	Do.
Salt and brine[2] ____	370,418	380,110	--	Finland 143,559; Sweden 119,507; Hungary 53,563.
Sodium compounds, n.e.s.:				
Carbonate, manufactured[2] ____	252,333	256,289	--	Yugoslavia 84,448; U.S.S.R. 55,412; Czechoslovakia 26,577.
Sulfate, manufactured ____	5	1,436	--	Yugoslavia 1,400; Indonesia 36.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked[2] ____	14,956	13,207	--	West Germany 9,309; Sweden 1,559; Belgium-Luxembourg 547.
Worked ____	8,391	9,610	94	West Germany 6,678; Denmark 1,460; Belgium-Luxembourg 812.
Dolomite, chiefly refractory-grade[2] __	5,345	3,429	--	Finland 3,303.
Gravel and crushed rock ____	162,491	76,445	--	All to West Germany.
Limestone other than dimension ___	9,440	1,382	--	Do.
Sand other than metal-bearing ____	51,316	118,475	--	Do.
Sulfur:				
Elemental:				
Crude including native and by-product[2] ___ thousand tons__	4,078	3,906	--	U.S.S.R. 868; Czechoslovakia 485; Brazil 408.
Colloidal, precipitated, sublimed_	7,894	11,770	--	Sweden 11,143; Austria 320; Yugoslavia 186.
Dioxide____	--	3,404	--	All to West Germany.
Sulfuric acid____	23,828	[2]108,091	--	U.S.S.R. 97,709; Sweden 9,552; Netherlands 230.
Other:				
Crude____	5,439	16,192	--	West Germany 15,793; Austria 398; Denmark 1.
Slag and dross, not metal-bearing ___	31,771	87,458	--	West Germany 87,371; France 45; Netherlands 42.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black ____	3	12	--	All to West Germany.
Coal:				
Anthracite and bituminous[2] thousand tons__	42,918	36,156	--	U.S.S.R. 10,373; West Germany 2,950; Finland 2,434.
Briquets of anthracite and bituminous coal____do____	54	2	--	Denmark 1; United Kingdom 1.
Lignite including briquets[2] __do____	--	201	--	East Germany 200.
Coke and semicoke[2] ____do____	1,794	1,639	--	U.S.S.R. 714; Austria 205; East Germany 144.
Peat including briquets and litter____	10,027	[2]5,173	--	Austria 3,710; Italy 1,239; United Kingdom 130.
Petroleum:				
Crude_ thousand 42-gallon barrels__	760	942	--	All to United Kingdom.
Refinery products:				
Liquefied petroleum gas do____	4	115	--	West Germany 97; Italy 13; Austria 5.
Gasoline ____do____	58	174	--	Sweden 99; West Germany 72; Austria 3.
Mineral jelly and wax __do____	28	37	--	Austria 24; Netherlands 12.
Kerosene and jet fuel___do____	17	21	--	All to Hungary.
Distillate fuel oil ____do____	1,503	1,161	--	West Germany 707; Netherlands 187; Belgium-Luxembourg 154.
Lubricants ____do____	372	232	--	Austria 133; Sweden 55; West Germany 34.
Residual fuel oil____do____	538	539	--	Sweden 224; West Germany 163; Austria 110.
Bitumen and other residues do____	8	2	--	West Germany 1.
Petroleum coke ____do____	44	NA		
Unspecified ____do____	706	1,152	--	NA.

[p]Preliminary. NA Not available.

[1]Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Poland, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2]Official Trade Statistics of Poland.

[3]Less than 1/2 unit.

[4]May include other precious metals.

Table 3.—Poland: Apparent imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate[2]	31,011	37,862	--	Hungary 20,446; Australia 12,143; Belgium-Luxembourg 5,273.
Oxides and hydroxides[2]	226,221	206,591	--	Hungary 104,250; Switzerland 65,157; West Germany 28,771.
Metal including alloys:				
Scrap	--	285	--	Austria 235; Sweden 33; Netherlands 17.
Unwrought[2]	91,484	86,391	--	U.S.S.R. 38,453; West Germany 17,594; Romania 12,664.
Semimanufactures[2]	8,461	9,232	--	U.S.S.R. 4,179; Austria 2,244; Czechoslovakia 1,817.
Antimony: Metal including alloys, all forms	--	34	--	All from Netherlands.
Chromium:				
Ore and concentrate[2]	150,993	151,093	--	U.S.S.R. 128,165; Turkey 15,616; Albania 5,312.
Oxides and hydroxides	461	212	--	All from United Kingdom.
Cobalt:				
Ore and concentrate	6	NA		
Oxides and hydroxides	6	21	--	Netherlands 16; West Germany 5.
Columbium and tantalum: Metal including alloys, all forms, columbium (niobium)	21	(3)	--	All from West Germany.
Copper:				
Ore and concentrate	1	2	--	All from United Kingdom.
Oxides and hydroxides	40	107	--	West Germany 87; United Kingdom 20.
Metal including alloys:				
Scrap	41	122	6	Sweden 116.
Unwrought[2]	17,138	19,991	--	United Kingdom 19,733; West Germany 200; Czechoslovakia 57.
Semimanufactures[2]	944	1,212	17	West Germany 373; United Kingdom 277; Yugoslavia 178.
Gold: Metal including alloys, unwrought and partly wrought, troy ounces	2,216	1,254	--	West Germany 900; Switzerland 193; Netherlands 161.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite[2], thousand tons	17,110	16,973	--	U.S.S.R. 13,577; Brazil 2,456; Sweden 860.
Metal:				
Scrap, do.	7	5	--	U.S.S.R. 4.
Pig iron, cast iron, related materials, do.	1,188	1,330	--	NA.
Ferroalloys:				
Ferrochromium	100	1,804	--	Yugoslavia 1,590; West Germany 214.
Ferromanganese	29,000	24,000	--	NA.
Ferromolybdenum	50	64	--	Spain 45; West Germany 19.
Silicon metal	625	4,918	--	Yugoslavia 4,629; West Germany 289.
Unspecified	23,225	25,132	--	NA.
Steel, primary forms, thousand tons	19	13	--	Yugoslavia 12.
Semimanufactures:				
Bars, rods, angles, shapes, sections, do.	363	325	--	Yugoslavia 34; Hungary 18; unspecified 249.
Universals, plates, sheets, do.	619	634	(3)	Czechoslovakia 121; West Germany 43; unspecified 296.
Hoop and strip, do.	43	60	(3)	West Germany 8; Yugoslavia 6; unspecified 40.
Rails and accessories, do.	8	17	--	NA.
Wire, do.	59	49	(3)	West Germany 4; Italy 3; unspecified 32.
Tubes, pipes, fittings, do.	193	243	--	Romania 84; West Germany 41; Yugoslavia 17.
Castings and forgings, rough, do.	13	13	--	NA.
Lead:				
Ore and concentrate[2]	614	300	--	West Germany 240; Netherlands 60.
Oxides	413	280	--	All from Netherlands.
Metal including alloys:				
Unwrought[2]	6,133	6,195	--	United Kingdom 5,365; West Germany 527; North Korea 303.
Semimanufactures	6	24	--	All from Belgium-Luxembourg.
Magnesium: Metal including alloys, unwrought[2]	1,111	1,454	--	Do.

See footnotes at end of table.

Table 3.—Poland: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Manganese:				
Ore and concentrate, metallurgical-grade[2]	648,163	617,977	--	U.S.S.R. 540,827; France 77,150.
Metal including alloys, all forms	35	NA		
Mercury, 76-pound flasks	522	NA		
Molybdenum:				
Ore and concentrate	--	39	--	All from Netherlands.
Metal including alloys, all forms	(3)	1	--	All from West Germany.
Nickel:				
Matte and speiss, Ni content	300	150	--	All from Cuba.
Oxides and hydroxides	--	1	--	All from United Kingdom.
Metal including alloys:				
Unwrought	21	NA		
Semimanufactures	67	66	--	West Germany 40; Sweden 14; United Kingdom 5.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$3,229	$1,635	--	United Kingdom $830; West Germany $354; Belgium-Luxembourg $266.
Silver: Metal including alloys, unwrought and partly wrought, do.	$301	$406	--	West Germany $236; France $66; United Kingdom $57.
Tin:				
Oxides	--	9	--	United Kingdom 5; Austria 4.
Metal including alloys:				
Unwrought[2]	3,634	3,029	--	United Kingdom 2,955; Austria 50; China 20.
Semimanufactures	18	1	--	All from West Germany.
Titanium:				
Ore and concentrate	[2]34,666	2,924	--	All from Netherlands.
Oxides	1,378	1,101	--	United Kingdom 674; West Germany 233; Japan 165.
Metal including alloys, all forms	2	12	--	United Kingdom 9; West Germany 3.
Tungsten: Metal including alloys, all forms	4	3	1	Netherlands 2.
Zinc:				
Ore and concentrate	--	4	--	All from Greece.
Oxides	--	2	2	
Metal including alloys:				
Unwrought[2]	4,615	5,254	--	U.S.S.R. 3,106; North Korea 2,127.
Semimanufactures	24	13	--	All from Netherlands.
Zirconium: Ore and concentrate	4,029	680	--	Netherlands 600; West Germany 80.
Other:				
Ores and concentrates	674	2,150	--	Australia 1,430; West Germany 720.
Oxides and hydroxides	1,481	74	--	All from United Kingdom.
Ashes and residues	20	NA		
Base metals including alloys, all forms[2]	13,455	15,423	--	Romania 7,321; U.S.S.R. 5,046; East Germany 458.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	383	760	190	Italy 544; Japan 18.
Artificial:				
Corundum	2,725	2,701	1	Yugoslavia 1,200; Hungary 641; Japan 450.
Silicon carbide	--	90	--	All from Italy.
Dust and powder of precious and semi-precious stones including diamond value, thousands	$541	$380	--	United Kingdom $328; Austria $49; Belgium-Luxembourg $3.
Grinding and polishing wheels and stones	1,453	1,410	17	Austria 432; Yugoslavia 374; West Germany 287.
Asbestos, crude[2]	69,361	81,690	--	U.S.S.R. 62,249; Canada 6,353; Italy 5,676.
Barite and witherite	--	30	--	All from United Kingdom.
Boron materials: Oxides and acids	250	7,778	--	Italy 7,728; France 50.
Cement	[2]15,626	32,002	--	Czechoslovakia 24,000; U.S.S.R. 8,000; Denmark 2.
Chalk	1	409	--	France 407; Netherlands 2.
Clays, crude:				
Bentonite	4,850	5,329	--	Hungary 5,020; Italy 299; United Kingdom 10.
Chamotte earth[2]	256	6,779	--	U.S.S.R. 5,534; United Kingdom 1,057; West Germany 188.
Fire clay	--	107	--	All from West Germany.
Kaolin[2]	123,782	145,961	122	Czechoslovakia 72,910; U.S.S.R. 28,793; United Kingdom 25,984.

See footnotes at end of table.

Table 3.—Poland: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Diamond:				
Gem, not set or strung value, thousands	$57	$258	--	United Kingdom $208; Belgium-Luxembourg $46; West Germany $4.
Industrial stones do.	$2,297	$2,169	--	Belgium-Luxembourg $1,724; Switzerland $367; West Germany $60.
Diatomite and other infusorial earth	254	2,175	1,915	Denmark 230; France 20.
Feldspar, fluorspar, related materials	20,438	10	--	All from Yugoslavia.
Fertilizer materials: Manufactured:				
Ammonia[2] thousand tons	72	24	--	All from U.S.S.R.
Nitrogenous[2] do.	26	69	--	Romania 39; West Germany 20; Czechoslovakia 10.
Potassic[2] do.	2,440	2,357	--	U.S.S.R. 1,702; East Germany 622; Austria 33.
Unspecified and mixed do.	(3)	(3)	--	Mainly from Sweden.
Graphite, natural[2]	7,445	6,082	38	Austria 3,538; Czechoslovakia 1,724; North Korea 388.
Gypsum and plaster	5,457	2,807	17	West Germany 2,790.
Iodine	27	NA		
Kyanite and related materials	17	20	--	All from United Kingdom.
Lime[2]	28,506	32,016	--	Romania 31,965.
Magnesium compounds[2]	222,513	263,398	--	North Korea 99,806; Brazil 71,499; Czechoslovakia 63,320.
Mica:				
Crude including splittings and waste[2]	1,750	1,241	--	India 1,240.
Worked including agglomerated splittings	25	27	--	Austria 23; France 2; Switzerland 2.
Phosphates, crude[2] thousand tons	2,965	3,261	285	Morocco 1,160; West Germany 630; U.S.S.R. 571.
Phosphorus, elemental	12,072	15,337	--	All from U.S.S.R.
Pigments, mineral:				
Natural, crude	--	21	--	All from Austria.
Iron oxides and hydroxides	705	1,050	--	West Germany 969; Japan 80; Netherlands 1.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$55	$16	--	West Germany $12; Hong Kong $4.
Synthetic do.	$19	$110	--	Belgium-Luxembourg $64; West Germany $25; Switzerland $14.
Salt and brine	--	1	--	All from Austria.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked[2]	4,519	3,487	--	Albania 1,577; Bulgaria 1,141; Hungary 514.
Worked	188	141	1	Italy 138; United Kingdom 2.
Dolomite, chiefly refractory-grade[2]	14,062	11,972	--	Hungary 11,956.
Gravel and crushed rock[2]	9,944	10,034	--	Norway 7,807; Finland 1,826.
Limestone other than dimension	100	250	--	All from West Germany.
Quartz and quartzite	3,369	2,352	--	West Germany 2,160; Sweden 192.
Sand other than metal-bearing	54	176	--	Italy 116; Sweden 60.
Sulfur:				
Elemental:				
Crude including native and by-product	12	NA		
Colloidal, precipitated, sublimed	5	NA		
Sulfuric acid	6	NA		
Talc, steatite, soapstone, pyrophyllite[2]	25,646	20,944	--	North Korea 7,167; Czechoslovakia 6,489; Austria 3,661.
Vermiculite, perlite, chlorite	--	5	--	All from United Kingdom.
Other: Crude	10,247	13,868	--	Hungary 11,904; West Germany 1,018; Netherlands 820.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	52	36	--	All from West Germany.
Carbon black[2]	31,248	29,982	--	Romania 7,051; Sweden 6,995; West Germany 6,445.
Coal: Bituminous thousand tons	1,031	1,060	--	U.S.S.R. 771; East Germany 289.
Coke and semicoke do.	--	35	--	All from United Kingdom.
Gas, natural: Gaseous[2] million cubic feet	212,418	208,285	--	All from U.S.S.R.
Peat including briquets and litter	77	30	--	All from Ireland.
Petroleum:[2]				
Crude thousand 42-gallon barrels	100,077	100,778	--	U.S.S.R. 94,631; Iran 1,938; Iraq 1,006.
Refinery products do.	24,841	26,174	137	U.S.S.R. 16,943; East Germany 806; Romania 791.

[p]Preliminary. NA Not available.

[1]Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Poland, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2]Official Trade Statistics of Poland.

[3]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Copper.—Copper mining and exports remained key components of Poland's mineral industry. The production of copper ore and electrolytic copper increased slightly compared with that of 1985. The copper industry was managed by the Kombinat Gorniczno-Hutniczy Miedi (KGHM), or the Copper Mining and Smelting Industrial Group, and mining continued at the Rudna, Polkowice, Lubin, Sieroszowice, and Konrad Mines in the Legnica-Glogów area in the southwestern part of the country. Poland's copper reserves, in contained metal, were measured at 50 million tons with bornite, chalcocite, and covellite as the main copper-bearing minerals.[4] Room-and-pillar mining with roof caving was used in conjunction with hydraulic fill and stoping that was reportedly fully automated. Silver was the main metal associated with copper; other valuable associated metals were cobalt, gold, lead, molybdenum, rhenium, vanadium, and zinc. Ore was dressed at four concentrators with a combined annual capacity of 30 million tons and shipped to the Glogów metallurgical center for processing at the Glogów I and Glogów II smelting and refining facilities. Earnings from annual exports of copper and silver from the Legnica-Glogów copper mining and refining complex have amounted to about $500 million.

During the year, work continued on expansion at the Sieroszowice Mine. A new shaft and concentrator were to go on-stream in 1986, but owing to labor disputes and a market downturn, the project's completion was tentatively set for 1990. Reportedly, the new sulfuric acid plant, which was part of KGHM's modernization program, went off-stream in 1986 after only a few days of operation, owing to leakage in the gas filtration equipment. The unit was built by the Chemadex enterprise of Krakow.

At yearend, China's National Nonferrous Metals Import-Export Corp. reportedly purchased 7,000 tons of cathode copper and concluded an agreement with Poland to purchase 100,000 tons of copper during the 1986-90 5-year plan period.

Iron and Steel.—Poland continued to mine relatively insignificant amounts of iron ore near Czestochowa, and the country's steel industry was based almost entirely on imports, largely from the Soviet Union. Developments in the iron and steel industry included the completion of a 25,000-ton-per-year rail mill at the Katowice steelworks and a section mill at the Pokoj steelworks at Ruda Slaska. Both projects were temporarily interrupted in the 1980's owing to financial constraints and were completed with Soviet aid and credits. Most of the output at the Katowice facility was reportedly destined for the U.S.S.R.

New coking units, using Soviet dry quenching technology, were put on-stream at the Katowice steelworks. The first stage of the coking plant would produce 1.5 million tons of coke per year and would replace obsolete and polluting coking facilities at the Silesian Iron and Steel Enterprises.

Lead and Zinc.—Poland continued to be a major European producer and exporter of lead and zinc. However, owing to declining ore grades and to Government policies that gave priority to the copper industry to expand and modernize, lead-zinc output in 1986 was on a declining trend: Production was considerably less than that of peak output reached in the 1960's as well as that of the early 1980's. The industry's other difficulty during 1986 was the decision by the London Metal Exchange to accept only high-grade electrolytic material and exclude standard zinc from its storage facilities. This decision was aimed at conforming with the latest market economy consumption trends.

Poland's lead-zinc reserves were delineated at about 350 million tons, containing 4.2% zinc and 1.7% lead. In contrast to the copper industry, the lead-zinc sector continued to be subsidized, and its 1986 production was just adequate to meet domestic needs.

INDUSTRIAL MINERALS

Poland produced a variety of industrial minerals such as barite, dolomite, gypsum, kaolin, salt, and sulfur. In 1986, production of most nonmetallic industrial minerals showed marked increases, compared with those in 1985.

Cement.—Although cement production rose by about 5.5% compared with that of 1985, the cement production plan for 1986 was not met, owing largely to restrictions of coal supplied to the producers. Poland's cement industry has been operating at about 72% of capacity, owing partly to fuel restrictions and partly to the obsolescence of over one-half of the country's cement

plants.[5] Approximately 70% of the machinery and equipment in the cement industry was reportedly depreciated and in need of repair or replacement. Insufficient capital was the chief reason for the slow modernization of the country's cement plants. There was also a labor shortage and high turnover of labor in the cement industry.

Salt.—Poland remained a major world producer of salt, with over 2% of total world output and recoverable industrial reserves measured at 75 billion tons. Early in the year, the new Mogilno Mine went on-stream in the Kujawy region. The new mine was to replace nearby operations at Inowroclaw, where mining was to cease later in the year. The production of rock salt in 1986 increased slightly compared with that of 1985.

Sulfur.—With potential resources at 900 million tons, including reserves delineated at 500 million tons, Poland continued to be a major world producer and exporter of native sulfur. Sulfur production remained at about the output level of 1985. Approximately 78% of the sulfur output in 1986 was exported, of which 51% was shipped to market economy countries and 48% to CMEA member states.

MINERAL FUELS

Coal.—Poland was the world's fourth-largest producer and exporter of bituminous coal. Despite a marginal increase in the country's coal output in 1986 compared with that of 1985, coal exports declined owing to increased domestic consumption. Planned coal exports for 1987 were to decrease further by about 2 million tons, and the planned output for 1987 would remain at the 1986 level. During the year, increased demand from CMEA countries resulted in a request by the U.S.S.R. for Poland to divert a shipment of 700,000 tons of coal for Italy to CMEA countries. The coal was originally destined for Italy's national public utility, Ente Nazionale Elettrica (ENE). ENE sources indicated that although some coal may still be purchased from Poland during the year, the bulk of the company's needs would be met by imports of bituminous coal from the United States. Coal remained one of Poland's chief sources of foreign exchange.

Petroleum and Natural Gas.—Poland's declining production of petroleum remained marginal, and the bulk of the country's needs were met by deliveries of crude oil and refinery products from the Soviet Union. In 1986, petroleum was reportedly discovered near Gorzów at a depth of 3,000 meters, and further exploration was planned in the region. The production of natural gas during the year declined by about 8.6%, and increased domestic consumption was met by about a 20% increase in natural gas imports from the U.S.S.R.

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[1]Foreign mineral specialist, Division of International Minerals.
[2]Rzeczpospolita (suppl.). Dec. 23, 1986, pp. 5-7.
[3]Trybuna Ludu. June 14-15, 1986 p. 7.
[4]Mining Magazine (London). Aug. 1985, pp. 92-111.
[5]Zycie Warszawy. Sept. 17, 1986, p. 3.

The Mineral Industry of Portugal

By John R. Craynon[1]

Portugal remained a relatively minor producer of mineral commodities in 1986. Its output of ferroalloys and tungsten, long of world significance, was reduced dramatically during 1986. However, the low world price for petroleum contributed to an improved economic situation. Realignment of trade patterns following the country's entry into the European Economic Community (EEC), continued development of a copper mine in southeastern Portugal and the closure of all but one of the country's tin and tungsten mines were the major minerals-related events of 1986.

Government Policies and Programs.—The Government of Portugal took several actions during the year that affected the minerals industry. The change in tariffs resulting from entry into the EEC resulted in increased competition for Portuguese metals and mineral products on domestic and Western European markets. The Government took steps to slowly devalue the escudo in an effort to stop the devaluation-inflation cycle that has plagued the economy in recent years. The move also made Portuguese exports more attractive on world markets.

The Government liberalized the investment laws to allow foreign entities to acquire up to 20% of Portuguese companies without prior Government authorization. In addition, a new framework of investment regulations for EEC-based companies was promulgated. In general, these firms were given the same rights and obligations as domestic companies, with the benefit of being able to repatriate all earnings. New projects submitted to the Government by the EEC-based companies were permitted to proceed without formal approval if no legal objections were raised within 60 days of the application.

A major program of investment incentives available to both domestic and foreign concerns was also instituted. The incentives were intended to promote development of Portugal's nonindustrialized areas, efficient energy usage, research and development efforts, and overall industrial restructuring.

PRODUCTION

Portugal continued to produce a variety of mineral commodities in 1986. The Government retained ownership or control of most of the important mineral producers. However, small private companies produced a number of industrial mineral commodities. Production of all minerals and related materials, except for dimension stone, ferroalloys, and tungsten, was of only domestic significance. Production of decorative marble accounted for nearly 70% of the value of Portuguese mineral output.

Table 1.—Portugal: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[p]
METALS					
Arsenic, white[e]	200	180	180	170	150
Beryl concentrate, gross weight	12	3	10	2	--
Columbite and tantalite concentrates, gross weight	6	[e]3	3	--	6
Copper:					
Ore and concentrate:					
Gross weight	2,002	1,735	1,654	1,183	865
Cu content	456	375	366	261	184
Metal:					
Smelter, primary and secondary	1,500	6,200	3,500	4,600	[e]6,000
Refined, primary and secondary	4,600	[e]4,600	5,300	[e]4,500	[e]4,500
Gold, mine output, Au content troy ounces	[r]10,506	[r]6,398	6,205	9,259	6,173
Iron and steel:					
Iron ore and concentrate:					
Gross weight:					
Hematite and magnetite				46,910	22,412
Manganiferous	27,100	35,500	36,000	26,300	28,200
Total	27,100	35,500	36,000	73,210	50,612
Iron content:					
Hematite and magnetite				2,017	9,413
Manganiferous	[r]9,377	12,248	11,772	8,502	9,447
Total	[r]9,377	12,248	11,772	10,519	18,860
Metal:					
Pig iron thousand tons	215	355	373	415	420
Ferroalloys:					
Ferromanganese[e]	[2]45,000	[r]40,000	[r]46,500	[r]48,000	20,000
Silicomanganese[e]	[r]23,500	[r]18,500	[r]24,000	[r]25,000	10,000
Ferrosilicon[e]	[r]8,500	[2]8,550	[r]9,000	[r]9,000	5,000
Silicon metal[e]	[r]10,000	[2]9,800	[r]10,500	[r]11,000	7,000
Ferrotungsten	212	[r]176	183	151	17
Total[e]	[r]87,212	[r]77,026	[r]90,183	[r]93,151	42,017
Steel, crude thousand tons	[r]502	[r]674	690	665	708
Lead: Refined, secondary	4,000	6,000	6,000	7,000	[e]6,500
Manganese: Mn content of iron ore	2,005	2,663	2,448	1,768	2,087
Silver, mine output, Ag content troy ounces	[r]30,702	[r]20,287	22,280	33,244	16,847
Tin:					
Mine output, Sn content	[r]374	[r]375	320	247	197
Metal, primary and secondary	[r]416	[r]443	432	408	194
Titanium, concentrates:					
Gross weight	[r]472	270	164	[e]144	232
Content of TiO_2	[r]236	135	82	72	116
Tungsten, mine output, W content	[r]1,353	1,183	1,509	1,755	1,637
Uranium concentrate: U content	[r]111	103	114	118	109
Zinc: Smelter, primary	[r]4,500	3,800	6,400	5,900	[e]6,500
INDUSTRIAL MINERALS					
Barite	[r]600	[r]637	318	1,094	120
Cement, hydraulic thousand tons	[r]5,966	[r]6,063	5,539	5,364	5,444
Clays:					
Kaolin	[r]63,031	[r]103,088	104,388	80,097	54,841
Refractory	[e]250,000	[r]196,262	291,592	[e]240,000	[e]250,000
Diatomite	1,770	1,870	1,600	1,600	2,120
Feldspar	41,327	33,509	29,003	29,011	33,740
Gypsum and anhydrite	237,364	249,032	227,708	[e]250,000	[e]230,000
Lime, hydrated and quicklime[e] thousand tons	250	230	[r]210	[r]200	200
Lithium minerals: Lepidolite	905	545	985	130	--
Nitrogen: N content of ammonia thousand tons	[e]132	111	160	154	[e]150
Pyrites and pyrrhotite (including cuprous), gross weight do.	263	[r]280	334	356	328
Salt:					
Rock do.	406	[r]429	455	463	459
Marine[e] do.	100	110	110	115	110
Total do.	506	[r]539	565	578	569
Sand do.	4,376	4,249	NA	NA	NA

See footnotes at end of table.

Table 1.—Portugal: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[p]
INDUSTRIAL MINERALS —Continued					
Sodium compounds, n.e.s.:[e]					
Sodium carbonate	170,000	160,000	150,000	150,000	155,000
Sodium sulfate	57,000	56,000	50,000	50,000	52,000
Stone:					
Basalt thousand tons	171	[r]115	63	NA	NA
Calcareous:					
Dolomite do	108	[r]117	157	NA	NA
Limestone, marl, calcite do	13,447	[r]10,059	10,985	NA	NA
Marble do	403	[r]421	440	NA	NA
Diorite do	265	[r]337	1,596	NA	NA
Gabbro do	139	[r]1	45	NA	NA
Granite do	5,585	[r]5,073	4,208	NA	NA
Graywacke do	13	[r]1	1	NA	NA
Ophite do	72	[r]29	48	NA	NA
Quartz do	[r]104	129	125	NA	NA
Quartzite do	611	[r]438	588	NA	NA
Schist do	208	[r]112	NA	NA	NA
Slate do	42	[r]37	NA	NA	NA
Syenite do	4	6	NA	NA	NA
Sulfur:					
Content of pyrites do	[r]115	124	140	155	144
Byproduct, all sources[e] do	2	5	4	5	5
Total do	[r]117	129	144	160	149
Talc	4,940	[r]7,325	6,822	4,998	4,141
MINERAL FUELS AND RELATED MATERIALS					
Coal, anthracite thousand tons	179	185	195	[e]237	237
Coke, metallurgical[e] do	[2]159	160	170	170	150
Gas, manufactured million cubic feet	4,907	5,135	5,159	5,111	[e]4,700
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	7,965	7,360	6,794	7,174	[e]8,200
Jet fuel do	3,408	3,688	4,416	4,150	[e]4,700
Kerosene do	395	271	240	225	[e]200
Distillate fuel oil do	13,800	16,113	13,875	14,509	[e]16,400
Residual fuel oil do	23,596	22,837	20,579	17,796	[e]15,300
Liquefied petroleum gas do	2,830	3,016	2,496	2,819	[e]3,200
Unspecified do	6,795	6,161	6,447	6,520	[e]8,600
Refinery fuel and losses do	410	413	3,983	1,748	[e]3,700
Total do	59,199	59,859	58,830	54,941	[e]60,300

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

[1]Table includes data available through May 18, 1987. Data in this table have been substantially revised from those appearing in previous editions of the Minerals Yearbook, Volume III, and reflect the best information available at the time of preparation.

[2]Reported figure.

TRADE

The current-account trade balance for Portugal in 1985, the latest year for which complete data were available, showed a surplus of nearly $300 million.[2] Low fuel prices contributed greatly to the surplus, as did the falling value of the dollar. The value of exports of goods equaled about 80% of the value of imports. Imports of minerals and fuels accounted for one-third of all imports, with petroleum and petroleum products amounting to about 25% of the total value.

While the quantity of imported petroleum remained the same in 1986 as in 1985, preliminary figures indicated that the value decreased by approximately 40%. Exports of minerals and fuels decreased about 25% by value from 1985 levels.

The geographic distribution of trade changed dramatically in 1986. Imports from EEC countries increased by over 30% to account for 57% of Portugal's total imports. Over two-thirds of exports were to EEC countries. Portugal's trade deficits with the Federal Republic of Germany, Italy, and Spain doubled during the year.

Trade with the United States decreased substantially in 1986. Coal remained the most important import from the United States, while steel sheet and wire rod were among the major exports to the United States.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Scrap	5,158	1,732	--	Netherlands 813; France 567; West Germany 220.
Unwrought	775	50	--	All to Angola.
Semimanufactures	1,219	673	17	Italy 177; United Kingdom 172; Switzerland 170.
Beryllium: Metal including alloys, all forms	30	--		
Columbium and tantalum: Ore and concentrate	10	--		
Copper:				
Ore and concentrate	1,352	--		
Matte and speiss including cement copper	252	168	--	All to Spain.
Sulfate	425	NA		
Metal including alloys:				
Scrap	855	441	--	Netherlands 392; United Kingdom 49.
Unwrought	3,927	1,638	--	Turkey 894; Yugoslavia 378; Italy 344.
Semimanufactures	1,788	1,949	592	Mozambique 412; Italy 315.
Iron and steel:				
Iron ore and concentrate: Pyrite, roasted	2,000	--		
Metal:				
Scrap	9,526	4,013	--	Belgium-Luxembourg 2,321; Netherlands 1,473; United Kingdom 140.
Pig iron, cast iron, related materials	r253	68	--	Mainly to Angola.
Ferroalloys:				
Ferromanganese	46,073	11,918	800	Greece 4,900; Italy 4,120; United Kingdom 1,543.
Unspecified	r44,882	36,887	--	West Germany 20,947; Japan 5,180; United Kingdom 3,637.
Steel, primary forms	3,815	156	--	Mainly to Belgium-Luxembourg.
Semimanufactures:				
Bars, rods, angles, shapes, sections	127,976	177,280	55,238	West Germany 28,944; United Kingdom 27,866.
Universals, plates, sheets	85,853	92,978	66,262	Romania 8,991; Belgium-Luxembourg 5,288.
Hoop and strip	147	762	--	Angola 722; Mozambique 39.
Rails and accessories	30	81	--	Tunisia 80.
Wire	3,117	5,504	13	Algeria 3,595; France 918; Iraq 161.
Tubes, pipes, fittings	6,330	7,043	--	West Germany 2,762; France 2,529; Angola 655.
Castings and forgings, rough	8,656	9,888	2,142	United Kingdom 4,425; Sweden 1,460.
Lead:				
Ore and concentrate	1,048	1,090	--	All to Belgium-Luxembourg.
Oxides	--	12	--	All to Angola.
Metal including alloys:				
Unwrought	9	66	--	Liberia 39; Angola 15; United Kingdom 9.
Semimanufactures	29	55	--	Angola 35; Morocco 14.
Magnesium: Metal including alloys, scrap	8	--		
Mercury value, thousands	--	$5	--	All to Angola.
Nickel: Metal including alloys:				
Scrap	14	14	--	All to United Kingdom.
Semimanufactures	10	(2)	--	NA.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$1,129	$3,007	--	United Kingdom $2,985; West Germany $22.
Silver:				
Waste and sweepings[3] do	$25	$7	--	All to West Germany.
Metal including alloys, unwrought and partly wrought do	$47	$10	--	Angola $7; Mozambique $2.
Tin: Metal including alloys:				
Scrap	14	127	--	United Kingdom 62; Spain 44; Netherlands 20.
Semimanufactures	8	8	--	Angola 6; Central African Republic 2.
Titanium: Oxides	20	31	--	All to Cape Verde.
Tungsten:				
Ore and concentrate	2,486	2,603	1,006	Japan 883; Netherlands 279.
Metal including alloys, all forms	5	--		
Zinc:				
Oxides	1,200	969	--	Italy 692; Netherlands 111; Morocco 110.
Metal including alloys:				
Scrap	100	--		
Unwrought	(2)	20	--	All to Israel.
Semimanufactures	63	20	--	Angola 12; Mozambique 3.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Other:				
Ores and concentrates	13	49	--	France 47; Japan 2.
Ashes and residues	2,967	2,716	--	Belgium-Luxembourg 1,670; Netherlands 687; United Kingdom 212.
Base metals including alloys, all forms	160	90	--	Netherlands 84; West Germany 6.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Artificial: Corundum	60	--		
Grinding and polishing wheels and stones	80	80	18	France 35; Angola 22.
Boron materials: Crude natural borates	28	--		
Cement	19,948	68,956	--	Ivory Coast 27,173; Guinea 16,483; Cape Verde 14,694.
Chalk	109	2,364	--	Spain 2,227; São Tomé and Principe 69; Cape Verde 68.
Clays, crude	565	5,441	--	France 4,950; Netherlands 330; Republic of South Africa 121.
Diamond: Gem, not set or strung value, thousands	$31,841	$34,494	$385	Switzerland $34,104.
Diatomite and other infusorial earth	18	94	--	Cape Verde 41; Venezuela 28; São Tomé and Principe 22.
Feldspar, fluorspar, related materials	1,297	--		
Fertilizer materials: Manufactured:				
Ammonia	4,072	6,669	--	Turkey 6,498; unspecified 166.
Nitrogenous	78,626	153,742	--	West Germany 88,823; Netherlands 21,800; France 10,095.
Phosphatic	76,885	68,483	--	Nigeria 31,000; United Kingdom 14,185; U.S.S.R. 11,350.
Potassic	2	712	--	Cyprus 697; Cape Verde 15.
Unspecified and mixed	35,362	22,303	--	Nigeria 10,000; Sweden 3,150; Mozambique 2,520.
Graphite, natural	59	1	--	All to Angola.
Gypsum and plaster	41	36	--	Cape Verde 14; Angola 13; Mozambique 7.
Lime	210	628	--	São Tomé and Principe 261; Cape Verde 162; Cameroon 36.
Magnesium compounds	--	36	--	Angola 35.
Mica:				
Crude including splittings and waste	823	646	--	All to United Kingdom.
Worked including agglomerated splittings	58	--		
Pigments, mineral: Iron oxides and hydroxides, processed	82	35	--	Cape Verde 28; Angola 6.
Salt and brine	9,029	11,088	53	Nigeria 10,251; France 490; West Germany 168.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	1,019	463	--	Cyprus 250; Morocco 120; Ivory Coast 60.
Sulfate, manufactured	2,100	NA		
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	125,856	93,908	326	Spain 37,802; Japan 30,312; Belgium-Luxembourg 6,860.
Worked	241,765	336,181	39,455	West Germany 189,545; United Kingdom 20,991.
Gravel and crushed rock	1,128	1,219	--	Spain 1,104; France 71; Singapore 41.
Limestone other than dimension	205	29	--	Mainly to Cape Verde.
Quartz and quartzite	29,839	12,924	--	Norway 11,409; United Kingdom 1,455; Ireland 60.
Sand other than metal-bearing	17,289	36,413	--	Greece 18,074; Gibraltar 17,200; Morocco 1,110.
Sulfur:				
Elemental: Crude including native and byproduct	10	22	--	Angola 18; Mozambique 4.
Sulfuric acid	21,820	18,174	--	Netherlands 6,664; Spain 3,829; Morocco 3,697.
Talc, steatite, soapstone, pyrophyllite	8	47	--	Angola 31; Mozambique 10; Cape Verde 5.
Other:				
Crude	279	25	--	Mozambique 13; Cape Verde 7; São Tomé and Principe 5.
Slag and dross, not metal-bearing	22	--		
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	7	185	--	Mainly to Angola.
Carbon: Carbon black	379	558	--	West Germany 415; Angola 127; Turkey 16.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coal: Anthracite and bituminous	10	5	--	All to Angola.
Coke and semicoke	72	55	16	Do.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	29	132	113	Cape Verde 17; Gibraltar 1.
Gasoline do	1,067	483	98	Iceland 259; United Kingdom 116.
Mineral jelly and wax do	8	3	--	Mainly to West Germany.
Kerosene and jet fuel do	2,155	2,389	NA	Iran 210; Denmark 140; unspecified 1,257.
Distillate fuel oil do	758	876	NA	Netherlands 356; Iceland 194; unspecified 325.
Lubricants do	157	158	NA	Italy 85; Greece 11; unspecified 48.
Residual fuel oil do	1,435	5,844	--	France 3,755; Netherlands 848; Belgium-Luxembourg 790.

rRevised NA Not available.
[1]Prepared by David J. Ellis.
[2]Less than 1/2 unit.
[3]May include other precious metals.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	1,400	8,374	--	France 6,951; Spain 815; West Germany 604.
Oxides and hydroxides	6,371	6,254	24	United Kingdom 2,301; West Germany 1,926; France 1,667.
Metal including alloys:				
Scrap	45	2,261	40	Spain 2,202.
Unwrought	26,110	35,752	--	Spain 13,494; Norway 10,798; Netherlands 4,621.
Semimanufactures	12,002	15,938	3	Spain 5,521; France 2,097; West Germany 2,066.
Antimony: Metal including alloys, all forms	32	NA		
Chromium:				
Ore and concentrate	859	1,281	--	Belgium-Luxembourg 433; Republic of South Africa 431; Netherlands 399.
Oxides and hydroxides	122	146	(2)	West Germany 80; Italy 40; U.S.S.R. 9.
Metal including alloys, all forms	6	--		
Cobalt:				
Oxides and hydroxides	6	8	--	Belgium-Luxembourg 4; Republic of South Africa 2.
Metal including alloys, all forms	9	NA		
Columbium and tantalum: Metal including alloys, all forms, tantalum	4	3	(2)	France 2; Japan 1.
Copper:				
Ore and concentrate	4,365	3,052	--	All from Spain.
Metal including alloys:				
Scrap	79	243	--	Spain 143; Greece 34; West Germany 28.
Unwrought	15,071	16,289	(2)	Chile 7,591; Peru 3,675; Belgium-Luxembourg 2,243.
Semimanufactures	10,577	13,913	3	West Germany 2,957; Italy 2,113; Spain 2,110.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	6,040	NA		
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	374,718	683,298	--	Canada 256,355; Venezuela 223,298; Mauritania 145,710.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal:				
Scrap	120,120	116,941	--	United Kingdom 69,012; Spain 19,771; Canada 13,012.
Pig iron, cast iron, related materials	47,773	40,643	--	Spain 33,373; Republic of South Africa 3,537; France 1,494.
Ferroalloys:				
Ferromanganese	93	2,369	--	France 2,221; West Germany 120; Norway 28.
Unspecified	r1,138	21,049	5,347	West Germany 6,599; Turkey 3,706.
Steel, primary forms	246,033	200,680	--	West Germany 104,969; Belgium-Luxembourg 39,076; France 20,804.
Semimanufactures:				
Bars, rods, angles, shapes, sections	105,095	165,742	10	Spain 49,976; West Germany 37,512; France 18,448.
Universals, plates, sheets	206,837	289,936	2,419	West Germany 69,001; Republic of South Africa 52,100; East Germany 49,204.
Hoop and strip	29,568	37,334	(2)	Belgium-Luxembourg 23,407; West Germany 6,120; France 3,929.
Rails and accessories	15,112	7,848	--	Netherlands 2,178; West Germany 1,988; Belgium-Luxembourg 1,368.
Wire	21,923	23,417	4	Spain 10,297; United Kingdom 4,152; Belgium-Luxembourg 3,420.
Tubes, pipes, fittings	18,140	30,120	3,029	West Germany 7,211; France 5,062; Spain 4,833.
Castings and forgings, rough	150	2,793	--	Switzerland 1,032; Canada 896; West Germany 415.
Lead:				
Oxides	597	684	--	West Germany 637; Spain 32.
Metal including alloys:				
Scrap	3	14,937	--	Spain 14,797; United Kingdom 139.
Unwrought	21,176	20,149	--	Peru 12,928; United Kingdom 2,413; Spain 1,478.
Semimanufactures	50	42	2	Spain 18; United Kingdom 18.
Magnesium: Metal including alloys, semimanufactures	5	5	(2)	West Germany 4; Switzerland 1.
Manganese:				
Ore and concentrate, metallurgical-grade	52,054	125,820	NA	Brazil 3,346; unspecified 122,453.
Oxides	1,256	1,227	--	Netherlands 782; Belgium-Luxembourg 194; Republic of South Africa 124.
Mercury 76-pound flasks	435	551	--	China 203; Mexico 174; Switzerland 87.
Nickel:				
Matte and speiss	4	2	--	All from Finland.
Metal including alloys:				
Scrap	7	6	NA	NA.
Unwrought	223	260	35	Finland 63; Republic of South Africa 60; United Kingdom 45.
Semimanufactures	377	233	(2)	West Germany 56; Finland 44; Norway 40.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$1,186	$1,403	$1	France $1,224; West Germany $126.
Silver: Metal including alloys, unwrought and partly wrought do	$5,170	$9,220	--	West Germany $8,783; Switzerland $197; France $138.
Tin:				
Ore and concentrate	80	218	--	Zaire 158; Burma 60.
Metal including alloys:				
Scrap	40	--		
Unwrought	396	182	--	Malaysia 140; Netherlands 40.
Semimanufactures	87	92	(2)	United Kingdom 53; West Germany 37.
Titanium:				
Oxides	10,181	9,029	713	Spain 2,261; Finland 1,923; United Kingdom 1,798.
Metal including alloys, all forms	14	NA		
Tungsten: Metal including alloys, all forms	6	9	(2)	Mainly to West Germany.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Oxides	99	638	6	France 365; West Germany 171; United Kingdom 76.
Metal including alloys:				
Scrap	1,030	2,178	193	United Kingdom 605; Saudi Arabia 558; Tunisia 195.
Unwrought	9,385	11,076	--	Canada 5,544; West Germany 1,537; Belgium-Luxembourg 1,354.
Semimanufactures	1,424	1,349	--	West Germany 528; United Kingdom 309; Belgium-Luxembourg 289.
Zirconium: Ore and concentrate	1,623	NA		
Other:				
Ores and concentrates	r27,344	4,277	--	Spain 3,522; Republic of South Africa 398; United Kingdom 171.
Ashes and residues	285	532	112	Spain 367; Republic of South Africa 35.
Base metals including alloys, all forms	(2)	65	1	Belgium-Luxembourg 30; West Germany 8; United Kingdom 7.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc.	544	521	4	Italy 197; Spain 130; Netherlands 61.
Artificial:				
Corundum	1,179	1,375	--	West Germany 902; France 134; Spain 119.
Silicon carbide	674	NA		
Dust and powder of precious and semi-precious stones including diamond value, thousands	$1,867	$2,908	$46	West Germany $1,422; Ireland $572; Belgium-Luxembourg $511.
Grinding and polishing wheels and stones	544	819	--	Italy 467; Spain 153; West Germany 63.
Asbestos, crude	8,126	9,931	4	Zimbabwe 4,280; Canada 3,673; Republic of South Africa 888.
Barite and witherite	564	1,216	1	Spain 822; West Germany 225; France 91.
Boron materials:				
Crude natural borates	10,559	7,308	--	Turkey 6,546; Spain 480; Netherlands 280.
Oxides and acids	665	269	--	Italy 172; France 85.
Cement	10,154	1,850	--	France 1,551; Netherlands 59; United Kingdom 35.
Chalk	10,964	6,688	--	France 5,034; United Kingdom 851; Belgium-Luxembourg 755.
Clays, crude	31,600	31,662	867	Spain 22,730; United Kingdom 5,918; West Germany 1,215.
Cryolite and chiolite	66	61	--	Mainly from Denmark.
Diamond:				
Gem, not set or strung value, thousands	$4,720	$2,043	--	Belgium-Luxembourg $1,119; Netherlands $655; Zaire $169.
Industrial stones do	$23,912	$30,868	NA	Switzerland $9,786; unspecified $21,049.
Diatomite and other infusorial earth	4,000	4,065	415	Spain 2,668; France 495.
Feldspar, fluorspar, related materials	2,137	3,284	--	France 2,749; United Kingdom 441; Spain 50.
Fertilizer materials:				
Crude, n.e.s	--	40	--	All from Italy.
Manufactured:				
Ammonia	44,475	40,632	2,100	Spain 10,576; United Arab Emirates 10,348; Italy 7,005.
Nitrogenous	51,659	54,570	--	France 14,141; Netherlands 12,724; United Kingdom 10,210.
Phosphatic	1,080	450	--	All from France.
Potassic	59,711	57,746	--	Spain 35,940; Israel 19,062; East Germany 2,725.
Unspecified and mixed	16,222	24,187	9,501	Morocco 11,470; United Kingdom 2,096.
Graphite, natural	95	162	12	United Kingdom 48; Spain 40; China 30.
Gypsum and plaster	37,423	36,257	1	Spain 27,261; Morocco 7,750; West Germany 978.
Iodine	11	NA		
Lime	784	84	--	France 40; West Germany 22; Spain 22.
Magnesium compounds	3,616	2,686	5	United Kingdom 1,701; Spain 281; Netherlands 244.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Mica:				
Crude including splittings and waste	283	175	--	Italy 67; France 66; Norway 20.
Worked including agglomerated splittings	14	20	1	France 9; Belgium-Luxembourg 4; Spain 3.
Nitrates, crude	1,036	536	--	Chile 500; West Germany 36.
Phosphates, crude	364,752	342,282	--	Morocco 337,260; Togo 5,000.
Phosphorus, elemental	20	NA		
Pigments, mineral: Iron oxides and hydroxides, processed	1,873	1,360	(2)	West Germany 840; Spain 294; Italy 77.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$6,779	$190	$8	Belgium-Luxembourg $43; Switzerland $33; West Germany $29.
Synthetic do.	$39	$37	--	West Germany $21; Austria $7.
Pyrite, unroasted	204	24	--	All from France.
Salt and brine	205	7,959	--	Italy 3,850; Spain 3,850; Netherlands 243.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	297	46,886	14,075	Italy 29,237; Republic of South Africa 1,196.
Worked	309	3,273	--	Italy 1,767; Belgium-Luxembourg 1,037; United Kingdom 469.
Dolomite, chiefly refractory-grade	4,872	4,702	--	United Kingdom 1,777; Norway 1,133; Italy 686.
Gravel and crushed rock	732	108	11	Belgium-Luxembourg 31; West Germany 25; Netherlands 24.
Limestone other than dimension	4,500	1,500	--	All from France.
Quartz and quartzite	128	11,806	--	Switzerland 11,643; Finland 59; Belgium-Luxembourg 56.
Sand other than metal-bearing	1,665	8,415	19	Spain 5,648; Belgium-Luxembourg 2,594.
Sulfur:				
Elemental:				
Crude including native and by-product	16,953	19,016	--	France 18,766; West Germany 172; Spain 78.
Colloidal, precipitated, sublimed	11	231	(2)	France 203; Italy 19; West Germany 9.
Sulfuric acid	93	18,969	--	Belgium-Luxembourg 10,805; United Kingdom 8,156.
Talc, steatite, soapstone, pyrophyllite	5,808	4,984	61	France 2,359; Belgium-Luxembourg 807; Austria 468.
Other:				
Crude	1,154	1,264	(2)	Spain 827; Finland 128; Italy 115.
Slag and dross, not metal-bearing	--	21,097	NA	Mainly from Spain.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	745	613	40	Spain 447; Netherlands 120.
Carbon: Carbon black	7,401	1,611	1	Spain 1,028; United Kingdom 346; France 144.
Coal: Anthracite and bituminous	478,674	1,468,535	927,306	Poland 210,940; Republic of South Africa 106,292.
Coke and semicoke	44,547	62,001	NA	United Kingdom 15,855; France 9,475; unspecified 25,362.
Peat including briquets and litter	2,498	2,957	--	West Germany 1,549; Ireland 359.
Petroleum:				
Crude thousand 42-gallon barrels	55,086	52,176	--	Saudi Arabia 10,991; Nigeria 9,282; Iraq 8,145.
Refinery products:				
Liquefied petroleum gas do.	3,272	3,159	156	United Kingdom 1,894; France 469; Netherlands 244.
Gasoline do.	4,242	5,005	--	Algeria 1,206; Spain 994; Netherlands 904.
Mineral jelly and wax do.	41	19	(2)	Spain 12; France 2; Netherlands 2.
Kerosene and jet fuel do.	58	273	(2)	Netherlands 149; United Kingdom 36; unspecified 53.
Distillate fuel oil do.	969	658	26	France 283; U.S.S.R. 132; United Kingdom 122.
Lubricants do.	228	332	20	Belgium-Luxembourg 70; United Kingdom 60; France 54.
Residual fuel oil do.	10,183	2,104	223	Spain 1,328; Saudi Arabia 272.
Bitumen and other residues do.	326	294	--	Spain 285; Belgium-Luxembourg 6.
Bituminous mixtures do.	67	57	(2)	Spain 34; Netherlands 14; United Kingdom 6.
Petroleum coke do.	99	373	372	West Germany 1.

[r] Revised. NA Not available.
[1] Table prepared by David J. Ellis.
[2] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Copper.—Underground development work continued at the Neves-Corvo copper project near Castro Verde in southern Portugal. In November, work to connect the main haulage level at 520 meters below the surface with the main ramp was completed. This enabled the rate of development to increase in anticipation of the concentrator startup planned for late 1988. The concentrator will initially process 1 million tons of ore annually, yielding 400,000 tons of concentrate containing nearly 150,000 tons of copper.

Sociedade Mineira de Neves-Corvo S.A.R.L., the operating company, was owned 51% by the Government company Empresa Desenvolvimento Mineira do Alentejo and 49% by RTZ Metals Group (RTZ) of the United Kingdom. Contracts were awarded to two Swedish companies, Boliden AB and Comtech AB, for underground design engineering and to Kaiser Engineering of the United States for surface facilities.

Reserves at the site were not fully defined by yearend. Reportedly, 33 million tons of 7.8% copper ore were proven. In addition, 33 million tons of complex lead-zinc ore averaging 5.7% zinc and, 1.7% lead and containing as much as 1.9 ounces per ton silver have been delineated. The deposit consists of four ore bodies: Neves, Corvo, Zambujal, and Graça. Each of the four is a massive sulfide lens. Copper mineralization tends to occur at the base of the lens, and lead-zinc occurs higher than and laterally separate from the copper. Copper mineralization also occurs as stockwork in footwall tuffs and as banded chalcopyrite in hanging wall shales. The four ore bodies cover an area of nearly 6.5 square kilometers. The complex ore has a maximum thickness of 95 meters in the Corvo ore body.[3]

Development was focused on mining copper-rich areas in the upper regions of the Corvo and Graça ore bodies. The main production shaft was being constructed to allow for expansion of production to 3 million tons of ore annually. Mining systems were planned to be adjusted to fit numerous variations in ore geometry. Drift-and-fill and cut-and-fill mining were planned for most work areas. Exploratory drilling continued for the purpose of obtaining data for mine planning and grade control. Some zones in the ore were found to grade as much as 26% copper. Evaluation of the complex lead-zinc ore was planned as a part of initial mining work.

Government-owned Quimica de Portugal E.P. (Quimigal) invited tenders for construction of a 100,000-ton-per-year copper smelter and refinery at Sines. The plant was planned to operate using concentrate from the Neves-Corvo Mine. Independent sources estimated, however, that overhead costs in Portugal, especially power costs, indicate that operating a smelter smaller than 200,000-ton-per-year capacity would not be cost effective. Involvement of RTZ in the Neves-Corvo project would also facilitate concentrates from the mine being processed by RTZ Spanish subsidiary Rio Tinto Minera S.A.'s smelter at Huelva, Spain, only 200 kilometers from the mine. Quimigal planned to go ahead with smelter construction at Sines, demonstrating the Portuguese Government's commitment to domestic industrial development.

Ferroalloys.—Eurominas Electro Metalurgia S.A.R.L. (Eurominas) halted production at its Setubal plant in late August, reportedly owing to weak market conditions and to carry out repairs. The plant had a capacity of 120,000 tons of high-carbon ferromanganese and 30,000 tons of silicomanganese annually. Although production was scheduled to resume in September, the restart was postponed indefinitely because of delays in repairs and the continued poor market. In addition, the Portuguese state-owned utility Electricidade de Portugal (EDP) forced Eurominas to renegotiate its power supply contract. EDP reportedly was seeking to increase power costs to levels that, according to Eurominas officials, made resumption of operations very difficult. However, Eurominas officials denied any link between the shutdown and the negotiations with EDP.

In November, separate negotiations between EDP and silicon metal and ferrosilicon producer Cia. Portuguesa de Fornos Eletricos S.A.R.L. (Fornos) reached a standstill because of Fornos' refusal to agree to the rate increase EDP was demanding. As a result, EDP disconnected the power to Fornos' Nelas Works. Fornos continued to sell silicon and ferrosilicon from stocks.

Iron and Steel.—Siderurgia Nacional S.A.R.L., Portugal's Government-owned steel company, began a 5-year, $100 million modernization of its Seixal integrated works near Lisbon and its Maia electric steel plant near Porto. The program involved the installation of a 400,000-ton-per-year

continuous six-strand billet caster at Seixal to replace a 150,000-ton-per-year, four-strand caster installed in 1970. Existing wire rod mills at Seixal and Maia were being rebuilt. In addition, the flat products shop, melting shop, and coke ovens at Seixal were being refurbished. When the work is completed, scheduled for late 1990, the production capacity at both facilities will remain at 1986 levels of 550,000 tons per year at Seixal and 200,000 tons per year at Maia.

Tungsten.—Beralt Tin and Wolfram (Portugal) S.A.R.L.'s Panasqueira Mine was the only producer operating at yearend. Several small mines, which accounted for nearly one-third of the wolframite concentrate output in 1985, closed in 1986. The closed mines were being maintained, and some development work continued. The Government supplemented the regular unemployment benefits being paid to the hundreds of out-of-work miners to provide them with their regular wages through yearend. The mine operators will owe the supplemental money to the Government when and if production resumes. The wage plan was to be reviewed late in the year to determine if it was to be continued through mid-1987. Debts incurred by the mine operators for this supplemental income could affect the future viability of the operations.

INDUSTRIAL MINERALS

Nitrogen (Ammonia).—Quimigal reopened a 900-ton-per-day ammonia plant at its Lavradio fertilizer complex in June. The unit had been idle since August 1985, when the failure of the shift conversion reactor caused significant damage to the plant.

Stone (Dimension).—In terms of value, the output of the dimension stone industry was overwhelmingly the most important sector of the mining industry in 1986. Reportedly, 1,000 operators were involved in quarrying throughout Portugal, ranging in size from large companies with several operations to small family businesses. Slate production, which made up an important part of the stone industry, was centered around Valongo in the Porto District. About 25% of the slate output was exported. Demand for slate in the interior flooring, exterior cladding, billiard table bed, and roofing markets has been increasing, and several companies were planning major expansions. Companhia Portuguesa de Ardoisias Lda. doubled capacity to 1,440 tons per year.

MINERAL FUELS

Portugal remained extremely dependent on imported sources of energy, especially petroleum. Coal, hydropower and uranium were produced domestically in relatively small quantities. The United States was a major supplier of metallurgical and steam coal to Portugal.

Coal accounted for less than 5% of primary energy usage in 1986, although steps were being taken to increase its share. The second unit of a four-unit coal-fired powerplant at Sines became operational in mid-year. The third unit was scheduled for completion in 1987 and the fourth by the end of 1989. A similar installation was planned to begin operation in northern Portugal in 1993, although a site was not announced. These powerplants will consume approximately 5.2 million tons of coal annually, or 60% of the country's projected 1995 consumption. In addition, coal consumption in the cement industry was forecast to grow by 20% by 1990 as more facilities convert to coal from fuel oil. Coal use in the cement industry was about 1 million tons in 1986.

Portuguese coal resources were very limited and were in two regions. Mining of poor-quality anthracite containing 35% ash was being carried out near Pejao in the Douro River Valley in the northern part of the country. Estimated reserves in the area were 40 million tons. Lignite reserves were about 65 miles northeast of Lisbon near Rio Maior. Reserves were estimated at 30 million tons of brown coal containing 30% ash and 45% water. No lignite mining was conducted during the year.

A 5-million-ton-per-year-capacity coal terminal, capable of handling 150,000-deadweight-ton vessels, was being constructed at Sines. Although planned for completion in mid-1988, it was not expected to be ready for use until 1990 because of construction delays. EDP completed a temporary facility capable of unloading 30,000-deadweight-ton vessels and handling 1 to 2 million tons of coal annually at Sines to serve in the interim.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Portuguese escudos (Esc) to U.S. dollars at the rate of Esc149.59 = US$1.00, the average exchange rate in 1986.

[3]White, L. Portugal: Neves-Corvo Emerging as a Copper Heavyweight. Eng. and Min. J., v. 187, No. 11, Nov. 1986, pp. 50-53.

The Mineral Industry of Romania

By Walter G. Steblez[1]

Romania's centrally planned economy and mineral industry grew at a slower rate in 1986 than in 1985. Most planned targets for the year were not met. Shortfalls in the country's planned total industrial production amounted to about 1.3%; those for coal, 4%; electric power, 3%; natural gas, 16%; and steel, 16%. The chief mineral industry development projects continued to be the Rosia Poieni copper mining and beneficiation complex and the Calimani sulfur deposit. A new copper concentrator at Zlatna, near the Rosia Poieni complex, was put on-stream at midyear. Romania continued to produce modest amounts of bauxite, copper, lead, and zinc, but had to import substantial quantities of these commodities to meet domestic demand. Most of Romania's raw material needs for the steel industry had to be met by imports. However, the country remained largely self-sufficient in most industrial minerals.

Government Policies and Programs.—The overriding policy of the Government continued to be the rapid repayment of Romania's convertible currency foreign debt. From 1981 to 1986, Romania's hard currency debt was reduced from $10.5 to $5.5 billion. Moreover, the Government announced plans to maintain and even accelerate its rate of repayment. A result of this policy during the 1981-86 period was the curtailment of needed imports of machinery and equipment and shortages of spare parts, leaving the country's industrial infrastructure severely deteriorated. Also, heavy emphasis on exports to maintain the rapid foreign debt repayment schedule created severe domestic shortage of food and fuel. Although the annual plans during the Government's seventh 5-year plan for economic development (1981-85) were not met, the published plans for 1987 and for the entire eighth 5-year plan period (1986-90) appear to be no less ambitious than the earlier plan. The near-term plan for 1987 specified far fewer actual goals than those for preceeding years. Greater emphasis was to be placed on the mining industry to produce more coal and lignite to rectify domestic fuel shortages. The metallurgical sector was to increase its range of marketable goods while reducing raw material and fuel consumption. Net industrial production was to grow by 9% to 10% and national income by 8% to 9% compared with those of 1986.[2]

Romania's eighth 5-year plan stipulated a 60.4% to 65.4% increase in national income and 86.7% to 94.2% growth in net industrial production by 1990 compared with those of 1985. Also, compared with those of 1985, the mining-extractive and metallurgical sectors were to grow by 39.1% and 48.3%, respectively, by 1990. During the same period, the output of cement, coal, electricity, and steel was to rise, respectively, by 39% to 47%, 152%, 43%, and 45% to 49%.[3]

PRODUCTION

Production shortfalls owing to inadequate and inefficient delivery of spare parts and equipment continued to depress most sectors of the mineral industry. Romania's tool industry, among others, was singled out in official sources for failure to produce a range of products needed by the minerals sector, as well as by other sectors of the economy.[4] Although a large degree of military discipline was introduced into the mineral industry, underutilization of machinery and equipment continued, as did overconsumption of raw materials and fuels on the one hand, and shortages on secondary recovery of metals and other materials, on the other.

Table 1.—Romania: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum:					
Bauxite, gross weight[e]	680,000	650,000	620,000	600,000	600,000
Alumina, calcined, gross weight	514,000	512,000	552,000	548,000	500,000
Ingot including alloys:					
Primary	208,000	223,000	244,000	247,000	235,000
Secondary	20,000	21,000	20,000	18,000	15,000
Total	228,000	244,000	264,000	265,000	250,000
Bismuth, mine output, Bi content[e]	80	80	80	80	80
Cadmium, smelter[e]	80	80	75	75	75
Copper:[e]					
Mine output, Cu content	26,000	27,000	25,000	26,000	27,000
Smelter:					
Primary	35,000	34,000	32,000	[3]32,963	32,000
Secondary	4,000	6,000	6,000	7,000	7,000
Total	39,000	40,000	38,000	39,963	39,000
Refined, primary and secondary[e]	50,000	47,000	45,000	46,000	43,000
Gold, mine output, Au content[e] troy ounces	65,000	65,000	65,000	65,000	60,000
Iron and steel:					
Iron ore:					
Gross weight thousand tons	2,146	1,987	1,916	2,287	2,300
Content (26% Fe) do	560	517	498	595	598
Metal:					
Pig iron do	8,637	8,190	9,557	9,212	9,500
Steel, crude do	13,055	12,593	14,437	13,975	[3]14,270
Ferroalloys:[e]					
Ferrochromium	39,000	42,000	45,000	44,000	44,000
Ferromanganese	75,000	80,000	87,000	80,000	82,000
Ferrosilicon	45,000	48,000	52,000	50,000	51,000
Silicomanganese	35,000	38,000	41,000	39,000	40,000
Silicon metal	3,600	3,800	4,100	3,800	4,500
Semimanufactures:					
Castings and forgings, finished[e] thousand tons	1,200	1,100	1,200	1,200	1,300
Pipes and tubes do	1,422	1,411	1,507	1,513	1,550
Rolled products do	9,346	9,179	10,329	9,900	10,000
Lead:					
Mine output, Pb content[e]	27,000	30,000	30,000	30,000	28,000
Metal, smelter:					
Primary[e]	40,500	40,000	[r]35,900	[r]38,600	37,000
Secondary	5,175	9,298	10,000	10,000	10,000
Total	45,675	49,298	45,900	48,600	47,000
Manganese:[4]					
Ore: Gross weight thousand tons	220	312	264	250	250
Concentrate:					
Gross weight do	55	78	66	[e]64	65
Mn content do	17	23	20	19	19
Silver, mine output, Ag content[e] thousand troy ounces	850	820	810	810	800
Zinc:[e]					
Mine output, Zn content	45,000	45,000	44,000	43,000	43,000
Metal, smelter, primary and secondary	39,800	42,000	41,000	40,000	39,000

See footnotes at end of table.

Table 1.—Romania: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
INDUSTRIAL MINERALS					
Barite[e]	78,000	78,000	75,000	75,000	75,000
Cement, hydraulic thousand tons	14,995	13,968	14,016	12,238	13,000
Clays:[e]					
Bentonite	175,000	177,000	180,000	180,000	185,000
Kaolin	410,000	410,000	410,000	410,000	410,000
Diatomite[e]	290,000	290,000	300,000	290,000	300,000
Feldspar[e]	84,000	85,000	85,000	86,000	86,000
Fluorspar[e]	20,000	20,000	20,000	20,000	20,000
Graphite[e]	12,500	12,500	12,500	12,000	12,000
Gypsum[e]	1,630	1,630	1,650	1,620	1,600
Lime thousand tons	3,792	3,623	3,848	3,717	3,700
Nitrogen: N content of ammonia do	2,587	2,727	2,861	2,880	2,900
Pyrites, gross weight[e] do	930	930	930	930	900
Salt:					
Rock do	1,902	1,838	1,874	1,900	2,000
Other do	2,854	2,758	3,000	3,449	3,500
Total do	4,756	4,596	4,874	5,349	5,500
Sand[e] do	2,900	2,500	2,500	2,500	2,500
Sodium compounds, n.e.s.:					
Caustic soda do	760	745	805	814	815
Sodium carbonate, manufactured, 100% Na_2CO_3 basis do	870	788	912	836	850
Sulfur:[e]					
S content of pyrites do	200	200	200	200	150
Byproduct, all sources do	150	150	150	150	140
Total do	350	350	350	350	290
Sulfuric acid do	1,900	1,941	1,915	[r]1,835	1,850
Talc[e]	65,000	[r]65,000	[r]66,000	65,000	64,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	102,000	101,166	106,900	108,593	109,000
Coal:					
Run-of-mine:					
Anthracite and bituminous thousand tons	9,658	10,629	10,653	10,472	11,000
Brown do	714	773	827	834	900
Lignite do	31,061	37,357	36,319	35,513	38,000
Total do	41,433	48,759	47,799	46,819	49,900
Washed (produced from above):					
Anthracite and bituminous:					
For coke and semicoke production do	2,244	2,618	2,903	2,963	3,000
For other uses do	4,944	5,175	5,555	5,694	5,710
Brown do	674	731	782	784	790
Lignite do	29,996	35,998	35,040	37,140	38,000
Total do	37,858	44,522	44,280	46,581	47,500
Coke:					
Metallurgical do	3,513	4,268	4,849	4,743	4,800
Other[e] do	450	450	450	[r]439	450
Total do	3,963	4,718	5,299	5,182	5,250
Fuel briquets (from brown coal)[e] do	730	750	750	750	750
Gas, natural:					
Gross:					
Associated million cubic feet	310,663	366,813	387,437	413,464	400,000
Nonassociated do	1,010,706	978,888	991,743	960,417	[3]945,126
Total do	1,321,369	1,345,701	1,379,180	1,373,881	1,345,126
Marketed[e] do	[3]1,010,706	1,100,000	1,127,000	[r]1,126,000	1,120,000

See footnotes at end of table.

Table 1.—Romania: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum:					
Crude:					
As reported ____ thousand tons__	11,742	11,593	11,453	10,718	11,000
Converted _ thousand 42-gallon barrels__	88,769	87,643	86,585	81,028	83,160
Refinery products:[5]					
Liquefied petroleum gas[e] ____do____	2,800	2,900	2,900	3,000	3,000
Gasoline ____do____	42,500	43,367	45,228	45,092	45,000
Jet fuel and kerosene[e] ____do____	7,300	7,300	7,300	7,000	7,000
Distillate fuel oil ____do____	[e]49,000	48,042	50,795	51,041	51,000
Residual fuel oil ____do____	[e]55,000	53,167	54,079	56,157	56,000
Asphalt[e] ____do____	3,500	3,000	3,000	3,000	3,000
Lubricants____do____	[e]4,000	3,927	4,039	4,004	4,000
Total ____do____	[e]164,100	161,703	167,341	169,294	169,000

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

[1]Includes data available through Sept. 30, 1987.

[2]In addition to the commodities listed, antimony, asbestos, and a variety of crude construction materials are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Estimated series were based on published data on concentrate production.

[5]Romanian sources do not indicate whether refinery fuel is reported as a part of the listed product yields. Moreover, additional minor products may be produced but are not listed in official sources.

TRADE

Romania's volume of foreign trade in 1986 declined compared with that of 1985. Notably, the country's export plan was not met and was 11.6% less than that of 1985, owing to a decline in the market price of petroleum products, which constitute a large part of Romania's exports, and to the failure of domestic foreign trade organizations to rapidly respond to changing market conditions.[5] Although Romania was a member of the Council for Mutual Economic Assistance (CMEA), CMEA exports to Romania of fuels and raw materials had been inadequate to the country's needs, forcing it to seek sources of supply outside CMEA at hard currency prices during the 1970's and 1980's. In 1986, there was an acceleration of Romania's trade with the U.S.S.R., increasing 23% compared with that of 1985. Romania, already a major importer of Soviet raw materials, substantially increased imports of Soviet petroleum, while increasing exports of food, steel products, and oil drilling equipment to that country. Also, Soviet exports of electric power, ferroalloys, iron ore, and natural gas to Romania registered marked increases during the year. Romania's commercial arrangements with other centrally planned economy countries for 1987 included an agreement with Bulgaria to promote specialized production in chemicals, metallurgy, and other fields.

An agreement with China at midyear called for Romanian exports of aluminum, industrial durables, and steel in exchange for consumer food and nonferrous metals. The agreement with Czechoslovakia for 1987 specified a trade volume increase of 5% compared with that of 1986 that would include an exchange of tools and other durable goods. Although Romania's mineral trade with the United States was largely limited to imports of bituminous coal from the United States and exports of petroleum products, it was conducted under conditions of Romania's most-favored-nation (MFN) status. In 1986, reportedly, a number of issues relative to Romania's domestic policies on human rights were raised by the U.S. Congress that placed continuation of Romania's MFN status in doubt.

Table 2.—Romania: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	20	NA		
Metal including alloys:				
Scrap	280	2,742	--	All to Italy.
Unwrought	[2]122,400	[2]139,100	--	France 19,235; Italy 13,279; Poland 12,664.
Semimanufactures	18,860	8,069	510	France 3,425; Japan 3,378.
Chromium: Oxides and hydroxides	323	204	125	West Germany 34; France 23; Austria 20.
Copper: Metal including alloys:				
Scrap	5,179	NA		
Unwrought	1,733	77	--	All to West Germany.
Semimanufactures	52	39	14	West Germany 25.
Gold:				
Waste and sweepings value, thousands	--	$137	$47	West Germany $51; Spain $39.
Metal including alloys, unwrought and partly wrought do	$86	$14	$11	Switzerland $3.
Iron and steel: Metal:				
Scrap	790	173	--	France 159; Yugoslavia 12; West Germany 2.
Pig iron, cast iron, related materials	352	418	--	West Germany 341; Sweden 76.
Ferroalloys:				
Ferromanganese	--	1,000	--	NA.
Ferrosilicomanganese	8,671	5,602	--	All to West Germany.
Ferrosilicon	187	NA		
Unspecified	5,367	6,099	--	Japan 4,805; Hungary 1,249; West Germany 45.
Steel, primary forms	75,000	77,030	29,549	Yugoslavia 22,068; United Kingdom 10,073.
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	1,077	1,498	1	Egypt 512; Yugoslavia 37; unspecified 916.
Universals, plates, sheets do	1,173	872	252	Italy 58; Japan 52.
Hoop and strip do	1	1	--	All to United Kingdom.
Rails and accessories do	([3])	([3])	--	Mainly to Greece.
Wire do	106	95	--	West Germany 8; Yugoslavia 5; unspecified 80.
Tubes, pipes, fittings do	[2]356	[2]410	32	Poland 83; West Germany 20.
Castings and forgings, rough do	3	6	([3])	Egypt 2; West Germany 2; Switzerland 1.
Lead: Metal including alloys, semimanufactures	8	NA		
Lithium: Oxides and hydroxides	--	73	--	All to West Germany.
Nickel: Metal including alloys, semimanufactures	--	3	--	All to Portugal.
Silver:				
Waste and sweepings value, thousands	--	$14	--	All to West Germany.
Metal including alloys, unwrought and partly wrought do	$253	$564	--	Yugoslavia $557; West Germany $7.
Tin: Oxides	--	18	--	All to Spain.
Tungsten: Metal including alloys, all forms	--	1	--	All to West Germany.
Zinc: Metal including alloys, unwrought	701	150	--	West Germany 125; France 25.
Other: Base metals including alloys, all forms[2]	11,303	14,661	--	NA.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	--	18	--	All to West Germany.
Artificial: Corundum	--	76	--	Do.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$603	$999	$93	Belgium-Luxembourg $857; West Germany $41.
Grinding and polishing wheels and stones	5	1	--	All to Netherlands.
Asbestos, crude	646	NA		
Barite and witherite	725	220	--	All to France.
Boron: Oxides and acids	561	99	--	All to Yugoslavia.

See footnotes at end of table.

Table 2.—Romania: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Cement thousand tons	[2]2,764	[2]2,477	--	Egypt 1,340; Hungary 73; unspecified 986.
Clays, crude	2	6	--	All to Italy.
Diamond:				
Gem, not set or strung value, thousands	$37	$3	--	All to West Germany.
Industrial stones do	$422	$84	--	All to Belgium-Luxembourg.
Fertilizer materials:				
Crude, n.e.s	3,024	NA		
Manufactured:				
Ammonia thousand tons	16	12	--	Greece 8; Yugoslavia 4.
Nitrogenous do	[2]1,512	[2]1,347	530	Egypt 154; West Germany 101.
Phosphatic do	40	33	--	Yugoslavia 26; Hungary 7.
Potassic do	6	NA		
Unspecified and mixed do	[2]2,833	[2]3,294	4	Thailand 94; Venezuela 63; unspecified 3,048.
Graphite, natural	12	NA		
Gypsum and plaster	16,872	12,225	--	All to Hungary.
Lime	24,484	31,965	--	Do.
Precious and semiprecious stones other than diamond: Synthetic value, thousands	$65	$53	--	Belgium-Luxembourg $46; West Germany $7.
Salt and brine	588,314	671,749	--	Hungary 449,733; Yugoslavia 222,016.
Sodium compounds, n.e.s.: Carbonate, manufactured	[2]473,600	[2]471,800	--	Yugoslavia 42,733; Hungary 41,535; Czechoslovakia 20,000.
Stone, sand and gravel: Dimension stone:				
Crude and partly worked	3,312	NA		
Worked	9,949	11,310	16	West Germany 10,461; Switzerland 467; Austria 366.
Other: Crude	162	159	--	All to West Germany.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	[2]24,800	[2]21,000	--	Poland 7,051; Czechoslovakia 2,649; Bulgaria 322.
Coal:				
Anthracite and bituminous	11,878	NA		
Briquets of anthracite and bituminous coal	46,410	NA		
Coke and semicoke	34	NA		
Gas, natural: Gaseous million cubic feet	[2]706	--		
Peat including briquets and litter	171	NA		
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	--	704	--	All to Italy.
Gasoline do	[2]31,151	[2]33,150	6,714	France 1,430; West Germany 1,159.
Mineral jelly and wax do	[2]20	[2]16	--	Pakistan 6; Thailand 5.
Kerosene and jet fuel do	102	27	--	Hungary 16; West Germany 6; Belgium-Luxembourg 5.
Distillate fuel oil do	[2]20,257	[2]20,664	(3)	Italy 15,054; France 929; Greece 336.
Lubricants[2] do	1,044	1,523	NA	NA.
Residual fuel oil do	[2]24,437	[2]17,086	1,039	Italy 5,267; United Kingdom 1,282; Sweden 1,248.
Bitumen and other residues do	13	12	--	All to Austria.
Petroleum coke[2] do	1,048	1,000	--	NA.

[p]Preliminary. NA Not available.

[1]Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Romania, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2]Official Trade Statistics of Romania.

[3]Less than 1/2 unit.

Table 3.—Romania: Apparent imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	704,760	274,564	--	All from Yugoslavia.
Oxides and hydroxides	20,536	41,158	--	Yugoslavia 26,004; Hungary 11,591; Netherlands 3,448.
Metal including alloys:				
Unwrought	900	2,622	--	Hungary 2,597; Netherlands 25.
Semimanufactures	2,317	1,687	18	Hungary 1,095; France 310; West Germany 116.
Cadmium: Metal including alloys, all forms	30	NA		
Chromium:				
Ore and concentrate	292	[2]101,400	--	Turkey 42,126; West Germany 439; unspecified 58,835.
Oxides and hydroxides	2	NA		
Metal including alloys, all forms	--	110	--	All from United Kingdom.
Cobalt:				
Oxides and hydroxides	6	NA		
Metal including alloys, all forms	12	31	--	United Kingdom 16; Netherlands 14; West Germany 1.
Copper:				
Oxides and hydroxides	20	25	--	All from West Germany.
Metal including alloys:				
Unwrought	17,489	8,360	--	Spain 5,199; Poland 3,151; United Kingdom 10.
Semimanufactures	7,280	7,761	--	Poland 7,020; West Germany 461; Italy 106.
Gold: Metal including alloys, unwrought and partly wrought, troy ounces	258	7,234	--	All from Switzerland.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite, thousand tons	[2]14,963	[2]15,207	--	U.S.S.R. 7,499; unspecified 7,708.
Metal:				
Scrap	--	12	--	All from France.
Pig iron, cast iron, related materials[2]	169,800	117,400	--	NA.
Ferroalloys:				
Ferrochromium	259	711	--	Yugoslavia 610; West Germany 101.
Ferromanganese	58,000	37,000	--	Spain 3,500; West Germany 1,000; unspecified 32,500.
Ferromolybdenum	81	20	--	All from United Kingdom.
Ferrosilicomanganese	20,120	20,195	--	All from U.S.S.R.
Silicon metal	398	185	--	All from Italy.
Unspecified[2]	75,142	87,034	--	NA.
Steel, primary forms	218,000	281,000	--	NA.
Semimanufactures:				
Bars, rods, angles, shapes, sections, thousand tons	197	249	--	Hungary 29; Yugoslavia 15; unspecified 200.
Universals, plates, sheets, do.	131	108	1	France 9; Portugal 9; unspecified 56.
Hoop and strip, do.	7	9	([3])	West Germany 6; Hungary 2.
Rails and accessories, do.	95	100	--	Yugoslavia 10; unspecified 90.
Wire, do.	9	9	--	West Germany 1; Yugoslavia 1; unspecified 6.
Tubes, pipes, fittings, do.	[2]27	[2]44	--	Czechoslovakia 5; Japan 3; unspecified 29.
Castings and forgings, rough, do.	([3])	1	--	NA.
Lead:				
Ore and concentrate	9,694	12,709	--	Yugoslavia 5,764; Ireland 4,200; Spain 2,745.
Oxides	1,003	1,135	--	All from Italy.
Metal including alloys:				
Unwrought	4,594	5,320	--	Morocco 3,450; Spain 1,700; Yugoslavia 170.
Semimanufactures	41	NA		
Magnesium: Metal including alloys:				
Unwrought	36	NA		
Semimanufactures	28	53	--	West Germany 46; Italy 7.
Manganese:				
Ore and concentrate, metallurgical-grade	165,000	225,000	--	NA.
Metal including alloys, all forms	--	31	--	All from United Kingdom.

See footnotes at end of table.

Table 3.—Romania: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Mercury 76-pound flasks	4,061	493	--	All from Spain.
Molybdenum: Metal including alloys, all forms	1	3	--	France 1; West Germany 1; United Kingdom 1.
Nickel:				
Matte and speiss, Ni content	1,048	351	--	All from Cuba.
Metal including alloys:				
Scrap	--	10	--	All from United Kingdom.
Unwrought	18	[2]10,900	--	NA.
Semimanufactures	211	228	--	West Germany 146; Italy 55; France 13.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$1,748	$625	--	France $406; Switzerland $208; Sweden $3.
Silver: Metal including alloys, unwrought and partly wrought do	$26	$159	--	West Germany $92; Switzerland $58; France $7.
Tin: Oxides	2	17	--	Italy 14; Austria 3.
Titanium:				
Ore and concentrate	--	6,425	--	All from Netherlands.
Oxides	--	1,559	--	Yugoslavia 724; West Germany 702; France 133.
Metal including alloys, all forms	--	9	--	West Germany 8; United Kingdom 1.
Tungsten: Metal including alloys, all forms	60	74	--	West Germany 73; France 1.
Zinc:				
Ore and concentrate	15,538	1,880	--	Spain 1,873; Greece 3.
Oxides	4,933	5,186	--	France 3,785; Yugoslavia 1,401.
Blue powder	527	NA		
Metal including alloys, semimanufactures	174	403	--	Belgium-Luxembourg 170; France 130; Poland 84.
Zirconium:				
Ore and concentrate	220	898	--	All from West Germany.
Metal including alloys, all forms	--	1	--	Do.
Other:				
Ores and concentrates	32,440	4	--	All from Italy.
Oxides and hydroxides	98	18	--	Austria 17; Switzerland 1.
Base metals including alloys, all forms	82	109	--	Austria 36; Japan 33; Belgium-Luxembourg 30.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Artificial: Corundum	6,852	9,043	--	Yugoslavia 3,702; Hungary 2,373; Japan 1,549.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$612	$228	$209	Belgium-Luxembourg $19.
Grinding and polishing wheels and stones	782	814	--	Italy 231; West Germany 212; Netherlands 103.
Asbestos, crude	332	733	--	Canada 727; Italy 6.
Barite and witherite	2,000	3,750	--	All from Yugoslavia.
Boron materials: Oxides and acids	1,401	NA		
Cement	175	12	--	All from Netherlands.
Clays, crude:				
Bentonite	--	16	--	All from United Kingdom.
Kaolin	800	4,293	--	Do.
Unspecified	54,991	827	--	West Germany 727; France 100.
Diamond:				
Gem, not set or strung value, thousands	$2	$49	--	United Kingdom $44; Belgium-Luxembourg $5.
Industrial stones do	$4,936	$3,965	--	Belgium-Luxembourg $2,026; United Kingdom $1,669.
Diatomite and other infusorial earth	782	1,072	89	France 961; West Germany 22.
Feldspar, fluorspar, related materials	4,844	12,585	--	All from Italy.
Fertilizer materials: Manufactured:				
Nitrogenous	5	209	--	All from West Germany.
Potassic	[2]872,596	[2]831,731	--	U.S.S.R. 321,000; East Germany 183,300.
Unspecified and mixed	7	NA		
Graphite, natural	89	65	--	West Germany 35; Austria 30.

See footnotes at end of table.

Table 3.—Romania: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Iodine	24	NA		
Lime	9	NA		
Magnesium compounds	78,353	45,593	--	Czechoslovakia 44,000; Greece 1,500; France 62.
Mica: Worked including agglomerated splittings	32	9	--	France 8; Austria 1.
Phosphates, crude thousand tons	[2]2,370	[2]2,404	96	Morocco 602; Egypt 53; unspecified 1,653.
Phosphorus, elemental	1,088	1,625	--	All from U.S.S.R.
Pigments, mineral: Iron oxides and hydroxides, processed	240	335	--	West Germany 196; Japan 119; Spain 20.
Precious and semiprecious stones other than diamond: Synthetic value, thousands	--	$26	--	Japan $22; West Germany $4.
Pyrite, unroasted	48,867	70,284	--	All from Yugoslavia.
Salt and brine	28	49	--	Italy 37; Sweden 12.
Stone, sand and gravel:				
Dimension stone, worked	207	89	--	Belgium-Luxembourg 60; Italy 20; Austria 9.
Gravel and crushed rock	185	268	--	Yugoslavia 210; United Kingdom 38; France 20.
Quartz and quartzite	131	205	--	West Germany 129; United Kingdom 76.
Sulfur:				
Elemental:				
Crude including native and byproduct	205,375	[2]392,900	24,496	Poland 126,000; Canada 46,243.
Colloidal, precipitated, sublimed	123	NA		
Dioxide	461	722	--	All from West Germany.
Sulfuric acid	24	7,103	--	Hungary 7,052; West Germany 45; Italy 6.
Talc, steatite, soapstone, pyrophyllite	290	334	--	West Germany 326; Belgium-Luxembourg 8.
Other: Crude	4,133	5,154	--	Italy 3,444; Greece 750; Yugoslavia 490.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	16	13	--	All from West Germany.
Carbon black	44	46	--	Netherlands 31; West Germany 14.
Coal: Anthracite and bituminous thousand tons	[2]7,043	[2]6,049	1,052	Poland 1,160; Australia 652.
Coke and semicoke do	[2]1,784	[2]1,898	--	Japan 641; West Germany 285; Czechoslovakia 150.
Gas, natural: Gaseous[3] million cubic feet	--	65	--	NA.
Petroleum:				
Crude thousand 42-gallon barrels	98,798	106,770	--	NA.
Refinery products:				
Liquefied petroleum gas 42-gallon barrels	12	NA		
Gasoline do	162,563	96,884	--	Yugoslavia 94,308; Belgium-Luxembourg 1,896; Italy 680.
Mineral jelly and wax do	4,085	86	--	France 47; Netherlands 31; Austria 8.
Kerosene and jet fuel do	2,372	519	--	Yugoslavia 434; United Kingdom 85.
Distillate fuel oil do	754	2,044	--	Austria 1,783; West Germany 261.
Lubricants do	41,888	27,720	21	West Germany 22,309; Austria 1,631; Italy 1,449.
Residual fuel oil do	3,783	160	--	All from West Germany.
Bituminous mixtures do	36	NA		
Petroleum coke do	30,547	104,500	--	All from Egypt.

[p]Preliminary. NA Not available.

[1]Table prepared by Jozef Plachy. Owing to a lack of official trade data published by Romania, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries.

[2]Official Trade Statistics of Romania.

[3]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Copper.—The development of one of Romania's largest open pit operations at Rosia Poieni continued during the year. Although the ore graded a low copper content of 0.2% to 0.3%, associated molybdenum values were sufficient to warrant development and exploitation. When fully operational, the mine would produce 9 million tons of ore per year at a 2.7:1 strip ratio.[6] In 1986, the first stage of a new copper concentrator nearby at Zlatna went into operation, designed to process part of the ore produced at Rosia Poieni. Copper production for the first 6 months of the year in metal contained in concentrate was reported to be 650 tons above that planned.

Iron and Steel.—Romania continued to emphasize expansion of the steel industry, and the country ranked among the world top producers on a per capita basis. However, most of Romania's steel products were uncompetitive, and the value of steel imports considerably exceeded the value of exports, although, in terms of volume, exports exceeded imports. For these reasons, and the need to balance increased imports of raw materials and fuels from the U.S.S.R., Romania increased steel exports to the U.S.S.R. and planned to increase them further in 1987.

In 1986, Romania continued the construction of a number of steel-rolling mills and Soviet-equipped pipe plants at Bucharest, Galati, and Slatina. The new mill under construction at Galati, the country's largest steel complex, would produce 1,420-millimeter-diameter steel pipe. Production was to start in 1987, and the output would be exported to the U.S.S.R. for use in Soviet gas pipelines, which would slightly reduce Soviet dependence on market economy countries for this product.

Lead and Zinc.—Although domestic output of lead and zinc concentrates increased slightly during the year, Romania needed to import substantial amounts of material to meet domestic requirements. At midyear, Romania signed a 5-year contract with Iran to purchase 30,000 tons of zinc per year and 10,000 tons of lead concentrates per year from Iran's Kuh Mine.

MINERAL FUELS

Coal.—Romania's production of coal increased slightly over that of 1985, but was well below the planned target for the year. Moreover, dislocations in deliveries to consumers caused fuel shortages throughout the country, especially during the winter months. Work continued in 1986 on the development of the Valea de Bramighere coking coal mine in the Jiu Valley.

Petroleum and Natural Gas.—Romania increased its dependence on the Soviet Union for both petroleum and natural gas. Soviet deliveries of petroleum more than doubled during the year to reach about 44 million barrels, and reportedly, the U.S.S.R. indicated a willingness to continue to supply Romania with 37 million barrels of petroleum per year, provided that Romania would maintain the delivery of goods specified by the U.S.S.R. under the terms of the new Soviet-Romanian trade agreement.

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[1]Foreign mineral specialist, Division of International Minerals.
[2]Revista de Statistica. No. 1, 1987, pp. 8-13.
[3]———. Nos. 10-11, 1986, pp. 17-28.
[4]———. No. 2, 1987, p. 17.
[5]Page 20 of work cited in footnote 4.
[6]Mine, Petrol, si Gaze. No. 7, 1984, pp. 323-326.

The Mineral Industry of Saudi Arabia

By Michael D. Fenton[1]

In mid-1986, Saudi Arabia reported a new official estimate of its proven reserve of crude oil, the largest in the world, at 169 billion barrels. Continued exploration and the use of enhanced recovery techniques might boost that figure to 300 billion barrels. This reserve represented one-fourth of the world's total oil reserves, and was expected to last nearly a century. Although there were over 52 commercial oilfields, most of the oil was within only a few very large fields. The two largest were the Ghawar Oilfield, the world's largest onshore field with 70 billion barrels, and the Safaniya Oilfield, the world's largest offshore field with 19 billion barrels. The installed crude oil capacity, which included gas-oil separating plants, main trunk pipelines, and oil loading terminals, but not saltwater-oil separators or flow lines, was 12.5 million barrels per day (bbl/d). The maximum sustainable capacity was 10.5 million bbl/d. Saudi Arabia's natural gas reserve, mostly associated gas, was the fifth largest in the world and third behind Iran and Qatar in the Middle East, with 126.1 trillion cubic feet or about 3.5% of the world's total reserves. The Ghawar Oilfield was the major source of gas or 35% of the country's total production.

The Saudi Arabian economy continued to be dependent upon exports of oil and oil-based products. Saudi oil production costs in 1986 were estimated at 50 cents per barrel, compared with about $18 per barrel for North Sea production, and as much as $30 per barrel in the United States. Despite these extremely low production costs, Gulf International Bank predicted that oil revenues would decline to about $19 billion in 1986 from about $27.3 billion in 1985 and $36.2 billion in 1984. An oil price of $14 per barrel and a production rate of 4.35 million bbl/d were assumed for this prediction.

During the early 1980's, when demand and prices for these commodities were high, huge financial reserves were amassed, but as demand and prices fell, these reserves were used to pay for development programs, and the liquid assets eventually declined to as little as $30 billion by 1986. To reduce its dependence on this limited range of commodities, the Government continued to seek ways to diversify the economy, such as the development of chrome, copper, columbium, gold, nickel, silver, and zinc deposits in the western third of the country. In addition, development of iron ore deposits was needed for the Saudi steel industry and aluminum deposits for smelters in Bahrain and the United Arab Emirates. Gypsum, limestone, magnesite, and phosphate deposits were also studied for possible economic potential.

After considerable delay during the first half of the year, the Government's Ministry of Petroleum and Mineral Resources renewed for a period of 4 years its contracts with the French state company Bureau de Recherches Géologiques et Minières and the U.S. Geological Survey to continue programs in mineral exploration and geological mapping. Additional contractors were secured to conduct coal, gold, phosphate, and potash exploration; to drill prospects; and to recruit and maintain geologists for the Deputy Ministry for Mineral Resources.

Saudi Arabian Basic Industries Corp. (SABIC), the Middle East's biggest nonoil industrial conglomerate, invested about $10 billion during its first stage of development (1976-86) in 12 international scale heavy industries producing steel, fertilizers, and petrochemicals at the industrial cities of

Yanbu and Jubail. SABIC's assets reached $5.8 billion by mid-1986. Planning continued toward the investment of an additional $4.5 billion during the period 1986-90 in facilities for the production of petrochemicals, plastics, fertilizers, and metals. In the petrochemicals sector, development focused on ethylene and its derivatives. Future development would proceed on propylene and its major first-order derivatives, such as polypropylene and acrylonitrile.

PRODUCTION AND TRADE

When the longstanding policy of acting as swing producer in the Organization of Petroleum Exporting Countries (OPEC) was abandoned during late 1985, Saudi Arabia significantly increased production, apparently to maintain its share of the market, to regain lost revenue, and to ensure oil's long-term dominance in the world energy market. This new policy of maximizing production and exports at any cost caused a dramatic fall in oil prices but did not solve the problems of declining Saudi export earnings and increasing budget deficits.

During October 1986, OPEC met and agreed to a new production level of 15 million bbl/d during November and December with quotas that would fix the price of oil at $18 per barrel. Saudi Arabia accepted a new quota of 4.353 million bbl/d and reduced its production. Production by Iraq, output from the Divided Zone, and OPEC natural gas liquids production was estimated to bring the total OPEC supply to world markets to about 17.2 million bbl/d during the last 2 months of 1986.

In January, the European Economic Community (EEC) imposed tariffs on Saudi Arabian petrochemicals that exceeded duty-free ceilings and were considered by EEC to be threats to the Western European petrochemical industry. The tariffs were 13% on methanol, 13% on ethylene glycol, 12.5% on high-density polyethylene, 12.5% on linear low-density polyethylene, and 8% on diethylene glycol. These tariffs were designed to offset cost advantages to Saudi producers having access to relatively inexpensive oil-associated methane and ethane feedstock and inexpensive power. The petrochemical and fertilizer industries were the main users of gases that would otherwise be flared, and they paid a price that reflected only the cost of collection and delivery. After the tariffs were imposed, the Saudi competitive advantage declined drastically as feedstock prices in Western Europe fell. The price of naphtha, the feedstock distilled from crude oil, fell dramatically with the price of oil, from $270 per ton in 1985 to less than $90 per ton in 1986, allowing Western Europe to produce ethylene almost as inexpensively as Saudi Arabia could. Western European producers made further gains as demand for products increased and technical problems at major plants were solved. In November, the EEC replaced its relatively flexible system of setting ceilings on duty-free imports with a new, tougher quota system. SABIC complained of unjustified protectionism but continued to sell as a result of strong demand for commodity chemicals and plastics.

SABIC produced 7.62 million tons of petrochemical, fertilizer, and steel products in 1986 compared with 6.33 million tons in 1985 and 2.78 million tons in 1984. Sales were 7.33 million tons in 1986, 75% of which was exports. The net profit for 1986 was $53.3 million compared with $40.8 million in 1985 and $9.7 million in 1984.

The U.S. Department of Commerce placed a 5.48% duty on steel imports from Saudi Iron and Steel Co. (Hadeed), which subsequently filed an appeal. The duty was the result of a suit filed by four U.S. steel producers that alleged that Hadeed was unfairly subsidized by the Government of Saudi Arabia and had an unfair price advantage.

U.S. imports of crude oil increased by 1.047 million bbl/d to 4.130 million bbl/d in 1986, and oil from OPEC members increased by 55% to about 2.837 million bbl/d.[2] The United States imported 685,000 bbl/d from Saudi Arabia, or nearly 17% of its import total, compared with 346,000 bbl/d, or 11% of the total, during 1982-85.[3]

Table 1.—Saudi Arabia: Production of mineral commodities[1]

Commodity	1982	1983	1984	1985[p]	1986[e]
Cement, hydraulic thousand metric tons	7,153	8,126	7,150	8,300	[2]11,500
Gas, natural:[3]					
Gross million cubic feet	1,200,000	950,000	1,025,900	1,133,000	1,341,000
Marketed[e] do	316,067	154,700	252,500	[r]716,000	[2]847,600
Gypsum thousand metric tons	363	500	300	[e]300	142
Iron and steel: Metal: Steel, crude do	70	400	842	1,106	1,100
Lime[e] do	170	[3]9	[3]12	12	12
Natural gas liquids, all forms[3] thousand 42-gallon barrels	[r]157,000	118,625	124,100	123,370	[2]149,650
Nitrogen: N content of ammonia thousand metric tons	207	[r]293	415	436	[2]467
Petroleum:[3]					
Crude thousand 42-gallon barrels	[r]2,366,295	1,657,100	1,701,995	1,236,620	[2]1,841,425
Refinery products:					
Gasoline do	36,700	[e]36,700	[e]37,000	49,000	49,000
Jet fuel do	16,700	[e]17,000	[e]17,000	4,100	4,100
Kerosene do	11,800	[e]12,100	[e]12,000	10,300	10,300
Distillate fuel oil do	67,000	[e]68,700	[e]68,700	86,900	86,900
Residual fuel oil do	93,748	[e]92,600	[e]92,600	87,200	87,200
Unspecified do	[r e]74,852	[r e]77,800	[r e]83,200	111,300	111,300
Refinery fuel and losses[e] do	10,000	9,000	10,000	[r]14,000	14,000
Total do	310,800	313,900	320,500	362,800	362,800
Sulfur: Byproduct, all sources thousand metric tons	900	[r]695	833	1,068	[2]1,300

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through Sept. 18, 1987.
[2]Reported figure.
[3]Includes the Saudi Arabian share of production in the Kuwait-Saudi Arabia Divided Zone.

COMMODITY REVIEW

METALS

Copper.—Jeddah-based Saudi Cable Co. completed the first year of operation of its 55,000-ton-per-year copper rod plant in June, the only one in the Arab world. Nearly 30% of its production was exported to Greece, Iraq, Japan, Jordan, Pakistan, Turkey, and the United Arab Emirates. The largest export order on record was from Iraq's Ministry of Industry and Minerals for 15,000 tons worth $30 million.

The plan to mine copper from the Jebel Sayid region was delayed because of the low price of the metal on world markets. The recoverable reserves estimated by the Red Sea Mining Co. was 9.8 million tons of ore averaging 1.88% copper at 80% recovery.

Gold.—The Mahd adh Dhahab gold mine, 170 miles northeast of Jeddah, was expected to start commercial production in early 1988. The initial capacity of the mine would be 400 tons per day of ore containing 0.8 troy ounce of gold per ton and 2.9 troy ounces of silver per ton with some copper and zinc. Production at the mine was expected to continue for at least 12 years. A $12.6 million contract for the design, engineering, procurement, and construction of the ore treatment plant was awarded to the West German and Taiwanese joint venture Saudi Kloechner Ret-Ser. Gold Fields Mahd adh Dhahab Ltd., a subsidiary of Gold Fields Group of the United Kingdom, developed the mine for the sole owner General Petroleum and Mineral Organization (Petromin), the state energy and minerals agency.

A gold mine at Sukhaibarat between Medina and Qassim Province received approval from Petromin and was expected to open within 2 years. The potential annual production was an estimated 48,800 troy ounces of gold over a period of 10 years.

Reserves were reported for the Zalim gold prospect, 300 kilometers north of Jeddah, by the U.S. firm Pincock, Allen, & Holt Inc. of Denver, Colorado. The reserves for underground mining to a depth of 100 meters was 480,000 tons averaging 0.4 troy ounce per ton with a cutoff grade of 0.1 troy ounce per ton. The reserve for open pit mining of eight separate deposits was 738,500 tons at a grade of 0.17 troy ounce per ton.

Iron and Steel.—Hadeed reported a $13.1 million profit in 1986 on a production of 1.9 million tons of steel reinforcing bars and rods from its Jubail plant and the Jeddah

Steel Rolling Mill Co. This production was a significant increase over the 1.18 million tons produced in 1985. Production in the direct-reduction (DR) plant rose to 1.1 million tons from 990,000 tons in 1985, while the steel factory's output increased to 1.3 million tons from 1.1 million tons in 1985.

Hadeed contracted with the Federal Republic of Germany's Eisenbau Essen (EBE) to determine the feasibility of expanding Hadeed's annual output to as much as 2 million tons from the current 1.2 million tons. Under consideration was a plan to begin exporting to Gulf Cooperation Council states, and to add flats, pipes, and small sections to the existing output of rebars and wire rod. EBE was also designing a new plant for National Wire Products Co. (Aslak) to be built in Jubail for about $43.9 million. The Aslak plant would have an annual capacity of 50,000 tons of steel wire products and would use raw materials from Hadeed.

Hadeed's iron ore requirements for the next few years were settled by contracts with Brazilian suppliers. Hadeed was to receive 2.3 million tons of Mutuca DR lump ore during a 6-year period and 1.792 million tons of pellets over the next 5 years.

Titanium.—Crystal Pigment Co.—a joint venture between the Sha'ir Co. for Trading, Industry, and Contracting of Saudi Arabia and the Kerr-McGee Corp. of the United States—will build and operate a 45,000-ton-per-year titanium dioxide plant at Yanbu for $120 million. Operations were scheduled to begin in late 1989. Rutile would be imported, but local deposits of titanium, mainly from the Yanbu area, may be developed.

Zinc.—Since 1975, the Saudi Arabian-Sudanese Red Sea Joint Commission has spent $40 million for exploration of the Atlantis II Deep situated in the Red Sea, 90 kilometers west of Jeddah. Possible annual production was estimated to be 60,000 tons of zinc, 11,000 tons of copper, 134 tons of cobalt, 3.4 million troy ounces of silver, and 25,700 troy ounces of gold. Development cost was estimated at about $120 million.

INDUSTRIAL MINERALS

Cement.—Declining local demand and low-cost imported cement continued to threaten the cement industry, and efforts to achieve cooperation among manufacturers and importers to alleviate these problems were unsuccessful. The domestic demand was a record high 22 million tons in 1984, but it fell to 14 million tons in 1985. The industry expected a further decline to 11 million tons by 1987. The Government ruled that contractors and concrete producers having Government contracts must purchase local cement first. Although production capacity was 12.9 million tons per year, 1986 production was only 11.5 million tons. About 6 million tons of clinker was stockpiled. Imports were 5,000,000 tons compared with 7,400,000 tons in 1985, but exports reached 531,746 tons compared with 25,000 tons in 1985.

Saudi-Kuwait Cement Manufacturing Co. increased its cement grinding capacity by adding two Polysius finish and grinding mills rated at 135 tons per hour each. The company produced 1.5 million tons of clinker while working at 80% capacity. Exports were only to Kuwait, a 45% equity holder. The Qassim Cement Co. added a 660,000-ton-per-year kiln line to double the plant's capacity. Southern Province Cement Co. (SPCC) was installing two sets of O-Sepa air separators to increase the capacity of the two finish mills. SPCC's truck fleet was replaced by a 1,000-ton-per-hour mobile limestone crushing unit with a 5.5-kilometer-long conveyor belt to feed crushed limestone directly to the plant from the quarry. Yamama Saudi Cement Co. Ltd. increased its capacity to 8,700 tons per day by installing a 3,000-ton-per-day precalcining system and two circular stacker-reclaimers—one for 92,000 tons of clay and the other for 121,000 tons of limestone. A $264 million cement plant having an annual capacity of 1 million tons was inaugurated in Rabigh, 150 kilometers north of Jeddah.

Fertilizer Materials.—Production in 1986 by the Saudi Arabian Fertilizer Co. (SAFCO) was 208,000 tons of ammonia, down 3% from that of 1985, 84,000 tons of sulfuric acid, which was comparable with 1985 production, and 18,600 tons of melamine, over twice the 1985 production. About three-quarters of the total was exported. Net profit for 1986 was $33.6 million, down 21% from that of 1985. The National Chemical Fertilizer Co.'s ammonia plant in Jubail, a SABIC-SAFCO joint venture, was 60% complete by yearend. The 500,000-ton-per-year plant was scheduled for completion by 1988.

SABIC agreed to supply 200,000 tons of urea to several companies in China during 1987. Saudi Arabia was also a major supplier of fertilizers to India, which took 447,000 tons during India's 1985-86 fiscal year (April 1, 1985, to March 31, 1986).

As of early 1986, no contract had been awarded for the continued exploration and commercial evaluation of potash deposits along the Red Sea coast. Only one of five target areas defined earlier had been drilled.

Gypsum.—The National Gypsum Co. was awarded a 30-year permit to mine gypsum and related materials for the gypsum industry in the 11,000-square-kilometer Maragha concession near Riyadh.

Magnesite.—Norwegian and Brazilian companies agreed to construct by 1988 a $75 million magnesite mine that may have a capacity of 15,000 tons per year.

Phosphate Rock.—Evaluation continued of the major phosphate deposit in the Al Jalamid area southeast of Turayf in northern Saudi Arabia. The ore body was 11 kilometers long, 2 kilometers wide, and an average 5 meters thick. The relatively low-grade deposit contained an estimated 310 million tons of 23% phosphorus pentoxide that would have to be upgraded to a selling grade of 34% to 36%. Transportation of the product to markets would be the major problem. Trucks would be uneconomical, and a railroad and slurry pipeline would be very expensive.

Sand.—The Arab Investment Bank financed studies of a large, high-purity quartz deposit that may be of optical glass quality.

Sulfur.—The $8.5 million, 300-ton-per-day sulfur plant at the Ras Tanura refinery began operating at the end of May. Sulfur was to be recovered from hydrogen sulfide-rich gas that was previously flared at the refinery.

MINERAL FUELS

Coal.—A long-term exploration program begun in 1982 continued to evaluate the coal potential of Saudi Arabia in 1986. Coal chips were discovered in water boreholes near Jordan, and similar coal chips from the Zulfi area north of Riyadh were found to have a rating of 10,000 British thermal units (Btu). A core sample of coal from Buradah was rated at 13,500 Btu. Such subbituminous coal could be used as a moisture retainer in the agriculture industry and as a fuel in powerplants.

Petroleum.—*Production.*—Average crude oil production rose by nearly 50% from about 3.40 million bbl/d in 1985 to about 5.05 million bbl/d in 1986, less than one-half of total sustainable capacity. Saudi Arabian oil production was about 25% of that produced by OPEC, and about 9% of world production. The Arabian-American Oil Co. (Aramco), accounted for nearly 94% of production with 4,700,000 bbl/d, while Getty Oil Co. produced about 200,000 bbl/d from its onshore concession in the Divided Zone, and the Arabian Oil Co. produced about 110,000 bbl/d from its offshore concession in the Divided Zone. During the period November 1-26, 1986, 200,000 bbl/d was sold to customers on behalf of Iraq, which received the proceeds, and 400,000 bbl/d was put into storage. Production of associated and nonassociated gas was increased by about 20% in 1986 from 716 billion cubic feet to 847.6 billion cubic feet.

Aramco had a $1 billion operating deficit in 1985 on a budget of $3.5 billion. During 1986, it was estimated that a reduced budget of $3 billion was accompanied by an increased deficit resulting from low oil prices and a traditional system of generous, expensive benefits and social welfare programs for its employees that could not be reduced easily. In an effort to reduce costs, Aramco decreased contract spending and reduced its work force, marine transport fleet, and car and bus fleet. The company invested more time on cost control and effective mothballing of surplus productive capacity with the expectation that production would not rise significantly above the quota of 4.353 million bbl/d in the near future.

Refining.—Saudi Arabian oil refining capacity of 1.548 million bbl/d at yearend 1986 was expected by the Government to increase to 1.873 million bbl/d on the completion of the Rabigh domestic and export refinery on the Red Sea. The country had excess refining capacity, especially for export products; the Jubail and Yanbu export refineries were operating at less than 60% of capacity for much of 1986.

Production at the Jeddah Oil Refinery Co. was down 6% from that of 1985 at 31.9 million barrels; profits totaled $8.9 million. The Riyadh Oil Refinery Co. that produced 40.6 million barrels in 1986, down slightly from 1985 production, accounted for nearly 20% of domestic needs. Output at the Yanbu domestic refinery was 63.9 million barrels. The Petromin-Mobil Refinery Co. reported an increase of 11.4% in output for 1986, a total of 72.3 million barrels. The 250,000-bbl/d export refinery in Jubail, owned by Petromin-Shell Refinery Co., and the new Rabigh refinery were still scheduled to be operational by 1989. The latter would have a capacity of 325,000 bbl/d of

naphtha, kerosene, gas and diesel oil, and fuel oil.

The modernization program at Aramco's Ras Tanura domestic refinery was completed in 1986, and a 250,000-bbl/d unit replaced four smaller ones. The refinery's capacity thereby increased to 500,000 bbl/d from 450,000 bbl/d of light and heavy diesel oil, fuel oil, naphtha, and kerosene.

Petromin Lubricating Oil Co. (Petrolube) produced 2,200,000 barrels of lubricating oils and greases in 1986 at its plants in Jeddah and Riyadh compared with 1,300,000 barrels in 1985. A total of 1,200,000 barrels was exported, including 20,000 barrels to Djibouti, Guatemala, Jordan, Lebanon, and North Yemen. Products were engine, hydraulic, turbine, and industrial oils and other special-grade oils. Petrolube completed its project to expand the annual design capacity of its Riyadh lube plant from 175,000 barrels to 500,000 barrels. Products were distributed in the Central and Eastern Provinces of the country. Petrolube's new plant in Jubail for processing lubricants was scheduled to be operating in mid-1987 with an annual capacity of 1 million barrels of lubricating oil and 5,000 tons of other lubricants.

The Lubrizol Transarabian Co., a joint venture owned by International Chemicals & Trading Co. of Saudi Arabia and Lubrizol Corp. of the United States, opened the country's first lubricant additives plant in Yanbu with an annual capacity of 30,000 tons after investing $18 million. A second plant was scheduled for operation in September 1986 by the Saudi Arabian Lube Additive Co., a joint venture between Yusuf Bin Ahmed Kanoo of Saudi Arabia and Esso Chemicals Co., a subsidiary of the Exxon Corp. of the United States. This $11 million plant would have an annual capacity of 20,000 tons.

The new Lubricating Oil Co. initiated plans to build an $8 million, 15,000-ton-per-year lubricants refinery in Jeddah that would recycle used oil from industries, truck service stations, car dealers, and workshops. The thermocracking refinery would distill the oil into base oil for lubricants, light-grade spindle oil for gears, and fuel oil for factories.

The Petromin-Mobil Export Fuels Refinery Co. increased production in 1986 by 14% to 158,000 bbl/d while running at only 63% of a total capacity of 250,000 bbl/d. Exports rose by 54% to 144,000 bbl/d, and the United States was the fastest growing market, taking 37% of production in the fourth quarter compared with 19% during the first quarter.

Two Swedish companies contracted to begin a construction program of six underground facilities to store petroleum products as a strategic reserve for the Armed Forces. The first site was to be at Yanbu.

Petrochemicals.—SABIC produced 3.54 million tons of petrochemicals in 1986 and 823,500 tons of plastics. Products were sold mainly in Western Europe and Asia, but some ethanol from Saudi Petrochemical Co. (Sadaf) went to the United States for finishing, and 5,000 to 6,000 tons of polyethylene from Al Jubail Petrochemical Co. (Kemya) was transshipped through the United States to South America. Sadaf operated at nearly 105% of design capacity during early 1986, and the company was also planning a near-term expansion program to raise ethylene capacity to 110%.

The Kemya polyethylene plant in Jubail began commercial operations on January 1. The ultimate annual capacity for linear low-density polyethylene was to be 260,000 tons. Kemya was a 50-50 joint venture between SABIC and Exxon Chemical Arabia Inc.

Saudi Venture Capital Group (SVCG), composed of over 26 local businessmen, was formed to participate as investors in new petrochemical projects. Fluor Arabia Ltd., a joint venture of E. A. Juffali and Bros. of Saudi Arabia and Fluor Corp. of the United States, was selected as the technical advisor that would offer projects to SVCG for consideration.

Arabian Petrochemical Co. (Petrokemya) announced its plan to build a 100,000-ton-per-year ethylene complex in Jubail that would begin operating in mid-1987. Production would be 50,000 tons of high-impact grade per year, 30,000 tons of general-purpose grade per year, and 20,000 tons of expandable-grade polystyrene per year. Petrokemya was operating at nearly 105% of capacity during early 1986.

Saudi Yanbu Petrochemical Co. ran its petrochemical plant at Yanbu at 10% over design capacity during its first full year of operation, which ended in June, and an additional 10% increase was planned by mid-1987. Annual design capacity was 450,000 tons of ethylene, 200,000 tons of ethylene glycol, and 320,000 tons of polyethylene.

The National Methanol Co. was running its Jubail petrochemical plant at 118% of

capacity in August. The plant started operating in June 1984 with a design capacity of 700,000 tons of methanol per year. It produced 440,000 tons in the first half of 1986, and the total 1986 production was estimated to have reached 800,000 tons. All methanol was exported, but in 1988, the plant will supply the Saudi-European Petrochemical Co., which is expected to produce 500,000 tons of methyl tertiary butyl ether per year.

Eastern Petrochemical Co. (Sharq) signed a loan agreement with 12 Saudi and international banks to finance the final 10% of its petrochemical complex at Jubail. The company operated a 130,000-ton-per-year linear low-density polyethylene plant and a 300,000-ton-per-year ethylene glycol plant. Sharq also contracted with 11 Japanese petrochemical firms to provide linear low-density polyethylene during the next 20 years. In 1986, 78,000 tons would be exported to Japan, with 97,500 tons annually thereafter.

The National Plastic Co. began operating and was expected to reach full annual production of 300,000 tons of vinyl chloride monomer and 200,000 tons of polyvinyl chloride (PVC) in 1987. The first cargo of about 12,000 tons of PVC was exported to Asia in October. SABIC, an 85% owner, planned to privatize the project by distributing 10% of the company's equity to the National Industrialization Co., 5% to three or four companies in the private sector, and 15% to a reserve for future acquisition by the private sector.

Saudi Urethane Chemicals Co. Ltd. was scheduled to begin commercial production by August 1986 of polyether polyols and blended polyurethane systems based on polyols. About 3,000 tons of polyols would be produced and blended annually to produce about 6,000 tons of polyurethane systems that would be used to manufacture rigid and flexible foam products. Saudi Arabia's dependence on imported polyols would be significantly reduced, and some of it would be exported to gulf and other Mideastern markets.

Transportation.—Aramco continued on its looping project on Petroline, which extends 1,215 kilometers from the Abqaiq-Ghawar Oilfields in the Eastern Province to Yanbu. When completed, the throughput capacity of the pipeline would be increased from 1.85 million bbl/d to 3.05 million bbl/d. The pumping rate on Petroline was restricted during November and December owing to a shutdown of the multiple pumping unit to permit the installation of tie-ins. Aramco customers had to switch their Yanbu nominations for Arabian Light to Ras Tanura. Aramco awarded a $298,000 contract to Sulzer Bros. of the United Kingdom to provide equipment to test overhauled gas turbine engines powering pumps and generators on Petroline.

The phase I pipeline of the Iraqi-owned Iraq Pipeline Trans Saudi Arabia (IPSA-1) carried Basrah Light crude oil about 630 kilometers from Iraq's southern oilfields to Petroline pump station PS-3 at a rate of 330,000 to 370,000 bbl/d until early November. At that time, the restricted pumping rate through Petroline caused a cutback at yearend to only 100,000 bbl/d. Completion of the Petroline expansion project in February 1987 would enable Iraq to export at a rate of 500,000 bbl/d through a terminal 20 miles south of Yanbu on the Red Sea. Bids were invited for the construction of a pipeline system, phase 2 (IPSA-2), that would link IPSA-1 to the new export terminal south of Yanbu. IPSA-2, 970 kilometers of 48-inch and 56-inch pipeline, would parallel Petroline and would have a capacity of 1.6 million bbl/d. The terminal would have a storage capacity of 10 million barrels and would have offshore loading facilities to accommodate tankers up to 400,000 deadweight tons.

At yearend, the Government announced its decision to sell 60 million barrels of oil stock stored in offshore tankers and onshore tanks in the Caribbean, Rotterdam, west Africa, and Southeast Asia. Earlier in the year, it had chartered 3 tankers to supplement its floating storage fleet that had then been composed of 16 tankers in Southeast Asia holding about 33 million barrels, and 4 tankers off west Africa holding about 10 million barrels. This expensive storage program had begun in 1983 to increase marketing flexibility and to provide security against a disruption in oil production or export. The completion of the Petroline expansion project would make the storage program unnecessary.

Sadaf received a new $27 million, 42,500-deadweight-ton petrochemical carrier from Daewoo Shipbuilding and Heavy Machinery Co. of the Republic of Korea to carry petrochemicals for a 17-year period. The ship is part of a joint venture between the Kuwait-based United Arab Shipping Co. and the National Shipping Co. of Saudi Arabia.

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[1]Physical scientist, Division of International Minerals.

[2]Energy Information Administration (U.S. Department of Energy). Monthly Energy Review. Apr. 1987.

[3]Work cited in footnote 2.

The Mineral Industry of Sierra Leone

By Michael D. Fenton and David J. Ellis[1]

Minerals remained Sierra Leone's principal foreign exchange earner in 1986. Mineral exports generated about 60% of total foreign exchange earnings. Sierra Rutile Ltd. (SRL) showed continued success in mining rutile and exporting it to world markets. Interest in the gold mining industry increased in response to improved gold prices.

The Government-owned National Diamond Mining Co. (NDMC) continued to negotiate with potential partners in the Koidu kimberlite diamond mining project. The cost of exploiting the kimberlite was estimated to be between $90 million and $140 million.[2] The NDMC was anxious to switch over from the older alluvial workings, which were suffering from obsolete machinery and rampant smuggling, to the proposed deep mining venture. Sierra Leone enacted changes in the monetary system in 1986. In June, as part of an effort to halt rising inflation and a falling average per capita income, the Government announced the implementation of several reforms recommended by the International Monetary Fund (IMF). These reforms included floating the Leone, which had previously been set at a fixed rate of exchange, abolishing price subsidies, and lifting price controls on certain commodities. Following enactment of these reforms, the leone fell to less than one-fifth of its previous value and consumer prices rose dramatically. This led to an increase in the foreign exchange entering Sierra Leone and provided a boost to trade. An arrangement was also reached with the IMF in November to provide a new standby credit balance on which the Government could draw.

PRODUCTION AND TRADE

Recorded production of diamonds decreased in 1986, with NDMC production down almost 40% to 62,500 carats. Diamond sales recouped $33 million, with $10 million coming from NDMC diamonds and the remainder from diamonds produced by licensed alluvial operators. Official gold exports totaled 12,000 ounces, down from 19,000 in 1985. Since interest in gold increased in 1986, the decrease in official exports may indicate an increase in smuggling. Production of rutile ore and concentrate increased owing to capital investment for an increase in production capacity. Exports increased to 97,400 tons shipped mainly to markets in Western Europe and the United States. The average price of rutile concentrate was $404 per ton. Production of bauxite increased slightly and exports totaled about 1.1 million tons, wet basis.

Table 1.—Sierra Leone: Production of mineral commodities[1]

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
Aluminum: Bauxite, gross weight thousand metric tons	631	785	1,040	1,184	1,200
Diamond:[3]					
Gem[e] thousand carats	203	242	240	[r]243	215
Industrial[e] do.	87	103	105	[r]106	100
Total do.	290	345	345	349	[4]315
Gold troy ounces	8,729	[3]12,000	[3]18,223	[3]19,004	[3]12,000
Gypsum	--	4,000	4,000	[e]4,000	4,000
Iron ore metric tons	66,000	420,000	355,000	[r e]70,000	--
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	228	213	238	287	300
Jet fuel do.	84	112	128	162	170
Kerosene do.	151	93	93	55	50
Distillate fuel oil do.	414	671	709	443	450
Residual fuel oil do.	295	400	433	379	360
Liquefied petroleum gas do.	9	9	9	9	9
Other do.	1	1	1	1	1
Refinery fuel and losses do.	25	60	64	60	60
Total do.	1,207	1,559	1,675	1,396	1,400
Salt[e] thousand metric tons	200	200	200	200	200
Titanium: Rutile ore and concentrate, 96% TiO_2 gross weight metric tons	47,709	71,800	91,300	80,611	[4]97,100

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

[1]Table includes data available through Aug. 17, 1987.

[2]In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone) was produced, but output was not reported, and available general information was inadequate to make reliable estimates of output levels. Sierra Leone annually refined 4,000 to 10,000 metric tons of salt from imported crude marine salt, but this was not included in the body of the table because it would represent double counting of materials credited to the country where the salt was originally collected. This output would be in addition to that reported in this table.

[3]Data are based on official exports and do not reflect smuggled material.

[4]Reported figure.

COMMODITY REVIEW

METALS

Gold.—The effects of a major interest in gold in the West African countries, initiated by rising gold prices, was evident in Sierra Leone. Over 500 gold licenses were issued by the Ministry of Mines to miners, dealers, and exporters. The gold industry continued to be placer-oriented, with much of the production coming from the area around Lake Sonfon and in the tributaries of the upper reaches of the Sewa River, in the northeastern area of Sierra Leone.

Iron Ore.—No further investor interest was shown in the deserted Marampa iron ore mines, despite much effort by the Government to attract new investors to replace Austromineral GmbH, which ceased operations in 1985. In the interim, the Government took over management of the mines to prevent loss of equipment and deterioration of mining facilities. A team of French engineers was expected to begin a new feasibility study on the iron ore deposits in early 1987.

Titanium.—Nord Resources Corp. (NRC) of Dayton, Ohio, continued to invest capital in its successful rutile dredging concession at Gbamgbama, near Bonthe in the Southern Province. NRC was full owner of SRL and managed to increase production at the same time as implementing new measures for an expansion of production capacity. During the course of the year, new buckets for the dredge were cast in the United Kingdom and were scheduled to replace the old buckets in 1987. The wet plant was refurbished in 1986, including installation of a new primary gravity concentrator that enabled the wet plant to produce an upgraded concentrate containing almost 50% titanium dioxide.

Another project initiated was a tailings plant for the reclamation of about 8,000 tons per year of rutile from long accumulated mine tailings. Production was scheduled to begin in 1987. Other key elements of the production expansion program included plans for the construction of a supplemental dredge with a capacity of 500 tons per hour, as well as the production of some ilmenite ore, both to be implemented in 1987.

INDUSTRIAL MINERALS

In June, after much Government and public dissatisfaction with the policies and results produced by the Government Gold and Diamond Office (GGDO) and the Precious Minerals Marketing Co. (PMMC), the managing director of the GGDO resigned, selling the 49% share of NDMC that he owned back to the Government. This left NDMC wholly Government owned. The GGDO was restructured under the leadership of a new chairperson of the board. At the same time, the PMMC, which had been hired to manage the NDMC, announced that alluvial diamond reserves were running low in the areas currently being worked and offered the Government three ways of meeting the situation.

The first alternative was to continue current mining and provide a subsidy of nearly $11 million. The second alternative was to cease work on the alluvial deposits until the planned kimberlite project was under way, and to sublet the alluvial workings as a means of bringing in enough funds to maintain the existing infrastructure. The third choice, which was selected, was the formation of a technical investigating committee to submit a status report on the alluvial workings to the Government. An interim management committee was set up to oversee the working of the mines until the investigating team had submitted its report. A new system of marketing for diamonds went into effect in August. Previously, the PMMC had been responsible for marketing almost all of the diamonds and had done so by selling them at the market in Antwerp. In the new system, both privately mined and NDMC diamonds were being sold by tender in the Bank of Sierra Leone building in Freetown, with the Government diamond valuer fixing a minimum sale price. Bidders paid for the diamonds on-the-spot in foreign exchange. Tenders were held every other month, with the first one occurring in August. Sales of diamonds earned about $1 million at the first tender, rose to $2.6 million at the second tender, then fell to $1.1 million in December amid complaints of obsolete machinery at the alluvial workings near Yengema.

The Government continued to pursue partners for the long-delayed Koidu kimberlite project. Negotiations regarding financing and terms of mining contracts continued with several mining groups, including Outokumpu Oy of Finland and Afro-West Mining Ltd. of Australia. Working of the two known kimberlite pipes would create much less of a security problem than the alluvial workings, thereby reducing losses to smuggling. Most sources estimate that one-half of the annual diamond production is being smuggled out of the country.[3]

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[1]Physical scientists, Division of International Minerals.

[2]Where necessary, values have been converted from leones (Le) to U.S. dollars at the average rate of Le1=US$0.12. However, it should be noted that the exchange rate of the leone was changed from a fixed rate to a floating rate in 1986, consequently the leone devalued dramatically in the latter part of the year.

[3]West Africa (London). Dec. 8, 1986, pp. 2563, 2565-2566.

The Mineral Industry of the Republic of South Africa

By George A. Morgan[1]

In 1986, the Republic of South Africa recorded increased value for overall mineral production and sales, primarily owing to a weaker rand. Mining and quarrying accounted for $9.3 billion[2] or 16% of a gross domestic product (GDP) of $56.6 billion, compared with 6% for agriculture, 13% for Government, 21% for manufacturing, and 9% for services. Total mineral sales were up 13% in terms of the South African rand and 9% in terms of U.S. dollars to $12.9 billion, of which $7.6 billion was gold, $2.3 billion was coal, $440 million was diamond, $243 million was copper, and $209 million was iron ore. Sales in the manufacturing sector totaled $37.9 billion, of which $3.2 billion was iron and steel, $2.5 billion was industrial chemicals, $1 billion was industrial mineral products, and $0.9 billion was nonferrous metal products. Capital expenditures by members of the Chamber of Mines (CM) were $1.1 billion.

Mining activity was primarily by six major mining corporations: Anglovaal Ltd., Anglo American Corp. of South Africa Ltd. (AAC), Barlow Rand Ltd. (BRL), General Mining Union Corp. Ltd. (Gencor), Gold Fields of South Africa Ltd. (GFSA), and Johannesburg Consolidated Investment Co. Ltd. (JCI).

Total employment in the mining sector at yearend 1986 was 752,264 compared with 724,587 in 1985. The foreign worker component of mine labor remained a major factor in production, principally in gold and coal mines. Wages and salaries paid amounted to $2.72 billion compared with $2.34 billion (revised) in 1985. Total employment in the manufacturing sector was 1,315,000, of which metal products accounted for 127,700; basic metal products, 110,200; chemical products, 94,000; and industrial mineral products, 78,400.

The Department of Manpower reported 643 strikes and 150 work stoppages involving 323,000 laborers. Over 40% of the workdays lost were by the mining industry. Attempts to introduce trackless equipment underground to improve productivity and reduce labor by 20% at the Randfontein and Western Areas gold mines led to unofficial strikes, absenteeism, and damaged machinery. The CM's employment company, the Employment Bureau of Africa, reported $220 million paid out in deferred pay, remittances, savings, and benefit payments in 1986, including that to foreign workers. About $105 million was paid to Lesotho, $35 million to Mozambique, and $16 million to Malawi. The Governments of Lesotho, Malawi, and Mozambique required that a portion of the pay of its mine workers employed in the Republic of South Africa be paid at home as compulsory deferred pay.

A National Advisory Council was formed to make recommendations to the Department of Economic Affairs and Technology on ways to increase the South African Geological Survey's contribution to the country's mining industry. Members of the council include the president of Mintek and the chief director of the Minerals Bureau. The Minerals Bureau compiled data from 800 operating mines in 1986 compared with 702 in 1985, including mines in Transkei, Bophuthatswana, Venda, and Ciskei. All

relevant information was stored on computer, and a statistical data base for ferroalloys and beneficiated mineral products was also implemented. The Geological Survey maintained a drill core collection at Silverton, completed development of the South African Mineral Deposits Data Base, and maintained the National Coal Data Base with information on about 18,000 drill holes.

PRODUCTION AND TRADE

The index of physical volume of all mining production including gold was 100.8 in 1986 compared with 104.6 (revised) in 1985 and 104.1 in 1984 (1980=100). The index of physical volume for iron and steel basic industries was 104.7 compared with 95.8 in 1985; for nonferrous metal basic industries, 111.6 compared with 108.9 in 1985; and for industrial chemicals, 93.0 compared with 88.9 in 1985.

About 54% of total export trade was unreported as to country of destination. Exports of coal through Richards Bay were 40.3 million tons compared with 39.6 million in 1985. Planned development of the terminal above the current shipping capacity of 44 million tons of coal was postponed.

Total rail transport by the South African Transport Services (SATS) was 166.0 million tons in 1986 compared with 164.8 million tons (revised) in 1985. SATS road transport was 4.1 million tons and 4.4 million tons in 1986 and 1985, respectively. Private transport services declined sharply as only 205 million tons was moved by private road and railroad services in 1986 compared with 318.9 million tons in 1985. The percentage of transport earnings by type of material transported was coal and coke, 23.5%; mineral products, 22.4%; base metals, 9.2%; and chemicals, 4.7%.

Table 1.—Republic of South Africa: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[p]
METALS					
Aluminum metal	105,500	161,300	167,357	164,600	171,575
Antimony concentrate:					
Gross weight	15,314	10,670	12,924	12,600	11,553
Sb content	9,135	6,302	7,440	7,390	6,816
Beryl concentrate (11% to 12% BeO)	58	21	1	5	3
Chromite, gross weight:					
More than 48% Cr_2O_3 thousand tons	33	25	53	65	39
44% to 48% Cr_2O_3 do.	1,193	1,070	1,242	1,975	2,294
Less than 44% Cr_2O_3 do.	939	1,137	1,711	1,658	1,574
Total[2] do.	2,164	2,232	3,006	3,699	3,907
Columbium-tantalum concentrate kilograms	9,960	406	317	1	--
Copper:					
Mine output, Cu content	188,709	204,984	198,179	195,436	184,205
Metal:					
Smelter	191,800	192,300	178,700	191,700	e180,000
Refined	142,800	157,700	155,722	164,304	158,631
Gold, primary thousand troy ounces	21,355	21,847	21,861	21,524	20,513
Iron and steel:					
Ore and concentrate:					
Gross weight thousand tons	24,554	16,605	24,647	24,414	24,483
Fe content do.	r15,715	10,627	15,749	15,076	15,424
Metal:					
Pig iron do.	6,762	5,213	5,455	6,574	e6,800
Ferroalloys, blast furnace and electric-furnace:					
Ferrochromium do.	e460	e720	886	852	919
Ferromanganese do.	e440	e143	196	331	337
Ferrosilicochromium do.	e20	18	27	5	(3)
Ferrosilicomanganese do.	e40	e143	196	238	273
Ferrosilicon do.	e100	e100	110	75	83
Ferrovanadium do.	e1	e1	3	3	1
Silicon metal do.	30	22	25	36	35
Total[2] do.	1,091	1,147	1,440	1,537	1,653
Steel, crude do.	8,271	7,190	7,827	8,582	8,800
Semimanufactures:					
Hot-rolled products do.	NA	NA	NA	7,005	7,189
Iron castings do.	NA	286	322	NA	NA
Steel castings and forgings do.	NA	112	111	101	91

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[p]
METALS —Continued					
Lead:					
Mine output, Pb content	90,288	87,533	94,764	98,424	97,778
Smelter, secondary	30,400	23,600	30,794	32,836	40,463
Manganese:					
Ore and concentrate, gross weight:					
Metallurgical:					
Over 48% Mn thousand tons	442	674	753	950	954
45% to 48% Mn do.	1,423	268	448	213	338
40% to 45% Mn do.	713	415	432	837	991
30% to 40% Mn do.	2,304	1,270	1,225	1,442	1,280
Total[2] do.	4,882	2,627	2,858	3,443	3,564
Chemical:					
Over 65% MnO_2 do.	(4)	(4)	(4)	1	4
35% to 65% MnO_2 do.	39	98	123	118	135
Less than 35% MnO_2 do.	295	161	69	38	16
Total[2] do.	334	259	192	158	156
Total manganese[2] do.	5,217	2,886	3,049	3,601	3,719
Metal	19,897	23,367	36,776	31,825	e32,000
Nickel:					
Mine output, Ni content[e]	22,000	20,500	25,000	25,000	25,000
Metal, electrolytic	14,425	e17,000	20,500	e20,000	e20,000
Platinum-group metals, metal content of concentrate, matte, refinery products[e 5] thousand troy ounces	2,600	2,600	3,500	3,700	3,600
Silver:					
Mine output, Ag content do.	6,943	6,513	6,997	6,700	7,145
Primary do.	e3,080	1,950	2,000	2,000	2,000
Tin:					
Concentrate:					
Gross weight[e]	7,500	6,700	5,900	5,600	5,250
Sn content	e3,035	2,668	2,301	2,153	2,054
Metal, primary[7]	2,884	2,685	1,592	1,463	1,816
Titanium:[e]					
Rutile concentrate	47,000	56,000	56,000	55,000	55,000
Slag	381,000	417,300	417,300	r435,000	435,000
Uranium oxide (U_3O_8)	6,833	7,128	6,762	5,744	5,460
Vanadium:					
Vanadiferous slag, gross weight	57,395	35,825	45,911	57,340	e68,170
V content:					
Of vanadiferous slag[e]	8,100	5,100	6,500	8,085	9,600
Of V_2O_3 and vanadate products[e]	3,613	3,733	6,017	5,930	5,761
Total	11,713	8,833	12,517	14,015	15,361
Zinc:					
Concentrate:					
Gross weight[e]	183,000	200,000	200,000	190,000	200,000
Zn content	91,516	109,981	106,107	96,943	101,859
Metal, smelter	79,700	84,384	88,406	93,700	81,000
Zirconium concentrate (baddeleyite and zircon)	e125,000	162,281	153,123	160,533	e160,000
INDUSTRIAL MINERALS					
Asbestos:					
Amosite	43,457	40,656	33,237	37,856	36,009
Chrysotile	81,140	93,016	75,414	91,645	91,001
Crocidolite	87,263	87,439	58,738	34,073	63,203
Total	211,860	221,111	167,389	163,574	190,213
Barite	3,177	6,683	4,467	4,387	8,653
Cement, hydraulic thousand tons	8,010	7,897	8,188	7,034	6,246
Clays:					
Attapulgite	4,398	4,425	4,843	5,885	10,125
Bentonite	30,827	39,529	41,849	43,472	48,265
Fire clay	259,767	117,807	162,665	168,145	202,883
Flint clay	163,075	69,984	93,755	123,810	130,721
Fuller's earth	311	312			
Kaolin	127,891	129,605	136,160	128,899	126,129
Corundum, natural	62	49	21	10	9

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[p]
INDUSTRIAL MINERALS —Continued					
Diamond:					
Gem[e] thousand carats	3,342	4,554	4,516	4,550	4,553
Industrial[e] do	5,812	5,757	5,627	5,652	5,674
Total do	9,154	10,311	10,143	10,202	10,227
Diatomite	596	1,088	258	214	1,800
Feldspar	47,854	45,114	39,018	33,012	52,762
Fluorspar:					
Acid-grade	293,821	232,750	289,294	310,211	293,368
Ceramic-grade	9,628	6,406	4,502	5,724	7,703
Metallurgical-grade	27,386	28,446	25,410	33,272	32,814
Total	330,835	267,602	319,206	349,207	333,885
Gem stones, semiprecious:					
Emerald crystals kilograms	[e]547	575	440	102	23
Tiger's-eye do	[e]112,000	120,000	111,500	178,821	257,554
Gypsum, crude	534,991	518,353	535,286	458,399	404,205
Kyanite-related materials:					
Andalusite	155,723	116,576	143,305	194,693	181,466
Sillimanite	10,060	815	1,311	1,337	1,330
Lime[7] thousand tons	2,150	1,892	2,110	2,014	1,944
Magnesite, crude	31,927	22,560	33,059	28,898	61,186
Mica:					
Sheet kilograms	—	—	—	81	—
Waste	1,762	2,672	4,478	2,072	2,510
Nitrogen: N content of ammonia thousand tons	571	575	580	[e]580	[e]580
Phosphate rock, gross weight do	3,161	2,887	2,496	2,433	2,920
Pigments, mineral, natural:					
Ochers	1,812	1,319	746	528	1,340
Oxides	324	369	245	224	161
Total	2,136	1,688	991	752	1,501
Pyrites, gross weight[e]	1,500,000	1,500,000	875,000	900,000	940,000
Quartz, quartzite, glass sand (silica) thousand tons	1,260	1,184	1,471	1,518	1,655
Salt	586,210	744,295	615,531	722,482	752,440
Silcrete	5,582	1,839	1,153	47	—
Sodium sulfate	2,062	630	820	75	466
Stone, n.e.s.:					
Dimension:					
Granite:[7]					
Sawn slabs	12,595	11,000	13,345	11,708	10,946
Rough blocks	160,000	150,000	196,237	315,707	317,079
Marble	6,725	4,936	1,000	1,000	NA
Slate	43,900	40,000	45,100	42,100	39,853
Crushed and broken:					
Limestone thousand tons	22,379	19,874	21,084	20,520	20,898
Shale do	482	454	533	527	526
Sulfur:					
S content of pyrites do	465	474	464	562	499
Byproduct:					
Of metallurgy[e] do	135	125	[e]91	85	108
Of petroleum[e] do	25	32	30	[r]100	110
Total[e] do	625	631	585	747	717
Sulfuric acid, gross weight[8] do	3,195	3,201	NA	NA	NA
Talc and related materials:					
Talc	9,743	7,617	10,561	10,220	8,641
Pyrophyllite (wonderstone)	4,070	3,575	3,851	4,227	4,606
Vermiculite	182,641	153,034	173,759	184,070	193,657
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Anthracite thousand tons	3,526	2,227	3,228	4,910	4,990
Bituminous do	140,650	142,896	159,681	168,606	171,871
Total do	144,176	145,123	162,909	173,516	176,861

See footnotes at end of table.

Table 1.—Republic of South Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[p]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	35,770	38,325	37,400	37,400	[e]37,500
Jet fuel do	3,285	3,285	3,200	3,280	[e]3,300
Kerosene do	3,650	3,650	3,488	3,410	[e]3,400
Distillate fuel oil do	37,230	40,880	38,791	39,165	[e]39,200
Residual fuel oil do	27,470	21,900	21,312	21,645	[e]21,600
Lubricants do	2,555	2,555	2,625	2,520	[e]2,500
Other do	11,315	12,410	12,492	12,470	[e]12,500
Refinery fuel and losses do	6,205	6,205	[e]6,000	[e]6,000	[e]6,000
Total do	127,480	129,210	125,308	125,890	[e]126,000

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Table includes data available through July 28, 1987.
[2]Data may not add to totals shown because of independent rounding.
[3]Contained in ferrochromium.
[4]Less than 1/2 unit.
[5]Includes osmiridium from gold ores estimated at 2,500 troy ounces per year.
[6]Reported figure.
[7]Domestic sales plus exports.
[8]Sulfuric acid was produced from gases derived from local smelting operations and from burning imported elemental sulfur.

Table 2.—Republic of South Africa: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984[r]	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	--	23	--	All to France.
Oxides and hydroxides	8	18	--	All to New Zealand.
Ash and residue containing aluminum	251	264	--	All to Spain.
Metal including alloys:				
Scrap	4,165	9,162	34	Japan 6,403; West Germany 882.
Unwrought	63,821	52,812	13,020	West Germany 16,998; Hong Kong 11,902.
Semimanufactures	2,200	3,923	2,881	Taiwan 820.
Antimony:				
Ore and concentrate	2,384	601	--	All to Belgium-Luxembourg.
Oxides	6,770	3,206	3,206	
Arsenic: Metal including alloys, all forms	--	113	113	
Beryllium: Ore and concentrate	84	36	36	
Cadmium: Metal including alloys, all forms	--	128	--	Belgium-Luxembourg 90; United Kingdom 38.
Chromium:				
Ore and concentrate thousand tons	[2]1,097	1,252	273	Japan 543; West Germany 185; Italy 107.
Oxides and hydroxides	829	1,218	1,218	
Cobalt:				
Oxides and hydroxides	4	2	([3])	Mainly to Portugal.
Metal including alloys, all forms	66	88	6	West Germany 42; United Kingdom 40.
Columbium and tantalum:				
Ore and concentrate	5	--		
Metal including alloys, all forms, tantalum kilograms	454	412	412	
Copper:				
Ore and concentrate	62,083	70,165	--	Japan 70,161.
Matte and speiss including cement copper	1,170	1,100	--	Greece 890; West Germany 158.
Oxides and hydroxides	--	9	--	All to United Kingdom.
Sulfate	--	20	--	Do.
Ash and residue containing copper	3,682	2,034	--	Spain 1,969; United Kingdom 65.
Metal including alloys:				
Scrap	11,101	163,094	--	Taiwan 146,216; Belgium-Luxembourg 2,847.
Unwrought	165,943	154,418	5,927	West Germany 70,181; Belgium-Luxembourg 36,983.
Semimanufactures	5,070	5,232	1,720	Hong Kong 2,030; Taiwan 624.

See footnotes at end of table.

Table 2.—Republic of South Africa: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984[r]	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Gold:				
Ore and concentrate value, thousands	$5			
Waste and sweepings do	$314	$631,585	$118	Switzerland $612,144; West Germany $1,716.
Metal including alloys, unwrought and partly wrought thousand troy ounces	3,567	4,172	3	Italy 3,890; West Germany 239.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite thousand tons	12,040	9,348	4	Japan 6,586; West Germany 999; United Kingdom 953.
Pyrite, roasted	--	37	37	
Metal:				
Scrap	46,853	51,538	--	Japan 30,894; Taiwan 14,326.
Pig iron, cast iron, related materials	118,763	402,435	27,674	Japan 299,991; Taiwan 28,689.
Ferroalloys:				
Ferrochromium	860,192	419,138	184,577	West Germany 149,831; Italy 42,861.
Ferromanganese	196,570	184,650	115,749	Italy 23,185; United Kingdom 8,515.
Ferromolybdenum	--	4	--	All to Austria.
Ferronickel	42	60	22	West Germany 38.
Ferrosilicochromium	5,698	486	--	Belgium-Luxembourg 396; Spain 90.
Ferrosilicomanganese	81,653	86,881	65,022	West Germany 14,379; United Kingdom 4,354.
Ferrosilicon	33,425	8,057	3,759	West Germany 2,735; Indonesia 713.
Silicon metal	8,079	15,455	3,567	United Kingdom 6,093; West Germany 5,223.
Unspecified	88,347	453,670	76	Japan 281,146; France 83,196; Sweden 27,306.
Steel, primary forms	218,876	319,251	49,820	Taiwan 75,297; Greece 58,328; Japan 50,225.
Semimanufactures:				
Bars, rods, angles, shapes, sections	326,881	426,088	77,014	Hong Kong 197,335; United Kingdom 44,620.
Universals, plates, sheets	405,756	322,013	--	Taiwan 55,202; Hong Kong 52,763; Portugal 52,100.
Hoop and strip	929	1,944	--	West Germany 1,498; Ireland 267.
Rails and accessories	34,555	58	--	France 56.
Wire	23,735	20,186	10,688	Hong Kong 2,060; Taiwan 1,840; Portugal 1,705.
Tubes, pipes, fittings	89,787	114,038	40,547	Hong Kong 27,763; West Germany 17,960.
Castings and forgings, rough	277	83	18	Hong Kong 48.
Lead:				
Ore and concentrate	126,413	120,499	(4)	France 49,048; Japan 34,622; West Germany 27,243.
Oxides	105	833	--	Belgium-Luxembourg 702; Canada 100.
Ash and residue containing lead	373	374	--	All to United Kingdom.
Metal including alloys:				
Scrap	722	698	--	Sweden 305; United Kingdom 146.
Unwrought	3,274	37,888	--	Taiwan 32,772; Japan 2,613.
Semimanufactures	186	81	--	Hong Kong 71; United Kingdom 10.
Lithium: Ore and concentrate	56	3,026	3,026	
Magnesium: Metal including alloys:				
Scrap	292	228	126	West Germany 85.
Unwrought	(5)	64	--	All to Spain.
Manganese:				
Ore and concentrate: Metallurgical-grade thousand tons	[2]3,038	[2]2,890	--	Japan 1,234; France 249; Italy 160.
Oxides	43,787	2,485	1,713	Taiwan 408; Portugal 124.
Metal including alloys, all forms	21,825	17,635	7,877	West Germany 3,507; United Kingdom 2,701.
Mercury 76-pound flasks	29	--		

See footnotes at end of table.

Table 2.—Republic of South Africa: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984[r]	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Molybdenum:				
Ore and concentrate	32,860	86	--	All to United Kingdom.
Metal including alloys, scrap value, thousands	$22	--		
Nickel:				
Ore and concentrate	20	--		
Matte and speiss	4,633	294	--	Austria 140; Greece 130.
Ash and residue containing nickel	--	70	--	All to United Kingdom.
Metal including alloys:				
Scrap	578	419	170	West Germany 108; United Kingdom 64.
Unwrought	15,795	16,111	2,084	West Germany 3,958; Italy 2,751; France 1,797.
Semimanufactures	696	48	--	France 38; Taiwan 10.
Platinum-group metals:				
Waste and sweepings value, thousands	$202	$142	--	All to West Germany.
Ash containing platinum do.	$1,537	--		
Metals including alloys, unwrought and partly wrought:				
Palladium troy ounces	778,497	579,613	579,613	
Platinum do.	1,126,995	1,051,007	1,018,856	United Kingdom 32,151.
Rhodium do.	116,612	115,485	115,485	
Iridium, osmium, ruthenium do.	219,021	95,648	95,648	
Unspecified value, thousands	$44,015	$329,426	$2,318	Japan $257,423; West Germany $28,480.
Silver:				
Ore and concentrate[6] do.	$185,296	$151,964	--	United Kingdom $151,850.
Waste and sweepings do.	$12,352	$3,625	--	United Kingdom $2,744; West Germany $881.
Metal including alloys, unwrought and partly wrought do.	$21,902	$24,594	$1	United Kingdom $14,608; Austria $7,322.
Tin:				
Ore and concentrate	3,329	3,276	--	United Kingdom 2,760; Netherlands 516.
Oxides value, thousands	--	$351	$351	
Ash and residue containing tin	--	305	--	United Kingdom 286; West Germany 19.
Metal including alloys:				
Scrap	147	50	--	United Kingdom 45.
Unwrought	821	717	105	United Kingdom 324; Japan 172.
Semimanufactures	3,390	--		
Titanium:				
Ore and concentrate	55,810	60,079	40,049	Netherlands 6,828; West Germany 5,665.
Oxides	85	761	500	Canada 207; Hong Kong 54.
Ash and residue containing titanium	--	76,417	--	All to Italy.
Tungsten:				
Ore and concentrate	19	--		
Ash and residue containing tungsten	--	69	--	All to United Kingdom.
Metal including alloys:				
Scrap	16	17	17	
Semimanufactures	2	--		
Unspecified	8	86	--	Yugoslavia 75; United Kingdom 11.
Uranium and thorium:				
Ore and concentrate value, thousands	$28,840	$34,105	--	Canada $34,079; Italy $26.
Oxides and other compounds	2,628	1,244	1,244	
Metal including alloys, all forms, uranium	465	--		
Vanadium:				
Oxides and hydroxides	5,400	734	135	Belgium-Luxembourg 599.
Ash and residues containing vanadium	12,197	14,678	--	All to Belgium-Luxembourg.
Metal including alloys, all forms	2	--		
Zinc:				
Ore and concentrate	61,161	32,027	(7)	Japan 16,009; Italy 9,917.
Oxides	32	19	--	All to New Zealand.
Ash and residue containing zinc	173	--		
Metal including alloys:				
Scrap	573	267	--	Portugal 108; Taiwan 105.
Unwrought	1,010	5,585	3,696	Japan 997; Brazil 223.
Semimanufactures	51,412	115	24	United Kingdom 86.
Zirconium: Ore and concentrate	[2]140,726	106,819	--	West Germany 38,248; United Kingdom 23,268; Italy 12,786.

See footnotes at end of table.

Table 2.—Republic of South Africa: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984[r]	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Other:				
Ores and concentrates:				
Of base metals	108,504	132,314	--	Sweden 49,001; Japan 36,646; Italy 17,340.
Of precious metals value, thousands	--	$1,382	--	All to Spain.
Oxides and hydroxides	615	4,906	--	Japan 3,241; Austria 1,025.
Ashes and residues	97,048	96,841	--	Italy 76,417; Austria 18,541.
Base metals including alloys, all forms	4,743	11,985	933	West Germany 3,572; Netherlands 1,933.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc value, thousands	--	$3	$3	
Dust and powder of precious and semi-precious stones including diamond do	$747	$2,499	$59	Taiwan $1,302; France $828.
Asbestos, crude	[2]163,107	[2]143,027	10,985	Japan 58,752; Taiwan 7,495; Yugoslavia 6,498.
Barite and witherite[2]	833	--		
Clays, crude:				
Bentonite[2]	915	1,445	--	NA.
Chamotte earth	6,483	12,314	--	United Kingdom 5,674; West Germany 3,467.
Kaolin[2]	638	1,297	--	NA.
Unspecified	68,898	37,022	--	Japan 29,955; Taiwan 2,864.
Diamond:				
Gem, not set or strung value, thousands	$449,650	$1,180,317	$328,488	Taiwan $745,559; Belgium-Luxembourg $73,307.
Industrial stones do	$52,989	$21,079	--	Japan $10,358; West Germany $6,338.
Dust and powder thousand carats	3,705	749	749	
Feldspar, fluorspar, related materials:				
Feldspar[2]	620	--	--	NA.
Fluorspar[2]	343,432	283,023	--	NA.
Unspecified	159,704	307,807	153,996	Japan 87,541; West Germany 64,726.
Fertilizer materials:				
Crude, n.e.s	870	226	--	Japan 102; Italy 70.
Manufactured:				
Nitrogenous	7,020	78	34	Italy 24.
Phosphatic	11,093	36	--	All to West Germany.
Potassic	--	113	--	All to United Kingdom.
Unspecified and mixed	17,243	53,085	--	West Germany 36,433; Belgium-Luxembourg 8,985.
Graphite, natural	11,439	430	--	United Kingdom 358; Taiwan 72.
Gypsum and plaster	2,184	[2]1,559	--	NA.
Kyanite and related materials:				
Andalusite[2]	91,574	142,143	--	NA.
Sillimanite[2]	1,340	1,467	--	NA.
Unspecified	27,571	104,819	--	West Germany 41,448; United Kingdom 26,974; Italy 25,362.
Lime	23	--		
Magnesium compounds:				
Magnesite, crude	1,312	419	--	Canada 216; United Kingdom 180.
Oxides and hydroxides	367	--		
Other	--	1,285	110	Italy 1,090; Taiwan 85.
Mica: Crude including splittings and waste	835	1,111	--	United Kingdom 622; Japan 239.
Nitrates, crude	620	--		
Phosphates, crude	929,468	619,934	--	West Germany 199,929; Belgium-Luxembourg 129,927; Denmark 101,105.
Phosphorus, elemental	830	890	197	Taiwan 633; Spain 60.
Pigments, mineral:				
Natural, crude	[2]155	[2]196	--	Belgium-Luxembourg 116; United Kingdom 60.
Iron oxides and hydroxides, processed	91	119	--	United Kingdom 72; Taiwan 47.

See footnotes at end of table.

Table 2.—Republic of South Africa: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984[r]	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Precious and semiprecious stones other than diamond:				
Natural ____ value, thousands__	$7,079	$4,783	$1,256	Taiwan $1,036; Hong Kong $1,027.
Synthetic ____ do____	$8	$376	--	Hong Kong $331; Spain $30.
Waste and sweepings ____ do____	$2,189	$1,396	$1,352	Spain $44.
Quartz crystal, piezoelectric_ kilograms__	125	--		
Salt and brine[2] ____	89,731	94,526	--	NA.
Sodium compounds, n.e.s.:				
Carbonate, manufactured ____	--	18	--	All to United Kingdom.
Sulfate, manufactured ____	2,847	85	--	All to Canada.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons__	291	313	--	Italy 78; France 62; Japan 61.
Worked ____	428	978	--	France 519; United Kingdom 214.
Dolomite, chiefly refractory-grade ___	13	--		
Gravel and crushed rock ____	35	73,590	--	All to United Kingdom.
Limestone other than dimension value, thousands__	--	$5	$5	
Quartz and quartzite ____	845	7,186	--	United Kingdom 2,882; Italy 2,600.
Sand other than metal-bearing ____	8,453	25,380	--	Belgium-Luxembourg 19,174; Spain 4,498.
Sulfur: Elemental:				
Colloidal, precipitated, sublimed ____	3	--		
Unspecified[2] ____	11,338	4,149	--	NA.
Talc, steatite, soapstone, pyrophyllite ___	20	303	175	West Germany 128.
Vermiculite ____	[2]157,882	[2]164,287	--	United Kingdom 43,708; West Germany 10,685; Italy 7,957.
Other:				
Crude ____	48,113	118,105	--	United Kingdom 36,738; France 24,121.
Slag and dross, not metal-bearing ___	7,118	11,848	--	Brazil 11,822.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black ____	5,729	6,193	--	United Kingdom 6,178.
Coal:				
Anthracite and bituminous thousand tons__	[2]38,161	[2]44,909	824	Japan 8,621; France 6,131; Italy 5,649.
Briquets of anthracite and bituminous coal ____	--	71,194	--	Italy 70,190.
Lignite including briquets ____	54,356	147	--	France 129.
Coke and semicoke ____	30	261,687	--	France 157,684; Netherlands 34,300.
Petroleum:				
Crude_ thousand 42-gallon barrels__	--	96,416	--	Italy 51,924; Netherlands 32,713.
Refinery products:				
Liquefied petroleum gas _do____	322	52	--	All to Reunion.
Gasoline, aviation ____ do____	[8]246	--		
Mineral jelly and wax ___ do____	174	203	91	West Germany 48; Japan 23.
Kerosene and jet fuel ___ do____	1,223	22	--	All to West Germany.
Distillate fuel oil ____ do____	36	123	--	Spain 96; Italy 26.
Lubricants____ do____	40	6	[3]	Reunion 4.
Residual fuel oil ____ do____	1,042	1,173	617	Spain 423; Italy 122.
Bitumen and other residues do____	266	47	--	All to Reunion.
Petroleum coke____ do____	7	[3]	--	All to France.

[r]Revised. NA Not available.

[1]Table prepared by Virginia A. Woodson. Because official South African trade statistics provide data only on the value of total exports of each commodity class (with no data on destinations) and not on quantity of material exported, this table has been compiled from a variety of sources including the data issued by the Republic of South Africa Department of Mines and Department of Mineral and Energy Affairs and official trade returns of trading partner countries. Data issued by the Government of the Republic of South Africa are footnoted; other figures are compiled from a variety of sources with specifics on destination obtained from the import statistics of the countries listed. Data presented are exports by the common customs area of Botswana, Lesotho, the Republic of South Africa, and Swaziland.

[2]Data issued by the Government of the Republic of South Africa.

[3]Less than 1/2 unit.

[4]Unreported quantity valued at $1,316,000.

[5]Unreported quantity valued at $5,000 imported by New Zealand.

[6]May include platinum-group metals.

[7]Unreported quantity valued at $1,963,000.

[8]Incomplete total; excludes imports expressed in value only.

Table 3.—Republic of South Africa: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	20,038	21,068	--	Australia 15,237; Switzerland 4,277; Netherlands 1,526.
Oxides and hydroxides	313,863	350,615	440	Australia 336,358; West Germany 5,650; Netherlands 3,562.
Metal including alloys:				
Scrap	657	766	--	United Kingdom 307; Netherlands 305; Norway 18.
Unwrought	169	38	--	All from United Kingdom.
Semimanufactures	15,100	13,711	272	West Germany 4,891; Australia 4,431; United Kingdom 1,939.
Arsenic: Metal including alloys, all forms	22	15	--	Sweden 12; unspecified 3.
Beryllium: Metal including alloys, all forms value, thousands	$5	$4	NA	NA.
Chromium:				
Ore and concentrate	--	6	--	Mainly from United Kingdom.
Oxides and hydroxides	245	415	18	West Germany 158; United Kingdom 143; Spain 34.
Cobalt:				
Oxides and hydroxides	23	17	--	Belgium-Luxembourg 12; unspecified 5.
Metal including alloys, all forms	81	177	15	United Kingdom 25; Canada 11.
Columbium and tantalum: Metal including alloys, all forms, tantalum kilograms	2,600	1,400	1,400	
Copper:				
Ore and concentrate	1	4	NA	NA.
Oxides and hydroxides	152	122	--	West Germany 107; Norway 10; Netherlands 5.
Metal including alloys:				
Scrap	312	877	--	United Kingdom 20; Netherlands 18; unspecified 839.
Unwrought	18	--	--	
Semimanufactures	7,692	4,057	144	West Germany 2,093; United Kingdom 451; Belgium-Luxembourg 231.
Gold:				
Waste and sweepings value, thousands	$121	--		
Metal including alloys, unwrought and partly wrought[2] troy ounces	r109,610	13,493	379	Switzerland 3,190; West Germany 2,579; France 1,798.
Iron and steel:				
Iron ore and concentrate, roasted pyrite	10	13,282	--	Mainly from Brazil.
Metal:				
Scrap	55,548	7,302	NA	NA.
Pig iron, cast iron, related materials	r4,241	1,940	19	Sweden 1,202; United Kingdom 585; West Germany 48.
Ferroalloys:				
Ferrochromium	5,630	5,080	29	Sweden 8; unspecified 5,043.
Ferromanganese	24	6	--	All from West Germany.
Ferromolybdenum	407	336	13	Belgium-Luxembourg 92; United Kingdom 85; Spain 62.
Ferrosilicomanganese	3	9	--	All from France.
Ferrosilicon	511	32	--	West Germany 20; France 5; Norway 5.
Silicon metal	9	12	2	United Kingdom 10.
Unspecified	2,122	2,468	17	United Kingdom 957; France 936; Italy 294.
Steel, primary forms	45,341	22,768	24	West Germany 823; unspecified 21,921.
Semimanufactures:				
Bars, rods, angles, shapes, sections	48,508	16,081	169	Japan 2,048; United Kingdom 2,046; West Germany 958.
Universals, plates, sheets	63,330	29,393	20	Japan 18,356; West Germany 8,094; Belgium-Luxembourg 577.
Hoop and strip	5,370	2,074	1	West Germany 1,053; United Kingdom 504; Belgium-Luxembourg 279.
Rails and accessories	4,463	8,493	--	Belgium-Luxembourg 36; Canada 18; unspecified 8,439.
Wire	27,802	13,784	3	Belgium-Luxembourg 2,267; France 1,699; West Germany 1,231.
Tubes, pipes, fittings	89,022	48,788	2,176	Japan 19,455; West Germany 7,358; United Kingdom 4,769.
Castings and forgings, rough	1,225	690	4	West Germany 284; Japan 31; unspecified 371.

See footnotes at end of table.

Table 3.—Republic of South Africa: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Lead:				
Ore and concentrate	7,277	15,567	--	All from Australia.
Oxides	73	28	--	Belgium-Luxembourg 17; France 8; West Germany 2.
Metal including alloys:				
Scrap	791	126	18	NA.
Unwrought	9,912	3,877	36	Belgium-Luxembourg 1,230; United Kingdom 442; Brazil 53.
Semimanufactures	65	42	--	United Kingdom 30; West Germany 7; France 1.
Lithium:				
Ore and concentrate	1,146	443	NA	NA.
Oxides and hydroxides	110	153	119	Hong Kong 34.
Magnesium: Metal including alloys:				
Scrap	8	6	NA	NA.
Unwrought	627	724	661	France 39; Canada 24.
Semimanufactures	92	36	33	Austria 2; United Kingdom 1.
Manganese:				
Ore and concentrate, metallurgical-grade	7,790	5,250	NA	NA.
Oxides	3,556	3,621	--	Belgium-Luxembourg 3,547; Canada 18; West Germany 3.
Mercury 76-pound flasks	841	647	--	United Kingdom 220; Spain 218; Italy 99.
Molybdenum:				
Oxides and hydroxides	188	414	17	United Kingdom 302; Chile 51; West Germany 22.
Metal including alloys, all forms	23	23	1	Belgium-Luxembourg 17; West Germany 3; Austria 2.
Nickel:				
Ore and concentrate	22	--		
Matte and speiss	577	903	--	All from Canada.
Metal including alloys:				
Unwrought	57	41	--	United Kingdom 12; West Germany 1; unspecified 28.
Semimanufactures	387	291	14	West Germany 77; United Kingdom 63; Japan 50.
Platinum-group metals: Metals including alloys, unwrought and partly wrought:				
Platinum troy ounces	497	1,705	644	Japan 716; United Kingdom 134.
Unspecified do	94,026	72,555	6,828	United Kingdom 60,252; West Germany 4,175.
Selenium, elemental	10	6	--	United Kingdom 5; Canada 1.
Silver:				
Waste and sweepings[3] value, thousands	$1,883	$3,760	--	United Kingdom $3,303; unspecified $457.
Metal including alloys, unwrought and partly wrought troy ounces	r817,584	326,425	--	West Germany 303,362; United Kingdom 5,073; unspecified 17,990.
Tellurium, elemental value, thousands	$3	--		
Tin:				
Ore and concentrate	5	5	NA	NA.
Metal including alloys, all forms	83	29	--	West Germany 14; United Kingdom 3; unspecified 12.
Titanium:				
Ore and concentrate	19	--		
Oxides	1,314	511	153	West Germany 321; United Kingdom 21.
Tungsten:				
Ore and concentrate	363	542	18	Canada 414; Spain 40; United Kingdom 34.
Metal including alloys, all forms	32	24	(4)	United Kingdom 1; unspecified 23.
Vanadium: Ore and concentrate	295	108	108	
Zinc:				
Oxides	100	36	1	West Germany 22; Netherlands 7.
Blue powder	831	267	--	Norway 120; West Germany 108; Belgium-Luxembourg 36.
Metal including alloys:				
Scrap	416	263	--	United Kingdom 20; unspecified 243.
Unwrought	2,846	3,685	--	West Germany 337; Netherlands 302; United Kingdom 50.
Semimanufactures	30	13	NA	NA.

See footnotes at end of table.

Table 3.—Republic of South Africa: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[1]	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Other:				
Ores and concentrates:				
Of precious metals value, thousands	$82,596	$67,700	$28	Norway $67,672.
Of base metals	3	9	NA	NA.
Oxides and hydroxides	327	222	128	West Germany 42; Japan 21.
Ashes and residues	913	746	--	Israel 197; United Kingdom 21; unspecified 528.
Base metals including alloys, all forms	471	224	125	United Kingdom 68;West Germany 11.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	331	429	181	Italy 52; Greece 47.
Artificial:				
Corundum	3,563	1,439	274	West Germany 485; United Kingdom 360.
Silicon carbide	r2,875	1,783	--	Norway 1,283; West Germany 255; Switzerland 152.
Dust and powder of precious and semi-precious stones excluding diamond value, thousands	$46	$103	--	Ireland $64; United Kingdom $18; West Germany $8.
Grinding and polishing wheels and stones	826	813	24	West Germany 231; Italy 173; France 100.
Asbestos, crude	20,913	11,528	8	Sweden 17; West Germany 5; unspecified 11,498.
Barite and witherite	3,495	1,464	--	United Kingdom 239; France 139; West Germany 65.
Boron materials:				
Crude natural borates	4,242	2,182	567	Netherlands 734; Belgium-Luxembourg 499.
Elemental value, thousands	$1,218	--		
Oxides and acids	694	645	12	France 368; Turkey 74; Italy 54.
Bromine	18	73	--	Israel 72; West Germany 1.
Cement	316,806	184,188	--	Japan 66,749; Norway 38,000; France 18,486.
Chalk	9,196	4,799	--	France 3,713; United Kingdom 580; Switzerland 290.
Clays, crude	33,549	30,506	5,337	United Kingdom 24,216; West Germany 420.
Cryolite and chiolite	178	48	--	Denmark 37; West Germany 10.
Diamond:				
Gem, not set or strung carats	226,000	267,500	44,000	United Kingdom 54,000; Belgium-Luxembourg 25,000.
Industrial stones do	278,500	359,000	--	United Kingdom 181,500; Ireland 45,500; West Germany 35,000.
Diatomite and other infusorial earth	5,333	6,039	5,568	France 193; Netherlands 34.
Feldspar, fluorspar, related materials	29	67	--	France 10.
Fertilizer materials: Manufactured:				
Ammonia	21,113	72,199	53,361	Brazil 18,832.
Nitrogenous	20,612	90,239	16,509	Netherlands 29,484; Belgium-Luxembourg 10,992.
Phosphatic	132	213	17	Israel 195; United Kingdom 1.
Potassic	294,470	292,296	--	Israel 148,050; Canada 45,737; West Germany 39,477.
Unspecified and mixed	1,688	1,145	--	United Kingdom 546; Netherlands 299; Belgium-Luxembourg 200.
Graphite, natural	4,122	3,834	--	Republic of Korea 850; Brazil 789; Norway 476.
Gypsum and plaster	8,609	7,331	39	West Germany 5,343; United Kingdom 1,280; Spain 573.
Lime	r6,676	7,425	57	France 5,760; Brazil 192.
Magnesium compounds:				
Magnesite, crude	56,360	35,907	--	Italy 4,000; Greece 3,881; Taiwan 3,002.
Oxides and hydroxides	23,602	39,724	51	Republic of Korea 12,679; Italy 10,992; United Kingdom 6,061.
Mica:				
Crude including splittings and waste	1,073	586	--	Australia 107; United Kingdom 1; unspecified 478.
Worked including agglomerated splittings	65	76	2	Switzerland 31; United Kingdom 13; Austria 11.

See footnotes at end of table.

Table 3.—Republic of South Africa: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Phosphates, crude	143,908	51,770	--	All from United Kingdom.
Phosphorus, elemental	24	48	--	United Kingdom 34; unspecified 14.
Pigments, mineral:				
Natural, crude	38	36	--	Mainly from Austria.
Iron oxides and hydroxides, processed	13,384	5,469	8	West Germany 4,869; United Kingdom 515; Spain 46.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$830	$1,085	$33	Hong Kong $84; Brazil $48; West Germany $44.
Synthetic do.	$8,474	$5,916	$48	Ireland $3,975; West Germany $489; Australia $272.
Pyrite, unroasted	69	38	--	West Germany 20; France 18.
Salt and brine	r50,528	2,565	--	United Kingdom 1,120; Israel 302; West Germany 185.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	297,959	229,340	134,030	United Kingdom 46,199; Spain 18,456.
Sulfate, natural and manufactured	18,650	67,100	46,667	France 12,700; West Germany 2,404.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	5,331	6,257	--	Italy 1,479; Finland 1,391; Spain 1,350.
Worked	2,208	1,165	(4)	Italy 666; United Kingdom 109; Greece 90.
Dolomite, chiefly refractory-grade	890	338	--	West Germany 217; United Kingdom 54; Norway 36.
Gravel and crushed rock	r24,905	13,497	--	France 130; West Germany 14; Denmark 9.
Limestone other than dimension	338	120	--	Japan 60; Sweden 40.
Quartz and quartzite	140	86	--	West Germany 62; United Kingdom 1.
Sand other than metal-bearing	526	542	11	Canada 122; West Germany 39; United Kingdom 16.
Sulfur:				
Elemental:				
Crude including native and by-product	597,145	463,502	998	Canada 460,818; Portugal 1,307.
Colloidal, precipitated, sublimed	223	53	--	West Germany 46.
Dioxide	1	11	NA	NA.
Sulfuric acid	62,088	17,523	--	West Germany 25; unspecified 17,498.
Talc, steatite, soapstone, pyrophyllite	3,198	2,545	201	Italy 625; Republic of Korea 521; Norway 386.
Other:				
Crude	r7,795	8,559	5	Greece 7,702; Australia 645; Japan 87.
Slag and dross, not metal-bearing	9,254	9,234	25	Sweden 8,102; Taiwan 1,035.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	435	257	168	Canada 6; unspecified 83.
Carbon black	3,757	1,331	261	West Germany 416; United Kingdom 211.
Coal: Anthracite and bituminous	1,716	1,058	NA	NA.
Coke and semicoke	5	11	--	France 5; unspecified 6.
Peat including briquets and litter	877	853	--	Canada 361; Sweden 231; Netherlands 104.
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	824	94	20	United Kingdom 46; Belgium-Luxembourg 15.
Mineral jelly and wax do.	473,475	477,371	79,005	Japan 123,320; West Germany 118,531.
Bitumen and other residues do.	r371	275	61	NA.
Bituminous mixtures do.	1,939	4,224	143	Netherlands 248; United Kingdom 150.
Petroleum coke do.	384,742	509,340	442,320	Belgium-Luxembourg 28,697; United Kingdom 23,121.

rRevised. NA Not available.

[1]Table prepared by H. D. Willis. Data presented are imports by the common customs area of Botswana, Lesotho, the Republic of South Africa, and Swaziland released by the Commissioner for Customs and Excise of the Republic of South Africa.

[2]May include platinum-plated gold.

[3]May include platinum-group metals.

[4]Less than 1/2 unit.

Table 4.—Republic of South Africa: Value of domestic sales and exports of major mineral commodities

(Thousand U.S. dollars)

Commodity	Domestic sales			Exports		
	1984	1985	1986[p]	1984	1985	1986[p]
METALS						
Antimony	16,166	7,741	NA	10,008	2,820	NA
Chromite	43,221	41,199	51,428	43,871	67,085	43,508
Copper	118,774	98,788	109,392	140,112	152,724	138,849
Gold	[1]	[1]	[1]	8,047,942	6,978,847	7,618,477
Iron ore	91,953	69,814	76,747	168,132	145,708	132,067
Lead concentrate	--	--	--	22,102	21,731	25,459
Manganese	22,252	25,049	30,051	119,271	111,305	89,504
Nickel	16,854	22,501	20,999	33,702	37,785	29,770
Silver	561	647	1,763	45,808	33,588	30,845
Tin	9,552	10,876	6,331	16,769	11,568	7,069
Titanium	4,377	13,133	[e]14,000	14,289	19,470	[e]22,000
Uranium[e]	NA	NA	NA	200,000	200,000	150,000
Vanadium	3,235	[e]3,500	[e]3,800	58,624	[e]60,000	[e]65,000
Zinc	42,143	29,859	23,280	18,598	5,442	10,593
Zirconium	342	540	NA	25,575	29,369	[e]30,000
INDUSTRIAL MINERALS						
Asbestos	3,680	1,715	2,116	66,519	44,973	41,547
Cement[e]	380,000	350,000	350,000	40,000	35,000	30,000
Clays, flint	2,558	4,446	9,341	1,708	1,372	1,189
Clays, other	6,064	4,859		54	106	
Diamond	[1]	[1]	[1]	361,180	353,557	465,501
Feldspar	2,763	1,888	2,440	61	--	75
Fluorspar	2,253	2,062	2,466	32,001	23,734	24,872
Granite	1,452	1,003	1,326	19,071	15,947	20,546
Gypsum	4,669	3,053	3,167	23	8	4
Kyanite-related materials:						
Andalusite	6,239	4,398	6,242	8,519	11,411	9,823
Sillimanite	112	17	46	178	134	80
Lime products	77,413	56,545	101,757	2,569	2,283	2,499
Limestone	52,212	34,345		87	78	
Magnesite	1,247	1,002	1,957	--	--	--
Mica	322	213	278	338	303	257
Phosphate rock	52,338	37,714	[e]35,000	17,335	16,532	[e]15,000
Pyrite-sulfur	31,512	19,097	26,064	396	89	--
Salt	22,449	17,168	18,833	2,527	2,018	2,253
Silica, sand	16,494	10,881	12,967	189	28	17
Slate	1,853	1,047	1,118	2,553	2,575	2,928
Stone, other	1,817	1,090	1,203	237	187	267
Vermiculite	374	261	250	13,315	12,630	15,095
Wonderstone	741	521	98	47	--	--
Miscellaneous	227,491	197,326	214,877	685,942	791,513	1,187,380
MINERAL FUELS						
Coal:						
Anthracite	18,480	14,394	971,068	101,177	129,455	1,391,720
Bituminous	1,175,960	861,070		1,092,282	1,302,949	
Total	2,459,923	1,949,762	2,100,405	11,413,111	10,624,324	11,604,194

[e]Estimated. [p]Preliminary. NA Not available.
[1]Value, if any, is included under exports.

Source: Republic of South Africa Department of Mineral and Energy Affairs, South Africa's Mineral Industry 1985; Minerals Bureau, Mineral Production and Sales Statistics, 1985 and 1986.

COMMODITY REVIEW

METALS

Antimony.—Exports of concentrate by Consolidated Murchison Ltd. declined owing to lower grade of the ore mined and to an increase in output of both crude and refined antimony trioxide.

Copper.—Palabora Mining Co. Ltd. (PMC) mined 95.4 million tons of ore and waste rock, and treated 29.4 million tons of ore grading 0.49% copper to produce 338,473 tons of copper concentrate grading 35.7% copper. Copper anode output totaled 131,936 tons grading 99.48% copper, of which 107,553 tons was of PMC origin, 13,794 tons was purchased, and 10,589 tons was toll smelted. Total cathode output was 128,864 tons grading 99.97% copper, of which 104,846 tons was of PMC origin and 24,018 tons was other copper. The average cost of production of cathode copper was $0.399 per pound. The use of emulsion explosives in place of slurry systems saved $661,000, and diesel fuel savings from the trolley assist system were $5.7 million. Expenditures of $34.7 million were approved for installation of a primary crusher at the 300-meter level on bench 29 of the open pit, with transport to the surface stockpiles by conveyor. Another $5.8 million was budgeted for expanding concentrate smelting capacity by 100 to 150 tons per day through the addition of a smelting cyclone over the existing reverberatory furnace. The casting plant produced 66,369 tons of continuous copper rod to meet local demand.

Mill throughput by O'okiep Copper Co. Ltd. was 1.77 million tons and head grade was 1.84% copper. Metal in concentrates was 29,891 tons, and recovery was 89%. Smelter operations were nearly at full capacity owing to increased toll smelting of concentrates from Prieska Copper Mines (Pty.) Ltd. (PCM). O'okiep expected to toll treat concentrates from PCM through 1987. Blister copper output was 37,832 tons.

Gold.—Ore milled in 1986 by about 40 major gold producers that were members of the CM was 108 million tons at an average grade of 0.181 troy ounce of gold per ton. The maximum depth at which exploitation occurred was 3,455 meters, and development work has taken place at 3,501 meters. Total working revenue for these mines was $7.3 billion, or $66.66 per ton of ore milled, equivalent to $369.58 per troy ounce of gold recovered. The average production cost per ton of ore milled was $32.51, equivalent to about $180 per troy ounce of gold produced. An average working profit of about $31 per ton of ore milled was realized, or $173 per troy ounce of gold recovered. The highest working profits on a troy-ounce basis were by Kloof Mine, $267; East Driefontein, $254; and West Driefontein, $251.

AAC's Free State Consolidated Gold Mines Ltd. (Freegold), consisting of the Free State Geduld and Western Holdings Mines in the northern region and President Brand and President Steyn Mines in the southern region, increased mill throughput to 21.75 million tons in 1986. The rationalization of mines and work areas allowed mill throughput capacity to increase to 24 million tons without adding a new plant. Freegold's unit cost per ton milled was $33.63. Freegold was also considering reopening its Jeanette Mine.

East Rand Gold and Uranium Co. Ltd. (Ergo) neared completion of its new $52 million carbon-in-leach plant at Daggafontein, near Springs. Slimes from impoundment sites would be reclaimed by hydraulic monitors and pumped up to 10 kilometers to the plant. Plant residue would be pumped via a causeway to a damsite 4 kilometers from the Ergo plant.

Gencor's Winkelhaak Mine milled 2.4 million tons of ore and recovered 437,000 troy ounces of gold. Average sale price for the year was $344 per troy ounce. Working cost per ton of ore milled was $25.44, up 24% over that of 1985. Reserves were nearly 11 million tons at a gold price of about $340 per troy ounce. About 7.7 million tons was available for mining at a grade of 0.276 troy ounce per ton.

Major exploration efforts were under way in the Potchefstroom area. Potchefstroom Gold Areas Ltd. reported intersections of significant gold-bearing horizons at depths of 3,800 meters. New Central Witwatersrand Ltd. reportedly intersected the same horizon at 1,300 meters. Grades of 0.48 troy ounce per ton were reported over a width of 73 centimeters.

The Rand Refinery Ltd., owned by members of the CM, completed installation of a $2.7 million, 2.2-megavolt-ampere submerged arc furnace to update gold and silver processing at its refinery at Germiston. The furnace was designed to process residues, borax slags, crushed crucibles and furnace linings, and spent activated carbon, as well as X-ray plates and electronic equipment. Capacity was 400 tons per month; full operating capacity was expected by mid-1987.

Table 5.—Republic of South Africa: Gold production and ore reserves, by producer

Producer	Production (troy ounces)				Developed ore	
	1983	1984	1985	1986[p]	Thousand metric tons	Troy ounces per ton
AAC Joint Metallurgical Scheme	115,981	129,066	121,777	88,199	NA	NA
Barberton	45,252	56,521	55,945	53,740	NA	NA
Blyvooruitzicht	593,708	501,381	426,084	425,617	4,805	0.572
Bracken	115,103	110,042	122,333	98,703	1,600	.190
Buffelsfontein	966,204	1,011,519	1,230,771	1,128,888	12,716	.322
Consolidated Murchison Ltd	18,683	25,302	[e]27,000	[e]28,900	NA	NA
Deelkraal	204,746	234,642	231,032	243,947	4,245	.233
Doornfontein	319,533	314,906	306,528	278,464	6,005	.271
Driefontein Consolidated Ltd.:						
East Driefontein	1,092,511	1,110,646	914,205	888,321	7,355	.510
West Driefontein	1,270,662	1,238,930	1,157,435	1,033,182	7,775	.516
Durban Deep	251,863	244,734	242,645	239,790	2,929	.148
East Rand Gold and Uranium Co. Ltd. (Ergo)	197,341	207,694	222,965	280,386	NA	NA
East Rand Proprietary Mine	357,037	335,017	329,590	296,539	8,094	.215
Elandsrand	316,955	343,813	378,430	380,536	4,854	.318
Free State Geduld	873,803	860,009	857,626	[1]	[1]	[1]
Freegold:						
North region	[1]	[1]	[1]	1,715,719	19,553	.367
South region	[2]	[2]	[2]	1,707,974	24,686	.319
Grootvlei	227,505	247,445	220,342	184,384	3,370	.179
Harmony	1,042,295	1,037,310	1,057,147	923,690	30,257	.183
Hartebeestfontein	968,663	996,778	926,921	993,855	18,268	.382
Kinross	392,866	432,748	473,474	397,238	9,710	.280
Kloof	978,852	1,048,190	1,001,173	927,258	6,350	.646
Leslie	125,308	148,170	125,507	112,302	2,050	.193
Libanon	328,423	285,440	282,116	287,157	6,183	.192
Loraine	270,960	278,271	286,604	280,804	10,257	.231
Marievale	39,381	38,790	36,533	32,344	520	.191
President Brand	771,165	726,580	670,869	[2]	[2]	[2]
President Steyn	834,292	783,615	738,752	[2]	[2]	[2]
Randfontein	952,903	998,781	1,035,606	869,966	11,097	.208
St. Helena	444,204	396,843	397,441	313,244	8,960	.304
St. Helena-Beisa	44,918	40,526				
Stilfontein	396,354	346,623	319,215	275,072	3,058	.329
Unisel	296,494	291,385	298,391	302,442	5,050	.244
Vaal Reefs	2,572,281	2,659,969	2,615,636	2,620,327	30,651	.399
Venterspost	195,785	203,315	188,844	189,782	6,565	.177
Western Areas	582,732	567,878	527,657	516,790	6,434	.194
Western Deep Levels	1,268,501	1,158,907	1,204,613	1,196,009	7,491	.576
Western Holdings	1,287,296	1,252,472	1,244,062	[1]	[1]	[1]
West Rand Consolidated	127,960	140,142	130,457	125,163	5,290	.217
Winkelhaak	467,842	471,709	445,956	442,419	10,900	.280
Witwatersrand Nigel	27,653	25,984	26,171	40,510	NA	NA
Other	463,684	558,828	687,377	594,004	NA	NA
Total or average	21,847,699	21,860,921	21,565,230	20,513,665	287,078	.291

[e]Estimated. [p]Preliminary. NA Not available.
[1]Free State Geduld and Western Holdings are included with Freegold, north region, commencing in 1986.
[2]President Brand and President Steyn are included with Freegold, south region, commencing in 1986.

Sources: Chamber of Mines of South Africa. Quarterly Analysis of Working Results, Oct.-Dec. 1981-85; supplements to the Mining Journal (London), 1981-86. Consolidated Murchison Ltd. Annual Reports 1981-85.

Iron Ore and Concentrate.—A decline in iron ore exports was compensated for by an increase in local consumption. The Sishen Mine of the South African Iron and Steel Industrial Corp. (Iscor) operated at a capacity of 19 million tons per year. Iscor itself consumed about 10 million tons per year. A 10-year contract for delivery of ore to Japanese steel mills via Saldanha Bay was due to expire in 1988. Vessels loading iron ore from Saldanha Bay completed loading in 1.5 days at a rate of 8,000 tons per hour. The round trip voyage to Japanese ports took 60 days.

Magnetite output by PMC of 104,249 tons of salable product was sold mainly for coal washing as heavy medium, and a small amount of fine-grade material was sold for use in a direct-reduction pilot plant.

Iron and Steel.—Of a total crude steel output of 7.2 million tons by Iscor, 70% was from basic oxygen furnaces and 30% was from electric furnaces. Iscor commissioned ultrahigh-power transformers at its Vanderbijlpark plant, enabling it to achieve a 35% sponge iron charge to its furnaces. Special scrap processing equipment was installed for supplying more precise grades

of scrap to the electric furnaces. Highveld Steel and Vanadium Corp. Ltd. (HSVC) reached the full rated operating capacity of its No. 2 iron plant at 500 tons per day. Modifications by HSVC have permitted output of 625 tons per day. The No. 2 plant was 100% more efficient than the No. 1 plant. Of total costs by HSVC, 40% were estimated to be for electricity, and 15% were for transportation. Local sales were mainly by Iscor, as large parastatals were prohibited from buying HSVC steel and were obliged to buy from Iscor. About 60% of Iscor's total steel output was sold locally.

Union Steel Corp. reported higher sales for 1986, but suffered its third successive year of loss owing to problems with a new direct-reduction plant.

Ferroalloys.—Total ferroalloy output was up by 5%, mainly owing to increased production of chromium alloys. South African Manganese Amcor Ltd. (Samancor), a Gencor subsidiary, accounted for 50% of total chromium alloy exports, followed by Middleburg Steel and Alloys Ltd. (MSA), a BRL subsidiary, at 30%. Samancor's Ferrometals plant at Witbank completed a $7 million furnace conversion project at yearend to produce intermediate charge chromium in granulated form. Liquid charge chromium from the Ferrometals East plant was used in the carbon reduction process. Total capacity was to be 50,000 tons per year of ferrochromium containing 1.5% to 6% carbon. Charge chromium capacity at the Ferrometals East plant was 310,000 tons per year, and at the Tubatse plant, 160,000 tons per year. Samancor was planning for the introduction of new technology for ferrochromium production at Tubatse to increase that plant's capacity by 70,000 tons per year.

A $7 million modernization program at the Middelburg plant would enable MSA to produce special grades of ferrochromium, including low-nitrogen and ultralow-carbon grades. MSA's Middelburg and Krugersdorp plants produced 247,000 tons of charge chromium and 32,000 tons of low-carbon ferrochromium. The plasma arc furnace at MSA's Palmiet plant at Krugersdorp operated at nearly full capacity, producing about 17,000 tons of ferrochromium. The furnace remained an experimental unit, although most operational problems had been solved.

Consolidated Metallurgical Industries Ltd. (CMI)—a subsidiary of JCI, 49.9%; AAC, 25.8%; and DAB Investments Inc., 4.1%—had a production capacity of 150,000 tons per year of granulated ferrochromium. CMI's consumption of electricity was about 2,700 kilowatt hours per ton of ferrochrome, compared with about 4,300 kilowatt hours per ton for other producers, making it an efficient, low-cost producer. At yearend 1986, CMI made a rights offer for the holdings of its shares that were held by Allegheny International Inc. of the United States. Allegheny sought to sell its 3.9% share holding in CMI, as well as to terminate the marketing agreement for CMI in the United States.

Ferroalloys (Pty.) Ltd. was 59% owned by Associated Manganese Mines of South Africa Ltd. and 31% by USX Corp. of the United States. It had a total ferrochromium capacity of about 120,000 tons per year at the Machadodorp plant.

Lead.—The total production of lead concentrate from the Black Mountain Mine was exported, and total revenue was up by 21% owing to higher prices. Development of the Pering Mine continued, and it was slated for opening at yearend 1987.

Manganese.—Sales by Samancor in the 13-month period ending March 1986 were 3.3 million tons. Output was concentrated at the Mamatwan and Wessels Mines with small tonnages of special grades produced at Hotazel. The Middelplaats Mine was on care and maintenance. Samancor began construction of a sinter plant in northern Cape Province at a cost of $26.4 million, with a throughput of 550,000 tons per year of ore from the Mamatwan Mine to produce 500,000 tons of sinter. About 400,000 tons was to be shipped to Samancor's Metalloys plant at Myerton for production of ferromanganese containing 44% manganese. The plant currently produces ferromanganese containing 38% manganese. The remaining 100,000 tons of sinter will be exported through Port Elizabeth. Transportation costs for manganese shipped from northern Cape Province were $13 per ton.

Nickel.—A new refining plant for production of battery-grade nickel sulfate was completed in November by PMC. The nickel sulfate was a byproduct of copper refining, and sales were about 1,000 tons per year. Nickel-based master alloys were produced by Metallurgical Processes (Pty.) Ltd., a subsidiary of Gencor.

Platinum-Group Metals (PGM).—Rustenburg Platinum Mines commenced construction of a new precious metals refinery at the Rustenburg mining complex, about

12 kilometers east of Rustenburg in Bophuthatswana, at a cost of $110 million. Commissioning of the plant was scheduled for yearend 1988. It will replace facilities at Royston in the United Kingdom and at Wadeville in the Republic of South Africa, using solvent extraction technology. Plans to start up the Maandagshoek Mine in early 1987 were postponed owing to the potential oversupply of PGM and spare capacity in existing mines. Maandagshoek was a shallow ore body with reportedly significantly higher rhodium content than existing company mines.

Potgietersrus Platinum Holdings, a 100% subsidiary of Rustenburg Platinum Holdings Ltd., held mineral rights covering the Platreef PGM horizon in Lebowa. The near-surface mineralization could be mined as an open pit mine.

East Rand Consolidated Mines Ltd. (ERCM) explored platinum-bearing horizons below its Kennedy's Vale vanadiferous magnetite deposit. Five drill holes were completed and three evaluated at a cost of $720,000. Ore grades and reserves were not reported, but a grade of 0.20 troy ounce per ton was necessary for the operation to be viable.

Western Platinum Ltd. (Wesplat), almost entirely owned by Lonrho Corp. of the United Kingdom following the purchase of Falconbridge Ltd.'s 49% holding, produced 250,000 troy ounces of PGM for the year ending September 1986. Planned expansions, mainly from the UG2 horizon, were expected to result in output of 500,000 troy ounces per year within 3 years. Wesplat opened its base metals refinery in December, with a throughput capacity of 4,000 tons of matte per year containing 48% nickel, 30% copper, 1.5% cobalt, and 0.22% PGM. PGM grades of concentrates produced by Wesplat from the UG2 horizon were three to five times higher than those obtained from the Merensky Reef.

Northam Platinum Ltd., controlled by GFSA (78%), Consolidated Gold Fields Ltd. of the United Kingdom (12%), and a private syndicate (10%), announced development of a PGM deposit at Northam, about 200 kilometers northwest of Johannesburg. Initial output from two shafts, commencing in 1991, was forecast by GFSA at 90,000 tons of ore milled per month, rising to 150,000 tons per month in 1994. Two additional shafts would be sunk commencing in 1994. Production could total 350,000 troy ounces per year of PGM. Both compressed air and hydropower technology would be used in the operation, with hydropower supplying 60% of total energy requirements. Capital costs were estimated at $247 million.

Golden Dumps Pty. Ltd. announced plans to open the Lefkochrysos Mine in the vicinity of Brits. Output would be as a shallow underground mine with a maximum depth of 1,000 meters, initially yielding 80,000 tons of ore per month and recovering 170,000 troy ounces of PGM per year. The mine would treat both UG2 ore and Merensky Reef ore with grades of 0.144 to 0.193 troy ounce per ton, respectively. Mine development costs were estimated at $88 million. Toll smelting and refining of concentrates was to be done overseas.

Silicon.—Samancor postponed the addition of two new furnaces costing about $35 million to its subsidiary Silicon Smelters Ltd. at Pietersburg owing to low world prices, reduced production from its current three furnaces, and a world oversupply of silicon.

Tantalite.—Utah Mining Co. of the United States sold its controlling interest in Southern Sphere Holdings and Tantalite Valley Minerals Co. to Severin Mining and Development Co. Included in the sale were high-grade tantalite deposits on both sides of the Orange River on the border with Namibia.

Tin.—Modifications to the smelter of Rooiberg Tin Ltd. allowed GFSA to treat larger quantities of low-grade concentrates. Output was 1,649 tons of metal compared with 1,292 tons in 1985, and at yearend 1986 no concentrates were available for sale. Rooiberg's earnings declined to $12 million, and the company suffered an operating loss of about $750,000. In October, the company closed three of its high-cost mines owing to low earnings. Only the C Mine and the smelter remained operational, as did the concentrator at the A Mine. GFSA's Union Tin Mines Ltd. placed its mines on care and maintenance as a result of an operating loss of $800,000. Union Tin had sales of tin-in-concentrates of only 185 tons.

Titanium.—Tisand Ltd. and Richards Bay Iron and Titanium (Pty.) Ltd. (RBIT) neared completion of mine and smelter expansion projects, respectively, at Richards Bay. Installation of a new bucket wheel dredge was to increase Tisand's mining capacity by 30%. RBIT's capacity to produce slag containing 85% titanium dioxide would increase to about 650,000 tons per year with commissioning of a third smelter.

Vanadium.—Vanadium South Africa Ltd. (Vansa), a wholly owned subsidiary of ERCM, was proceeding with plans to mine 17,000 tons per month of vanadiferous magnetite ore with a recovery of 1.51% vanadium pentoxide at Kennedy's Vale. Output would be about 3,000 tons of vanadium pentoxide per year. Reserves were 2.925 million tons grading 1.95% vanadium pentoxide. HSVC originally mined the deposit under tribute from ERCM. Mining would begin in 1988 and initially be opencast using bucket loaders and 20-ton dump trucks. Vansa ordered a 3-meter-diameter, $340,000 magnetite ball mill, which will utilize a 44-ton ball charge to produce 40 tons per hour of minus-300-micrometer product.

Vametco Minerals Co., owned by Strategic Metals Corp. of the United States, restarted it Nitrovan plant at Brits in March following completion of transfer of the plant from Bon Accord. Exports from the plant were mainly to Europe.

HSVC operated its No. 2 iron plant at full capacity, increasing output of vanadium-bearing slag. The Vantra Div. of HSVC, which was responsible for vanadium production, purportedly accounted for nearly 60% of the company's profits.

Zinc.—Fire damage to two rectiformers at the Zinc Corp. of South Africa Ltd.'s (Zincor) plant in March resulted in the loss of production of almost 13,000 tons. Production in 1986 was 80,802 tons, and sales were 84,467 tons. Purchases were 3,236 tons to meet local demand, and exports were 1,402 tons to meet contractual agreements. Working costs, including raw material costs, were up 33% to about $220 per ton of slab zinc produced. Zincor commenced construction of a magnesium preleach plant in order to account for higher levels of magnesium expected in ore mined from the Pering Mine in northern Cape Province.

Open pit development work costing $30 million was nearly completed at the Pering Mine. Output would be 1.1 million tons of ore per year yielding 60,000 tons of zinc concentrate and 9,000 tons of lead concentrate. Reserves were 18.4 million tons grading 3.61% zinc and 0.64% lead. Lead concentrates were to be treated at the Tsumeb smelter in Namibia.

Zirconium.—Output of crude zirconium concentrates by PMC was 25,281 tons, up 20% over that of 1985. Baddeleyite output was 11,522 tons, and 12,011 tons was processed to chemicals. Total sales of zirconia products were $12.6 million.

INDUSTRIAL MINERALS

Andalusite.—Mining of andalusite commenced on the Hoogenoeg farm near Pietersburg in northern Transvaal following two previous unsuccessful attempts to exploit the deposit profitably.

Asbestos.—Production capacity was reduced at both the Penge and Kuruman Mines as lower sales, reduced dollar prices, and high production costs continued to depress the industry. Capacity was expected to be cut further to 60% at the Penge and to 40% at the Kuruman in 1987. About 31% of the work force, or 900 people, would be retrenched at both mines. Griqualand Exploration and Finance Co. Ltd. (Gefco) also suspended operations at the Pomfret crocidolite mine. The mine supplied 15% of Gefco's production. Gefco was involved in a long-term project to revegetate old asbestos dump sites and to prevent the exposure of waste fiber by grazing animals.

Cement.—The industry operated at about 60% of total capacity, with about 4 million tons of capacity idle. Transportation and distribution of cement was centralized through the Cement Distributors Association, which was made up of Pretoria Portland Cement Ltd. (PPC), 45%; Anglo-Alpha Ltd., 35%; and Blue Circle Cement Co. Ltd., 20%. PPC completed construction of a $2.4 million synthetic gypsum plant at the Jupiter cement works, a $2.6 million coal handling and blending plant at Lime Acres, and upgraded computer-controlled operations at the Riebeeck West plant.

Clays.—G & W Base and Industrial Minerals (Pty.) Ltd. commenced mining of attapulgite on its leases on the Zuurverdiend farm near Thabazimbi.

Diamond.—Output was up slightly, and average per carat prices increased sharply from $36.75 in 1985 to $42.87 in 1986. Total ore treated by De Beers Consolidated Mines Ltd. was 23.23 million tons compared with 22.4 million in 1985. De Beers negotiated a new recognition agreement with the National Union of Mineworkers (NUM) covering the Finsch, Kimberly, and Namaqualand Mines. The Premier Mine was not included owing to insufficient recruitment by NUM. Output was up at the Finsch Mine owing to processing of old treatment plant dumps. Nearly 600,000 tons of additional material was treated yielding 86.6 carats per 100 tons compared with 94.8 carats per 100 tons in 1985. An in-pit crusher and

conveyor system linked to the decline tunnel was successfully implemented in September. Work on extending development of the underground mine continued throughout the year, and commissioning of production was planned for 1990.

The De Beers, Dutoitspan, Bultfontein, and Wesselton Mines, all in the Kimberley Mines Div., were active throughout the year. Output was just over 1 million carats from 4.36 million tons of ore treated averaging 23.01 carats per 100 tons. The dump retreatment section processed 1.239 million tons averaging 18.39 carats per 100 tons. The Kimberley and Koffiefontein Mines remained on care and maintenance, with the latter mine scheduled for reopening in 1988 with a work force of 1,100 people.

Total Namaqualand Mine output was 5.121 million tons yielding 18.63 carats per 100 tons. Overburden stripping nearly doubled from 8 million tons in 1985 to 15.3 million tons in 1986. At the Buffels marine complex, work commenced on restarting the AK3 plant, and the walking dragline was recommissioned at yearend. The Koingnaas complex treated over 1.8 million tons consisting of 336,000 tons of gravel from the Mitchells Bay plant and 1.5 million tons of ore from the Koingnaas Mine. The Langhoogte Mine yielded 29,902 carats at an average grade of 19.67 carats per 100 tons from 152,000 tons of ore.

Total tonnage treated at the Premier Mine was 7.939 million tons yielding 2.9 million carats. Underground output was 5.575 million tons averaging 36.36 carats per 100 tons while dump material averaging 35.2 carats per 100 tons yielded 832,119 carats. Development work below the gabbro sill continued with commissioning of the winze conveyor serving the north side of the mine. Equipping of a conveyor to serve the south side was under way.

Marine West Corp., a marine diamond recovery company, was successful in prospecting and exploiting its concession area south of the mouth of the Orange River. Diamond recovery from a single vessel was 3,000 carats in October and 1,000 carats over a 2-day period in November.

Rex Diamonds (Pty.) Ltd. continued prospecting and commenced mining of diamonds on the Stieniesrust and Leeuwkop farms near Theunissen in the Orange Free State. Some 80% of an annual output of 3,000 to 5,000 carats was to be exported, and the remaining high-quality stones would be sold locally. De Beers neared completion of prospecting on the Venetia diamond deposit in northern Transvaal, and prospecting was being extended to the adjacent Krone and Rugen farms. Development of a diamond mine on the Ruigtelaagte farm, near Lichtenburg, was well advanced and expected to begin producing on a large scale in 1987.

Table 6.—Republic of South Africa: Marketed diamond output, by Province

Province	1984		1985		1986[p]	
	Output (carats)	Price per carat	Output (carats)	Price per carat	Output (carats)	Price per carat
Mine diamond:						
Transvaal	2,570,183	$28.17	2,700,601	$22.45	2,884,380	$24.07
Cape Province	6,078,008	26.55	6,147,626	30.27	6,077,429	34.84
Orange Free State	92,656	44.15	68,143	64.73	31,929	94.67
Total or average	8,740,847	27.29	[1]8,916,369	28.34	8,993,738	31.60
Alluvial diamond:						
Transvaal	44,195	163.92	52,617	161.78	47,422	178.71
Cape Province	1,335,326	103.75	1,232,406	94.63	1,186,042	122.04
Orange Free State	344	512.82	1,079	359.50	2,130	500.15
Total or average	1,379,865	106.00	1,286,102	97.85	[1]1,235,593	124.87
Grand total	10,120,712	37.54	10,202,471	36.75	10,229,331	42.87

[p]Preliminary.
[1]Data do not add to total shown because of independent rounding.

Sources: Minerals Bureau, Mineral Production and Sales Statistics, 1984, 1985, and 1986. R1=$0.6954 for 1984, R1=$0.4564 for 1985, and R1=$0.4408 for 1986.

Emerald.—Output was from the Gravelotte Mine in northeastern Transvaal. Production was 8,000 tons per month of emerald-bearing schist, yielding 10,000 to 20,000 carats of emerald of all grades. About 1.5 million carats was held in stock owing to the weak market. Gravelotte Emerald Mines Ltd. converted a number of base metal claims to precious metal claims, as well as acquiring additional claims for gold exploitation near Gravelotte.

Fertilizer Materials.—Triomf Fertilizer Ltd. closed its Richards Bay phosphate plant owing to low prices worldwide. The plant's output was mainly export oriented and had a production capacity of 400,000 tons per year each of phosphoric acid and diammonium phosphate.

Langfos, a raw sedimentary rock phosphate fertilizer produced by Samancor at Langebaan in western Cape Province, had high sales levels owing to good results achieved through application of the fertilizer in drought conditions. Calmafos, a treated phosphate fertilizer, was produced on an intermittent basis at the Meyerton plant.

Granite.—Consolidated Granite Corp., formerly Enyati Resources Co., produced black and pink granite both for export and for local use. Output was being expanded following 2 years of development work. Aftertax earnings in the year ended June 1986 were $5.2 million.

Lime.—PPC Lime was the largest of two major lime producers in the country and operated at about 60% of capacity. PPC Lime commissioned a $2.6 million coal handling system at its Limeacres plant in northern Cape Province. A 100-meter-diameter circular stockpile was capable of holding 45,000 tons of coal.

Phosphate Rock.—Phosphate rock output was primarily by the Phosphate Development Corp. Ltd. from the Palabora carbonatite. A small production of guano has been realized on an annual basis from islands off the northwest coast, including Possession, Ichaboe, Langert's Bay, Dyer, Malgas, and Bird Islands. Output in 1985, the latest year available, was 3,416 tons. Several supply contracts expired at yearend 1985, either to allow the recovery of sea bird populations, or for placement of certain islands under the National Parks Board for inclusion in the West Coast National Park.

Salt.—A total of 86 operations produced salt from solar evaporation of inland and coastal salt pan brines, or from seawater. Sea salt was produced at Port Elizabeth, Velddrif, and Walvis Bay. Brines from inland salt pans were pumped into dams and allowed to evaporate just to the point of crystallization, at which time they are pumped to shallow dams for complete crystallization. Trial shipments of salt produced from inland salt pans in the Loeriesfontein area along the route of the Sishen-Saldanha Bay railroad were being made through the Saldanha Bay terminal. A shipment of 2,200 tons was made in June and an estimated 30,000 tons was expected to be exported by March 1987. The exports were aimed at utilizing excess shipping capacity on the railroad line.

Sulfuric Acid.—PMC completed its new sulfuric acid plant with a capacity of 15,000 tons of sulfuric acid per month. Output was mainly purchased by Bosveld Kunsmis Ltd. for use in the production of fertilizers. The plant achieved a 95% removal rate for sulfur gases, handling up to 180,000 cubic meters per hour.

Vermiculite.—Full production capacity was utilized with output of 193,973 tons of concentrate containing 89.9% vermiculite by PMC owing to increased demand from domestic and overseas markets. The first phase of a plant expansion to increase recovery of finely sized material was commissioned in November, and phase two was due for commissioning in early 1987.

MINERAL FUELS

At yearend 1985, the latest year for which comprehensive data were available, the country had 26 power stations supplying electricity with a total generating capacity of 24,359 megawatts. Twenty stations were coal fired with a total capacity of 20,637 megawatts, two were hydroelectric with 540 megawatts of capacity, two were gas turbine with 342 megawatts of capacity, one was nuclear with 1,840 megawatts of capacity, and one was powered by pumped storage and had a capacity of 1,000 megawatts. The Electricity Supply Commission (Escom) was constructing five new coal-fired power stations, each with six 600-megawatt units. At full power, coal consumption would be 60 million tons per year for all five plants.

Coal.—There were 102 operational collieries in 1986, of which 11 produced more than 5 million tons per year. AAC and Gencor were the largest producers. Local coal sales were primarily dependent upon demand by the Government-controlled Escom. Escom's decision to phase out older powerplants and to place other plants on

reserve storage led to changes in the coal supply situation. Several new plants were scheduled for commissioning over the next 10 years, including Lekwe, Lethabo, and Tutuka. Lethabo alone will consume 15 million tons annually.

AAC's Amcoal Corp. supplied Iscor with 660,000 tons of blend coking coal from the Kleinkopje open pit mine, and 350,000 tons of coking coal from the Vryheid Coronation Mine.

Coal sales by Trans-Natal Coal Corp. Ltd., a subsidiary of Gencor, were 31 million tons compared with 28.7 million tons in 1985. Pretax income from the sales was $120 million. Trans-Natal filled its export allocation through the port of Richards Bay and commenced additional exports through Durban. Of total coal sales by Trans-Natal, 25% was expected to be sold to Escom in 1987, and 57%, exported. The remainder would be sold to the general local market. Gencor's torbanite synfuel project moved from the laboratory to the pilot plant stage, with the current research phase expected to last 2 years.

The South African Coal, Oil and Gas Corp. Ltd. (Sasol) consumed 38.3 million tons of coal for the year ending June 1986. Sasol I consumed 5.9 million tons, all supplied by the Sigma Mine, and Sasol II and Sasol III each consumed about 16 million tons. In the Sigma Mine, mining by rib pillar extraction and longwall mining accounted for 59% of the mine's output. Full output was reached despite difficult geological conditions and a major fire caused by spontaneous combustion. Sasol's four Secunda Mines supplied 29.6 million tons of coal. Mine research to improve productivity included development of high-pressure water-assisted coal cutting and drilling, and improved longwall supports and longwall equipment transportation. Face length at the Twistdraai Mine was increased to between 200 and 240 meters, which resulted in a 10% increase in output. Sasol expected to decrease purchase of coal from outside groups to about 500,000 tons per year.

The prohibition on imports of coal imposed by the United States in October was expected to seriously affect exports by the Transvaal Coal Owners Association. Overall sales losses due to sanctions were expected to be about 8 million tons in 1987. The Rietspruit colliery was considering retrenching workers. The Industrial Development Corp. commissioned its experimental gasifier, which uses coal tailings as fuel. About 20 million tons of coal tailings requiring disposal was produced annually.

Petroleum.—The state-owned Southern Oil Exploration Corp. (Pty.) Ltd. (Soekor) drilled 23 exploratory holes totaling 65,408 meters using three drilling rigs. Four holes showed sufficient oil or gas to warrant further tests. In 1985, 17 holes totaling 49,035 meters were drilled by 2 drilling rigs. A prospect 65 miles southwest of Mossel Bay, the site of a major natural gas field, yielded 5,000 barrels per day of light crude oil and 5 million cubic feet per day of gas. Although not commercially viable, drilling was expected to continue. The total number of exploratory holes drilled by Soekor since offshore drilling began in 1960 was 142. Soekor spent about $80.6 million on exploration in 1986, and $367.8 million since 1965, of which $350.7 million was for offshore exploration for oil and gas.

The second phase of seismic tests was under way at Colchester, near Port Elizabeth. Drilling of the area by Johannesburg Mining and Finance Corp. Ltd. was planned for early 1987.

Uranium.—PMC produced 185 tons of calcined uranium oxide and had sales of $13.2 million in 1986, compared with 218 tons produced and no sales in 1985. The uranium extraction plant at the Harmony gold mine closed, resulting in slightly lower overall output.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from South African rands (R) to U.S. dollars at the rate of R1 = US$0.4564 for 1985 and R1 = US$0.4408 for 1986.

Table 7.—Republic of South Africa: Production of U_3O_8, by producer

(Kilograms)

Company or mine	1982	1983	1984	1985[p]	1986
AAC Joint Metallurgical Scheme[1]	863,361	718,928	596,787	602,104	529,811
Blyvooruitzicht	252,270	289,156	233,092	--	--
Buffelsfontein	580,500	611,000	613,500	713,500	597,000
East Rand Gold and Uranium Co. Ltd. (Ergo)	264,814	229,885	216,131	150,997	155,780
Harmony	591,090	623,600	496,680	426,300	330,243
Hartebeestfontein	429,103	441,446	436,283	428,367	465,059
Palabora copper	257,879	218,635	159,769	217,828	185,443
Randfontein	462,837	491,067	592,776	609,332	600,498
St. Helena-Beisa	253,612	454,792	353,294	--	--
Vaal Reefs	1,721,782	1,877,421	1,962,977	1,881,828	1,930,044
West Driefontein	224,601	174,566	159,638	86,705	81,435
Western Areas	170,638	282,465	305,403	311,836	265,211
Western Deep Levels	183,394	173,841	145,632	54,036	--
Miscellaneous	577,176	541,190	489,646	268,421	319,745
Total	6,833,057	7,127,992	6,761,608	5,751,254	5,460,269

[p]Preliminary.

[1]Includes recovery of U_3O_8 from concentrates and tailings produced by the Free State Geduld, Free State Saaiplaas, President Brand, President Steyn, Welkom, and Western Holdings Mines, all subsidiaries of Anglo American Corp. Ltd. in the Orange Free State Province.

Sources: Chamber of Mines of South Africa. Quarterly Analysis of Working Results, Oct.-Dec. 1982-86; Department of Mineral and Energy Affairs, Annual Reports 1982-85; East Rand Gold and Uranium Co. Ltd., Annual and Quarterly reports, 1982-86; Minerals Bureau, Mineral Production and Sales Statistics, 1985 and 1986; Palabora Mining Co. Ltd., Annual Reports 1981-85.

The Mineral Industry of Spain

By John R. Craynon[1]

Entry into the European Economic Community (EEC) had a significant effect on the mineral-related industries in Spain, especially in the steel-producing sector. Spain remained a very important producer of minerals and a processor of imported minerals and related materials, contending for the position of the world's leading producer of slate and strontium. The country was also the world's 2d leading producer of granite, marble, and mercury; the 3d largest producer of pyrite and natural sodium sulfate; the 6th largest producer of fluorspar; the 7th largest producer of kyanite and other refractory minerals; the 8th largest producer of feldspar, magnesite, and potash; the 9th largest producer of tantalite; and the 10th largest producer of anthracite, asphalt, and bentonite.

Spain's mineral production was also of great importance to the EEC. Spain was the sole producer of mercury, natural sodium sulfate, and tantalite within the EEC. The production of antimony, copper, fluorspar, gold, lead, pyrite, and silver was the largest among EEC countries. Spain mined approximately 94% of the EEC's copper, 86% of the antimony, 65% of the gold and pyrite, 47% of the silver, 41% of the lead and magnesite, 38% of the iron ore and tungsten, and 28% of the fluorspar and zinc.

Changes in the trading patterns for steel products, the opening of a new zinc mine, and disruptions in the mercury market were major events affecting the mineral industry.

Government Policies and Programs.—In March, the Cortés, Spain's legislature, passed a law that allowed the Instituto Geológico y Minero de España (IGME) to become an independent commercial organization rather than the administrative organization it had been. The IGME was given the authority to direct its activities on a project basis and to conduct joint operations with other public and private sector organizations without administrative restrictions.

PRODUCTION

Spain ranked 38th in the world in terms of the value of mineral production and 9th with regard to the number of minerals produced. If energy materials are not included, the country ranked 19th, its varied mineral industries producing more mineral commodities than any other EEC country.

The activities of the mineral industry were situated throughout the country. The operations were controlled both by private and governmental entities. The Government had a major stake in most of the important mineral sectors. Principal companies included Empresa Nacional del Alúminio S.A., which produced aluminum; Empresa Nacional Hulleras del Norte S.A., which produced bituminous coal; Rio Tinto Minera S.A. (RTM), which produced copper ore and refined copper; Sociedad Minera y Metallúrgica de Peñarroya de España (Peñarroya), which produced lead ore and primary lead; Minas de Almadén y Arrayanes S.A. (MAYASA), which produced mercury; Empresa Nacional Siderúrgica S.A. (ENSIDESA) and Altos Hornos de Vizcaya S.A. (AHV), which produced steel; and Asturiana de Zinc S.A., which produced zinc ore and primary zinc.

Table 1.—Spain: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum:					
Bauxite	7,361	5,208	7,263	2,427	7,000
Alumina	673,000	737,000	741,569	724,700	725,000
Metal:					
Primary	366,500	357,614	380,830	370,118	354,400
Secondary	[e]35,000	36,000	40,600	[e]38,000	35,000
Antimony, mine output, Sb content	459	489	583	248	200
Cadmium metal	286	278	290	268	[2]247
Copper:					
Mine output, Cu content	47,614	49,964	63,105	55,486	[3]46,874
Metal:					
Blister:					
Primary	105,000	100,000	97,000	88,000	90,000
Secondary	30,000	18,000	30,000	40,000	40,000
Total	135,000	118,000	127,000	128,000	130,000
Refined:					
Primary	145,900	137,600	117,400	101,700	113,200
Secondary	26,000	21,000	39,000	50,000	45,000
Total	171,900	158,600	156,400	151,700	158,200
Gold, mine output, Au content ___ troy ounces	109,858	162,296	123,330	185,524	150,000
Iron and steel:					
Iron ore and concentrate (including byproduct concentrate):					
Gross weight ___ thousand tons	8,370	7,449	7,961	6,463	[2]6,089
Fe content ___ do	4,130	3,512	3,558	2,926	[2]2,778
Metal:					
Pig iron ___ do	5,991	5,398	5,338	5,477	[3]4,803
Ferroalloys, electric-furnace ___ do	259	253	291	[e]300	300
Steel:					
Crude ___ do	13,160	12,731	13,484	14,235	[3]11,977
Castings and forgings ___ do	209	156	156	138	150
Total ___ do	13,369	12,887	13,640	14,373	12,127
Semimanufactures ___ do	9,970	10,787	10,703	11,050	11,000
Lead:					
Mine output, Pb content	73,271	82,453	96,638	85,636	[2]79,587
Metal:					
Primary	99,500	107,800	110,088	112,800	100,992
Secondary	32,100	36,000	49,912	43,300	32,000
Mercury:					
Mine output, Hg content ___ 76-pound flasks	50,832	43,250	22,680	25,333	25,000
Metal ___ do	48,808	41,075	44,090	45,042	42,000
Silver, mine output, Ag content thousand troy ounces	3,787	1,496	4,999	9,482	7,500
Tantalum minerals (tin byproduct):					
Gross weight ___ kilograms	53,630	47,000	31,950	18,300	9,000
Ta content ___ do	14,142	15,066	9,739	4,496	2,200
Tin:					
Mine output, Sn content	518	444	438	637	[2]281
Metal, primary	3,700	3,700	4,400	3,900	3,500
Titanium dioxide[e]	40,000	35,000	34,000	38,000	35,000
Tungsten, mine output, W content	545	517	565	458	[2]447
Uranium, mine output, U_3O_8 content	280	283	366	308	[2]373
Zinc:					
Mine output, Zn content	167,000	167,715	230,378	234,695	[2]223,146
Metal, primary and secondary	181,800	189,900	207,400	213,300	[2]213,600
INDUSTRIAL MINERALS					
Barite	50,031	52,410	68,919	67,512	65,000
Bromine[e]	350	330	300	350	280
Cement, hydraulic, other than natural thousand tons	29,569	30,632	25,435	24,197	24,000
Clays:					
Attapulgite	42,296	44,654	43,907	59,697	50,000
Bentonite	112,326	82,530	72,582	90,239	80,000
Kaolin, marketable:					
Crude	72,956	63,480	56,640	96,533	75,000
Washed	165,936	191,632	262,633	317,186	280,000
Refractory, not further described	453,425	453,952	516,166	449,226	450,000
Other ___ thousand tons	11,318	10,262	9,006	9,598	10,000
Diatomite and tripoli	63,365	55,638	73,013	96,251	80,000
Feldspar	131,071	116,137	136,943	136,190	135,000

See footnotes at end of table.

Table 1.—Spain: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
INDUSTRIAL MINERALS —Continued					
Fluorspar:					
Gross weight:					
Acid-grade	[r]197,550	190,749	253,221	266,774	[2]259,229
Metallurgical-grade	37,075	41,585	42,445	38,835	[2]27,567
Total	[r]234,625	232,334	295,666	305,609	[2]286,796
CaF_2 content:					
Acid-grade	[r]157,205	190,749	246,121	258,561	[2]252,670
Metallurgical-grade	29,247	41,585	33,710	31,140	[2]22,102
Total	[r]186,452	232,334	279,831	289,701	[2]274,772
Gypsum and anhydrite, crude thousand tons	5,048	5,620	5,365	5,525	5,500
Kyanite, andalusite, related materials	5,105	4,486	3,000	2,800	3,000
Lime, hydrated and quicklime[e] thousand tons	1,100	1,000	[2]1,088	1,100	1,200
Magnesite:					
Calcined	154,421	173,876	169,191	173,927	175,000
Crude	533,595	597,137	691,542	692,196	700,000
Mica	3,428	1,300	990	727	500
Nitrogen: N content of ammonia thousand tons	538	[r]506	670	600	600
Pigments, mineral:					
Ocher	11,709	9,879	10,316	10,293	10,500
Red iron oxide[e]	23,000	20,000	20,000	[r]21,000	20,000
Potash, K_2O equivalent	691,931	656,726	677,201	658,863	[2]695,816
Pumice	970,480	1,002,301	829,827	849,440	900,000
Pyrite including cuprous, gross weight thousand tons	[e]2,200	2,306	2,329	2,676	[2]2,610
Salt:					
Rock including byproduct from potash works do	2,213	2,008	2,156	2,160	2,100
Marine and other do	1,077	1,149	1,233	1,079	1,000
Sand and gravel: Silica sand[3] do	1,611	2,100	2,267	2,467	2,500
Sepiolite	329,243	345,932	237,570	341,193	300,000
Sodium compounds, n.e.s.:					
Carbonate, manufactured[e] thousand tons	500	500	550	550	525
Sulfate:					
Natural:					
Glauberite, Na_2SO_4 content	92,737	130,566	214,198	243,745	225,000
Thenardite, Na_2SO_4 content	117,776	132,513	152,829	237,502	200,000
Manufactured[e]	170,000	170,000	170,000	[r]150,000	150,000
Stone:					
Calcareous:					
Chalk thousand tons	397	377	362	412	NA
Dolomite do	1,967	2,020	2,112	2,196	NA
Limestone do	83,831	84,080	77,468	74,173	NA
Marble do	665	685	623	798	NA
Marl do	6,380	6,346	5,772	5,043	NA
Basalt do	1,269	1,064	1,992	3,956	NA
Granite do	7,671	7,527	7,853	9,127	NA
Ofite do	846	1,044	1,212	1,225	NA
Phonolite do	680	449	472	559	NA
Porphyry do	309	461	475	795	NA
Quartz do	455	502	372	252	NA
Quartzite do	432	602	831	993	NA
Sandstone do	1,807	1,365	1,599	2,274	NA
Serpentine do	303	360	376	375	NA
Other do	25,308	23,659	23,055	25,243	NA
Strontium minerals:					
Gross weight	34,900	34,500	27,000	42,500	40,000
Sr_2O_4 content	32,108	31,740	24,840	39,100	36,800
Sulfur:					
S content of pyrites thousand tons	1,029	1,073	1,094	1,231	[2]1,195
Byproduct:[e]					
Of metallurgy do	[2]130	120	125	115	105
Of petroleum do	[2]10	8	9	9	8
Of coal (lignite) gasification do	[2]3	3	3	2	2
Total do	[2]1,172	1,204	1,231	1,357	[2]1,310
Talc and steatite	[r]62,686	69,467	72,237	88,776	85,000

See footnotes at end of table.

Table 1.—Spain: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
MINERAL FUELS AND RELATED MATERIALS					
Coal (marketable):					
Anthracite ---------- thousand tons	5,205	5,370	5,476	5,810	[2]5,645
Bituminous ---------- do	10,217	10,049	9,814	10,281	[2]10,485
Lignite ---------- do	23,882	24,524	24,303	23,572	[2]22,350
Total ---------- do	39,304	39,943	39,593	39,663	[2]38,480
Coke, metallurgical ---------- do	NA	3,422	2,842	[e]3,000	3,000
Gas, natural: Marketed ---- million cubic feet	105	183	6,245	9,626	[2]15,506
Peat ----------	60,092	39,622	55,561	54,049	52,000
Petroleum:					
Crude ------ thousand 42-gallon barrels	11,170	21,693	16,361	15,217	[2]13,153
Refinery products:					
Liquefied petroleum gases ----- do	10,834	12,597	14,964	13,642	13,500
Naphtha ---------- do	12,138	18,606	23,709	24,973	23,000
Gasoline, motor ---------- do	38,505	47,787	52,350	57,019	50,000
Jet fuel ---------- do	15,816	16,968	18,160	19,312	18,000
Kerosene ---------- do	3,231	1,418	1,860	3,309	2,500
Distillate fuel oil ---------- do	75,055	74,771	78,067	85,887	80,000
Residual fuel oil ---------- do	123,762	108,391	108,238	94,719	105,000
Lubricants including grease ---- do	(4)	(4)	(4)	2,856	(4)
Other ---------- do	49,896	45,927	28,420	43,411	37,000
Refinery fuel and losses ------- do	8,108	10,405	1,112	5,582	7,000
Total ---------- do	337,345	336,870	326,880	350,710	336,000

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Table includes data available through July 31, 1987.
[2]Reported figure.
[3]Includes sand obtained as a byproduct of feldspar and kaolin production.
[4]Included with "Refinery products: Other."

TRADE

The trade balance in 1986 recorded a deficit of nearly $6 billion,[2] increasing over 35% compared with that of 1985, even though the value of imported petroleum decreased by $4 billion. Other imports increased by nearly $9 billion.

Spain had the highest degree of mineral self-sufficiency of any EEC country, with net import reliance of only 31%. The trade deficit in raw materials, excluding energy materials, was estimated to be $614 million, a decrease of over 30% from that of 1985. Spain acquired only 10% by value of its mineral imports from EEC countries, while approximately 54% of its mineral exports went to those countries.

EEC entry created some trade problems in several product sectors, especially steel. Spain sought, and was granted, protection from imports of certain types of steel under the safeguard provisions of its accession treaty. (See "Iron and Steel" section of "Commodity Review" for details.)

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	(2)	1	--	All to Chile.
Alkaline-earth metals	1	(2)	--	All to Libya.
Aluminum:				
Ore and concentrate	558	807	--	Portugal 753; France 50; Tunisia 3.
Oxides and hydroxides	20,725	16,525	--	Sweden 9,768; Norway 3,604; Finland 3,099.
Ash and residue containing aluminum	4	--		
Metal including alloys:				
Scrap	95	42	14	Portugal 22; Ireland 4.
Unwrought	231,244	208,384	12,484	Netherlands 113,211; China 17,874; Japan 16,758.
Semimanufactures	27,325	32,080	2,905	France 4,715; Cuba 4,542; Japan 4,254.
Antimony:				
Oxides	--	5	--	All to Italy.
Metal including alloys, all forms	465	240	--	Netherlands 176; France 28; Morocco 19.
Arsenic: Metal including alloys, all forms	--	(2)	--	All to Cuba.
Bismuth: Metal including alloys, all forms	--	(2)	--	Do.
Cadmium: Metal including alloys, all forms	184	209	--	All to Netherlands.
Chromium:				
Ore and concentrate	15	--		
Oxides and hydroxides	176	225	(2)	Sweden 77; Republic of South Africa 50; France 39.
Metal including alloys, all forms	(2)	(2)	--	All to France.
Cobalt:				
Oxides and hydroxides	--	27	--	All to West Germany.
Metal including alloys, all forms	65	104	--	West Germany 69; Netherlands 18; Finland 16.
Columbium and tantalum:				
Ore and concentrate	45	--		
Ash and residue containing columbium and/or tantalum	--	508	--	Netherlands 316; West Germany 192.
Metal including alloys, all forms:				
Columbium (niobium)	4	--		
Tantalum	66	4	(2)	Mainly to West Germany.
Copper:				
Ore and concentrate	50,205	74,975	200	Canada 17,474; Sweden 11,421; U.S.S.R. 11,209.
Matte and speiss including cement copper	1,418	1,959	--	All to Belgium-Luxembourg.
Oxides and hydroxides	108	(2)	--	All to Morocco.
Sulfate	1,202	996	--	France 913; United Kingdom 37; Venezuela 27.
Metal including alloys:				
Scrap	450	569	--	West Germany 266; France 178; Italy 30.
Unwrought	71,887	72,503	(2)	France 19,827; Netherlands 14,153; United Kingdom 12,249.
Semimanufactures	15,593	15,955	164	United Kingdom 2,615; France 1,104; West Germany 1,021.
Gold: Metal including alloys, unwrought and partly wrought, troy ounces	96,453	65,299	--	United Kingdom 36,524; Switzerland 17,040; Cuba 5,980.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite, thousand tons	1,973	1,879	--	Netherlands 766; France 484; West Germany 331.
Pyrite, roasted, do.	14	4	--	France 2; United Kingdom 2.
Metal:				
Scrap	4,024	1,251	14	Belgium-Luxembourg 991; Netherlands 90; West Germany 71.
Pig iron, cast iron, related materials	18,863	46,529	11	East Germany 13,951; Bangladesh 10,958; Italy 6,673.
Ferroalloys:				
Ferrochromium	r14,308	15,939	--	France 3,958; Belgium-Luxembourg 3,168; Sweden 3,076.
Ferromanganese	r24,579	26,781	7,846	West Germany 7,179; Italy 4,501.
Ferromolybdenum	r956	2,079	20	Netherlands 1,870; Sweden 95; Poland 45.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Ferroalloys —Continued				
Ferronickel	45	--	--	
Ferrosilicomanganese	5,237	7,074	1,872	West Germany 4,100; Belgium-Luxembourg 575.
Ferrosilicon	8,233	5,980	--	West Germany 5,964; Portugal 9; Morocco 2.
Silicon metal	6,287	7,247	1,020	Japan 5,185; West Germany 774.
Unspecified	612	1,520	1,236	United Kingdom 97; Belgium-Luxembourg 72.
Steel, primary forms thousand tons	739	1,154	24	Turkey 414; China 133; Morocco 95.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	4,090	4,279	189	China 914; Egypt 561; U.S.S.R. 382.
Universals, plates, sheets do	1,054	1,181	116	U.S.S.R. 291; Iran 103.
Hoop and strip do	33	39	[2]	France 17; U.S.S.R. 5; West Germany 4.
Rails and accessories do	5	[2]	--	Mainly to Venezuela.
Wire do	75	45	1	Portugal 7; Libya 5; Syria 3.
Tubes, pipes, fittings do	599	614	48	U.S.S.R. 91; China 88; West Germany 29.
Lead:				
Ore and concentrate	42,322	40,769	--	U.S.S.R. 15,030; United Kingdom 7,071; Republic of Korea 5,766.
Oxides	79	753	--	U.S.S.R. 540; Morocco 122; Australia 53.
Ash and residue containing lead	15,440	25,546	--	Portugal 19,450; Belgium-Luxembourg 4,232; France 1,308.
Metal including alloys:				
Scrap	5,026	14	--	All to United Kingdom.
Unwrought	61,488	56,016	--	U.S.S.R. 34,450; Italy 5,751; Turkey 4,657.
Semimanufactures	87	121	--	West Germany 82; Portugal 17; Andorra 5.
Lithium: Oxides and hydroxides	--	[2]	--	All to Portugal.
Magnesium: Metal including alloys, semimanufactures	2	40	--	France 34; Cuba 5.
Manganese:				
Ore and concentrate, metallurgical-grade	23	--	--	
Oxides	2,637	2,204	1	Nigeria 520; U.S.S.R. 513; Iraq 500.
Metal including alloys, all forms	r([2])	1	--	All to France.
Mercury 76-pound flasks	46,139	27,318	8,874	Belgium-Luxembourg 4,524; France 2,726.
Molybdenum:				
Ore and concentrate	28	--		
Metal including alloys:				
Scrap	([2])	([2])	--	All to United Kingdom.
Semimanufactures	([2])	1	--	Mainly to Netherlands.
Nickel:				
Matte and speiss	--	([2])	--	All to Portugal.
Oxides and hydroxides	1	10	--	Singapore 8; Portugal 1.
Ash and residue containing nickel	67	139	--	Austria 66; Netherlands 29; West Germany 22.
Metal including alloys:				
Scrap	328	164	--	West Germany 103; France 58; United Kingdom 2.
Unwrought	([2])	--	--	
Semimanufactures	30	9	--	West Germany 3; Netherlands 2; Cyprus 1.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	192,906	14,114	932	Argentina 6,848; West Germany 4,565; Panama 1,190.
Rare-earth metals including alloys, all forms	([2])	--		
Selenium, elemental	([2])	--		
Silicon, high-purity	1	([2])	--	All to Cuba.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Silver:				
Ore and concentrate value, thousands	$119	--		
Metal including alloys, unwrought and partly wrought thousand troy ounces	5,144	5,337	41	United Kingdom 3,440; Netherlands 675; West Germany 418.
Tin:				
Ore and concentrate	6	5	--	All to United Kingdom.
Oxides	2	12	--	All to Denmark.
Ash and residue containing tin	--	339	--	United Kingdom 277; West Germany 40; Netherlands 21.
Metal including alloys:				
Scrap	99	56	--	All to United Kingdom.
Unwrought	400	203	--	Netherlands 120; United Kingdom 51; France 20.
Semimanufactures	9	49	--	France 48.
Titanium:				
Oxides	18,202	10,815	3,615	France 1,522; Morocco 1,073.
Metal including alloys:				
Scrap	14	6	--	All to France.
Unwrought	--	1	--	All to West Germany.
Semimanufactures	(2)	13	(2)	United Kingdom 9; Italy 3.
Tungsten:				
Ore and concentrate	870	714	18	West Germany 595; Netherlands 47; France 36.
Metal including alloys:				
Scrap	1	(2)	--	All to United Kingdom.
Unwrought	--	(2)	--	Do.
Semimanufactures	(2)	3	--	Netherlands 2.
Uranium and/or thorium: Ore and concentrate	2	--		
Vanadium: Oxides and hydroxides	(2)	--		
Zinc:				
Ore and concentrate	83,756	119,509	--	Italy 41,455; Finland 28,802; Belgium-Luxembourg 16,979.
Oxides	2,373	2,029	--	Belgium-Luxembourg 648; West Germany 479; France 262.
Blue powder	90	829	289	U.S.S.R. 500; West Germany 39.
Matte	122	144	--	All to Portugal.
Ash and residue containing zinc	12,550	10,147	--	East Germany 6,814; Belgium-Luxembourg 1,600; France 1,413.
Metal including alloys:				
Scrap	2,657	--		
Unwrought	106,004	127,214	13,994	Netherlands 58,489; China 17,644.
Semimanufactures	286	203	--	Japan 62; Nicaragua 35; Guinea 24.
Zirconium:				
Ore and concentrate	307	300	--	Mexico 216; Portugal 46; Cuba 38.
Metal including alloys, scrap	--	24	--	All to Portugal.
Other:				
Ores and concentrates	--	3	--	All to Dominican Republic.
Oxides and hydroxides	284	40	2	Portugal 24; Switzerland 10; West Germany 3.
Ashes and residues	5,238	412	54	Belgium-Luxembourg 138; Japan 128; United Kingdom 74.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1,791	1,747	(2)	West Germany 939; Portugal 231; France 164.
Artificial:				
Corundum	195	709	--	West Germany 452; Portugal 166; Israel 43.
Silicon carbide	3,750	4,649	36	United Kingdom 1,805; France 930; Belgium-Luxembourg 924.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$25	$105	$12	Ireland $39; West Germany $26; Mexico $15.
Grinding and polishing wheels and stones	2,778	3,337	430	France 480; West Germany 419.
Asbestos, crude	518	189	(2)	Portugal 184; France 3; Morocco 1.
Barite and witherite	51,833	58,957	--	West Germany 18,544; Angola 15,402; Nigeria 7,500.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Boron materials:				
Crude natural borates	358	1,311	--	Portugal 550; Italy 358; Tunisia 330.
Elemental	(2)	(2)	--	All to Cuba.
Oxides and acids	36	9	--	Portugal 8; Peru 1.
Cement thousand tons	10,795	7,980	3,193	Egypt 1,901; Ivory Coast 355.
Chalk	9,147	2,669	--	Portugal 2,202; France 292; Senegal 22.
Clays, crude:				
Bentonite	29,986	29,045	--	Portugal 11,127; Netherlands 5,738; Libya 3,401.
Chamotte earth	1,008	350	--	Portugal 131; Italy 72; Cuba 40.
Fuller's earth	--	2,817	--	Netherlands 1,203; Italy 337; Venezuela 270.
Kaolin	108,994	109,218	--	Italy 37,839; West Germany 20,445; Finland 12,770.
Unspecified	45,557	50,150	--	Netherlands 24,651; United Kingdom 6,166; France 5,228.
Diamond:				
Gem, not set or strung carats	1,309	1,556	13	Belgium-Luxembourg 1,308; France 98; Hong Kong 81.
Industrial stones do	69,025	3,687,756	5,945	West Germany 2,905,295; Ireland 761,105; Belgium-Luxembourg 13,280.
Diatomite and other infusorial earth	2,233	3,250	--	Belgium-Luxembourg 817; Italy 388; United Kingdom 342.
Feldspar, fluorspar, related materials:				
Feldspar	3,482	4,739	--	France 2,303; Syria 1,950; Tunisia 250.
Fluorspar	156,137	148,978	30,026	Canada 29,978; Italy 29,953.
Unspecified	5	--		
Fertilizer materials:				
Crude, n.e.s	3,817	538	--	France 298; Andorra 240.
Manufactured:				
Ammonia	37	40	--	Cape Verde 14; Saudi Arabia 10; Mauritania 3.
Nitrogenous	199,252	301,698	--	Belgium-Luxembourg 67,080; Netherlands 60,486; West Germany 46,638.
Phosphatic	150	1,488	--	France 1,459; Ireland 21; Andorra 7.
Potassic	586,897	562,261	11,600	France 107,650; Italy 86,105; Norway 76,525.
Unspecified and mixed	221,008	136,216	1	China 50,950; El Salvador 16,298; Venezuela 15,645.
Graphite, natural	3	42	--	West Germany 20; Italy 20; Angola 1.
Gypsum and plaster thousand tons	2,275	2,193	1,129	Sweden 173; Denmark 157.
Iodine	1	1	--	Mainly to Japan.
Kyanite and related materials	70	50	--	Netherlands 48; Portugal 2.
Lime	10,010	9,051	--	France 5,606; Lebanon 1,189; Guinea 1,170.
Magnesium compounds:				
Magnesite, crude	330	620	--	France 555; Italy 24.
Oxides and hydroxides	123,237	121,858	744	France 5,532; West Germany 1,889; unspecified 111,318.
Mica:				
Crude including splittings and waste	49	60	--	Morocco 49; Portugal 8; France 2.
Worked including agglomerated splittings	98	147	--	West Germany 30; Turkey 29; Italy 27.
Nitrates, crude	1,037	23	--	All to France.
Phosphates, crude	45	24	--	All to Morocco.
Phosphorus, elemental	(2)	(2)	--	Mainly to Cuba.
Pigments, mineral:				
Natural, crude	45	--		
Iron oxides and hydroxides, processed	10,285	10,120	723	United Kingdom 1,352; Canada 757; Yugoslavia 727.
Potassium salts, crude	49	--		
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$550	$176	--	Saudi Arabia $108; Panama $18; Belgium-Luxembourg $12.
Synthetic do	$324	$216	$31	Switzerland $114; Italy $28.
Pyrite, unroasted	r386,088	312,087	2,620	Belgium-Luxembourg 180,951; Turkey 40,989; Yugoslavia 29,771.
Salt and brine	537,197	893,973	396,261	Brazil 64,300; Norway 63,296.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	55,147	114,197	--	Republic of South Africa 41,889; United Kingdom 20,750; Argentina 16,512.
Sulfate, manufactured	118,048	140,947	--	West Germany 26,805; Italy 20,940; United Kingdom 15,460.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	284,352	435,962	211	Italy 287,140; Gibraltar 103,180; France 11,690.
Worked	317,025	305,488	31,417	France 161,918; West Germany 44,945.
Dolomite, chiefly refractory-grade	121,601	121,470	1,000	United Kingdom 109,261; Ireland 1,650.
Gravel and crushed rock	32,790	33,686	1	Morocco 20,750; Andorra 9,841; Gibraltar 2,122.
Quartz and quartzite	353,108	390,562	--	Norway 258,738; Sweden 47,709; France 27,388.
Sand other than metal-bearing	201,548	182,879	1	Andorra 166,922; Portugal 5,296; Greece 3,957.
Sulfur:				
Elemental:				
Crude including native and by-product	1,107	145	--	Portugal 69; France 37; Morocco 36.
Colloidal, precipitated, sublimed	135	34	--	France 33.
Dioxide	108	168	--	Portugal 92; France 43; Italy 16.
Sulfuric acid	257,289	182,661	13,815	Belgium-Luxembourg 46,558; Morocco 35,634; Netherlands 13,992.
Talc, steatite, soapstone, pyrophyllite	33,124	31,197	--	Belgium-Luxembourg 22,533; United Kingdom 3,160; France 2,376.
Vermiculite, perlite, chlorite	539	407	--	Italy 377; Portugal 24; Andorra 5.
Other:				
Crude	719,161	770,541	--	Belgium-Luxembourg 256,358; France 170,733; West Germany 141,517.
Slag and dross, not metal-bearing	79,752	205,195	2,709	France 89,356; Greece 60,611; Portugal 40,866.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	3,150	199	--	Portugal 198.
Carbon:				
Carbon black	12,637	17,857	--	France 11,025; United Kingdom 2,694; Italy 1,873.
Gas carbon	5,264	4,583	--	Morocco 3,382; Tanzania 74; France 34.
Coal:				
Anthracite	1	4,974	--	Portugal 2,950; Denmark 2,000; Indonesia 24.
Bituminous	3,432	1	--	All to Andorra.
Briquets of anthracite and bituminous coal	--	(2)	--	Do.
Coke and semicoke	--	11,107	--	United Kingdom 8,935; Sweden 1,250; Portugal 819.
Gas, natural: Gaseous million cubic feet	(2)	--		
Peat including briquets and litter	169	229	--	Saudi Arabia 215; Cuba 6; Guatemala 6.
Petroleum:				
Crude thousand 42-gallon barrels	1,213	--		
Refinery products:				
Liquefied petroleum gas do	1,180	1,077	--	United Kingdom 279; Morocco 255; Netherlands 220.
Gasoline do	10,430	17,409	7,911	Netherlands 2,416; France 1,992.
Mineral jelly and wax do	62	90	--	West Germany 45; Netherlands 33; Portugal 6.
Kerosene and jet fuel do	3,880	5,701	394	Iran 1,412; United Kingdom 872; Netherlands 814.
Distillate fuel oil do	5,342	5,709	--	Netherlands 740; France 707; West Germany 309.
Lubricants do	2,190	2,560	124	France 1,049; Netherlands 293; Italy 282.
Residual fuel oil do	43,296	41,699	1,426	Netherlands 7,350; United Kingdom 7,296; France 4,171.
Bitumen and other residues do	3,469	4,112	1,342	Algeria 458; United Kingdom 297.
Bituminous mixtures do	364	412	(2)	Libya 113; Netherlands 74; Portugal 26.
Petroleum coke do	3	13	--	United Kingdom 12; Portugal 1.

rRevised.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	67	86	--	West Germany 84; United Kingdom 1.
Alkaline-earth metals	26	68	--	France 43; West Germany 20; Canada 4.
Aluminum:				
Ore and concentrate thousand tons	1,812	1,589	--	Guinea 1,497; Guyana 44; China 20.
Oxides and hydroxides	23,040	25,235	66	France 14,405; West Germany 6,308; United Kingdom 3,032.
Ash and residue containing aluminum	7,218	11,668	771	Austria 2,977; Netherlands 2,204; Belgium-Luxembourg 1,273.
Metal including alloys:				
Scrap	6,036	9,143	788	Portugal 4,165; France 2,460.
Unwrought	10,585	10,656	(2)	Iceland 5,704; West Germany 2,158; Venezuela 398.
Semimanufactures	18,669	22,802	775	West Germany 5,168; Italy 3,811; United Kingdom 3,275.
Antimony:				
Ore and concentrate	436	587	--	Thailand 315; Peru 134; China 100.
Oxides and hydroxides	321	200	--	France 61; Belgium-Luxembourg 58; Romania 18.
Metal including alloys, all forms	21	41	--	France 22; Mexico 9; Belgium-Luxembourg 5.
Arsenic:				
Oxides and acids	100	118	--	Belgium-Luxembourg 70; France 45; Italy 2.
Metal including alloys, all forms	28	13	(2)	Mainly from Switzerland.
Beryllium: Metal including alloys, all forms	--	(2)	(2)	Mainly from West Germany.
Bismuth:				
Oxides and hydroxides	--	35	--	All from Belgium-Luxembourg.
Metal including alloys, all forms	102	59	(2)	Belgium-Luxembourg 36; United Kingdom 20; Mexico 1.
Cadmium: Metal including alloys, all forms	31	49	--	Belgium-Luxembourg 48.
Chromium:				
Ore and concentrate	114,162	79,042	--	Albania 38,700; Republic of South Africa 20,786; Turkey 16,350.
Oxides and hydroxides	284	298	2	West Germany 207; Poland 45; United Kingdom 34.
Metal including alloys, all forms	58	29	(2)	United Kingdom 16; West Germany 10; Sweden 1.
Cobalt:				
Ore and concentrate	--	(2)	--	All from West Germany.
Oxides and hydroxides	84	97	25	Belgium-Luxembourg 32; Canada 18.
Metal including alloys, all forms	119	131	2	West Germany 33; Zaire 26; Finland 18.
Columbium and tantalum: Metal including alloys, all forms:				
Columbium (niobium)	(2)	1	--	All from West Germany.
Tantalum	7	5	4	NA.
Copper:				
Ore and concentrate	146,958	125,318	--	Morocco 60,315; Papua New Guinea 41,769; Mexico 19,879.
Matte and speiss including cement copper	8,032	3,126	--	West Germany 1,295; France 998; Peru 505.
Oxides and hydroxides	581	542	4	West Germany 200; Norway 145; Italy 115.
Sulfate	33	164	(2)	France 119; West Germany 33; United Kingdom 1.
Ash and residue containing copper	22,994	42,047	3,869	Brazil 17,296; Sweden 2,701.
Metal including alloys:				
Scrap	23,321	31,112	10,210	France 7,147; West Germany 2,194.
Unwrought	46,512	51,325	3	Chile 32,653; Belgium-Luxembourg 9,309; Peru 2,030.
Semimanufactures	38,668	36,379	256	France 10,733; Italy 5,880; Belgium-Luxembourg 5,837.
Germanium: Metal including alloys, all forms	(2)	(2)	--	Mainly from Belgium-Luxembourg.
Gold:				
Waste and sweepings value, thousands	$205,728	$148,330	$3,976	Switzerland $111,236; France $26,686; West Germany $5,103.
Metal including alloys, unwrought and partly wrought troy ounces	21,991	53,274	--	Switzerland 35,237; West Germany 15,979; Italy 2,026.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Hafnium: Metal including alloys, all forms	22	--		
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	4,220	5,023	10	Brazil 3,018; Venezuela 659; Australia 641.
Pyrite, roasted do	4	--		
Metal:				
Scrap do	5,020	6,146	901	United Kingdom 2,985; France 1,666.
Pig iron, cast iron, related materials	138,206	177,624	6	Brazil 52,096; Venezuela 46,266; Malaysia 32,579.
Ferroalloys:				
Ferrochromium	52,294	46,615	56	Republic of South Africa 27,906; Sweden 5,360; Zimbabwe 3,177.
Ferromanganese	1,045	1,260	--	West Germany 1,241; France 10; United Kingdom 7.
Ferromolybdenum	67	162	--	United Kingdom 61; Netherlands 35; Belgium-Luxembourg 28.
Ferronickel	8,690	7,908	--	France 3,456; Dominican Republic 2,347; Greece 1,250.
Ferrosilicochromium	2,368	1,691	--	Zimbabwe 1,601; Republic of South Africa 90.
Ferrosilicomanganese	1,601	1,516	--	All from Republic of South Africa.
Ferrosilicon	2,750	5,299	--	Norway 2,175; France 1,880; West Germany 439.
Silicon metal	906	65	(2)	France 54; West Germany 8; Norway 2.
Unspecified	3,269	3,479	46	France 1,686; West Germany 1,265; Italy 146.
Steel, primary forms	416,352	669,407	2	France 180,455; West Germany 104,485; Netherlands 95,743.
Semimanufactures:				
Bars, rods, angles, shapes, sections	143,224	145,391	233	West Germany 40,793; France 31,084; Italy 9,994.
Universals, plates, sheets	406,195	469,283	91	West Germany 157,698; France 85,921; Netherlands 53,772.
Hoop and strip	90,061	81,564	26	West Germany 36,277; France 14,264; Netherlands 9,087.
Rails and accessories	1,869	1,484	--	United Kingdom 480; Belgium-Luxembourg 263; West Germany 204.
Wire	16,657	12,152	28	Belgium-Luxembourg 5,540; France 2,301; Netherlands 1,114.
Tubes, pipes, fittings	45,820	41,429	1,896	France 16,671; West Germany 7,339; Italy 4,393.
Castings and forgings, rough	2,089	1,711	1	France 1,537; West Germany 103; United Kingdom 16.
Lead:				
Ore and concentrate	88,050	66,862	--	Morocco 16,375; Italy 11,531; Republic of South Africa 9,485.
Oxides	2	20	(2)	Peru 10; Portugal 4; West Germany 3.
Ash and residue containing lead	8,549	16,041	6	Belgium-Luxembourg 14,036; Greece 1,832; Portugal 166.
Metal including alloys:				
Scrap	226	784	548	Canada 203; France 9.
Unwrought	4,938	3,663	--	France 3,155; West Germany 338; Netherlands 99.
Semimanufactures	90	174	3	West Germany 79; France 26; United Kingdom 25.
Lithium:				
Oxides and hydroxides	100	140	107	Yugoslavia 20; U.S.S.R. 10.
Metal including alloys, all forms	(2)	(2)	--	Mainly from United Kingdom.
Magnesium: Metal including alloys:				
Scrap	10	7	--	Mainly from France.
Unwrought	1,260	1,505	569	Norway 461; France 428.
Semimanufactures	26	66	13	West Germany 44; Italy 3.
Manganese:				
Ore and concentrate, metallurgical-grade	417,653	299,032	1	Republic of South Africa 105,637; Ghana 74,606; Gabon 70,761.
Oxides	1,011	757	8	Belgium-Luxembourg 373; Ireland 343; Republic of South Africa 20.
Metal including alloys, all forms	504	466	97	United Kingdom 150; France 139.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Mercury ——— 76-pound flasks	37	31	3	West Germany 24; Austria 4.
Molybdenum:				
Ore and concentrate	3,446	4,600	1,041	Chile 2,115; United Kingdom 860.
Oxides and hydroxides	(2)	(2)	--	Mainly from United Kingdom.
Metal including alloys:				
Unwrought	(2)	1	(2)	Mainly from Belgium-Luxembourg.
Semimanufactures	39	24	11	West Germany 4; Belgium-Luxembourg 3.
Nickel:				
Matte and speiss	2,376	1,849	155	Canada 1,031; Cuba 434.
Oxides and hydroxides	82	24	--	All from Canada.
Ash and residue containing nickel	200	121	--	France 64; West Germany 46; Chile 11.
Metal including alloys:				
Scrap	21	8	--	United Kingdom 5; France 1; West Germany 1.
Unwrought	4,778	3,780	107	Canada 1,033; Zimbabwe 729; U.S.S.R. 667.
Semimanufactures	1,279	1,118	8	Netherlands 556; West Germany 296; France 72.
Platinum-group metals:				
Waste and sweepings value, thousands	$6,823	$7,342	$481	France $3,245; United Kingdom $1,010; Netherlands $710.
Metals including alloys, unwrought and partly wrought ——troy ounces	20,609	146,737	193	West Germany 104,491; Switzerland 5,755; United Kingdom 2,315.
Rare-earth metals including alloys, all forms	24	11	--	Austria 6; U.S.S.R. 5.
Rhenium: Metal including alloys, all forms	(2)	1	--	Mainly from Finland.
Selenium, elemental	45	46	(2)	Canada 24; United Kingdom 19; West Germany 1.
Silicon, high-purity	65	23	(2)	France 22.
Silver:				
Ore and concentrate[3] value, thousands	$38,046	$18,901	$915	Papua New Guinea $9,910; Morocco $1,939; Republic of South Africa $1,382.
Waste and sweepings ——do——	$47,541	$34,045	$4,829	France $16,080; Switzerland $5,407.
Metal including alloys, unwrought and partly wrought ——troy ounces	514,416	739,473	2,122	West Germany 318,874; United Kingdom 96,673; Switzerland 70,153.
Tellurium, elemental	9	3	(2)	U.S.S.R. 2.
Tin:				
Ore and concentrate	4,351	4,202	--	Thailand 2,773; Burma 875; Zaire 426.
Oxides	268	209	--	United Kingdom 136; Italy 43; West Germany 25.
Ash and residue containing tin	37	11	11	
Metal including alloys:				
Scrap	--	(2)	--	All from United Kingdom.
Unwrought	85	253	(2)	Malaysia 170; Bolivia 27; United Kingdom 27.
Semimanufactures	82	116	(2)	West Germany 54; United Kingdom 36; France 12.
Titanium:				
Ore and concentrate	187,789	188,617	--	Australia 92,981; Norway 57,882; Sri Lanka 17,947.
Oxides	1,092	1,073	30	West Germany 384; Belgium-Luxembourg 280; France 270.
Metal including alloys:				
Scrap	492	497	162	France 181; United Kingdom 113.
Unwrought	100	322	104	Italy 148; United Kingdom 56.
Semimanufactures	502	309	219	Italy 58; United Kingdom 13.
Tungsten:				
Oxides and hydroxides	1	--		
Metal including alloys:				
Scrap	(2)	1	--	Mainly from West Germany.
Unwrought	3	4	--	France 2; United Kingdom 1.
Semimanufactures	379	473	(2)	Belgium-Luxembourg 463; Austria 5; United Kingdom 1.
Uranium and/or thorium:				
Ore and concentrate	--	27	--	Austria 23; Portugal 4.
Metal including alloys, all forms, uranium	(2)	(2)	--	All from United Kingdom.
Vanadium: Oxides and hydroxides	540	145	(2)	Republic of South Africa 71; Finland 40; China 29.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Ore and concentrate	72,157	34,950	--	Ireland 24,452; Peru 5,848; Chile 4,650.
Oxides	353	412	--	West Germany 284; France 122; Belgium-Luxembourg 3.
Blue powder	21	77	--	Norway 35; France 20; West Germany 10.
Matte	2,200	3,018	20	France 1,287; West Germany 1,075; Egypt 300.
Ash and residue containing zinc	1,243	2,294	54	West Germany 969; France 598; Switzerland 267.
Metal including alloys:				
Scrap	564	252	--	France 157; Italy 47; United Kingdom 40.
Unwrought	230	1,730	--	Belgium-Luxembourg 1,229; France 385; West Germany 95.
Semimanufactures	947	727	1	Belgium-Luxembourg 297; West Germany 276; France 63.
Zirconium:				
Ore and concentrate	34,909	37,210	--	Australia 20,204; Republic of South Africa 16,945; United Kingdom 59.
Metal including alloys:				
Unwrought	--	(2)	--	All from Netherlands.
Semimanufactures	(2)	1	(2)	Mainly from United Kingdom.
Other:				
Ores and concentrates	(2)	(2)	--	Mainly from France.
Oxides and hydroxides	171	98	--	United Kingdom 47; France 33; Italy 10.
Ashes and residues	6,076	6,461	66	Italy 3,501; West Germany 1,253; Australia 283.
Base metals including alloys, all forms	(2)	--		
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	865	1,763	22	Greece 815; Italy 218; France 179.
Artificial:				
Corundum	5,461	5,589	42	France 1,691; Austria 1,458; West Germany 1,297.
Silicon carbide	1,867	2,450	(2)	West Germany 733; Switzerland 517; France 473.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$3,383	$4,111	$779	Ireland $3,186; United Kingdom $59.
Grinding and polishing wheels and stones	1,478	1,546	8	Italy 479; West Germany 285; France 262.
Asbestos, crude	47,471	38,022	15	Canada 15,711; Zimbabwe 13,480; Italy 5,948.
Barite and witherite	392	261	(2)	France 245; West Germany 14.
Boron materials:				
Crude natural borates	98,174	78,288	31,647	Turkey 46,620; Italy 21.
Elemental	(2)	(2)	(2)	Mainly from Finland.
Oxides and acids	159	390	--	Italy 224; France 156; United Kingdom 10.
Bromine	284	165	--	Israel 134; France 28; Italy 2.
Cement	54,752	5,443	1	France 3,672; Netherlands 852; West Germany 739.
Chalk	8,153	9,818	9	France 9,741; West Germany 31; United Kingdom 10.
Clays, crude:				
Bentonite	31,234	31,913	408	Morocco 24,460; Greece 4,187; United Kingdom 682.
Chamotte earth	7,774	6,394	1,346	France 5,006; West Germany 40.
Fuller's earth	--	19	19	
Kaolin	187,549	188,449	12,180	United Kingdom 160,297; France 15,664.
Unspecified	21,884	22,946	67	United Kingdom 13,617; France 5,233; West Germany 3,609.
Cryolite and chiolite	1,068	75	--	Denmark 57; France 13; Greenland 5.
Diamond:				
Gem, not set or strung, carats	49,194	141,494	143	Belgium-Luxembourg 67,354; Portugal 37,504; Israel 20,994.
Industrial stones, do	132,575	836,601	11,330	Zaire 366,900; Republic of South Africa 312,772; Belgium-Luxembourg 106,250.
Diatomite and other infusorial earth	2,579	2,742	761	France 1,639; Italy 273.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Feldspar, fluorspar, related materials:				
Feldspar	18,067	18,403	--	France 17,212; West Germany 638; Portugal 288.
Fluorspar	240	158	--	France 128; Mexico 20; West Germany 10.
Unspecified	2,738	1,672	--	Canada 883; Norway 765; France 22.
Fertilizer materials:				
Crude, n.e.s	1,865	851	--	Netherlands 635; France 93; Italy 81.
Manufactured:				
Ammonia	622,446	705,395	100,274	Libya 87,308; Ireland 81,876.
Nitrogenous	130,868	106,315	1	West Germany 25,158; Netherlands 24,636; France 12,257.
Phosphatic	17,477	8,867	(2)	Belgium-Luxembourg 3,963; Portugal 2,100; West Germany 1,389.
Potassic	649	1,790	--	Israel 1,250; France 386; Senegal 79.
Unspecified and mixed	48,890	49,858	5,225	Morocco 22,870; Belgium-Luxembourg 6,160.
Graphite, natural	2,005	2,519	(2)	Japan 192; Chile 22; Canada 1.
Gypsum and plaster	13,662	19,056	17	Morocco 18,056; United Kingdom 768; France 153.
Iodine	189	215	(2)	Japan 192; Chile 22; Canada 1.
Kyanite and related materials	r3,253	3,327	247	Republic of South Africa 2,442; France 316.
Lime	r263	330	--	West Germany 219; France 49; Morocco 33.
Magnesium compounds:				
Magnesite, crude	4	26	--	Netherlands 24; United Kingdom 2.
Oxides and hydroxides	65,619	66,982	56	Greece 16,006; Italy 13,589; United Kingdom 7,802.
Other	--	272	--	West Germany 158; France 113.
Mica:				
Crude including splittings and waste	1,271	4,002	1	United Kingdom 2,629; France 525; India 328.
Worked including agglomerated splittings	180	142	81	Belgium-Luxembourg 22; France 12.
Nitrates, crude	17,102	24,056	--	All from Chile.
Phosphates, crude thousand tons	2,895	2,775	--	Morocco 2,424; Senegal 168; Togo 83.
Phosphorus, elemental	69	225	(2)	West Germany 116; Republic of South Africa 60; United Kingdom 34.
Pigments, mineral:				
Natural, crude	169	314	--	West Germany 105; United Kingdom 104; Finland 40.
Iron oxides and hydroxides, processed	6,842	5,896	16	West Germany 4,625; France 564; United Kingdom 271.
Potassium salts, crude	21	--		
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$4,279	$5,832	$45	Thailand $3,177; India $655; Brazil $437.
Synthetic do	$3,124	$5,193	$552	Ireland $1,045; Switzerland $1,000; Republic of Korea $970.
Pyrite, unroasted	151	356	--	France 221; Italy 135.
Quartz crystals, piezoelectric kilograms	--	1	--	All from Japan.
Salt and brine	1,118	619	4	United Kingdom 337; Netherlands 217; West Germany 26.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	2,809	143	(2)	France 134; Canada 4; United Kingdom 4.
Sulfate, manufactured	599	386	(2)	West Germany 361; Belgium-Luxembourg 22; France 2.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	127,506	147,945	60	Portugal 42,713; Italy 36,368; Finland 33,562.
Worked	5,426	7,736	2	Italy 4,125; Portugal 2,392; Norway 106.
Dolomite, chiefly refractory-grade	6,838	9,865	--	Belgium-Luxembourg 4,895; France 3,111; Italy 1,392.
Gravel and crushed rock	50,927	46,082	--	Morocco 39,075; France 5,894; United Kingdom 639.
Quartz and quartzite	7,524	7,849	--	Yugoslavia 4,901; West Germany 1,085; Belgium-Luxembourg 986.
Sand other than metal-bearing	38,397	55,143	43	France 39,255; Morocco 8,583; Republic of South Africa 4,498.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Sulfur:				
Elemental:				
Crude including native and by-product	46,595	71,254	15,255	France 42,227; Canada 12,199.
Colloidal, precipitated, sublimed	463	60	(2)	West Germany 50; France 9.
Dioxide	(2)	23	--	All from Italy.
Sulfuric acid	21,197	6,147	(2)	United Kingdom 3,650; France 2,240; Belgium-Luxembourg 130.
Talc, steatite, soapstone, pyrophyllite	9,365	11,682	190	France 8,171; Norway 1,244; Belgium-Luxembourg 1,130.
Vermiculite, perlite, chlorite	46,528	41,156	--	U.S.S.R. 29,660; Turkey 9,000; Republic of South Africa 1,477.
Other:				
Crude	18,768	20,073	945	Morocco 6,010; Norway 4,013; West Germany 1,555.
Slag and dross, not metal-bearing	3,238	3,194	1	France 2,068; West Germany 1,009; United Kingdom 49.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	825	514	469	United Kingdom 45.
Carbon:				
Carbon black	2,066	3,873	225	France 1,858; West Germany 1,226; Netherlands 494.
Gas carbon	17,661	17,608	203	France 14,902; Netherlands 806; United Kingdom 707.
Coal:				
Anthracite thousand tons	(2)	6	--	All from Republic of South Africa.
Bituminous do	6,995	8,412	3,256	Republic of South Africa 2,269; Australia 1,403.
Briquets of anthracite and bituminous coal do	(2)	(2)	--	Mainly to Italy.
Lignite including briquets do	480	140	--	West Germany 138; France 2.
Coke and semicoke do	272	214	33	Poland 88; France 43; West Germany 39.
Gas, natural:				
Gaseous million cubic feet	776	(2)	--	Mainly from France.
Liquefied thousand tons	1,790	1,902	(2)	Algeria 1,233; Libya 669.
Peat including briquets and litter	36,984	50,000	--	West Germany 30,181; Netherlands 10,519; Finland 2,125.
Petroleum:				
Crude thousand 42-gallon barrels	324,652	319,436	--	Mexico 55,063; Iraq 37,422; Libya 32,973.
Refinery products:				
Liquefied petroleum gas do	11,181	10,578	167	Saudi Arabia 2,392; Algeria 2,272; United Kingdom 1,523.
Gasoline do	11,502	12,911	(2)	Syria 2,720; Iraq 2,227; Romania 1,054.
Mineral jelly and wax do	r25	31	(2)	Netherlands 8; West Germany 7; France 5.
Kerosene and jet fuel do	r169	291	7	Libya 203; West Germany 73.
Distillate fuel oil do	13,528	8,484	1,768	U.S.S.R. 1,246; Bulgaria 858.
Lubricants do	436	629	90	France 245; West Germany 29.
Residual fuel oil do	10,120	13,170	3,770	France 1,099; Libya 686.
Bitumen and other residues do	25	85	--	France 84.
Bituminous mixtures do	58	29	21	United Kingdom 4; France 2.
Petroleum coke do	6,675	4,581	3,939	United Kingdom 370; Syria 185.

rRevised. NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.
[3]May include other precious metals.

COMMODITY REVIEW

METALS

Copper.—In July, RTM announced plans to temporarily close its copper mines at Cerro Colorado, Alfredo, and Santiago because of the low price of copper and the relatively high value of the peseta. The shutdown, which was to affect 1,300 jobs, was planned to last 18 months, although some sources considered the move to be a permanent one. The announcement was followed by public demonstrations including strikes of RTM's entire work force of over 2,000 employees. The miners charged that the mines were being closed as a result of interference by RTM's parent company, RTZ Metals Group Ltd. of the United Kingdom. RTZ was involved in the development of the rich Neves-Corvo deposit in nearby Portugal in which it holds a 49% stake. The workers feared that the closure of the Spanish mines was caused by the need to make capacity available at RTM's Huelva smelter and refinery for the Neves-Corvo concentrates. However, production at Neves-Corvo was not scheduled to begin until late 1988.

The regional government of Andalucía ordered the restart of operations on October 1 following the social unrest. RTM complied with this order but began feasibility studies into the long-term viability of these operations given current copper prices.

Iron Ore.—Agrupación Minera S.A., a subsidiary of AHV, extended the closure of its Gallarta Mine, which began in September 1985 through the end of April. This action was taken to reduce surplus sinter stocks at AHV's Sestao steelworks. The extension was due in part to the reconstruction of the No. 2A blast furnace and a 10-day strike in February and March at Sestao.

Iron and Steel.—The Spanish iron and steel industry experienced a particularly difficult year in 1986. Spain slipped from 13th to 15th place in world steel output. Disagreement continued about the effectiveness of the restructuring program in the integrated and specialty steelmaking sectors. Changes in the trade balance of almost all steel products resulted from the EEC entry. The elimination of export incentives and the introduction of value-added tax and EEC trade arrangements produced most of the changes. Consumption of steel experienced significant growth, although most of the demand was filled by imports.

The loss of export incentives was only one of the reasons the steel trade situation worsened. The large decrease in oil prices seriously affected Spain's markets for construction steel in north Africa and the Middle East. Steel export quotas instituted by the EEC on the basis of historical trade patterns limited access to the European market. The worldwide weakness of the dollar was also detrimental to steel exports, as was the high domestic cost of electricity.

High prices on the Spanish market and the removal of tariffs on European steel contributed to the flood of low-priced imports, which increased to 35% of demand from 25% in 1985. The trade imbalance was so severe that the country requested that the safeguard measures included in its EEC accession treaty be invoked in March. The EEC agreed and instituted import quotas on several types of steel. Spain's export quota was also liberalized. Imports of some of the restricted products greatly exceeded the quotas because of import licenses issued prior to the introduction of the safeguard measures.

Although trading companies and steel consumers lobbied against the import restrictions, saying that they served to further increase artificially high prices, Spain requested that import quotas be maintained in 1987 and 1988. In December, the EEC Commission granted a 1-year extension with quarterly revisions to cover hot- and cold-rolled coil, heavy plate, wire rod, and galvanized sheet.

In September, Portugal requested and received sanctions against Spanish exports of rebars and smooth bars, wire rods, and sections under the terms of its EEC accession treaty. Restrictions were placed on these items following a dramatic increase in deliveries to Portugal in the first half of the year. The EEC Commission limited exports to Portugal for the last 2-1/2 months of the year.

Rationalization plans continued in every sector of the industry. Spain continued to plan cuts in capacity in long products and other carbon steels totaling about 3 million tons. Additional capacity cuts were being planned for the special and stainless steel sectors. Several industry associations were involved in negotiations with the Government to allocate the required reductions among their member companies.

AHV proceeded with its program of modernization and restructuring. Reconstruc-

tion of the No. 2A blast furnace at its Sestao works continued on schedule. In addition, the third of three new continuous slab casters was commissioned in February. In August, the 20-year-old, 1.5-million-ton-per-year blooming mill was shut down, giving the company a 100% continuous casting ratio. The company also brought three 110-ton oxygen converters into full production and installed new deoxidation and desulfurization units in the ladle metallurgy post-treatment section.

The first of two walking beam furnaces was brought on-stream at the Ansio hot strip mill in early September. Construction on the second unit and installation of a stand on the mill to increase productivity continued. Capacity of the hot strip line after modernization was projected as 2.2 million tons per year. The company permanently closed the electric furnace at its Baracaldo works in February.

Work progressed on ENSIDESA's 68-inch hot strip mill at Avilés. The renovation had been scheduled for completion in midyear, but delays forced the postponement of commissioning until the first half of 1987. Construction of the oxygen steelmaking shop also continued in 1986. The facility was expected to come on-line in 1987. The continuous slab casters for the new plant were not planned to be in use until first quarter 1988.

Lead.—Lead producer Compañia La Cruz S.A. suspended payments in July following several months of severe financial difficulties. The company closed its 4,000-ton-per-month-capacity Linares smelter in early September for what was planned to be a 3-month shutdown. The closure was extended through yearend while the company and the Andalucía regional government studied the results of a market feasibility study. The company was planning to secure operating capital and feedstocks of concentrate during the shutdown, although reportedly a number of suppliers sold their concentrate elsewhere, leaving La Cruz without the stocks it desired.

MAYASA stopped the development work for the prospective Navalmedio lead-zinc mine because of low prices for both metals. The project was situated near the company's mercury mines west of Ciudad Real.

Mercury.—MAYASA attempted to reduce its losses by setting a producer price for mercury. Negotiations with major Algerian producers led to an informal agreement early in the year to maintain a joint commercial policy without fixing prices or production levels. Sales of mercury from China, Turkey, and the U.S.S.R. on the world market led to a deterioration in the price. MAYASA refused to lower its price, and its sales decreased accordingly.

In September, the company halted production of ore at the Almadén Mine and suspended spot sales of metal. In addition, company officials filed with the EEC Commission for the imposition of antidumping tariffs on Soviet mercury. The company then began meeting with the Soviets in an attempt to reach an agreement on the volume of Soviet mercury available on the world market. In November, the company, in a joint move with Algerian producer Enterprise Nationale des Metaux Non-ferreux et Substances Utiles, extended the suspension of spot sales until the end of March 1987.

Although production increased significantly, the company posted losses of nearly $4 million. As a cost-cutting measure, MAYASA considered the closure of the Almadén Mine before the originally planned 1989 date. Social and political concerns prevented this option from being exercised during 1986.

Zinc.—Cía. Asua-Erandio S.A. of Bilbao signed a contract for the construction of a plant to recover zinc and lesser amounts of lead and other metals from steelwork dusts. The plans called for the construction of a rotary kiln in which the dusts are to be heated and the nonferrous metals volatilized. The metals were then to be recovered as oxide and pelletized and briquetted. The briquets are an excellent feed material for Imperial smelters. The plant was expected to recover 14,000 to 15,000 tons of lead and zinc from dusts previously landfilled when operational in 1987.

Asturiana de Zinc S.A., the country's largest zinc producer, was awarded reduced power tariffs by the Government. Although the 2-year pact made significant reductions in the power costs for each year, the company claimed that the proposed charges still left them at a great disadvantage compared to French companies whose power costs are much less. Company officials stated that the removal of export incentives as a result of EEC membership and the high cost of power have further limited the industry's attempts to become internationally competitive.

Despite the company's investment of nearly $54 million at its Reocín Mines, the

production costs there were still much too high. The cost per ton of zinc produced at Reocín was $546, over $19 more than at Exploración Minera Internacional España S.A.'s (EXMINESA) Rubiales Mine, and over $38 more than imported zinc.

EXMINESA's Troya Mine started up on October 1, 3 months ahead of schedule. Production was planned at a rate of 960 tons per day. The ore averages 15.7% zinc and 0.8% lead. The Troya ore is sedimentary, with an average thickness of 7 to 8 meters and an average width of 200 meters. Ramps at the northern and southern ends of the ore body provide access to the ore at 100 to 120 meters from the surface. The use of room-and-pillar mining was planned for the entire mine, and facilities for primary crushing were installed underground at the base of the northern ramp, which was to be used as the haulageway.

In November, EXMINESA commissioned the 300,000-ton-per-year throughput capacity concentrator at the Troya Mine in Guipúzcoa, 30 kilometers south of San Sebastián. Production of 60,000 tons of zinc concentrates containing 30,000 to 35,000 tons of metal was scheduled to begin in January or February 1987. The mine will also produce about 3,000 tons of lead concentrates. The mine development and concentrator construction was forecast to cost less than the original estimate of $30.7 million.

Peñarroya continued the evaluation of its Santa Bárbara zinc prospect near Toral de los Vados in León. The project, scheduled to begin development in 1987, was expected to require an investment of $32 million for the planned underground mine.

INDUSTRIAL MINERALS

Unión Explosivos Rio Tinto S.A. (ERT), Spain's largest privately owned chemical group, completed an important exploration and investigation program on the Catalán potash field in northeastern Spain. The field is situated in the Provinces of Barcelona and Lérida, approximately 75 kilometers from the Port of Barcelona. The study, which employed geophysical and geological techniques as well as drilling, enabled an evaluation of the minable reserves in the 2,600-square-kilometer field. Three of Spain's largest mines were in the district, including two—Llobregat and Cardona—that were owned by ERT. As a result of the investigations, the probable reserves minable by conventional methods were estimated at about 250 million tons of potash content. Proven reserves at the operating mines were calculated at 50 million tons of potash. If recovery of reserves lying deeper than 1,500 meters by solution mining was considered, the probable reserves in the district were estimated to increase to 500 million tons of potash.

MINERAL FUELS

Spain's production of energy materials remained insufficient to meet the country's needs. Imports of coking coal from the United States and Australia, liquefied natural gas from Algeria, and petroleum from Mexico, the United Kingdom, and Venezuela were extremely important for meeting demand. In May, two nuclear powerplants came on-line, making nuclear power the most important source of electricity, producing approximately 40% of the electricity generated. Hydropower declined by 26.5%, and thermal power stations increased their output by 16.5%.

Coal.—Huellera-Vasca-Leonesa S.A. awarded a contract to British Mining Consultants Ltd. of the United Kingdom to conduct a feasibility study for a new mine near La Robla. The coal seams in that area are thick but are steeply inclined and highly folded and faulted. The study was to evaluate the minable reserves as differentiated from the insitu reserves and the appropriate mining methods for the situation. Caving methods normally used only in metal mines were to be considered.

Empresa Nacional Carbonífera del Sur opened another underground mine in the Guadito Coalfield, 80 kilometers north of Córdoba near the town of Peñarroya. The María Mine was projected to produce coal from the San Rafael seam group for 20 years. The coalfield had been abandoned in the early 1960's owing to exhaustion of reserves. French-owned lead producer Peñarroya, the original operator of coal mines in the area, had failed to conduct effective exploration and the full extent of reserves was not known. Exploration conducted following the closure of the Peñarroya mines indicated significant potential for mining. Five underground mines and two open pit mines were operating in the region in 1986.

Natural Gas.—The Gaviota Gasfield, situated in the Bay of Biscay, came on-stream in May. The field contains an estimated 700 billion cubic feet of gas. In June, the Government approved a 7-year plan to extend

the gas distribution system into central and northwestern Spain. Also included in the $1.9 billion plan were new liquefied natural gas regasification plants for Huelva and Cartagena.

Uranium.—Empresa Nacional del Uranio S.A. announced plans to invest $71.4 million over a 5-year period to increase output from its Salamanca mines. Production was expected to increase from 200 to 800 tons of uranium oxide per year by expanding the Saelices El Chico Mine and developing the Alameda del Gardón deposit.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Spanish pesetas (Ptas) to U.S. dollars at the rate of Ptas140.05=US$1.00, the average rate in 1986.

The Mineral Industry of Sweden

By Richard H. Singleton[1]

Sweden remained a significant world producer of iron ore, ferrochromium, and steel; copper, lead, and silver metals and zinc ore; and arsenic and selenium. Raw materials for these industries were supplied indigenously except that chromium ore was imported. During 1986, 22 base metal sulfide mines, 4 iron mines, and 1 tungsten mine were in operation.

The Swedish base metal mining and smelting industry began an extensive cost-cutting program, including high-grade ore selection, in response to a tightening world market. Production and exports of copper and lead metals increased, but production of gold from indigenous sources apparently decreased. A novel technique for base metals and gold exploration, based on gaseous entrainment of trace elements from deep deposits to the surface, was being licensed by Boliden AB. Trial runs of a new plasma arc ferrochrome smelter began while a small conventional ferrochromium smelter closed.

Alleged dumping of Swedish specialty steel products, particularly stainless steel pipe and tubing, into the U.S. market continued, and preliminary U.S. Government findings indicated some damage to U.S. producers. A major Swedish specialty steel company merged with a similar Finnish company.

Government support ensured continuance of the depressed small tungsten mining industry for another 4 years.

Despite the Government's planned shutdown of Sweden's nuclear power industry during the 1994-2010 period, Government approval of repair of faulty steam generators ensured continued current operation of a major nuclear power station, one of four such units.

Swedish imports of U.S. coal and coke continued to decrease as did total imports of these commodities. Imports of crude petroleum and production of refined oil products increased. A sharp drop in oil import prices and a devaluation of the U.S. dollar, with respect to the krona, converted the negative account balance of 1985 to a positive $0.8 billion[2] in 1986, although accumulated foreign debt remained high at 19% of the annual gross domestic product (GDP). Most of the improvement occurred during the first quarter of 1986. The real GDP, about one-third of which was exported, increased by only 1%. The lowered rate of inflation, 3% compared with 7% in 1985, allowed interest rates to be decreased. The wage-rate increase, about 9%, continued to be high. A strike of Government workers during the month of October had some adverse affects on raw material supply to the steel industry because it included certain crane operators.

PRODUCTION AND TRADE

Production of mined lead increased as did production and exports of lead metal. Production and net exports of refined copper also increased, while gold mining and smelting of gold from indigenous concentrates apparently decreased. Talc production decreased sharply as did exports. Imports of crude oil and production of refined oil products, especially fuel oil, increased significantly.

Imports of U.S. coal and coke decreased in value by about one-third to $66 million. The value of exports to the United States, about one-tenth of total exports, decreased by 10% to $3.8 billion. Sweden's favorable balance of trade more than doubled to a net export of $5.6 billion; about one-quarter of this balance was with the United States.

Table 1.—Sweden: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum:					
Primary	78,898	82,156	82,903	83,703	77,000
Secondary	r17,445	r17,434	17,557	17,545	17,500
Arsenic: Trioxide, refined[e]	r9,000	r9,000	r10,000	r10,000	10,000
Copper:					
Mine output, Cu content	r56,293	r76,540	89,381	91,867	86,000
Metal:					
Smelter:					
Primary	72,504	78,756	79,775	74,668	83,000
Secondary	17,397	23,076	22,895	26,017	20,000
Total smelter	89,901	101,832	102,670	100,685	2103,000
Refined:					
Primary	r50,620	r50,141	53,527	e52,000	66,000
Secondary[e]	r11,684	r13,216	10,377	12,652	16,000
Total refined	62,304	63,357	63,904	64,652	82,000
Gold:					
Mine output, Au content—troy ounces	r78,640	r108,300	141,600	148,900	130,000
Metal, primary[3]—do	r67,930	r77,700	106,200	e110,000	100,000
Iron and steel:					
Iron ore and concentrate:					
Gross weight—thousand tons	16,143	r14,265	18,123	20,454	220,489
Fe content—do	10,490	r9,270	11,780	13,500	213,520
Metal:					
Pig iron and sponge iron—do	1,883	2,112	2,323	2,523	2,500
Ferroalloys:					
Ferrochromium	116,724	119,491	134,028	135,453	135,000
Ferrochromium-silicon	19,954	18,377	30,633	26,243	25,000
Ferromolybdenum	552	641	229	161	150
Ferrosilicon	14,177	19,406	23,278	28,279	25,000
Ferrotungsten	365	366	180	(4)	--
Ferrovanadium	8	--	--	--	--
Total	151,780	158,281	188,348	190,136	185,150
Steel, crude—thousand tons	3,936	4,116	4,705	4,813	24,710
Semimanufactures, rolled—do	r3,435	3,598	3,988	4,254	4,000
Lead:					
Mine output, Pb content	83,012	r85,762	82,845	80,604	90,000
Metal:					
Smelter:					
Primary:					
Crude	34,069	26,025	15,878	15,535	15,000
Refined	29,621	r34,780	49,758	43,221	50,000
Total primary	63,690	r60,805	65,636	58,756	65,000
Secondary	19,900	r15,170	27,737	25,861	28,113
Total smelter	83,590	r75,975	93,373	84,617	93,113
Refined:					
Primary	r29,621	r34,780	49,758	43,222	50,000
Secondary	19,900	r15,170	27,737	25,861	28,113
Total refined	r49,521	r49,950	77,495	69,083	278,113

See footnotes at end of table.

Table 1.—Sweden: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS —Continued					
Selenium, elemental, refined	27	42	68	[e]60	70
Silicon metal	14,852	20,340	20,206	[e]20,000	20,000
Silver:					
Mine output, Ag content thousand troy ounces	[r]6,028	[r]6,655	7,676	7,442	7,500
Metal, primary[3] do.	[r]4,842	[r]5,284	4,624	[e]5,000	5,000
Tungsten, mine output, W content	[r]349	365	385	402	[2]357
Zinc, mine output, Zn content	[r]192,727	[r]216,605	215,589	221,298	220,000
INDUSTRIAL MINERALS					
Cement, hydraulic thousand tons	2,304	2,240	2,393	2,101	[2]2,119
Clays: Kaolin	305	305	196	106	100
Feldspar, salable, crude and ground	54,669	52,913	49,833	41,720	40,000
Fluorspar concentrate	2,854	2,042	3,454	3,169	3,000
Kyanite	--	--	--	2,200	5,000
Lime, mostly quicklime thousand tons	581	610	648	649	650
Nitrogen: N content of ammonia do.	77	49	49	18	[2]46
Phosphate rock (byproduct):					
Gross weight do.	[r]128	107	133	193	[2]192
P_2O_5 content do.	[r]49	41	51	74	[2]74
Pyrite, gross weight do.	426	430	418	407	[2]447
Quartz	13,485	13,041	17,539	[e]17,000	17,000
Sodium sulfate[e] thousand tons	100	100	100	100	100
Stone:					
Dimension, mostly unfinished:					
Granite do.	115	120	132	144	140
Limestone do.	27	15	15	15	15
Sandstone do.	3	3	4	3	3
Slate do.	59	[r]29	22	21	20
Crushed:					
Dolomite do.	[r]672	[r]645	820	945	900
Granite do.	10,715	9,892	9,873	10,283	10,000
Limestone:					
For cement manufacture do.	1,181	918	986	765	800
For lime manufacture do.	611	759	687	[e]700	700
For other construction and industrial uses do.	2,125	2,117	2,039	[e]2,000	2,000
Chalk (ground) do.	34	38	40	[e]40	40
Marl do.	2,431	2,717	2,718	[e]2,700	2,700
For agricultural uses (ground) do.	151	184	153	[e]150	150
For other uses (ground) do.	71	67	108	[e]100	100
Total do.	6,604	6,800	6,731	6,455	6,490
Quartzite do.	[r]1,261	[r]1,397	1,533	[r e]1,500	1,500
Sandstone do.	141	140	138	[e]140	140
Other do.	571	610	666	[e]600	600
Sulfur:					
S content of pyrite do.	206	208	202	197	[2]216
Byproduct:					
From metallurgy[e] do.	109	125	159	173	160
From petroleum do.	22	20	26	23	25
Total do.	337	353	387	393	401
Sulfuric acid do.	856	928	930	960	[2]1,001
Talc and steatite	17,753	21,056	17,882	14,400	[2]2,000
MINERAL FUELS AND RELATED MATERIALS					
Carbon black thousand tons	23	24	26	[e]25	25
Coke, metallurgical do.	1,148	1,159	1,236	1,203	[2]1,174
Peat, for agricultural use[e] do.	60	60	60	60	60
Petroleum:					
Crude thousand 42-gallon barrels	105	172	98	68	[2]31
Refinery products:					
Liquefied petroleum gas do.	928	1,299	1,891	2,088	[2]2,726
Naphtha do.	1,343	1,640	1,700	1,096	[2]1,513
Gasoline, motor do.	19,346	21,326	27,931	25,466	26,500
Jet fuel do.	1,544	2,256	3,784	4,032	3,800
Kerosene do.	124	155	116	202	[2]217
Distillate fuel oil do.	33,122	35,219	34,137	34,480	[2]40,769

See footnotes at end of table.

Table 1.—Sweden: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum —Continued					
Refinery products —Continued					
Residual fuel oil thousand 42-gallon barrels	31,242	36,157	27,999	25,288	[2]25,781
Other do	4,126	4,129	4,853	5,252	5,400
Refinery fuel and losses do	3,682	4,988	5,175	3,938	7,000
Total do	95,457	107,169	107,586	101,842	113,706

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Table includes data available through July 22, 1987.
[2]Reported figure.
[3]Includes only that recovered from indigenous ores excluding scrap.
[4]Revised to zero.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	--	541	--	Netherlands 519.
Oxides and hydroxides	296	513	107	West Germany 286; Denmark 62.
Metal including alloys:				
Scrap	3,150	8,699	9	Finland 4,379; West Germany 2,760; Denmark 394.
Unwrought	38,173	41,816	1	Netherlands 12,913; West Germany 11,220; Norway 6,629.
Semimanufactures	46,287	48,726	1,612	United Kingdom 10,944; Denmark 9,681; Norway 6,165.
Cadmium: Metal including alloys, all forms	15	15	NA	NA.
Chromium:				
Ore and concentrate	6	13	--	All to Norway.
Oxides and hydroxides	6	29	NA	NA.
Metal including alloys, all forms	49	4	NA	NA.
Cobalt: Metal including alloys, all forms	58	125	NA	NA.
Copper:				
Ore and concentrate	71,079	108,707	--	Finland 57,004; West Germany 33,986; Turkey 10,487.
Oxides and hydroxides	41	2	NA	NA.
Sulfate	6	48	NA	NA.
Ash and residue containing copper	9,238	5,892	NA	NA.
Metal including alloys:				
Scrap	1,575	3,624	--	Denmark 1,974; West Germany 847; Greece 386.
Unwrought	66,033	54,207	74	Belgium-Luxembourg 28,868; West Germany 14,092; France 4,994.
Semimanufactures	83,254	75,616	15,829	Denmark 8,092; Norway 7,824.
Gold:				
Waste and sweepings value, thousands	$4,596	$2,677	NA	NA.
Metal including alloys, unwrought and partly wrought do	$48,751	$50,966	NA	NA.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	17,615	18,302	132	West Germany 4,367; Belgium-Luxembourg 3,220; Netherlands 1,665.
Pyrite, roasted do	(2)	(2)	--	All to United Kingdom.
Metal:				
Scrap	21,667	21,631	(2)	Spain 7,377; West Germany 6,752; Denmark 1,476.
Pig iron, cast iron, related materials	115,358	108,202	98	Japan 15,796; West Germany 14,681; United Kingdom 11,239.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Ferroalloys:				
Ferrochromium	95,793	103,121	NA	NA.
Ferromanganese	673	1,167	NA	NA.
Ferromolybdenum	193	101	NA	NA.
Ferronickel	--	3	NA	NA.
Ferrosilicochromium	2,279	2,226	NA	NA.
Ferrosilicomanganese	11	65	NA	NA.
Ferrosilicon	20,564	21,416	NA	NA.
Unspecified	933	343	NA	NA.
Steel, primary forms	587,095	761,882	314,168	China 114,477; West Germany 69,882.
Semimanufactures:				
Bars, rods, angles, shapes, sections	861,080	867,357	76,836	West Germany 240,473; Denmark 83,837; United Kingdom 80,785.
Universals, plates, sheets	911,508	991,546	141,141	West Germany 205,447; Denmark 142,469.
Hoop and strip	120,853	120,237	12,747	West Germany 26,815; Denmark 15,637.
Rails and accessories	33,387	41,241	2,686	Norway 14,614; Pakistan 8,201; India 5,300.
Wire	74,858	67,261	8,439	West Germany 11,604; Finland 8,023.
Tubes, pipes, fittings	236,390	243,321	30,515	West Germany 40,789; France 24,780.
Castings and forgings, rough	4,326	3,016	1	Norway 1,212; Belgium-Luxembourg 444; Denmark 359.
Lead:				
Ore and concentrate	47,918	42,962	--	West Germany 23,882; Belgium-Luxembourg 15,165.
Oxides	6	146	NA	NA.
Metal including alloys:				
Scrap	458	165	--	Cyprus 101; Denmark 49.
Unwrought	63,406	64,772	--	U.S.S.R. 20,253; Norway 11,259; Finland 8,970.
Semimanufactures	143	404	1	Denmark 223; United Kingdom 107.
Magnesium: Metal including alloys:				
Scrap	556	674	100	West Germany 403; Denmark 58.
Semimanufactures	74	221	NA	NA.
Manganese:				
Ore and concentrate, metallurgical-grade	--	24	--	France 23.
Oxides	1	1	NA	NA.
Metal including alloys, all forms	68	86	NA	NA.
Mercury 76-pound flasks	2,813	NA		
Molybdenum:				
Ore and concentrate	745	1,375	--	NA.
Oxides and hydroxides	(2)	42	NA	NA.
Metal including alloys, all forms	71	118	NA	NA.
Nickel:				
Ore and concentrate	402	--		
Metal including alloys:				
Scrap	613	533	--	West Germany 319; India 100; Netherlands 79.
Unwrought	622	96	--	United Kingdom 52; Netherlands 40.
Semimanufactures	1,417	1,476	417	United Kingdom 255; West Germany 212.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$1,849	$1,248	$4	United Kingdom $390; Netherlands $336; Norway $204.
Silicon, high-purity do	$23,466	$20,141	NA	NA.
Silver:				
Ore and concentrate[3] do	--	$70	--	All to Switzerland.
Waste and sweepings[3] do	$14,967	$15,822	$1,112	United Kingdom $4,591; West Germany $4,385; Norway $2,716.
Metal including alloys, unwrought and partly wrought thousand troy ounces	7,780	6,334	--	Mainly to West Germany.
Tin: Metal including alloys:				
Unwrought	64	168	--	All to West Germany.
Semimanufactures	24	154	--	Denmark 58; Finland 49; Norway 34.
Titanium:				
Ore and concentrate	27,049	5	--	NA.
Oxides	17	77	NA	NA.
Metal including alloys, all forms	275	188	NA	NA.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Tungsten:				
Ore and concentrate	498	193	--	Austria 144; West Germany 39.
Oxides and hydroxides	10	--		
Metal including alloys, all forms	111	194	NA	NA.
Zinc:				
Ore and concentrate	428,451	426,511	--	Finland 94,605; Norway 93,102; France 81,844.
Oxides	461	484	NA	NA.
Ash and residue containing zinc	31,391	33,061	NA	NA.
Metal including alloys:				
Scrap	3,067	2,457	--	Norway 944; West Germany 426.
Unwrought	613	1,104	--	Denmark 660; Norway 416.
Semimanufactures	29	28	--	NA.
Zirconium:				
Ore and concentrate	81	30	--	NA.
Metal including alloys, all forms	38	15	NA	NA.
Other:				
Oxides and hydroxides	18	NA		
Ashes and residues	22,468	9,553	NA	NA.
Base metals including alloys, all forms	226	207	NA	NA.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	10	49	(2)	Finland 42.
Artificial:				
Corundum	36	48	NA	NA.
Silicon carbide	882	416	NA	NA.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$38	$31	--	Finland $25.
Grinding and polishing wheels and stones	2,046	1,940	NA	NA.
Barite and witherite	48	4	--	NA.
Boron materials:				
Crude natural borates	6	--		
Oxides and acids	7	20	NA	NA.
Cement	760,854	655,666	NA	NA.
Chalk	9,293	8,668	--	Finland 4,229; Norway 2,678; Denmark 923.
Clays, crude:				
Kaolin	5,505	4,466	--	NA.
Unspecified	3,519	4,556	--	NA.
Diamond:				
Gem, not set or strung value, thousands	$3,883	$2,545	$223	Finland $828; Belgium-Luxembourg $806; Norway $252.
Industrial stones ---do---	$75	$74	$5	Ireland $23; United Kingdom $17.
Diatomite and other infusorial earth	71	611	--	Belgium-Luxembourg 592.
Feldspar, fluorspar, related materials:				
Fluorspar	1,847	4,939	--	NA.
Unspecified	29,681	21,803	--	NA.
Fertilizer materials:				
Crude, n.e.s	1,720	1,006	--	Norway 811; Denmark 91; United Kingdom 87.
Manufactured:				
Ammonia	234	609	NA	NA.
Nitrogenous	229,802	243,508	NA	NA.
Phosphatic	84,510	69,827	NA	NA.
Potassic	2	4	NA	NA.
Unspecified and mixed	215,753	201,612	NA	NA.
Graphite, natural	117	128	11	United Kingdom 46; Netherlands 35; United Kingdom 28.
Gypsum and plaster	496	377	--	Finland 251; Denmark 70; Norway 49.
Lime	15,446	18,699	NA	NA.
Magnesium compounds	502	1,869	--	Norway 939; Finland 779; Denmark 89.
Mica:				
Crude including splittings and waste	28	20	--	Finland 9; United Kingdom 5; West Germany 2.
Worked including agglomerated splittings	3	3	NA	NA.
Nitrates, crude	9	--		
Phosphates, crude	91,286	98,426	--	All to Norway.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Phosphorus, elemental	1	--		
Pigments, mineral: Iron oxides and hydroxides, processed	321	971	NA	NA.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$3,234	$6,862	--	Belgium-Luxembourg $6,204; Denmark $433.
Synthetic do.	$23,042	$25,762	--	Ireland $25,439; Finland $303.
Pyrite, unroasted	13,452	30	--	Denmark 20; Thailand 8.
Salt and brine	5,342	2,063	--	Denmark 724; Norway 656; Finland 247.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	95	255	NA	NA.
Sulfate, manufactured	103,340	90,938	NA	NA.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	182	191	1	Italy 63; West Germany 57; Denmark 24.
Worked do.	21	20	NA	NA.
Dolomite, chiefly refractory-grade do.	46	36	--	Denmark 8; Norway 8; Netherlands 7.
Gravel and crushed rock do.	1,810	1,607	--	Denmark 930; West Germany 444; United Kingdom 106.
Limestone other than dimension do.	782	845	--	Finland 717; Denmark 108; West Germany 13.
Quartz and quartzite do.	477	424	(2)	Norway 399; Iceland 17; West Germany 3.
Sand other than metal-bearing do.	140	117	--	Denmark 58; Norway 54; West Germany 5.
Sulfur:				
Elemental:				
Crude including native and by-product	1,588	1,502	--	Finland 1,488; Angola 7; Netherlands 7.
Colloidal, precipitated, sublimed	116	25	NA	NA.
Dioxide	24,412	34,690	NA	NA.
Sulfuric acid	4,336	21,645	NA	NA.
Talc, steatite, soapstone, pyrophyllite	14,619	12,305	--	Netherlands 7,693; United Kingdom 1,995; Norway 1,876.
Other:				
Crude	5,802	6,530	--	Norway 3,376; Denmark 1,956; Finland 735.
Slag and dross, not metal-bearing	216,322	106,502	62	United Kingdom 54,895; Republic of South Africa 14,368; East Germany 12,851.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	6	1	--	All to Finland.
Carbon black	15,150	16,963	NA	NA.
Coal: Bituminous	22,935	112,014	--	Ireland 47,119; United Kingdom 31,529; Hungary 16,128.
Coke and semicoke	206,037	77,189	--	Finland 58,383; Norway 13,318; United Kingdom 5,488.
Peat including briquets and litter	32,859	36,763	--	Norway 17,675; Denmark 10,242; Saudi Arabia 2,948.
Petroleum:				
Crude thousand 42-gallon barrels	--	689	--	Netherlands 474; United Kingdom 215.
Refinery products:				
Liquefied petroleum gas value, thousands	$31,935	$24,047	$2,267	United Kingdom $8,563; France $4,902; Denmark $2,674.
Gasoline thousand 42-gallon barrels	7,522	7,761	--	Denmark 3,442; Norway 2,364; West Germany 1,102.
Mineral jelly and wax do.	5	1	--	Mainly to Norway.
Kerosene and jet fuel do.	287	963	--	Norway 567; Denmark 351; West Germany 23.
Distillate fuel oil do.	19,366	16,251	--	Denmark 7,576; West Germany 6,367; Norway 773.
Lubricants do.	1,006	1,136	(3)	Norway 322; United Kingdom 210; Netherlands 132.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Residual fuel oil thousand 42-gallon barrels	18,241	13,588	327	Belgium-Luxembourg 3,449; Denmark 3,443; United Kingdom 2,636.
Bitumen and other residues do	1,185	1,773	--	Norway 907; Denmark 557; United Kingdom 84.
Bituminous mixtures do	55	56	10	Belgium-Luxembourg 7; Finland 6.

NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.
[3]May include other precious metals.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	61,749	52,073	--	France 20,541; West Germany 16,149; Guyana 9,537.
Oxides and hydroxides	251,174	242,730	24	Suriname 69,479; Venezuela 51,611; West Germany 39,113.
Metal including alloys:				
Scrap	2,114	1,507	--	Norway 1,021; Denmark 370; Cyprus 68.
Unwrought	48,468	46,265	(2)	Norway 26,977; Canada 7,829; Spain 3,027.
Semimanufactures	83,378	77,341	531	West Germany 23,764; Norway 7,663; France 7,146.
Antimony: Metal including alloys, all forms	2	73	NA	NA.
Arsenic: Metal including alloys, all forms	3,036	930	NA	NA.
Cadmium: Metal including alloys, all forms	241	260	NA	NA.
Chromium:				
Ore and concentrate	580,363	387,240	NA	NA.
Oxides and hydroxides	956	987	--	Poland 550; West Germany 246; United Kingdom 87.
Metal including alloys, all forms	282	248	NA	NA.
Cobalt:				
Oxides and hydroxides	6	8	6	Belgium-Luxembourg 2.
Metal including alloys, all forms	363	488	NA	NA.
Columbium and tantalum: Metal including alloys, all forms, tantalum	(2)	1	NA	NA.
Copper:				
Ore and concentrate	49,877	106,474	--	Greece 42,157; Chile 23,462; Norway 22,570.
Matte and speiss including cement copper	4,327	5,042	--	France 4,987.
Oxides and hydroxides	817	768	NA	NA.
Sulfate	1,097	997	NA	NA.
Ash and residue containing copper	40,115	22,902	NA	NA.
Metal including alloys:				
Scrap	18,566	21,275	3,557	France 6,522; United Kingdom 4,091.
Unwrought	65,146	61,247	254	Chile 12,492; West Germany 9,886; Belgium-Luxembourg 8,867.
Semimanufactures	36,572	41,017	126	West Germany 18,194; United Kingdom 4,406; Finland 3,981.
Gold:				
Waste and sweepings value, thousands	$299	$690	NA	NA.
Metal including alloys, unwrought and partly wrought do	$5,021	$6,014	NA	NA.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	38,920	67,950	--	Norway 67,550; Netherlands 256.
Pyrite, roasted	--	6,869	--	All from Norway.
Metal:				
Scrap	839,378	884,890	8,392	United Kingdom 460,286; U.S.S.R. 182,393; Norway 85,507.
Pig iron, cast iron, related materials	49,169	56,639	87	Brazil 13,055; U.S.S.R. 12,899; Norway 7,205.
Ferroalloys:				
Ferrochromium	47,632	52,006	NA	NA.
Ferromanganese	31,582	28,406	(2)	Norway 17,847; Republic of South Africa 5,482; France 4,371.
Ferromolybdenum	1,634	1,377	NA	NA.
Ferronickel	21,483	7,317	NA	NA.
Ferrosilicochromium	1,450	1,645	NA	NA.
Ferrosilicomanganese	12,221	15,696	NA	NA.
Ferrosilicon	27,814	21,251	NA	NA.
Unspecified	3,826	3,710	NA	NA.
Steel, primary forms	113,802	71,030	(2)	West Germany 25,095; United Kingdom 17,771; Netherlands 10,870.
Semimanufactures:				
Bars, rods, angles, shapes, sections	467,579	413,208	2,447	West Germany 97,332; France 64,159; United Kingdom 59,590.
Universals, plates, sheets	870,186	789,459	328	West Germany 202,099; Belgium-Luxembourg 154,951; France 105,296.
Hoop and strip	147,289	133,035	58	West Germany 54,875; United Kingdom 17,643; Belgium-Luxembourg 13,705.
Rails and accessories	5,192	4,008	(2)	West Germany 1,555; United Kingdom 1,087.
Wire	26,995	31,177	41	Belgium-Luxembourg 11,052; Finland 6,063; West Germany 4,220.
Tubes, pipes, fittings	334,702	317,134	214	West Germany 77,957; Finland 50,683; United Kingdom 46,818.
Castings and forgings, rough	9,774	10,316	(2)	Denmark 3,112; Norway 2,350; West Germany 1,752.
Lead:				
Ore and concentrate	21,845	6,592	--	Canada 3,178; West Germany 1,812; Morocco 1,602.
Oxides	2,924	3,905	6	West Germany 2,044; United Kingdom 1,030; France 670.
Metal including alloys:				
Scrap	10,170	20,660	--	Denmark 10,416; Norway 6,052; Finland 2,628.
Unwrought	3,333	4,811	599	United Kingdom 1,786; Mexico 700; Denmark 643.
Semimanufactures	992	1,092	1	West Germany 866; Netherlands 115.
Magnesium: Metal including alloys:				
Unwrought	1,754	1,688	16	Norway 1,620.
Semimanufactures	138	111	22	West Germany 45; Norway 21.
Manganese:				
Ore and concentrate, metallurgical-grade	486	336	--	France 239; Netherlands 93.
Oxides	213	255	91	Spain 63; Belgium-Luxembourg 37.
Metal including alloys, all forms	977	1,073	NA	NA.
Mercury 76-pound flasks	580	464	--	West Germany 174; Spain 87; China 58.
Molybdenum:				
Ore and concentrate	6,347	6,481	NA	NA.
Oxides and hydroxides	138	125	NA	NA.
Metal including alloys, all forms	71	137	NA	NA.
Nickel:				
Matte and speiss	2,935	2,603	--	Australia 2,484.
Metal including alloys:				
Scrap	4,556	5,678	1,302	West Germany 1,933; United Kingdom 1,527.
Unwrought	12,932	12,284	1,699	Canada 2,753; United Kingdom 2,330.
Semimanufactures	975	1,113	112	United Kingdom 640; West Germany 149.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$33,011	$29,216	$5,232	Switzerland $13,141; United Kingdom $3,948.
Selenium, elemental	107	41	NA	NA.
Silicon, high-purity	330	387	NA	NA.
Silver:				
Ore and concentrate[3] value, thousands	$31,060	$29,184	$10	Peru $11,678; Chile $7,030; Greece $4,808.
Waste and sweepings[3] do	$7,907	$6,692	$3,019	Finland $1,690; France $1,253.
Metal including alloys, unwrought and partly wrought thousand troy ounces	5,562	5,370	NA	Mainly from West Germany.
Tin: Metal including alloys:				
Scrap	12	87	--	Denmark 68; Norway 17.
Unwrought	440	577	1	United Kingdom 283; Malaysia 60; West Germany 55.
Semimanufactures	143	133	(2)	Netherlands 58; West Germany 41; United Kingdom 27.
Titanium:				
Ore and concentrate	4,620	4,636	NA	NA.
Oxides	3,729	4,861	120	Norway 1,830; Finland 917; United Kingdom 762.
Metal including alloys, all forms	289	45	NA	NA.
Tungsten:				
Ore and concentrate	813	1,150	NA	NA.
Metal including alloys, all forms	154	42	NA	NA.
Zinc:				
Ore and concentrate	--	5	--	All from West Germany.
Oxides	1,151	1,321	--	United Kingdom 403; Netherlands 370; Norway 241.
Blue powder	414	388	NA	NA.
Ash and residue containing zinc	23,339	29,246	NA	NA.
Metal including alloys:				
Scrap	7	96	--	Norway 65; Denmark 31.
Unwrought	38,187	35,188	26	Norway 16,392; Finland 12,488.
Semimanufactures	183	193	NA	NA.
Zirconium:				
Ore and concentrate	3,272	3,113	NA	NA.
Metal including alloys, all forms	125	128	NA	NA.
Other:				
Oxides and hydroxides	939	NA		
Ashes and residues	21,681	13,784	NA	NA.
Base metals including alloys, all forms	140	114	NA	NA.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1,172	2,933	23	Iceland 2,231; Italy 251.
Artificial:				
Corundum	6,775	6,116	312	West Germany 3,341; Austria 545; Netherlands 456.
Silicon carbide	6,786	6,470	NA	NA.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$2,770	$3,533	$23	Switzerland $2,526; Ireland $630; Netherlands $190.
Grinding and polishing wheels and stones	2,941	2,954	54	Austria 1,144; West Germany 399; France 318.
Asbestos, crude	1,000	1,042	NA	NA.
Barite and witherite	5,321	5,606	--	West Germany 5,091; China 426.
Boron materials:				
Crude natural borates	20,761	14,718	5,420	Turkey 5,831; Netherlands 3,037.
Elemental	--	1	--	NA.
Oxides and acids	748	887	35	France 602; Turkey 92.
Cement	232,420	200,025	28	Poland 89,568; East Germany 86,222; Denmark 15,173.
Chalk	31,569	25,972	10	Norway 9,485; West Germany 8,150; Denmark 5,895.
Clays, crude:				
Bentonite	6,653	6,026	NA	NA.
Kaolin	403,377	419,400	NA	NA.
Unspecified	32,138	39,269	NA	NA.
Cryolite and chiolite	396	1,110	--	Denmark 665; Iraq 445.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Diamond:				
Gem, not set or strung value, thousands	$12,780	$9,353	$123	Belgium-Luxembourg $5,167; Israel $2,367; United Kingdom $748.
Industrial stones do.	$639	$753	$21	Netherlands $281; United Kingdom $164; Belgium-Luxembourg $133.
Diatomite and other infusorial earth	2,566	2,826	731	Denmark 1,113; Spain 688.
Feldspar, fluorspar, related materials:				
Fluorspar	11,419	9,929	NA	NA.
Unspecified	11,932	11,860	NA	NA.
Fertilizer materials:				
Crude, n.e.s	372	44	--	West Germany 23; Finland 20.
Manufactured:				
Ammonia	232,188	277,932	(2)	U.S.S.R. 156,965; Netherlands 63,345; Poland 24,254.
Nitrogenous	569,034	591,314	NA	Mainly from Norway.
Phosphatic	--	52	--	All from Republic of South Africa.
Potassic value, thousands	$18,666	$16,634	$357	West Germany $8,543; East Germany $3,477; U.S.S.R. $2,192.
Unspecified and mixed	367,520	307,013	(2)	Norway 155,194; Belgium-Luxembourg 66,011; Netherlands 39,027.
Graphite, natural	674	743	17	China 248; West Germany 205; Norway 134.
Gypsum and plaster	299,024	290,109	153	Spain 159,735; East Germany 122,468; West Germany 6,478.
Lime	8,433	7,519	--	United Kingdom 3,214; Finland 1,406; Belgium-Luxembourg 1,383.
Magnesium compounds	29,965	28,126	246	China 10,115; Greece 5,754; Austria 2,938.
Mica:				
Crude including splittings and waste	422	447	--	Norway 163; India 103; United Kingdom 94.
Worked including agglomerated splittings	61	76	(2)	Switzerland 48; West Germany 11; Belgium-Luxembourg 10.
Nitrates, crude	4,200	4,600	--	Chile 4,560.
Phosphates, crude	774,210	749,688	152,763	U.S.S.R. 320,081; Morocco 262,144.
Phosphorus, elemental	36	28	NA	NA.
Pigments, mineral: Iron oxides and hydroxides, processed	6,007	6,323	6	West Germany 5,242; United Kingdom 302; Spain 286.
Potassium salts, crude	1,863	2,175	--	All from West Germany.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$2,602	$4,216	$40	Thailand $2,275; Sri Lanka $521; Switzerland $414.
Synthetic do.	$1,771	$2,237	$1,764	Thailand $208; West Germany $90.
Pyrite, unroasted	14,749	21,970	--	Norway 11,758; Finland 10,049; West Germany 161.
Salt and brine thousand tons	1,225	1,256	2	West Germany 364; Netherlands 354; United Kingdom 133.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	121,331	106,443	--	East Germany 45,802; West Germany 25,134; Netherlands 19,189.
Sulfate, manufactured	19,236	19,454	NA	NA.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	4,325	5,189	2	Norway 2,357; Finland 1,764; India 721.
Worked	9,861	10,751	(2)	Portugal 4,632; Italy 3,564; Norway 593.
Dolomite, chiefly refractory-grade	131,527	137,195	--	United Kingdom 56,977; Norway 38,850; Belgium-Luxembourg 37,270.
Gravel and crushed rock	71,084	70,091	--	Norway 30,594; Denmark 14,516; Finland 9,910.
Limestone other than dimension	47,333	51,538	--	Denmark 25,252; Norway 14,953; United Kingdom 9,805.
Quartz and quartzite	64,190	59,133	13	Spain 46,399; Finland 6,395; Netherlands 4,213.
Sand other than metal-bearing	331,813	379,303	47	Denmark 232,287; Belgium-Luxembourg 120,496; United Kingdom 18,520.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Sulfur:				
Elemental:				
Crude including native and by-product	14,995	6,318	--	Poland 4,621; Norway 1,295.
Colloidal, precipitated, sublimed	9,525	12,004	--	Poland 11,143; Norway 847.
Dioxide	8,648	11,733	NA	NA.
Sulfuric acid	25,705	28,501	(2)	Finland 9,985; Poland 9,552; Norway 8,743.
Talc, steatite, soapstone, pyrophyllite	22,945	26,349	20	Finland 10,565; Norway 6,738; Belgium-Luxembourg 5,032.
Other:				
Crude	214,580	220,773	390	Norway 203,448; West Germany 14,180.
Slag and dross, not metal-bearing	26,715	32,597	20	Netherlands 10,719; West Germany 7,734; Norway 6,683.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	796	653	239	Trinidad and Tobago 414.
Carbon black	11,970	12,147	368	West Germany 6,333; Netherlands 4,072; United Kingdom 1,172.
Coal:				
Anthracite thousand tons	18	30	NA	NA.
Bituminous do	3,931	4,804	NA	NA.
Lignite including briquets do	9	3	--	East Germany 2.
Coke and semicoke do	264	382	46	United Kingdom 140; West Germany 72.
Gas, natural: Gaseous thousand cubic feet	529	NA		
Peat including briquets and litter	9,653	24,231	--	Finland 21,857; U.S.S.R. 1,890.
Petroleum:				
Crude thousand 42-gallon barrels	95,661	101,260	--	United Kingdom 52,013; Norway 14,967; Nigeria 8,426.
Refinery products:				
Liquefied petroleum gas do	4,477	4,045	93	United Kingdom 2,720; Denmark 825.
Gasoline do	18,918	20,264	9	United Kingdom 4,384; Finland 4,363; Denmark 4,146.
Mineral jelly and wax do	128	112	1	West Germany 66; Hungary 12.
Kerosene and jet fuel do	2,687	1,959	(2)	Finland 578; Spain 410; Netherlands 386.
Distillate fuel oil do	20,508	21,857	413	East Germany 4,628; United Kingdom 4,282; Spain 1,567.
Lubricants do	2,115	2,029	20	U.S.S.R. 722; United Kingdom 376; Netherlands 356.
Residual fuel oil do	17,004	19,457	415	U.S.S.R. 5,347; United Kingdom 4,282; Spain 1,567.
Bitumen and other residues do	275	243	(2)	Mainly from Finland.
Bituminous mixtures do	41	32	2	Finland 15; France 8.
Petroleum coke do	312	279	3	United Kingdom 163; Japan 77.

NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.
[3]May include other precious metals.

COMMODITY REVIEW

METALS

Aluminum.—Gränges Aluminium, a wholly owned subsidiary of Electrolux AB, increased its secondary aluminum capacity to 45,000 tons by plant acquisitions, especially a 12,000-ton-per-year secondary ingot plant at Amhult north of Göteborg. Expansion of Sweden's sole aluminum smelter at Sundsvall, owned by Gränges, to a 92,000-ton-per-year capacity continued and was expected to be completed by year-end 1988 at a total cost of $35 million. This construction activity lowered production by nearly 10%. Total Swedish supply, mostly for Gränges' 110,000-ton-per-year aluminum semimanufacturing industry, was maintained by increased imports. The approximate raw aluminum supply breakdown in 1986 was secondary aluminum, 17%; net imports, 12%; and primary aluminum from Sundsvall, the balance.

Copper.—In December, Luossavaara Kiirunavaara AB (LKAB), Sweden's state-owned major iron ore producer, sold its large Viscaria copper mine in northern Sweden to Outokumpu Oy, the large Finnish metals producer. Operation of the mine had begun in 1982, and a first profit, although small, was shown in 1985. The mine produced 115,000 tons of copper concentrate in 1986 with an average copper content of 24%. About 40% of this concentrate was shipped to Outokumpu's Harjavalta smelter in Finland.

Boliden Mineral's large Aitik copper mine, which produced nearly one-half of Sweden's concentrate, began a high-grading program of ore selection. This, together with improved productivity and beneficiation methods, was expected to lower costs sufficiently to allow the operation to remain competitive in the world market. Boliden Mineral's Stekenjokk Mine, which produced about 10% of Sweden's copper concentrate, was expected to close at yearend because of ore depletion.

A novel exploration technique for detecting underground deposits of base metals to depths of at least 1,000 feet was developed by Boliden Mineral and the Institute of Physics at Lund. The method is based upon the natural transport in a carrier gas of trace amounts of copper, silver, and zinc, as well as arsenic, chlorine, and sulfur from the deposits to the surface. Samples of gas are collected and analyzed by special sensitive methods. This low-cost technique had been demonstrated in Sweden and elsewhere, and although gold had not been detected, it could be inferred by the detection of associated elements such as arsenic. Licensing of the patented Geogas technique was made available.

Most of Boliden AB's base metal mines, as well as its Ronnskar smelter, operated at a financial loss during the first 9 months of the year because of low world prices for copper, lead, and zinc and the lowered value of the U.S. dollar; the average exchange rate of the dollar with the Swedish krona decreased by 17% between 1985 and 1986. Trelleborg AB, Sweden's large producer of rubber equipment, acquired 44% of Boliden AB early in the year for about $100 million. Trelleborg's interest was instrumental in turning the company around financially before yearend through technical improvements and improved productivity, and a profit was made in the final quarter. Negotiations were under way at yearend between the Government and Boliden AB regarding the economic impact of environmental regulations pertaining to the mines and the smelter.

Ferroalloys.—SwedeChrome AB finished construction of its plasma arc ferrochrome smelter at Malmö and began trial runs in August producing pig iron. The trial runs continued throughout the remainder of the year. SwedeChrome's intention was to switch to ferrochrome production in early 1987 and to reach a full capacity of 80,000 tons per year by yearend. Two furnaces, each with four 6-megawatt plasma torches, were to be used, giving a total plant power capacity of 48 megawatts. Lower production costs were to be realized by using chromite ore fines instead of lump, a powdered coal reductant instead of coke, and through a higher percentage conversion to metal. Economic operation was also contingent on the sale of byproduct fuel gases and excess heat to the city of Malmö. Sweden has no reserves of chromite ore, and the industry had lost its South African source because of a Government import ban and was losing its Finnish source because of sharply reduced exports from Finland. Alternate sources, especially Zimbabwe, were being sought. SwedeChrome was owned by an eight-member consortium including the process developer, SKF Steel Engineering AB, which changed its name at yearend to SKF Plasma Technologies AB.

Ferrolegeringar Trollhätteverken AB closed its 35,000-ton-per-year ferrochrome plant at Trollhätten in November. The other Swedish producer, Vargön Alloys AB, a subsidiary of Switzerland's Vargön AG, produced about 120,000 tons of ferrochrome during 1986.

Lead and Zinc.—Boliden Mineral's lead-zinc mines, which produced about 70% of Sweden's lead and zinc concentrates, operated at a loss because of low product prices, high operating costs, and rents payable to the Government in compliance with the Swedish Mining Law. Boliden Mineral's large Laisvall lead mine, which produced about two-thirds of Sweden's concentrate, began a high-grading program of ore selection and a reduction in staff to lower production costs. Under consideration was whether or not several of Boliden Mineral's smaller lead-zinc mines would continue to operate. Cost-cutting options included improved productivity, reduced output, and possible lower Government rental rates.

Manganese.—Manganese-rich nodules were discovered in the north end of the Gulf of Bothnia between Finland and Sweden. Estimated resources exceeded 1 million tons of manganese at water depths of 200 to 350 feet. Sweden has no other manganese resources, and its steel industry had been fully dependent upon imported ferromanganese and manganese ore.

Silicon.—Construction of the silicon plant at Uddevalla, announced in 1985 by Uddevalla Kiselmetallverk AB, was delayed indefinitely because of uncertainty over the future cost of electricity, particularly as influenced by the projected termination of nuclear power in Sweden. A planned ferrosilicon plant at Malmö was put on a similar permanent hold.

Steel.—Final approval was given in October for the merger of Finland's Ovako Oy with Sweden's SKF Steel AB to form Ovako Steel AB, headquartered near Stockholm. The merger included all activities of the two specialty steel companies except plasma technology, which remained with AB SKF, the Swedish parent company. The new company was one of the largest producers of specialty steel in Europe with expected sales of about 1.2 million tons per year valued at nearly $800 million and a work force of about 7,000 employees. Plans for rationalization had not been finalized by yearend. The merged company reported a loss of about $14 million in 1986 caused by the closure of the Hallefors melt shop in Sweden and its disposal of SKF Plasma, which remained with AB SKF. Ovako's Imatra Works in Finland was to supply continuously cast billets for the Hallefors mill.

A group of U.S. producers filed a petition in October with the International Trade Commission (ITC) and the U.S. Department of Commerce concerning the alleged dumping of Swedish tube and pipe into the U.S. market. The ITC determined that there was a reasonable indication that U.S. industries were being materially injured by the imports, and Commerce found in a preliminary determination that Sweden had subsidized the products, although by only a little over 1%. Swedish imports increased about 25% compared with those of 1985 and equaled approximately 10% of the market. Both the Swedish Government and industry disclaimed the dumping.

Tungsten.—Deliveries of scheelite concentrate by Sweden's only tungsten producer, AB Statsgruvor, a subsidiary of LKAB, more than doubled to 687 tons of contained tungsten trioxide, and the inventory was reduced significantly. A long-term sales agreement was obtained with AB Sandvik Hard Materials for the major portion of the product. Nevertheless, the company showed a loss for the second consecutive year, mainly because of high underground mining costs and a 40% reduction in concentrate prices. The value of tungsten concentrate on the world market was lowered by decreased world demand, aggressive marketing by China, and the decreasing value of the U.S. dollar. Cost reduction measures, including a staff reduction from 95 to 81 employees, the sales contract, and a Government contingency loan, allowed the company to remain in operation. The loan was to be written off incrementally over a 4-year period provided the mine continued to operate. The mine supplied about 40% of domestic demand during 1986.

INDUSTRIAL MINERALS

Kyanite.—Svenska Mineral AB, a Swedish producer of ground limestone and lime, became the sole owner of Svenska Kyanite AB, which operated a new 25,000-ton-per-year quarry and beneficiation plant in western Sweden for the second successive year.

Nitrogen.—Approval of construction of the $420 million Nynas Energy Chemical Complex at Nynashamn was delayed by Government authorities until it could be guaranteed that sulfur emissions would not exceed 3 milligrams per megajoule of energy production. Four bids for the engineering work had been received prior to the August 15 deadline. Denmark's Superfos A/S subsequently withdrew from the project. Rebidding was being rescheduled to a 1987 date, and the design of the complex was being modified significantly with more emphasis on the generation of electrical power. Ammonia production was likely to become a byproduct or possibly eliminated altogether. A new partner was being sought to replace the 20% share vacated by Superfos.

Peat.—LKAB Torv A/B produced 70,000 tons of peat during its fourth summer of mining at Rautavuoma in northern Sweden, more than twice that of 1985. LKAB sold this peat division to Gallivare Varmeverk AB at yearend. Peat imports doubled to 48,000 tons.

MINERAL FUELS

A source breakdown of energy consumption in Sweden in 1986 was imported oil, 46%; nuclear power, 15%; hydropower, 15%; wood and peat, 15%; imported coal, 9%; and imported natural gas, 0.4%. All but 4% of electrical energy came from nuclear and hydropower sources. Nuclear power consumption increased by 14%, mostly at the expense of hydropower, which decreased by 16%. Total consumption of imported fuels showed little change. Parliament decided in the spring to increase significantly taxes on imported oil and coal but not on gas. In the fall, a new Ministry of Environment and Energy was formed to replace the energy administrative group that had formerly been part of the Ministry of Industry.

Parliament approved an expenditure of $170 million to replace faulty steam generators in the Ringhals nuclear power station on the west coast south of Göteborg. This largest of four nuclear power complexes in Sweden was rated at 3,380 megawatts, over one-third of the country's nuclear energy capacity. An interim 40-year storage facility for spent fuel was inaugurated in April near Oskarshamn, the site of another nuclear energy complex on the east coast about 100 miles south of Stockholm. Denmark requested that Baresback, another Swedish nuclear energy complex situated across the Ore Sund about 13 miles from Copenhagen, be closed as soon as possible. The Government of Sweden promised to take this under consideration, taking into account the economic consequences thereof.

A contract was signed with Denmark increasing deliveries of Danish gas by 50% to 21 billion cubic feet per year for the following 20-year period. Sweden had an option to further increase these deliveries by one-sixth. The gas was to supply southwestern Sweden, mostly to industries in that region. A pipeline network was being extended northward from Malmö and was expected to reach Göteborg by 1988.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Swedish kronor (SKr) to U.S. dollars at the rate of SKr7.11 = US$1.00, the average for 1986.

The Mineral Industry of Switzerland

By George A. Rabchevsky[1]

The recovery of Switzerland's economy started in the beginning of 1983 and continued in 1986. Switzerland remained one of the world's richest nations, with the highest per capita income in Western Europe and the lowest unemployment. Tourism and banking were the backbone of its economy. Zurich, canton and city, dominated banking, insurance, and industry; Bern, the domestic politics; and Geneva, international affairs.

Switzerland has the most rugged topography of the European Alps; outcrops are abundant, and the geology is extremely complex. Its scenic beauty, neutral politics, and central geographical location made Switzerland a unique country in many respects. About one-half the size of its neighbor Austria, Switzerland's population is almost equal to it. Unlike the neighboring Alpine countries, however, and despite its spectacular geology, Switzerland is not endowed with rich and abundant mineral resources, even though small occurrences of minerals are plentiful. The small size and low grade of these deposits led to their closure in the first half of this century. Thus, mining activities have come to a virtual standstill—in particular, in the field of metallic ores.[2] In 1986, a handful of industrial minerals were economically exploitable, and some metals were produced from imported ore. Except for hydroelectric power, all mineral fuels were also imported. The Swiss metalworking and related industries employed about 186,500 workers, or 6% of the total work force, contributing a sizable percentage to the gross national product.

PRODUCTION

All industries in Switzerland, including minerals, were privately owned and operated. Traditionally, salt was the only Government-owned monopoly in this sector. Unemployment decreased by 0.5% and industrial production grew by about 4%. Only six industrial mineral commodities were produced from indigenous natural resources, and aluminum continued to be the only metal produced in appreciable quantities from imported ores. All requirements for hydraulic cement were almost totally met through domestic production. Gasoline and other petroleum products were produced for domestic consumption entirely from imported crude stock.

Table 1.—Switzerland: Production of mineral commodities[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum, smelter, primary ____ metric tons__	75,256	75,974	79,173	72,742	[3]80,249
Iron and steel:					
Pig iron and blast furnace ferroalloys _____	10	10	54	66	65
Electric-furnace ferroalloys[e] _____	5	4	5	5	5
Steel, crude _____	[r]835	835	978	987	1,000
Semimanufactures, rolled products _____	780	780	800	950	950
Lead, refined, secondary _____ metric tons__	3,000	2,000	2,000	2,000	2,000
INDUSTRIAL MINERALS					
Cement, hydraulic _____	[r]4,100	[r]4,138	4,181	4,254	[3]4,393
Gypsum[e] _____	[r]90	[r]186	[r]220	[r]220	200
Lime _____	46	42	41	37	40
Nitrogen: N content of ammonia[e] _____	33	33	30	30	30
Salt _____	362	[r]317	372	374	360
Sodium compounds, n.e.s.: Carbonate[e] metric tons__	45	45	44	45	43
Sulfur, byproduct, all sources _____ do____	2,965	2,711	2,878	2,638	2,500
MINERAL FUELS AND RELATED MATERIALS					
Gas, manufactured _____ million cubic feet__	[r]1,132	[r]1,131	1,098	1,154	1,180
Petroleum refinery products:					
Liquefied petroleum gas thousand 42-gallon barrels__	1,297	1,180	1,608	1,677	1,600
Gasoline, all kinds _____ do____	9,041	9,624	8,683	9,083	9,000
Jet fuel _____ do____	1,814	2,030	2,030	1,936	2,000
Kerosene _____ do____	41	37	26	32	32
Distillate fuel oil _____ do____	12,800	13,479	13,272	13,683	13,300
Residual fuel oil _____ do____	3,315	4,547	4,703	4,382	4,500
Other refinery products _____ do____	756	702	839	721	700
Refinery fuel and losses _____ do____	1,692	1,265	1,221	1,191	1,200
Total _____ do____	30,756	32,864	32,382	32,705	32,332

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

[1]Table includes data available through Apr. 24, 1987.

[2]In addition to the commodities listed, a variety of crude construction materials (common clay, sand and gravel, and stone) is undoubtedly produced, but output is not reported, and available general information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

TRADE

Switzerland depended on imports of raw materials for domestic production of metal commodities, only a small portion of which were exported. The overall economy, however, depended on exports of finished products, tourism, and services. The neighboring Western European countries were Switzerland's main trading partners. Electrical power and fuelwood were the only energy sources that were not imported. Overall, exports slowed down owing to international price competition. The fall of prices in imported oil helped to stimulate the economy.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals ____ kilograms	23,930	2,604	551	France 196; Italy 125.
Alkaline-earth metals ____ do	104	98	NA	West Germany 19.
Aluminum:				
Ore and concentrate	(2)	10	NA	NA.
Oxides and hydroxides	288	1,445	26	France 1,090; West Germany 178.
Metal including alloys:				
Unwrought including scrap	53,895	49,570	1,063	West Germany 26,696; Italy 16,648; France 1,495.
Semimanufactures	92,225	101,668	4,717	West Germany 20,405; France 13,861; United Kingdom 10,176.
Antimony: Metal including alloys, all forms ____ kilograms	2,639	172	106	Austria 3.
Arsenic: Oxides and acids ____ do	144	148	NA	NA.
Beryllium: Metal including alloys, all forms ____ do	246	159	15	Italy 73.
Chromium: Oxides and hydroxides	19	75	1	West Germany 66; Austria 3.
Cobalt: Oxides and hydroxides kilograms	32	205	--	West Germany 9.
Columbium and tantalum: Metal including alloys, all forms, tantalum do	381	794	16	West Germany 398; France 167; Italy 19.
Copper:				
Ore and concentrate ____ do	215	(2)	--	All to Saudi Arabia.
Matte and speiss including cement copper	712	2,593	(2)	Belgium-Luxembourg 757; Italy 593; West Germany 427.
Sulfate	9	25	NA	West Germany 15; United Kingdom 2; Italy 1.
Metal including alloys:				
Scrap	15,518	13,268	129	West Germany 5,424; Austria 2,206; Hungary 1,885.
Unwrought	r5,256	5,790	--	West Germany 3,792; Italy 1,933; Israel 21.
Semimanufactures	25,779	25,730	3,079	West Germany 9,455; France 3,223.
Gold: Metal including alloys, unwrought and partly wrought thousand troy ounces	28,607	29,897	(2)	United Kingdom 79; Portugal 69; unspecified 29,615.
Iron and steel:				
Iron ore and concentrate, pyrite, roasted	75	28	--	Peru 10; France 8; West Germany 5.
Metal:				
Scrap	106,295	100,135	1	Italy 80,666; West Germany 14,155; France 1,443.
Pig iron, cast iron, related materials	1,240	829	27	West Germany 623; Peru 78; Spain 70.
Ferroalloys:				
Ferroaluminum	1	2	--	NA.
Ferrosilicon	140	115	2	Peru 38; West Germany 30; France 16.
Silicon metal	5,866	6,445	204	West Germany 4,718; Venezuela 600; Mexico 350.
Unspecified	206	199	--	West Germany 78; Peru 38; Egypt 32.
Steel, primary forms	11,952	6,721	--	Italy 3,555; France 2,665; West Germany 437.
Semimanufactures:				
Bars, rods, angles, shapes, sections	546,698	535,213	20,883	West Germany 282,316; Italy 128,369; France 46,519.
Universals, plates, sheets	131,071	96,012	1,368	West Germany 67,864; Italy 6,882; France 5,481.
Hoop and strip	33,664	35,196	44	Austria 16,023; West Germany 9,423; France 7,638.
Rails and accessories	r4,489	3,354	106	Italy 2,072; Austria 358; West Germany 222.
Wire	19,804	25,369	2,909	West Germany 12,995; France 3,651.
Tubes, pipes, fittings	185,068	210,029	13,727	West Germany 76,952; Netherlands 19,343; Denmark 16,836.
Castings and forgings, rough	8,913	10,269	40	West Germany 4,438; France 2,867; Italy 661.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides	12	5	--	Austria 2; West Germany 2.
Metal including alloys:				
Scrap	10,077	10,391	--	Italy 6,636; France 1,103; Austria 1,048.
Unwrought	6,815	4,983	--	Italy 3,081; West Germany 1,192; Netherlands 366.
Semimanufactures	30	44	1	Austria 20; West Germany 16.
Magnesium: Metal including alloys:				
Unwrought including scrap	210	202	--	West Germany 178; Denmark 7; United Kingdom 7.
Semimanufactures	613	584	66	France 140; Belgium-Luxembourg 89; Italy 77.
Manganese: Oxides	9	146	--	Singapore 131; U.S.S.R. 14.
Mercury 76-pound flasks	232	854	--	France 285; West Germany 222; Belgium-Luxembourg 133.
Molybdenum: Metal including alloys, all forms	13	12	(2)	West Germany 4; Czechoslovakia 3; United Kingdom 1.
Nickel: Metal including alloys:				
Scrap	422	256	--	West Germany 250; United Kingdom 6.
Unwrought	12	105	(2)	West Germany 97; Belgium-Luxembourg 5.
Semimanufactures	482	563	3	France 175; West Germany 145; Italy 67.
Platinum-group metals: Metals including alloys, unwrought and partly wrought thousand troy ounces	1,253	999	47	Japan 369; West Germany 189; United Kingdom 116.
Rare-earth metals including alloys, all forms kilograms	42	72	--	France 50.
Silver:				
Waste and sweepings[3] value, thousands	$213,201	$154,916	$3	Greece $117,362; West Germany $26,919; France $4,571.
Metal including alloys, unwrought and partly wrought thousand troy ounces	15,573	17,485	2	United Kingdom 565; Italy 412; unspecified 14,970.
Tin: Metal including alloys:				
Scrap	43	90	--	Netherlands 60; West Germany 30.
Unwrought	179	198	1	West Germany 109; Italy 60; Netherlands 10.
Semimanufactures	26	24	(2)	Italy 7; Netherlands 6; West Germany 2.
Titanium: Oxides	162	397	(2)	Belgium-Luxembourg 241; Turkey 62; Austria 59.
Tungsten: Metal including alloys, all forms	70	63	(2)	West Germany 29; Belgium-Luxembourg 14; United Kingdom 10.
Uranium and thorium: Oxides and other compounds	2	7	(2)	West Germany 3; United Kingdom 2.
Zinc:				
Oxides	9	22	--	France 14; West Germany 3; Brazil 2.
Blue powder	39	25	--	West Germany 18; Austria 3.
Metal including alloys:				
Scrap	1,184	1,182	--	Italy 531; West Germany 485; France 120.
Unwrought	118	137	--	Netherlands 102; West Germany 35.
Semimanufactures	87	79	--	France 38; Italy 10; Netherlands 8.
Other:				
Ores and concentrates	86	105	NA	Portugal 51; West Germany 20; Republic of South Africa 9.
Ashes and residues	15,763	15,485	11	West Germany 5,049; Belgium-Luxembourg 3,970; Italy 2,508.
Base metals including alloys, all forms	345	302	66	West Germany 148; France 30.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	25	28	(2)	France 18; West Germany 3.
Artificial:				
Corundum	207	271	18	West Germany 154; Austria 13.
Silicon carbide	6,547	5,504	NA	NA.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Abrasives, n.e.s. —Continued				
Dust and powder of precious and semiprecious stones including diamond kilograms	3,513	3,369	189	Italy 1,207; France 408; West Germany 405.
Grinding and polishing wheels and stones	1,842	1,912	32	United Kingdom 509; West Germany 338; Algeria 198.
Asbestos, crude	35	5	--	Austria 2; West Germany 1.
Barite and witherite	30	38	--	West Germany 34; Ivory Coast 3.
Boron materials:				
Crude natural borates	1	5	--	West Germany 4; Thailand 1.
Oxides and acids	5	5	--	West Germany 1; Peru 1.
Cement	17,552	16,575	--	West Germany 16,211; France 238; Austria 21.
Chalk	989	280	31	West Germany 154; France 50.
Clays, crude	28,190	50,513	(2)	West Germany 50,303; Austria 74; France 52.
Cryolite and chiolite	2	46	--	West Germany 40; Thailand 2.
Diamond:				
Gem, not set or strung value, thousands	$1,022,908	$1,002,872	$74,702	United Kingdom $558,815; Israel $214,406.
Industrial stones do.	$44,663	$39,771	$878	Italy $16,078; France $4,358; West Germany $3,480.
Diatomite and other infusorial earth	32	40	(2)	Yugoslavia 23; Italy 3; West Germany 1.
Feldspar, fluorspar, related materials	169	159	--	Peru 61; Portugal 28; Thailand 16.
Fertilizer materials:				
Crude, n.e.s	2,441	2,210	--	Austria 1,160; France 909; Oman 98.
Manufactured:				
Ammonia	10	31	4	West Germany 19; France 6.
Nitrogenous	1,946	1,953	(2)	West Germany 845; East Germany 735; U.S.S.R. 210.
Phosphatic	19	2	NA	NA.
Unspecified and mixed	r4,446	3,535	(2)	West Germany 896; Saudi Arabia 752; Ecuador 388.
Graphite, natural	14	10	1	West Germany 2; Peru 2.
Gypsum and plaster	13,847	11,970	--	France 11,820; West Germany 14; Italy 10.
Lime	2,464	787	13	Norway 386; West Germany 141.
Magnesium compounds: Oxides and hydroxides	16	16	(2)	West Germany 6; France 3.
Mica:				
Crude including splittings and waste	75	130	--	West Germany 97; Austria 7; Netherlands 7.
Worked including agglomerated splittings	397	447	3	United Kingdom 62; Sweden 59; Norway 44.
Phosphorus, elemental kilograms	199	222	--	West Germany 109.
Pigments, mineral:				
Natural, crude	32	29	--	Austria 2.
Iron oxides and hydroxides, processed	49	78	(2)	Austria 23; France 22; West Germany 21.
Potassium salts, crude	21	103	NA	West Germany (2); France (2).
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$213,566	$168,344	$26,398	United Kingdom $31,749; France $29,988.
Synthetic do.	$18,674	$20,003	$3,575	West Germany $3,657; France $2,196.
Pyrite, unroasted	--	16,853	--	West Germany 16,852; U.S.S.R. 1.
Salt and brine	102	49	(2)	France 22; Belgium-Luxembourg 6; West Germany 1.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	21,287	22,532	--	Italy 11,690; West Germany 10,398.
Sulfate, manufactured	596	178	--	Italy 80; Austria 42; France 21.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	27,507	21,978	3	West Germany 11,448; Italy 9,072; Austria 725.
Worked	9,618	8,319	2	West Germany 7,185; Austria 653; Italy 254.
Dolomite, chiefly refractory-grade	17	38	--	West Germany 23; Burma 6; Italy 2.
Gravel and crushed rock	50,497	8,972	6	West Germany 6,769; Netherlands 836; France 727.
Limestone other than dimension	21	25	NA	West Germany 23.
Quartz and quartzite	33,169	30,777	(2)	Italy 29,733; West Germany 780; Netherlands 94.
Sand other than metal-bearing	16,287	16,837	(2)	Italy 10,968; France 5,082; West Germany 581.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Sulfur:				
Elemental:				
Crude including native and by-product	8,151	4,634	--	Yugoslavia 2,992; West Germany 1,282; France 299.
Colloidal, precipitated, sublimed	3	27	--	West Germany 26.
Dioxide	4	9	--	NA.
Sulfuric acid	11,071	20,209	2	West Germany 18,156; Austria 1,310; France 620.
Talc, steatite, soapstone, pyrophyllite	126	95	(2)	Austria 45; France 11; West Germany 8.
Other:				
Crude	5,370	3,917	--	Austria 2,000; West Germany 1,370; France 128.
Slag and dross, not metal-bearing	30,347	36,051	--	West Germany 23,617; Italy 8,940; Austria 2,797.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2	3	--	All to Saudi Arabia.
Carbon black	125	253	1	Czechoslovakia 101; West Germany 97; France 14.
Coal: Anthracite and bituminous	2,503	2,204	--	All to West Germany.
Coke and semicoke	3,194	257	--	West Germany 247; Austria 7; Iraq 2.
Peat including briquets and litter	1,906	1,522	--	Austria 1,349; West Germany 173.
Petroleum:				
Crude—42-gallon barrels	4	7	--	NA.
Refinery products:				
Liquefied petroleum gas do	334,173	489,694	70	Italy 468,779; West Germany 11,693; Yugoslavia 7,679.
Gasoline do	21,930	145,852	--	Austria 145,086; West Germany 238; Hungary 119.
Mineral jelly and wax do	527	776	165	West Germany 109; Italy 102.
Kerosene and jet fuel do	287	2,464	--	Austria 2,325; West Germany 78.
Distillate fuel oil do	171,796	110,020	--	Mainly to Austria.
Lubricants do	95,361	126,084	5,229	Italy 27,118; West Germany 24,696; France 20,951.
Residual fuel oil do	2,215,556	1,938,007	--	West Germany 1,537,255; Austria 350,835; France 49,917.
Bitumen and other residues do	109	18	--	France 6; Spain 6.
Bituminous mixtures do	21,592	11,684	61	West Germany 3,388; France 2,036; Italy 903.
Petroleum coke do	319	390	72	West Germany 297.

[r]Revised. NA Not available.
[1]Table prepared by David J. Ellis.
[2]Less than 1/2 unit.
[3]May include other precious metals.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	592	519	1	West Germany 459; United Kingdom 31; France 27.
Alkaline-earth metals	2	1	--	Mainly from West Germany.
Aluminum:				
Ore and concentrate	2,370	44	NA	NA.
Oxides and hydroxides	162,234	146,751	268	Australia 134,162; West Germany 10,406; France 1,539.
Metal including alloys:				
Unwrought including scrap	63,189	78,745	153	Norway 22,660; Iceland 20,097; West Germany 16,647.
Semimanufactures	56,440	62,106	417	West Germany 31,775; Belgium-Luxembourg 7,645; Austria 6,826.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Antimony: Metal including alloys, all forms	34	27	(2)	China 26.
Arsenic: Oxides and acids	4	31	--	France 21.
Beryllium: Metal including alloys, all forms kilograms	1,308	1,019	825	West Germany 179.
Chromium: Oxides and hydroxides	576	788	3	West Germany 367; Italy 301; Spain 77.
Cobalt: Oxides and hydroxides	2	2	(2)	West Germany 1; United Kingdom 1.
Columbium and tantalum: Metal including alloys, all forms, tantalum kilograms	1,650	1,457	633	Austria 591; West Germany 150.
Copper:				
Ore and concentrate do	300	25	--	Mainly from Austria.
Matte and speiss including cement copper	8,928	11,637	54	West Germany 4,065; Chile 2,918; Belgium-Luxembourg 2,133.
Sulfate	851	802	--	U.S.S.R. 210; France 194; Italy 119.
Metal including alloys:				
Scrap	3,290	6,845	496	U.S.S.R. 2,379; West Germany 2,368; Austria 765.
Unwrought	r1,020	1,403	4	West Germany 961; Belgium-Luxembourg 184; United Kingdom 159.
Semimanufactures	82,358	89,100	515	West Germany 36,094; France 13,664; United Kingdom 13,401.
Gold: Metal including alloys, unwrought and partly wrought thousand troy ounces	24,637	28,392	1	France 95; West Germany 33; unspecified 28,251.
Iron and steel:				
Iron ore and concentrate, pyrite, roasted	10,049	6,418	--	Belgium-Luxembourg 3,850; West Germany 1,622; Italy 930.
Metal:				
Scrap	272,801	239,934	5	West Germany 185,356; France 30,706; Netherlands 13,852.
Pig iron, cast iron, related materials	79,443	70,402	1	West Germany 40,025; France 15,585; Brazil 6,067.
Ferroalloys:				
Ferroaluminum	286	301	--	United Kingdom 152; Belgium-Luxembourg 49; Spain 46.
Ferrosilicon	8,049	7,219	23	West Germany 2,971; Norway 1,149; France 1,078.
Silicon metal	179	264	(2)	West Germany 153; Norway 96; France 9.
Unspecified	17,269	15,003	--	Norway 4,984; West Germany 4,348; France 2,403.
Steel, primary forms	203,080	208,572	13	West Germany 68,617; Netherlands 47,424; United Kingdom 42,398.
Semimanufactures:				
Bars, rods, angles, shapes, sections	596,647	638,396	572	West Germany 162,710; Italy 154,217; Belgium-Luxembourg 140,361.
Universals, plates, sheets	731,224	703,501	19	West Germany 192,317; Belgium-Luxembourg 116,133; France 109,305.
Hoop and strip	253,015	238,318	485	West Germany 128,165; Netherlands 43,422; Austria 22,790.
Rails and accessories	45,968	41,748	--	Austria 25,539; West Germany 9,229; Italy 4,639.
Wire	39,364	41,945	127	West Germany 13,522; Italy 7,545; Belgium-Luxembourg 5,992.
Tubes, pipes, fittings	148,623	153,737	112	West Germany 67,731; Italy 22,743; France 17,432.
Castings and forgings, rough	12,775	14,622	28	West Germany 6,084; East Germany 3,268; Italy 1,791.
Lead:				
Ore and concentrate	(2)	3	--	All from France.
Oxides	155	265	--	West Germany 208; France 44.
Metal including alloys:				
Scrap kilograms	188	1,687	--	West Germany 1,487; France 200.
Unwrought	8,167	10,681	--	France 3,413; Canada 2,685; West Germany 1,467.
Semimanufactures	1,535	1,721	2	West Germany 1,535; Belgium-Luxembourg 135; Austria 27.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Magnesium: Metal including alloys:				
Unwrought including scrap	2,361	2,119	70	Norway 1,093; Italy 469; Canada 274.
Semimanufactures	22	56	19	West Germany 25; Italy 8.
Manganese: Oxides	1,161	1,118	(2)	Greece 810; Belgium-Luxembourg 101; Japan 74.
Mercury 76-pound flasks	1,789	1,705	--	Spain 639; West Germany 574; Netherlands 150.
Molybdenum: Metal including alloys, all forms	21	23	(2)	Austria 13; West Germany 8; France 1.
Nickel: Metal including alloys:				
Scrap	70	86	--	West Germany 32; Austria 16; Spain 14.
Unwrought	901	1,261	77	Republic of South Africa 260; Canada 165; Norway 161.
Semimanufactures	1,327	1,565	136	West Germany 963; United Kingdom 202.
Platinum-group metals: Metals including alloys, unwrought and partly wrought thousand troy ounces	1,784	1,198	132	United Kingdom 388; West Germany 178; Netherlands 170.
Rare-earth metals including alloys, all forms	5	5	(2)	France 3; Austria 1.
Silver:				
Waste and sweepings[3] value, thousands	$122,831	$67,655	$1,733	Spain $20,329; Greece $9,240; Saudi Arabia $7,565.
Metal including alloys, unwrought and partly wrought thousand troy ounces	35,301	29,047	4	West Germany 1,343; United Kingdom 1,130; unspecified 25,877.
Tin:				
Ore and concentrate kilograms	--	235	NA	NA.
Metal including alloys:				
Scrap	8	7	--	Mainly from Italy.
Unwrought	791	977	1	Malaysia 425; Netherlands 142; Indonesia 140.
Semimanufactures	345	407	(2)	West Germany 251; Netherlands 89; France 14.
Titanium: Oxides	2,290	2,348	162	West Germany 902; Belgium-Luxembourg 349; France 312.
Tungsten: Metal including alloys, all forms	75	98	22	West Germany 24; France 20.
Uranium and thorium: Oxides and other compounds	13	16	1	France 7; West Germany 5; Austria 2.
Zinc:				
Ore and concentrate	2	4	--	All from West Germany.
Oxides	1,330	1,432	(2)	France 673; West Germany 289; United Kingdom 285.
Blue powder	3,077	3,352	17	Belgium-Luxembourg 1,587; West Germany 930; France 469.
Metal including alloys:				
Scrap	466	24	--	Mainly from Italy.
Unwrought	21,441	26,363	2	Poland 7,187; West Germany 5,689; Norway 4,203.
Semimanufactures	1,162	1,536	1	West Germany 764; Belgium-Luxembourg 301; France 200.
Other:				
Ores and concentrates	3,889	4,442	--	Republic of South Africa 1,461; West Germany 1,226; Belgium-Luxembourg 567.
Ashes and residues	977	807	1	West Germany 611; Austria 60; United Kingdom 48.
Base metals including alloys, all forms	1,097	1,204	115	Belgium-Luxembourg 239; France 197; Republic of South Africa 177.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	3,720	9,462	100	West Germany 6,756; Iceland 2,334; Italy 240.
Artificial:				
Corundum	7,009	7,077	91	West Germany 3,244; Austria 2,373; France 698.
Silicon carbide	1,535	4,017	10	West Germany 3,519; Norway 243; Italy 210.
Dust and powder of precious and semiprecious stones including diamond kilograms	8,117	5,671	1,350	Ireland 3,367; West Germany 313.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Abrasives, n.e.s. —Continued				
Grinding and polishing wheels and stones	1,797	2,171	26	West Germany 1,008; Italy 335; Austria 215.
Asbestos, crude	4,772	5,058	--	Canada 1,990; U.S.S.R. 1,919; Republic of South Africa 780.
Barite and witherite	1,294	1,348	--	West Germany 808; France 497.
Boron materials:				
Crude natural borates	6,346	302	5	Netherlands 296.
Oxides and acids	444	402	(2)	West Germany 122; Turkey 98; Italy 94.
Cement	309,577	350,964	10	Italy 155,844; West Germany 115,770; France 50,027.
Chalk	30,558	38,431	22	France 30,999; Italy 5,486; West Germany 1,611.
Clays, crude	171,026	179,468	1,442	West Germany 81,103; United Kingdom 66,174; France 20,274.
Cryolite and chiolite	55	35	--	Denmark 30; West Germany 5.
Diamond:				
Gem, not set or strung value, thousands	$1,198,752	$1,036,659	$78,787	United Kingdom $733,218; Belgium-Luxembourg $72,002.
Industrial stones do.	$43,446	$38,951	$5,496	Ireland $27,334; West Germany $2,720.
Diatomite and other infusorial earth	6,244	6,920	218	Denmark 5,052; France 900; Italy 486.
Feldspar, fluorspar, related materials	11,890	17,301	--	West Germany 6,620; Italy 6,108; France 3,052.
Fertilizer materials:				
Crude, n.e.s	19,104	17,649	3	France 12,238; Italy 3,034; West Germany 1,973.
Manufactured:				
Ammonia	22,074	22,306	1	Austria 11,447; France 6,464; Czechoslovakia 2,198.
Nitrogenous	93,870	94,564	43	Austria 36,846; West Germany 18,003; Italy 12,847.
Phosphatic	107,781	92,105	813	France 62,195; Belgium-Luxembourg 26,539; Netherlands 1,854.
Unspecified and mixed	185,249	164,647	10,046	France 50,093; West Germany 40,031; Belgium-Luxembourg 22,185.
Graphite, natural	141	108	3	West Germany 82; Italy 16.
Gypsum and plaster	66,404	70,096	--	West Germany 40,469; France 15,331; Italy 14,007.
Lime	74,213	71,824	--	West Germany 37,099; Italy 34,643.
Magnesium compounds:				
Magnesite, crude	(2)	12	--	NA.
Oxides and hydroxides	4,941	5,383	10	Austria 2,954; Spain 1,581; West Germany 461.
Meerschaum, amber, jet kilograms	3	1	--	NA.
Mica:				
Crude including splittings and waste	753	611	--	France 390; West Germany 87; United Kingdom 57.
Worked including agglomerated splittings	373	388	(2)	France 230; Belgium-Luxembourg 104; India 39.
Nitrates, crude	13	14	--	All from Austria.
Phosphates, crude	6,423	6,247	--	Morocco 5,306; Israel 488; France 366.
Phosphorus, elemental	4,437	4,419	84	Italy 1,273; France 1,113; West Germany 905.
Pigments, mineral:				
Natural, crude	325	309	--	Austria 120; West Germany 107; Italy 20.
Iron oxides and hydroxides, processed	2,832	3,387	39	West Germany 3,278.
Potassium salts, crude	111,788	81,381	--	France 60,230; West Germany 18,237; East Germany 2,912.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$281,680	$210,450	$30,761	United Kingdom $37,158; Panama $24,243.
Synthetic do.	$8,162	$8,902	$1,468	France $3,290; West Germany $1,215.
Pyrite, unroasted	154	84	--	West Germany 57; Italy 26.
Salt and brine	2,084	1,932	(2)	France 1,630; West Germany 148.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	5,188	5,968	--	East Germany 2,551; West Germany 1,422; France 1,359.
Sulfate, manufactured	17,480	19,166	--	West Germany 9,671; Austria 8,293; France 1,086.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	142,369	110,346	(2)	West Germany 37,879; Austria 32,911; Italy 20,523.
Worked	114,396	125,452	1	Italy 93,787; Portugal 8,322; Austria 7,689.
Dolomite, chiefly refractory-grade	20,886	22,410	--	Italy 15,478; France 2,740; Belgium-Luxembourg 2,044.
Gravel and crushed rock thousand tons	5,445	5,785	(2)	France 3,234; West Germany 1,460; Italy 699.
Limestone other than dimension	19,060	12,805	--	France 6,311; Italy 5,799; West Germany 695.
Quartz and quartzite	23,218	35,636	382	Italy 14,925; Portugal 14,523; West Germany 5,413.
Sand other than metal-bearing thousand tons	1,355	1,506	21	Italy 662; France 367; West Germany 352.
Sulfur:				
Elemental:				
Crude including native and by-product	46,043	48,577	--	West Germany 48,517; France 45.
Colloidal, precipitated, sublimed	138	206	--	France 114; West Germany 64.
Dioxide	44	39	--	Italy 23.
Sulfuric acid	2,764	2,846	1	West Germany 2,658; Austria 165; France 12.
Talc, steatite, soapstone, pyrophyllite	13,368	13,421	--	Austria 8,980; Italy 1,834; France 1,243.
Other:				
Crude	106,342	117,215	1,587	West Germany 63,580; Spain 19,009; France 11,282.
Slag and dross, not metal-bearing	36,238	34,998	--	West Germany 22,571; France 11,511; Austria 463.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,870	1,268	120	Trinidad and Tobago 787; West Germany 341.
Carbon:				
Carbon black	4,708	5,048	151	West Germany 2,364; France 1,733; Italy 552.
Gas carbon	161	277	--	All from West Germany.
Coal:				
Anthracite and bituminous	543,702	473,541	126,425	Republic of South Africa 122,346; West Germany 79,971.
Briquets of anthracite and bituminous coal	11,851	12,473	--	West Germany 11,390; Belgium-Luxembourg 648; France 399.
Lignite including briquets	30,234	32,846	--	West Germany 31,195; East Germany 1,556; Austria 89.
Coke and semicoke	87,730	78,260	19	West Germany 52,961; France 19,235; Netherlands 3,587.
Peat including briquets and litter	59,215	61,945	--	West Germany 55,321; U.S.S.R. 5,765; Netherlands 449.
Petroleum:				
Crude thousand 42-gallon barrels	30,073	28,744	--	Libya 13,763; Nigeria 5,806; Algeria 5,413.
Refinery products:				
Liquefied petroleum gas do	13,594	12,901	(2)	West Germany 6,446; Netherlands 6,420; France 20.
Gasoline do	18,187	18,109	116	Belgium-Luxembourg 5,793; West Germany 4,596; Netherlands 1,795.
Mineral jelly and wax do	109	108	1	West Germany 65; France 16; Austria 10.
Kerosene and jet fuel do	488	656	(2)	Netherlands 142; West Germany 131; Belgium-Luxembourg 124.
Distillate fuel oil do	35,366	36,902	144	U.S.S.R. 12,333; Netherlands 6,736; Belgium-Luxembourg 5,413.
Lubricants do	563	591	8	West Germany 154; Italy 134; Netherlands 98.
Residual fuel oil do	1,687	1,485	--	West Germany 882; Belgium-Luxembourg 336; Netherlands 218.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Bitumen and other residues thousand 42-gallon barrels	944	1,023	--	West Germany 686; Italy 195; France 124.
Bituminous mixtures do	62	63	(2)	West Germany 40; France 14; Netherlands 3.
Petroleum coke do	342	364	108	West Germany 256.

rRevised. NA Not available.
[1]Table prepared by David J. Ellis.
[2]Less than 1/2 unit.
[3]May include other precious metals.

COMMODITY REVIEW

METALS

Aluminum.—The Swiss Aluminium Ltd. (Alusuisse) group reorganized its management and drastically reduced its European and worldwide primary aluminum capacity because of falling prices and high energy costs. Instead, the company planned to expand its secondary metal capacity for the processing of secondary metal and scrap, special aluminum products, and chemicals.

Alusuisse has been in the aluminum business since 1888, when it opened Europe's first aluminum electrolysis plant at Neu Lassen; at the beginning of 1986, it ranked as one of the world's largest aluminum smelters. Plans were prepared to reduce Alusuisse's worldwide smelter capacity of 808,000 tons by almost 50% in 1987. The capacity of the older plant at Chippis was to be reduced by 12,000 tons in two stages before the end of 1987. Capacity at the more modern Steg smelter was to be held at 48,000 tons per year. The company was also disposing of unprofitable operations in the United States, the Federal Republic of Germany, and Italy, but was retaining a controlling interest in the Gove bauxite mine and alumina plant in Australia.[3]

Gold.—Gold was refined from secondary materials at a new plant in Neuchâtel by Compagnie des Metaux Precieux S.A. There is no gold mining in Switzerland, and despite the abundance of outcrops throughout the Swiss Alps, little gold exploration has ever been carried out. Micham Exploration Inc., however, began drilling and evaluating gold potential in three mineralized sections. A gold showing was discovered in 1983, and the samples from a road cut graded 0.054 ounce of gold per ton. The exploration area is in the upper reaches of the Rhine River near the town of Disentis, which has some past gold mining history.[4]

Iron and Steel.—All iron ore and concentrate were imported for a nominal production of pig iron, as was scrap for the production of steel. The four steel plants were restructured and each employed fewer workers than it did in 1974. Production and productivity improved significantly in 1986, which was reflected in elevated sales and profits. The largest steelmaker, Von Roll Ltd. in Gerlafinger, reported a profit for the second year, after a loss in 1984. The company also operated a profitable steel subsidiary in the United States. A new 85-ton Demag electric arc furnace was installed by Monteforno Acciaierie Laminatoi S.A. at its Monteforno minimill. After a 1985 decision, Switzerland no longer produced any speciality steel. All imports of speciality steel were in billet form and were used almost totally for the production of long products.

INDUSTRIAL MINERALS

The production of portland cement was an important mineral-related extraction activity in Switzerland. While the production from indigenous limestone deposits remained stable, the labor, energy, and transportation costs rose. Over 50% of the cement was shipped by rail, 90% of which was in bulk form. Transportation costs were about 32% of the industry's total operating costs.[5] A grinding plant in Darlingen and another in Liesberg were shut down owing to overcapacity. Holderbank Management and Consulting Ltd. of Zurich operated 70 plants in 25 countries. Bündner Cementwerke AG in

Untevaz was building the first desulfurization plant in the Swiss cement industry.

Switzerland also produced gypsum, salt, and soda ash in appreciable quantities. Gips-Union A.G. was the only gypsum producer; salt was regulated by a state monopoly for domestic consumption only at a 400,000-ton-per-year capacity; and soda ash was produced by La Soudiere Swisse at Zurzach at a 45,000-ton-per-year capacity.

MINERAL FUELS

Other than hydropower, Switzerland possessed no abundant indigenous energy resources. The share of hydropower in electricity generation was about 58%, while nuclear energy continued to increase its share, reaching 39%. Natural gas production started only in spring of 1985, but production levels were negligible. Switzerland imported most of its gas from the Netherlands and the Norwegian sector of the North Sea through supply companies in the Federal Republic of Germany. Switzerland refined its own petroleum products, based totally on imported crude stocks. Demand for oil products remained considerably below the processing capacities for crude oil.[6] Switzerland reduced its share of oil in total energy requirements from over 64% in 1973 to about 47% in 1986. During that period, nuclear energy tripled to 19%, and solid fuel doubled to almost 5%. Gas went from an almost negligible amount to almost 5%. Exploration for oil continued with a 9-year program that started in 1983. The industry spent about $308 million[7] for energy research in the past several years.

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[1]Physical scientist, Division of International Minerals.

[2]Jaffe, F. C. Switzerland. Mineral Deposits of Europe, V. 3: Central Europe. Inst. Min. and Metall., Mineral. Soc. (London), 1986, p. 41.

[3]Metal Bulletin (London). Sept. 9, 1986.
Financial Times (London). Oct. 15, 1986.

[4]The Northern Miner (Toronto, Ontario, Canada). Oct. 20, 1986, p. 1.

[5]Rock Products. Oct. 1986, p. 34.

[6]Swiss Banking Magazine Bulletin (Zurich). V. 91, Winter 1985-86, p. 20.

[7]Where necessary, values have been converted from Swiss francs (SwF) to U.S. dollars at the rate of SwF1.95=US$1.00.

The Mineral Industry of Taiwan

By E. Chin[1]

Taiwan is an island with meager and limited resources of minerals and fuels. The total value of mine output in 1986 was only $380 million.[2] Eighty-three percent of the value was from the small amounts of coal, oil, and natural gas produced. The remainder of the value of mine production was from a collection of small operations for industrial minerals. There was no metal ore mining in Taiwan. Metal production in Taiwan was dominated by a 6-million-ton-per-year steel output capacity. The only other metal production was by a 50,000-ton-per-year copper refinery. Aluminum refining ceased in 1982.

Shipments during 1986 of selected domestically produced minerals were as follows, in thousand dollars:

Commodity	Value
Natural gas	183,454
Coal	109,947
Marble	10,532
Sulfur	8,542
Serpentine	3,124
Dolomite	2,638
China clay	1,090
Salt	990
Limestone	974
Fire clay	968
Feldspar	444
Talc	334
Mica	244
Chiolite	209
Asbestos	2
Total	323,492

Aside from fuels, the most significant shipments were of carbonate minerals, followed by byproduct sulfur, serpentine, and clays.

Taiwan's net domestic product (NDP) at current prices increased from $31.9 billion in 1980 to $54.3 billion in 1986. However, the input of mining and quarrying to the NDP decreased from 1.06% in 1980 to 0.56% in 1986. In comparison, manufacturing accounted for 39.0% of the NDP in 1986, followed by commerce, 14.9%; Government services, 9.4%; agriculture, 6.6%; housing, 5.7%; transportation and communications, 5.5%; and other, 18.3%.[3]

Employment by the mining and quarrying sector averaged 32,250 persons in 1986, with an average work month of 180 hours. Monthly wages averaged $425 per person. In comparison, manufacturing, the largest industrial sector, employs 2.3 million persons, with an average work month of 210 hours at a monthly average wage of $330.

In 1984, the Executive Yuan proposed 14 key projects, most to be completed by 1990 at an estimated cost of $20 billion. These projects included the third-phase expansion of China Steel Corp. (CSC). Other projects included the construction of a nuclear powerplant at Yanliao, a pump storage station at Sun-Moon Lake, a thermal powerplant at Taichung, harbor facilities to handle liquefied natural gas (LNG), renovation of naphtha crackers, and construction of reservoirs at Liyutan, Houku, and Ssunchungchi. The remaining six projects involved programs for telecommunications, railways, highways, subway systems, rapid mass transit services, flood control, ecological preserves, urban waste disposal, medical care, and grassroot development in rural areas.

The large industrial firms in Taiwan were Government enterprises. State-run metal producing, processing, and consuming operations included CSC, Tang Eng Iron Works Co. Ltd., Taiwan Metal Mining Corp. (TMMC), Taipei Iron Works, Taiwan Machinery Manufacturing Corp., China Shipbuilding Corp., and the Central Mint of

China. Jurisdiction over the energy sector was exercised by the Chinese Petroleum Corp. (CPC), China Petrochemical Development Corp., and Taiwan Power Co. (Taipower). Other Government enterprises included Kaohsiung Ammonium Sulphate Corp., Taiwan Alkali Co. Ltd., Taiwan Fertilizer Co. Ltd., and Taiwan Salt Works.

There were both Government and private operations for the production of coal, dolomite, limestone, and marble. Private companies accounted for 95% of the output of coal, 51% of the dolomite, 98% of the limestone, and 92% of the marble. Over 98% of the sulfur was recovered from oil refining at Kaohsiung by CPC.

PRODUCTION

Because of Taiwan's very weak minerals resource base, mine output of any ore mineral was of little consequence by world standards. The total value of mine production had declined annually from $559 million in 1981 to $380 million in 1986. Output of crude oil and associated natural gas was valued at $204 million in 1986, followed by coal, $111 million, and all other mining output, $65 million.

There was no mine production of metallic minerals. The carbonate minerals dolomite, limestone, and marble dominated the nonfuel mining sector. The remainder of the output was a small array of industrial minerals: asbestos, chiolite, clays, feldspar, gem stones, mica, salt, serpentine, sulfur, and talc.[4]

State enterprises accounted for all of the output of oil and natural gas. The output of coal, dolomite, limestone, marble, and sulfur was by a mix of state-owned enterprises and private companies. The remainder of Taiwan's mineral production was by small private companies.[5]

The total value of mining and manufacturing was $75 billion in 1985 and $80 billion in 1986. The mining sector accounted for 0.55% of the total value in 1985 compared with 0.47% in 1986.

In the manufacturing sector, the metal-producing industries were dominated by iron and steel, copper, secondary metal recovery and refining, and byproduct gold and silver, in decreasing order of production. The total value of metal production in 1986 was $3.6 billion, of which iron and steel accounted for 75%. Secondary metal recovery from ship scrapping was valued at $293 million; copper refining, $82 million; and other nonferrous metals, $501 million. In comparison, Taiwan's production of metal manufactures, such as metal products, machinery, and transport equipment, totaled $17.3 billion in 1986.

The manufacture of value-added industrial mineral products totaled $2.1 billion in 1986. This sector was dominated by cement, $1,131 million; porcelain and clay products, $363 million; and marble, $141 million.[6]

Table 1.—Taiwan: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
METALS					
Aluminum: Metal, primary	10,120	--	--	--	--
Copper: Metal, refined	47,377	37,960	48,436	46,734	50,439
Gold, primary troy ounces	71,770	52,361	37,794	30,633	29,270
Iron and steel: Metal:					
Pig iron thousand tons	2,695	3,415	3,360	3,429	3,740
Ferroalloys:					
Ferromanganese	18,665	21,763	19,803	18,508	20,040
Ferrosilocomanganese	21,311	18,509	23,082	22,688	20,933
Ferrosilicon	16,930	18,304	23,714	17,272	14,007
Steel, crude thousand tons	4,078	5,017	5,224	5,326	5,679
Lead, refinery, secondary[e]	35,000	38,000	44,300	44,400	--
Silver, primary troy ounces	504,092	345,273	364,274	366,078	405,521
INDUSTRIAL MINERALS					
Asbestos	2,392	2,819	1,355	625	--
Cement, hydraulic thousand tons	13,432	14,810	14,234	14,418	14,806
Clays:					
Fire clay	35,577	36,926	52,479	63,446	64,652
Kaolin	87,532	102,895	79,411	76,605	63,228
Feldspar	10,620	11,866	15,452	11,055	26,290

See footnotes at end of table.

Table 1.—Taiwan: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
INDUSTRIAL MINERALS —Continued					
Gypsum:					
Precipitated	1,320	1,522	1,882	2,199	2,247
Other	725	1,500			
Lime	138,126	131,862	117,496	105,132	109,690
Mica	44	311	304	114	774
Nitrogen: N content of ammonia	317,647	310,594	268,427	206,781	265,248
Pyrite, gross weight					10
Salt, marine	262,103	79,188	218,491	173,898	136,078
Sodium compounds, n.e.s.:					
Caustic soda	358,736	295,349	350,527	386,505	365,913
Carbonate (soda ash)	59,220	93,820	107,210	112,018	133,358
Stone:					
Dolomite thousand tons	261	228	258	231	258
Limestone do	11,378	13,183	12,936	12,722	12,462
Marble do	8,581	9,281	9,542	10,259	10,603
Serpentine do	119	116	123	208	234
Sulfur:					
S content of pyrite				4	5
Byproduct, all sources	20,080	26,936	28,705	42,949	62,980
Total	20,080	26,936	28,705	42,953	62,985
Talc	30,661	27,053	18,680	17,560	21,552
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	21,313	32,968	39,842	43,264	48,363
Coal, bituminous thousand tons	2,384	2,236	2,011	1,858	1,725
Coke do	159	150	141	132	148
Gas, natural:					
Gross[e] million cubic feet	48,000	48,000	49,000	44,000	40,000
Marketed do	43,526	43,689	44,698	39,731	36,111
Petroleum:					
Crude thousand 42-gallon barrels	874	847	855	743	660
Refinery products:					
Gasoline do	14,154	17,422	17,518	25,408	18,128
Kerosene do	98	86	61	282	956
Distillate fuel oil do	19,792	21,898	21,972	23,852	19,480
Lubricants do	702	835	951	856	887
Residual fuel oil do	57,133	58,019	56,426	56,080	53,591
Asphalt do	2,271	2,406	2,311	2,999	3,195
Other[2] do	1,442	3,449	8,517	9,916	3,478
Refinery fuel, losses and not reported[e 3] do	25,000	27,000	27,000	30,000	25,000
Total do	120,592	131,115	134,756	149,393	124,715

[e]Estimated. [p]Preliminary.
[1]Includes data available through July 2, 1987.
[2]Naphtha, solvent oil, and base oil.
[3]Includes liquefied petroleum gas and jet fuel.

TRADE

The value of Taiwan's exports in 1986 was $36.8 billion, and that for imports, $24.2 billion. The United States, Japan, and Hong Kong, in that order, continued to be Taiwan's major trading partners. Shipments to the United States were valued at $20.2 billion, followed by Japan, $4.8 billion; Hong Kong, $3.1 billion; and Australia and Canada, each with $1.4 billion. Receipts from Japan were $8.8 billion, followed by the United States, $5.8 billion; and collectively from Australia, Canada, the Federal Republic of Germany, Hong Kong, and Saudi Arabia, $4.1 billion.

Taiwan is dependent on foreign sources for fuels and minerals. In 1986, imports were valued at $2,038 million for oil and $535 million for coal. Imports of metals were valued at $2,663 million; metallic mineral ores, $203 million; and industrial minerals, $141 million.

Taiwan's economy is export oriented. The largest export categories were electrical machinery, $8,847 million; textiles, $8,549 million; and plastic products, $3,509 million. Exports of transportation equipment were valued at $1,681 million; machinery, $1,589 million; and chemicals, $1,479 million.[7]

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	3,564	4,734	--	Republic of Korea 3,320; Panama 750.
Metal including alloys, all forms	15,396	32,186	1,035	Hong Kong 20,914; Japan 7,375.
Chromium: Oxides and hydroxides	6	--		
Columbium and tantalum: Metal including alloys, all forms, tantalum	22	22	15	Japan 6.
Copper:				
Matte and speiss including cement copper	13	7	--	All to Peru.
Sulfate	910	161	--	Australia 60; Philippines 41.
Metal including alloys:				
Scrap	6,495	7,453	95	Japan 6,338.
Unwrought	300	90	19	Republic of Korea 50.
Semimanufactures	14,635	12,666	824	Hong Kong 3,654; Saudi Arabia 3,061; Singapore 1,458.
Gold: Waste and sweepings	18	21	21	
Iron and steel: Metal:				
Scrap	202,414	388,225	22	Thailand 282,491; Japan 63,731.
Pig iron, cast iron, related materials	1,157	2,186	1,254	Republic of Korea 200; United Kingdom 132; Japan 106.
Ferroalloys	5,852	2,689	6	Indonesia 943; Japan 543; Thailand 417.
Steel, primary forms	107,728	159,078	5,261	Japan 68,850; Singapore 28,604; Philippines 27,783.
Semimanufactures, thousand tons	1,852	1,735	225	Japan 438; Singapore 141; Saudi Arabia 134.
Lead:				
Ore and concentrate	15	--		
Oxides	21	--		
Metal including alloys, all forms	16,046	20,755	7	Japan 8,784; Republic of Korea 7,790.
Magnesium: Metal including alloys, all forms	495	466	215	Japan 129; Netherlands 121.
Manganese:				
Ore and concentrate	20	(2)	--	All to Singapore.
Oxides	1	--		
Molybdenum: Metal including alloys, all forms, kilograms	6,531	1,497	140	Netherlands 1,191.
Nickel: Metal including alloys:				
Scrap	1,825	1,889	--	Japan 1,845.
Unwrought and semimanufactures	57	402	2	Australia 207; Netherlands 184.
Platinum-group metals:				
Waste and sweepings[3]	62	10	1	Hong Kong 8.
Metals including alloys, unwrought and partly wrought, troy ounces	482	1,575	--	Switzerland 579; Sweden 514; Hong Kong 322.
Rare-earth metals including alloys, all forms	23	15	--	Indonesia 14.
Silicon, high-purity	26	(2)	(2)	Singapore (2).
Silver:				
Ore and concentrate[3] value, thousands	$3	--		
Waste and sweepings	1	--		
Metal including alloys, unwrought and partly wrought, troy ounces	8,809	30,543	--	Hong Kong 27,360.
Tin:				
Oxides, kilograms	1,448	267	--	All to Hong Kong.
Metal including alloys, all forms	339	401	20	Hong Kong 153; Japan 130.
Titanium: Oxides	57	30	--	Canada 18; Singapore 6.
Tungsten: Metal including alloys, all forms	17	63	35	Netherlands 20.
Uranium and/or thorium: Metal including alloys, all forms	137	65	28	Japan 7; Malaysia 7; Nigeria 5.
Zinc:				
Oxides	2,843	2,760	--	Japan 2,265.
Blue powder	865	182	(2)	Japan 180.
Metal including alloys, all forms	2,002	997	566	Japan 198; Hong Kong 59.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	14	26	6	Indonesia 9; Malaysia 8.
Artificial: Corundum	426	388	--	Japan 365.
Dust and powder of precious and semiprecious stones including diamond, kilograms	2,844	9,155	645	Italy 6,883; Canada 1,520.
Grinding and polishing wheels and stones	2,888	2,724	1,418	Thailand 273; Indonesia 214; Singapore 185.
Asbestos, crude	100	--		
Boron materials: Oxides and acids, kilograms	1,203	91	--	All to Singapore.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Cement—thousand tons	3,467	3,994	3	Hong Kong 1,252; Singapore 1,157; Japan 630.
Clays, crude	974	2,032	--	Philippines 1,845.
Diamond:				
Natural:				
Gem, not set or strung—thousand carats	27,990	6,600	5,230	Republic of South Africa 1,200.
Industrial stones—do.	180	34,800	33,800	Thailand 1,000.
Synthetic:				
Gem, not set or strung—do.	r5,180	16,520	8,775	Canada 2,500; Republic of Korea 1,500; Thailand 1,400.
Industrial stones—do.	29,240	164,990	--	Thailand 83,260; Republic of Korea 73,160.
Diatomite and other infusorial earth	226	60	--	Japan 50.
Feldspar, fluorspar, related materials	26	12	--	Mainly to Malaysia.
Fertilizer materials: Manufactured:				
Ammonia	153	34	--	Philippines 20; Hong Kong 14.
Nitrogenous	2,756	1,025	(2)	Japan 1,020.
Potassic	6,600	12,600	--	Japan 12,300.
Unspecified and mixed	37,803	2,455	14	Singapore 1,750; Malaysia 422.
Graphite, natural	237	188	--	Japan 108; Philippines 30.
Gypsum and plaster	228	553	--	Indonesia 532.
Iodine—kilograms	1,700	2,379	--	Republic of Korea 1,500; Philippines 554.
Magnesium compounds, unspecified	380	--	--	
Meerschaum, amber, jet—kilograms	16	25,389	1,938	Malaysia 16,820.
Mica, all forms	295	337	(2)	Japan 174; New Zealand 89.
Pigments, mineral: Iron oxides and hydroxides, processed	2	2	(2)	Republic of South Africa 1.
Precious and semiprecious stones other than diamond:				
Natural—kilograms	129,304	104,073	46,856	Italy 16,773; Hong Kong 15,705; Japan 8,042.
Synthetic—do.	79,016	37,918	5,381	Italy 16,826; Saudi Arabia 3,930.
Salt and brine	1,239	1,472	36	Hong Kong 1,200.
Sodium compounds, n.e.s.: Sulfate, manufactured	33,168	31,292	--	Japan 9,602; Republic of Korea 4,414; Singapore 3,766.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	9,300	7,132	13	Japan 6,619.
Worked	44,926	45,062	1,767	Saudi Arabia 34,850.
Dolomite, chiefly refractory-grade	25,612	47,250	--	Japan 44,740.
Gravel and crushed rock	274,864	193,614	16	Japan 192,181.
Limestone other than dimension	157	10,129	--	Malaysia 8,200; Japan 1,700.
Quartz and quartzite	135	--	--	
Sand other than metal-bearing	273,333	337,972	3	Japan 336,892.
Sulfur:				
Elemental:				
Crude including native and byproduct	2,783	1,497	--	Indonesia 1,291.
Colloidal, precipitated, sublimed	219	75	--	Indonesia 50; Philippines 18.
Sulfuric acid	1,298	246	--	Hong Kong 162; Australia 56.
Talc, steatite, soapstone, pyrophyllite	1,007	509	--	Indonesia 208; Philippines 180.
Other:				
Crude	2,902	1,628	135	Thailand 615; Malaysia 272.
Slag and dross, not metal-bearing	82,686	60,059	300	Japan 58,200.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	5,691	9,281	11	Indonesia 5,501; Hong Kong 1,715; Thailand 875.
Coal, all grades including briquets	r17	(2)	--	All to Saudi Arabia.
Coke and semicoke	12,031	9,364	--	Indonesia 5,382; Thailand 2,000.
Peat including briquets and litter	49	18	--	All to Japan.
Petroleum refinery products:				
Gasoline, motor—42-gallon barrels	25	9	--	Mainly to Japan.
Mineral jelly and wax	1,157	551	16	Indonesia 291; Hong Kong 126.
Kerosene and jet fuel—thousand 42-gallon barrels	10,021	11,210	(2)	Japan 3,974; Singapore 3,694.
Distillate fuel oil—do.	7,582	7,932	--	NA.
Lubricants—do.	821	724	427	United Arab Emirates 122; Republic of Korea 67.

rRevised. NA Not available.
[1]Table prepared by Audrey D. Wilkes.
[2]Less than 1/2 unit.
[3]May include other precious metals.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	55,241	19,518	--	Malaysia 19,458.
Oxides and hydroxides	7,189	7,680	302	Japan 6,932.
Metal including alloys:				
Scrap	6,483	6,237	2,375	Republic of South Africa 836; United Kingdom 549.
Unwrought	99,923	147,204	20,184	Republic of South Africa 32,772; Australia 32,696; Canada 22,323.
Semimanufactures	22,801	32,293	892	Japan 11,855; Australia 10,037.
Antimony: Oxides	NA	380	30	France 170; Japan 84.
Arsenic: Oxides and acids	432	368	(2)	France 248; Republic of Korea 59.
Cadmium: Oxides and hydroxides	NA	249	(2)	Republic of Korea 123; Belgium-Luxembourg 118.
Chromium:				
Ore and concentrate	3,514	10,726	--	India 9,601; Republic of South Africa 962.
Oxides and hydroxides	2,528	1,938	340	Japan 902; West Germany 457.
Cobalt: Oxides and hydroxides	43	23	--	Belgium-Luxembourg 16.
Copper:				
Ore and concentrate	212,923	160,931	10,636	Canada 127,635.
Sulfate	448	364	29	Japan 296.
Metal including alloys:				
Scrap	34,016	28,400	19,773	Hong Kong 2,930; Singapore 1,605.
Unwrought	91,134	47,665	280	Philippines 23,157; Japan 6,290; Zaire 3,119.
Semimanufactures	52,877	41,378	1,798	Japan 28,997; Republic of Korea 5,208.
Gold:				
Bullion, troy ounces	964,801	376,591	--	United Kingdom 210,227; Switzerland 166,364.
Metal including alloys, unwrought and partly wrought, thousand troy ounces	1,677	1,109	346	Japan 756.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite, thousand tons	5,199	4,896	NA	Australia 2,701; Brazil 1,793.
Pyrite, roasted	15,151	11,360	--	Mainly from Philippines.
Metal:				
Scrap	577,658	694,665	447,562	Hong Kong 124,053; Japan 70,933.
Pig iron, cast iron, related materials	217,749	180,392	526	Brazil 115,376; Republic of South Africa 28,689.
Ferroalloys	15,767	16,159	232	Republic of South Africa 12,994.
Steel, primary forms	279,319	242,557	4	Brazil 110,332; Republic of South Africa 75,297.
Semimanufactures, thousand tons	1,327	1,196	18	Japan 1,029.
Lead:				
Ore and concentrate	11	(2)	--	All from Indonesia.
Oxides	2,959	2,754	3	Australia 2,165.
Metal including alloys:				
Scrap	56,773	54,839	28,361	Australia 6,420; Saudi Arabia 6,131; Jordan 4,399.
Unwrought	11,596	12,272	623	Australia 7,993; Japan 2,299; Namibia 901.
Semimanufactures	130	29	15	Japan 9.
Magnesium: Metal including alloys, all forms	836	720	225	Norway 227; France 168.
Manganese:				
Ore and concentrate	97,160	128,970	190	Republic of South Africa 47,546; Gabon 29,310; Indonesia 26,414.
Oxides	1,709	1,624	2	Japan 741; Republic of South Africa 408.
Metal including alloys, all forms	22	35	3	Republic of South Africa 11; Netherlands 9.
Mercury, 76-pound flasks	324	290	146	Japan 137.
Molybdenum: Metal including alloys, all forms	90	60	43	West Germany 10.
Nickel:				
Matte and speiss	1,949	2,938	--	All from Canada.
Metal including alloys:				
Scrap	136	396	189	Netherlands 161.
Unwrought	4,497	3,863	28	Canada 2,263; Norway 953.
Semimanufactures	399	302	17	Japan 98; Australia 64; United Kingdom 42.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals:				
Ore and concentrate[3] value, thousands	$33	$35	$17	United Kingdom $17.
Metals including alloys, unwrought and partly wrought thousand troy ounces	80	69	2	Hong Kong 30; United Kingdom 16; Japan 12.
Rare-earth metals including alloys, all forms	150	178	16	Japan 105; West Germany 43.
Selenium, elemental	9	34	--	Norway 18; Japan 11.
Silicon, high-purity	1,634	1,609	9	Norway 825; Canada 246; France 198.
Silver:				
Waste and sweepings[3] value, thousands	$896	$387	$377	Japan $7.
Metal including alloys, unwrought and partly wrought thousand troy ounces	5,720	1,515	147	Japan 875; United Kingdom 100; Hong Kong 85.
Tin: Metal including alloys, all forms	2,575	2,090	14	Malaysia 669; Hong Kong 520; Indonesia 242.
Titanium: Oxides	10,302	9,950	242	Japan 4,655; West Germany 3,793.
Tungsten: Metal including alloys, all forms	48	46	7	Japan 28.
Uranium and/or thorium: Oxides and other compounds	12	20	(2)	France 10.
Zinc:				
Oxides	280	210	10	Japan 90; Republic of Korea 86.
Blue powder	231	244	--	Greece 92; West Germany 55.
Metal including alloys:				
Scrap	13,322	19,837	13,095	United Kingdom 2,734; West Germany 1,057.
Unwrought	51,585	54,423	32	Australia 21,787; Japan 11,056; Canada 10,901.
Semimanufactures	953	784	7	Japan 738.
Other:				
Oxides and hydroxides	NA	330	30	Australia 199; Japan 44.
Ashes and residues	22,883	19,013	6,997	Australia 4,405; Japan 3,085.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	3,240	2,726	390	Japan 1,672; France 298.
Artificial: Corundum	9,740	8,779	37	Japan 4,126; Hong Kong 1,756; Brazil 1,565.
Asbestos, crude	31,764	24,519	958	Canada 13,868; Republic of South Africa 7,495.
Barite and witherite	7,914	4,131	--	Mainly from Thailand.
Boron materials:				
Crude natural borates	1,474	2,142	--	Japan 1,129; Netherlands 995.
Oxides and acids	1,266	1,684	1,550	Turkey 37; Italy 36.
Bromine	57	14	14	
Cement	1,108	5,232	79	Denmark 2,861; Japan 1,828.
Clays, crude:				
Bentonite	14,040	16,623	14,296	India 1,109; Japan 509.
Fire clay	947	457	--	Japan 415.
Kaolin	82,337	80,129	40,526	Indonesia 12,985; Malaysia 7,565; Hong Kong 6,762.
Unspecified	142,106	128,317	5,178	Hong Kong 64,046; Japan 37,141; India 11,080.
Cryolite and chiolite	143	216	--	All from Denmark.
Diamond:				
Natural:				
Gem, not set or strung thousand carats	80	[4]105	55	Italy 50.
Industrial stones do	175,535	[5]620	80	Japan 405; Philippines 130.
Synthetic:				
Gem, not set or strung do	335	885	335	Belgium-Luxembourg 500.
Industrial stones do	15,480	2,075	40	Japan 1,940.
Diatomite and other infusorial earth	4,692	3,544	2,116	Japan 1,124.
Feldspar, fluorspar, related materials	110,482	140,593	736	Thailand 42,852; Hong Kong 28,565; Japan 24,614.
Fertilizer materials: Manufactured:				
Nitrogenous	171,290	176,530	(2)	Saudi Arabia 173,433.
Phosphatic	20	64	--	All from Japan.
Potassic	186,908	130,566	496	Canada 64,766; Jordan 34,280; Israel 18,003.
Unspecified and mixed	15,581	8,218	5,721	West Germany 1,221; Japan 910.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Graphite, natural	6,574	8,428	57	Republic of Korea 7,250; Japan 496.
Gypsum and plaster	332,696	411,838	411	Thailand 301,779; Japan 69,421; Australia 39,899.
Iodine	19	35	5	Japan 30.
Magnesium compounds:				
Oxides and hydroxides	7,454	8,027	38	Japan 7,319.
Other	20,264	20,242	--	India 12,360; Malaysia 5,520.
Mica:				
Crude including splittings and waste	294	193	27	India 67; Japan 59.
Worked including agglomerated splittings	203	452	(2)	Japan 359.
Phosphates, crude	367,089	308,858	(2)	Jordan 200,798; Morocco 85,280; Israel 15,020.
Phosphorus, elemental	1,137	1,404	424	Republic of South Africa 633; Netherlands 308.
Pigments, mineral:				
Natural, crude	9	10	--	Japan 9.
Iron oxides and hydroxides, processed	17,757	16,694	123	Japan 11,539; West Germany 1,689.
Precious and semiprecious stones other than diamond:				
Natural	2,985	3,166	78	Brazil 1,280; Republic of South Africa 1,147.
Synthetic	27	13	1	Italy 7; Japan 3.
Salt and brine	711,505	805,115	7	Australia 771,265.
Sodium compounds, n.e.s.: Carbonate, natural and manufactured	15,631	17,564	15,029	Kenya 2,190.
Stone, sand and gravel:				
Dimension stone: Crude and partly worked	52,168	45,829	32	India 14,992; Italy 10,378; Republic of Korea 4,978.
Dolomite, chiefly refractory-grade	2,444	2,052	35	Japan 956; United Kingdom 823.
Limestone other than dimension	1,940	20	20	
Quartz and quartzite	818	2,103	--	India 1,110; Hong Kong 318; Republic of Korea 318.
Sand other than metal-bearing	15,628	9,459	140	Malaysia 3,800; Australia 3,318.
Sulfur:				
Elemental:				
Crude including native and byproduct	63,374	74,955	3,261	Canada 61,751; Japan 9,943.
Colloidal, precipitated, sublimed	243,935	158,334	6,377	Canada 113,421; Japan 38,511.
Sulfuric acid	82,535	98,406	193	Japan 98,201.
Talc, steatite, soapstone, pyrophyllite	9,915	10,744	1,311	Republic of Korea 4,400; Thailand 2,158; Hong Kong 1,291.
Vermiculite	302	461	--	United Kingdom 146; Republic of South Africa 144; India 94.
Other:				
Crude	133,780	118,000	5,297	Republic of Korea 97,169.
Slag and dross, not metal-bearing	6,862	16,775	135	Japan 13,476.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	71	155	95	United Kingdom 37.
Carbon black	4,133	4,601	782	Australia 1,415; Japan 1,353.
Coal, all grades including briquets thousand tons	7,684	10,270	3,161	Australia 5,484; Republic of South Africa 979.
Coke and semicoke	203,000	172,957	(2)	Japan 172,880.
Peat including briquets and litter	144	209	--	Finland 122; Sweden 33.
Petroleum:				
Crude thousand 42-gallon barrels	130,361	119,944	(2)	Saudi Arabia 43,850; Kuwait 21,979; United Arab Emirates 18,487.
Refinery products:				
Liquefied petroleum gas do	5,001	4,429	--	Saudi Arabia 3,146; Kuwait 700.
Mineral jelly and wax do	102	109	17	Japan 57; Belgium-Luxembourg 19.
Distillate fuel oil do	9,622	3,965	2,476	Singapore 1,137.
Lubricants do	483	457	139	Japan 191.
Nonlubricating oils do	87	127	18	Japan 39; Philippines 39.
Petroleum coke do	298	188	154	Japan 33.

NA Not available.
[1]Table prepared by Audrey D. Wilkes.
[2]Less than 1/2 unit.
[3]May include other precious metals.
[4]Excludes unreported quantity valued at $1,159,300.
[5]Excludes unreported quantity valued at $80,400.

COMMODITY REVIEW

METALS

Metal mining in Taiwan is sporadic and limited to copper and iron sands. During the period 1984-86, there was no mine output of metallic ores. Taiwan's primary metals industry is limited to copper and iron and steel.

Aluminum.—Aluminum production by Taiwan Aluminium Corp. (Talco) at its Kaohsiung smelter ceased in 1982. Taipower planned to purchase the outstanding shares in Talco in 1987 for payment of its debts. Talco continued limited operation of its rolling mills. In 1986, Talco produced 9,343 tons of aluminum sheet and 1,527 tons of foil from imported ingot.

Copper.—TMMC operated a 50,000-ton-per-year smelter-refinery complex at Juifang. The smelter used imported concentrate primarily from Canada and the Philippines. In addition to refined copper, TMMC produced byproduct silver and gold from anode sludge. Despite the financial losses from the high-interest rates of its loans and lower copper prices, the complex was operated at full capacity in 1986. Because of mounting financial liabilities, Taipower planned to purchase the smelter-refinery and other properties of TMMC in 1987 in order to dissolve the company.

Iron and Steel.—CSC operated the country's only integrated iron and steel facility at Kaohsiung. In July 1984, CSC launched a $1.4 billion expansion of its Kaohsiung complex. Installation of blast furnace No. 3 was expected in November 1987, whereby CSC's capacity would increase from 3.2 million tons to 5.6 million tons. All of CSC's raw material requirements of iron ore and coking coal were met by imports.

There were numerous small mills operating electric furnaces and rolling facilities. These private operations simply melt scrap and produce small sections such as reinforcing bars for the construction industry. The collective annual output capacity of these mills was close to 2.2 million tons.

Taiwan's shipbreaking capacity was the largest in the world. Of the 169 vessels sold for demolition in 1986, Taiwan purchased 75 vessels with a total deadweight of 9.3 million tons. This tonnage constituted 63% of all the vessels sold for demolition. The shipbreaking industry provides scrap ferrous metal for CSC and the small steel mills in Taiwan.

Nickel.—Talent Metals Corp. operated a 7,000-ton-per-year nickel smelter at Kaohsiung. Talent Metals was a joint venture between Inco Ltd. of Canada (30% equity ownership) and Taiwanese interests. Nickel oxide was imported from Canada to produce shot and pig. Tang Eng was the major customer for the nickel produced by Talent Metals for its 130,000-ton-per-year stainless steel plant in Kaohsiung. Sixty percent of Tang Eng's production capacity was nickel-based stainless steel. Talent Metals was experiencing financial difficulties, and its debts were mounting. The company intended to file for bankruptcy in early 1987, at which time the Government of Taiwan was to purchase the facility and reorganize it into Taiwan Nickel Refining Co.

INDUSTRIAL MINERALS

Taiwan produced a limited array of industrial minerals, whose individual outputs were insignificant by world standards. Government-owned operations accounted for all of the output of salt from evaporites at Chiayi, Kaohsiung, and Taiwan Prefectures and at Taiwan City, as well as for all of the gypsum output from Chiayi Prefecture and Taiwan City. Private companies accounted for all of the output of asbestos, clays, feldspar, gem stones, mica, pyrite, quartz crystal, serpentine, and talc. Government-owned operations accounted for 47% of the output of dolomite, less than 1% of limestone, 9% of marble, and 99% of sulfur.[8]

Cement.—There were 11 companies operating 17 plants for the production of cement. All of the large producers operated captive limestone quarries. Production was close to 15 million tons. During the year, 11.3 million tons of cement was domestically consumed and 3.5 million tons was exported.

Fertilizer Materials.—Kaohsiung Ammonium Sulphate and Taiwan Fertilizer, both Government-owned enterprises, dominated the fertilizer industry. Virtually all of the raw material requirements for fertilizer production were imported. Fertilizer production was close to 1.4 million tons, and domestic shipments were valued at $178 million.

Other Industrial Minerals.—E. I. du Pont de Nemours & Co. Inc.'s proposal to construct a 60,000-ton-per-year titania plant in Lukang, Changhua County, was blocked by

local residents. Government authorities were not able to assuage the public concern over possible adverse environmental considerations. PPG Industries Inc. completed the expansion of its precipitated silica plant in Taichung, doubling the annual output capacity to 20,000 tons. In addition, PPG entered into a joint venture agreement with China Petrochemical Development to construct a chlorine-caustic soda plant in Taiwan.

MINERAL FUELS

Taiwan has meager resources of mineral fuels. Annual coal production has steadily declined since 1980. In 1986, only 1.7 million tons of coal was mined in comparison to imports of 11.0 million tons. Over 99% of mine production was by small private companies. Sixty-three percent of the coal mined was in Taipei Prefecture, followed by 15% for Miaoli Prefecture, 10% for Keelung City, and 8% for Hsinchu Prefecture. The remainder of the production was in Taoyuan Prefecture and Taipei City. Because of a series of mine explosions, a number of mines were shut down. There were currently 108 pits in operation.

Taiwan produces very modest quantities of natural gas and associated oil condensate. About 60% of the natural gas output is from one offshore well in northwestern Taiwan near Hsinchu. The remainder of the output was from gas wells in Miaoli Prefecture.

Taiwan's total supply of primary energy was 39.3 million kiloliters of oil equivalence. Twenty-nine percent of the supply was from domestic production. Nuclear energy accounted for 62% of the domestic production, followed by hydropower, 15%; coal and natural gas, each 11%; and oil condensate, the remainder. The bulk of the energy supply was from imports of mineral fuels. Receipts of crude oil in 1986 were valued at $2,038 million, and $535 million for coal. The largest consumer of commercial energy was the transportation sector, followed, in order, by chemicals, metal manufacture, industrial mineral products, textiles, and the energy sector. The mining sector accounted for only 0.4% of the total consumption of commercial energy.

CPC signed a 20-year contract to import 1.5 million tons of LNG annually from Indonesia beginning in 1990. CPC will construct an LNG receiving facility at an estimated cost of $750 million, which is expected to be completed in 1989. The Council for Economic Planning and Development later gave CPC approval to plan the expansion of the receiving station to 3.0 million tons per year. The LNG will be used to generate electricity as well as be used as an industrial and household fuel.

Nuclear power generation in Taiwan began in late 1977 and has grown annually. Nuclear generation presently accounts for 18% of the total supply of primary commercial energy. Because the nuclear power sector was to be further expanded, Taipower was to secure foreign sources of uranium. On July 16, 1986, Taipower and Rocky Mountain Energy Co., a subsidiary of Union Pacific Corp. of the United States, ratified a 5-year agreement for uranium exploration in Wyoming. Taipower will provide one-third of the total joint venture capital of $18 million. Under the terms of the agreement, Taipower will have purchase rights to all uranium ore discovered during the exploration program.

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[1]Physical scientist, Division of International Minerals.
[2]Where necessary, values have been converted from New Taiwan dollars (NT$) to U.S. dollars at the rate of NT$37.76=US$1.00 in 1986.
[3]American Institute in Taiwan. U.S. State Dep. Aitgram A-024, May 20, 1987.
[4]Council for Economic Planning and Development (Taipei). Industry of Free China. V. 67, No. 3, Mar. 1987, p. 94.
[5]Taiwan Provincial Bureau of Mines (Taipei). Reconstruction Statistics of Taiwan Province 1986. Part III. The Mining and Quarrying. 1986, p. 184.
[6]Ministry of Economic Affairs (Taipei). Industrial Production Statistics Monthly. V. 213, May 1987, p. 160.
[7]Ministry of Finance (Taipei). Monthly Statistics of Exports and Imports. No. 210, Feb. 1987, p. 320.
[8]Work cited in footnote 5.

The Mineral Industry of Thailand

By Gordon L. Kinney[1]

The Thai mining and quarrying sector was one of the smaller components of the gross national product (GNP), accounting for 2.9% of the total. However, the mining sector was gaining in importance as an increasing proportion of the mineral output was being consumed domestically or being further processed for added value before being exported. Domestically consumed minerals were given tax and royalty concessions to encourage their use. Thailand produced 36 minerals plus natural gas, lignite, and petroleum. Low world prices continued to affect the value of mineral output, which dropped about 16% in 1986. Lower tin prices, following the collapse of the International Tin Council's (ITC) price support system, accounted for much of the decrease in value. The value of barite, fluorite, and tungsten ores also declined because of lower demand and lower prices.

Only 5 of Thailand's minerals ranked in the top 10 in world production. These were barite, fluorite, tantalum, tin, and tungsten. Thailand's plans to become a major world supplier of intermediate tantalum compounds were snuffed out as Thailand Tantalum Industry Co. Ltd.'s (TTIC) tin slag processing plant was destroyed by fire, just weeks before it was scheduled to begin operations.

The energy situation was in a state of flux as lower world oil prices forced changes in the Thai consumption pattern and production and exploration plans. Domestic gas consumption declined as imported fuel oil became more competitive. Unocal Thailand Ltd., Thailand's main gas producer, was faced with diminishing revenue and a poor outlook for an early recovery of energy prices. It therefore cut back on expenditures for exploration and new production facilities.

The Government Board of Investment (BOI) granted promotional privileges for a lead smelting project. Most of the lead ingot would be for domestic consumption, thereby saving considerably on import costs.

Lower interest rates, energy costs, strong export sales, and relatively stable internal conditions all helped the economy in 1986 while lower mineral and commodity prices and a world trend toward protectionism on the trade front were negative factors. The Government has encouraged exports through its fiscal and monetary policies.

The Consumer Price Index increased only 1.9% compared with 2.5% in 1985. The balance of payments recorded a substantial improvement compared with that of 1985. Overall, the GNP rose to $14.9 billion,[2] a 3.8% increase over that of 1985 at constant 1972 prices. The Thai press indicated that the 4% growth reported in 1985 was being revised downward to 3.2%. Thus, the 1985-86 "recession" was more severe than originally thought. Most observers predicted a growth of 5% in 1987, and inflation was expected to remain at a low level.

The ongoing countrywide airborne geophysical survey has fallen somewhat behind schedule. The electromagnetic phase of the work was delayed in 1986 and rescheduled to start in April 1987 and should take about a year. The overall survey was reportedly the biggest of its type ever attempted in the world. The project was being funded in part by a $38 million Asian Development Bank loan. The survey will provide a complete geophysical map of the country and should reveal promising areas for various types of mineral development. Seismic survey work was under way on the Khorat Plateau in the search for exploitable potash deposits.

The joint Department of Mineral Resources (DMR)-United Nations Development Program showed the existence of economic deposits of tin and other heavy minerals in the offshore areas of Phangnga Province in southern Thailand. More detailed investigations are to be directed toward the values of the byproduct minerals such as ilmenite, monazite, stuverite, and zircon. A similar joint endeavor was reportedly to be conducted off the eastern Province of Rayong.

PRODUCTION

The value of mineral output declined to $346 million in 1986 compared with $412 million in 1985. The reported production of tin concentrate and ingot remained about the same as that of 1985. The output, however, was actually much less from the mines because a good proportion of the concentrate entering the market was stockpiled material held at the mines or at the Thailand Smelting and Refining Co. (Thaisarco) smelter because of ITC production restrictions during 1985. The Kuala Lumpur Tin Market (KLTM) tin prices will strongly influence the 1987 level of mine production. A price increase of 10% to 15% would definitely increase the output of many mines that were operating well below capacity during 1986, and probably bring a number of closed mines back into operation. Any decline in prices from the 1986 yearend closing would force many of the remaining Thai tin producers out of business.

Production of tantalum compounds, scheduled to begin in midyear, was delayed by at least 2 years because of a fire at the TTIC tantalum processing plant in Phuket. Construction of a small lead smelter was under way, and lead ingot production should begin in 1987. The slump in worldwide oil exploration was the cause of the much lower barite production. Lower demand and strong competition from other suppliers caused the decline in fluorite output. The increase in gypsum production reflected higher demand on the export market, while the lignite increase was due to more power generation and additional domestic industries using the relatively inexpensive fuel for their energy needs.

Table 1.—Thailand: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
METALS					
Antimony:					
Ore and concentrate:					
Gross weight	1,567	2,808	4,636	2,917	2,397
Sb content[e]	666	1,193	1,970	1,240	1,019
Metal, smelter	28	13	--	135	386
Columbium and tantalum ores and concentrates, gross weight:[2]					
Columbite and tantalite:					
Gross weight kilograms	39,000	549,000	477,000	432,000	122,000
Cb content do	6,600	93,300	81,000	73,400	20,740
Ta content do	9,000	126,300	128,800	116,640	32,940
Stuverite:					
Gross weight do	10,000	275,000	30,000	309,000	240,000
Cb content do	780	22,100	2,400	24,800	19,300
Ta content do	800	21,400	2,300	24,000	18,700
Iron and steel:					
Iron ore:					
Gross weight	26,750	40,304	60,670	93,800	37,330
Fe content	14,713	22,167	33,369	51,590	20,532
Metal:					
Pig iron	6,338	159	--	--	--
Steel:					
Crude	312,158	243,900	380,971	447,032	460,000
Semimanufactures (selected):					
Bars	229,203	385,000	281,934	319,802	340,000
Galvanized iron sheets	126,890	123,679	132,455	128,681	120,000
Tinned plates	62,227	73,119	91,974	68,175	75,000
Lead:					
Mine output, Pb content of 42.5% Pb concentrate	18,580	21,015	16,662	19,654	26,301
Metal: Ingot, secondary	929	3,174	6,198	7,536	9,122

See footnotes at end of table.

Table 1.—Thailand: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
METALS —Continued					
Manganese ore:					
Chemical-grade, over 75% MnO_2	12	--	8	27	--
Battery- and chemical-grade, 75% MnO_2	3,398	4,804	6,110	3,930	4,001
Metallurgical-grade, 46% to 50% MnO_2	4,348	1,906	2,577	455	887
Total, gross weight	7,758	6,710	8,695	4,412	4,888
Total, Mn content	3,724	3,221	4,174	2,118	2,346
Rare-earth metals:					
Monazite concentrate, gross weight	162	277	298	245	1,609
Xenotime	46	38	28	24	28
Tin:					
Mine output, Sn content	26,109	19,943	21,960	16,864	17,066
Metal, smelter, primary	25,479	18,467	19,729	17,996	19,672
Titanium: Ilmenite and leucoxine concentrate, gross weight	18	205	536	1,566	14,286
Tungsten concentrate:					
Mine output, gross weight	1,661	1,092	1,439	1,137	922
Mine output, W content	855	562	741	586	479
Zinc:					
Mine output, gross weight	--	--	147,993	276,909	373,833
Mine output, Zn content	--	--	41,438	77,535	97,197
Metal, smelter, primary	--	--	--	62,108	58,552
Zirconium ore and concentrate, gross weight	196	199	290	878	1,705
INDUSTRIAL MINERALS					
Barite	330,948	187,437	174,918	230,970	142,232
Cement, hydraulic thousand tons	6,609	7,263	8,240	7,916	7,914
Clays:					
Ball clay	2,200	4,960	2,520	7,988	11,203
Kaolin	17,846	36,350	58,616	106,704	116,037
Kaolinite (dickite)	--	--	--	--	16,113
Diatomite	80	425	471	410	204
Feldspar	19,326	47,908	74,404	104,392	115,163
Fluorspar:					
Crude mine output:					
High-grade	176,084	159,959	230,228	263,059	156,409
Low-grade	106,609	77,716	64,940	91,500	40,715
Total	282,693	237,675	295,168	354,559	197,124
Salable product:					
Acid-grade (beneficiated low-grade)	81,024	46,689	57,151	35,840	11,500
Metallurgical-grade	176,084	159,959	230,228	263,059	156,409
Total	257,108	206,648	287,379	298,899	167,909
Graphite	630	86	--	--	--
Gypsum	753,433	760,361	1,110,660	1,273,459	1,665,557
Phosphate rock, crude	4,265	5,158	3,075	4,072	4,940
Salt:					
Rock	11,100	5,679	9,850	12,786	12,000
Other[e]	165,000	165,000	165,000	165,000	165,000
Sand, silica	82,820	116,094	166,787	157,571	153,565
Stone:					
Calcite	1,020	1,871	1,272	1,040	230
Dolomite	9,662	7,927	10,364	16,160	13,771
Limestone for cement manufacture only thousand tons	6,371	8,936	9,223	9,845	9,605
Marble	9,311	26,428	37,927	21,479	14,718
Marl for cement manufacture only thousand tons	458	--	--	--	--
Quartz, not further described	7,531	15,159	20,687	27,305	18,068
Shale for cement manufacture only thousand tons	1,248	1,200	1,564	1,448	1,013
Talc and related materials:					
Pyrophyllite	19,989	18,875	26,851	42,002	36,165
Talc	2,009	1,273	1,628	1,476	2,886
MINERAL FUELS AND RELATED MATERIALS					
Coal: Lignite thousand tons	1,964	1,866	2,337	5,146	5,542
Natural gas (gross production) million standard cubic feet	47,036	56,762	85,506	132,275	127,765
Petroleum:					
Crude thousand 42-gallon barrels	[3]3,832	2,401	5,387	7,918	7,738
Natural gas condensate do.	NA	2,379	3,008	5,202	5,207
Refinery products:					
Gasoline do.	12,366	13,365	12,620	12,836	13,837
Jet fuel do.	5,648	6,275	6,432	6,474	7,227

See footnotes at end of table.

Table 1.—Thailand: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum —Continued					
Refinery products —Continued					
Kerosene thousand 42-gallon barrels	2,277	2,725	1,539	1,036	931
Distillate fuel oil do	17,879	19,198	17,409	21,127	23,115
Residual fuel oil do	15,201	13,591	15,494	13,353	13,768
Liquefied petroleum gas do	1,255	1,434	1,541	1,555	1,566
Naphtha do	[e]1,300	--	--	--	--
Asphalt do	[e]900	--	--	--	--
Refinery fuel and losses and unspecified do	[e]1,710	[e]1,700	2,671	2,467	1,264
Total do	58,536	58,288	57,706	58,848	61,708

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

[1]Includes data available through Aug. 4, 1987.

[2]Excludes columbium- and tantalum-bearing tin slags, which make Thailand the world's largest source of newly mined tantalum.

[3]Includes natural gas condensate.

TRADE

The value of exports grew by 19% to $8.8 billion in 1986 while that of imports declined by 1.7% to $9.6 billion. The trade deficit fell by a dramatic 67% to $829 million. The value of tin exports fell by 44% to an estimated $116 million[3] because of the catastrophic price drop after the ITC collapse in October 1985. Polished gem stones and jewelry emerged during the year as important new exports. Exports of ceramics, tile, and glass have been trending steadily upward. These materials were produced from domestic mineral output except for soda ash and some specialized glazes and fluxes. Zinc production surpassed domestic needs allowing a substantial amount of exports in 1986.

Fertilizer and steel were major import items. Petroleum imports remained important, but its value dropped by 10% in the wake of the world oil price decline. Exports of condensate from the offshore gasfields increased as production exceeded the local demand. Thai and Japanese interests had been studying the possibility of developing the Texas Pacific (Thailand) Inc.'s offshore gas reserves for the purpose of exporting liquefied natural gas to Japan. The project would cost nearly $9 billion, and the depressed price of petroleum has made it uneconomical under the prevailing conditions.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	1,220	1,041	(2)	Singapore 280; Hong Kong 205; Malaysia 176.
Antimony: Ore and concentrate	5,491	5,417	3,032	Yugoslavia 610; Belgium-Luxembourg 529; India 392.
Columbium and tantalum: Ore and concentrate	274	88	--	West Germany 48; Netherlands 40.
Copper: Sulfate	164	163	--	Japan 102.
Gold:				
Waste and sweepings kilograms	r2	237	119	United Kingdom 60; Saudi Arabia 30.
Metal including alloys, unwrought and partly wrought troy ounces	--	32,140	31,034	Singapore 1,029.
Iron and steel: Metal:				
Scrap	3,548	3,575	32	Hong Kong 2,677.
Pig iron, cast iron, related materials kilograms	75	--		
Semimanufactures:				
Tubes, pipes, fittings	105,453	167,268	51,916	United Arab Emirates 30,070; Hong Kong 19,908; Japan 17,247.
Unspecified	10,651	20,620	1,250	Liechtenstein 13,960; Burma 1,945.
Lead: Ore and concentrate	42,004	46,788	--	Japan 19,000; Netherlands 10,870; Australia 8,000.
Manganese:				
Ore and concentrate, metallurgical-grade	4,100	--		
Oxides	3 36	--		
Silver:				
Waste and sweepings[4] kilograms	r8	35	--	United Kingdom 30.
Metal including alloys, unwrought and partly wrought troy ounces	181,266	2,411	--	All to Malaysia.
Tin: Metal including alloys:				
Unwrought	19,538	19,838	6,831	Netherlands 6,330; Japan 4,180.
Semimanufactures	--	61	--	All to Japan.
Tungsten: Ore and concentrate	1,885	1,142	535	West Germany 279; India 90.
Zinc:				
Ore and concentrate	--	1,480	--	China 1,000.
Oxides	46	91	--	Japan 54; Sri Lanka 27.
Metal including alloys, all forms	216	20,365	--	China 10,205; India 2,603; Bangladesh 1,598.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Dust and powder of precious and semi-precious stones kilograms	--	500	--	Mainly to Malaysia.
Grinding and polishing wheels and stones	41	22	2	Burma 11.
Barite and witherite	205,557	213,869	69,609	Indonesia 83,052; Saudi Arabia 22,040.
Cement	87,327	72,059	--	Malaysia 50,946; Nepal 7,725.
Clays, crude	234	4,883	--	Taiwan 4,750.
Diamond:				
Gem, not set or strung carats	119,784	99,804	10,859	Belgium-Luxembourg 27,860; Hong Kong 27,217; Switzerland 22,255.
Unsorted do	4,030	148	--	All to Israel.
Feldspar	16,982	35,198	--	Taiwan 31,000.
Fluorspar	230,137	199,640	16,000	Japan 87,690; U.S.S.R. 54,300; Republic of Korea 27,350.
Gypsum and plaster	779,708	906,267	(2)	Taiwan 318,616; Malaysia 183,314; Indonesia 144,404.
Precious and semiprecious stones other than diamond:				
Natural kilograms	138,337	105,016	4,672	Hong Kong 88,954.
Synthetic do	404	1,493	195	Switzerland 708; Italy 239.
Salt and brine	52,971	61,548	(2)	Malaysia 45,197; Singapore 13,571.
Sodium compounds, n.e.s.:				
Carbonate, manufactured kilograms	--	200	--	All to Taiwan.
Sulfate, manufactured	232	386	--	All to Laos.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	441	360	--	All to Taiwan.
Worked	809	1,871	1	Brunei 1,021; Bangladesh 549.
Dolomite, chiefly refractory-grade	5,376	2,316	--	Singapore 1,656; Philippines 360.
Gravel and crushed rock	--	1	--	All to Singapore.
Limestone other than dimension	4,049	5,489	(2)	Malaysia 4,683; Singapore 288.
Quartz and quartzite	15,401	25,185	--	Japan 25,000.
Sand other than metal-bearing	962	298	--	All to Malaysia.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Sulfur: Elemental, all forms	110	334	--	Philippines 306.
Talc, steatite, soapstone, pyrophyllite	8,343	2,889	--	Philippines 2,650.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	4,081	5,298	--	Indonesia 3,012; Sri Lanka 1,065; India 1,048.
Petroleum refinery products:				
Kerosene and jet fuel, 42-gallon barrels	192,371	391,075	--	NA.
Lubricants, do	680,743	287,271	--	NA.
Unspecified, thousand 42-gallon barrels	7	3,669	3,275	Taiwan 373.

rRevised. NA Not available.
[1]Table prepared by Audrey D. Wilkes.
[2]Less than 1/2 unit.
[3]Synthetic manganese dioxide.
[4]Includes other precious metals.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	11,652	7,506	--	China 4,248; Malaysia 3,057.
Oxides and hydroxides	10,724	13,347	36	Japan 10,158; China 1,605; United Kingdom 864.
Metal including alloys, all forms	55,447	49,431	1,114	Canada 19,184; Australia 17,275; Bahrain 4,358.
Antimony:				
Ore and concentrate	1,645	3,700	--	Burma 3,635.
Metal including alloys, all forms	[2]27	20	--	Mainly from China.
Arsenic:				
Ore and concentrate: Arsenic trisulfide	2	--		
Oxides and acids	97	61	--	Mainly from China.
Chromium:				
Ore and concentrate	78	1,400	--	Japan 1,320.
Oxides and hydroxides	415	413	65	West Germany 250; Japan 24.
Metal including alloys, all forms, kilograms	2,578	2,556	19	United Kingdom 2,509.
Cobalt:				
Oxides and hydroxides	12	203	--	Italy 108; Republic of Korea 65.
Metal including alloys, all forms, kilograms	310	312	--	Japan 150; United Kingdom 100.
Columbium and tantalum: Metal including alloys, all forms, tantalum	152	2	--	Mainly from Japan.
Copper: Metal including alloys, all forms	30,440	26,998	105	Zambia 12,455; Japan 8,088; Philippines 2,445.
Gold: Metal including alloys, unwrought and partly wrought, troy ounces	76,486	140,160	13,328	Singapore 100,328; Japan 22,673.
Iron and steel: Metal:				
Scrap	494,354	657,950	35,004	Taiwan 276,371; Singapore 73,013; United Kingdom 36,397.
Pig iron, cast iron, related materials	16,032	18,600	7	Japan 12,070; Indonesia 5,000.
Ferroalloys:				
Ferrochromium	80	242	--	Zimbabwe 122; Singapore 105.
Ferromanganese	3,386	4,015	40	Australia 1,902; Norway 1,020.
Ferronickel	100	[3]	--	All from Japan.
Ferrosilicomanganese	1,186	1,644	--	Norway 1,309; Taiwan 200.
Ferrosilicon	3,606	3,967	--	Norway 1,520; France 929; Yugoslavia 670.
Silicon metal	13	13	--	Norway 8; Japan 5.
Unspecified	1,502	1,274	2	Australia 351; France 307; Japan 285.
Steel, primary forms	514,746	581,514	10,985	Republic of Korea 102,823; Japan 97,334; Brazil 84,652.
Semimanufactures, thousand tons	1,113	1,451	12	Japan 1,199.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides	334	514	(3)	Australia 380; West Germany 97.
Metal including alloys, all forms	14,203	9,455	(3)	Australia 5,506; Japan 2,784.
Magnesium: Metal including alloys, all forms	53	54	34	Norway 7; France 5.
Manganese:				
Ore and concentrate:				
Chemical-grade	48	--		
Metallurgical-grade	24	--		
Oxides	2,458	132,360	--	Japan 131,619.
Metal including alloys, all forms	43	16	--	United Kingdom 14.
Mercury 76-pound flasks	151	251	--	Japan 173; Belgium-Luxembourg 75.
Nickel: Metal including alloys, all forms	1,146	1,095	5	Republic of Korea 341; Greece 251; Canada 148.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	27,810	193	--	Mainly from Japan.
Silver:				
Ore and concentrate[4]	1,848	141	--	Japan 72; Burma 69.
Metal including alloys, unwrought and partly wrought thousand troy ounces	1,499	3,018	38	France 2,700; Japan 170; West Germany 89.
Titanium:				
Ore and concentrate	781	1,887	--	Australia 1,883.
Oxides	1,135	1,828	3	Japan 876; Belgium-Luxembourg 256; France 175.
Tungsten: Metal including alloys, all forms	7	5	1	Japan 2.
Zinc:				
Oxides	457	429	(3)	Taiwan 276; Japan 84; West Germany 41.
Blue powder	45	15	--	Norway 8; Singapore 5.
Metal including alloys:				
Unwrought	44,966	13,968	--	Australia 8,502; Canada 2,818; Japan 1,362.
Semimanufactures	420	345	1	West Germany 129; Japan 61; Norway 42.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	2,253	2,470	56	Netherlands 1,587; India 662.
Artificial:				
Corundum	545	733	34	Japan 468; Italy 171.
Silicon carbide	393	448	--	Switzerland 163; West Germany 99; China 58.
Dust and powder of precious and semiprecious stones including diamond kilograms	1,338	27	2	Japan 10; Belgium-Luxembourg 8.
Grinding and polishing wheels and stones	1,955	1,738	2	Japan 819; Taiwan 291; Spain 94.
Asbestos, crude	66,545	71,516	11,941	Canada 34,294; Mozambique 6,686; Zimbabwe 6,487.
Boron materials: Oxides and acids	171	242	163	West Germany 49; Italy 27.
Cement	6,357	2,133	--	Singapore 1,000; France 902.
Clays, crude	16,464	18,149	5,090	Australia 4,304; China 2,722; United Kingdom 1,558.
Diamond:				
Gem, not set or strung carats	215,836	134,235	22,079	India 72,957; Belgium-Luxembourg 23,641.
Industrial stones do	13,261	12,965	--	Ghana 5,153; Belgium-Luxembourg 4,984.
Unsorted do	962,260	318,261	27	Belgium-Luxembourg 94,521; Ghana 56,170.
Diatomite and other infusorial earth	98	36	36	
Feldspar, fluorspar, related materials:				
Feldspar	1,054	1,197	--	India 589; China 500.
Fluorspar	703	101	--	Italy 100.
Unspecified	88	314	--	Canada 221; Italy 92.
Fertilizer materials: Manufactured:				
Ammonia	2,289	2,890	(3)	Indonesia 1,122; Japan 1,120.
Nitrogenous	440,390	447,947	500	Japan 280,049; West Germany 76,262.
Phosphatic	1,002	1,000	--	All from Netherlands.
Potassic	41,671	42,018	--	U.S.S.R. 27,860; Israel 5,500; Republic of Korea 4,050.
Unspecified and mixed	763,087	694,393	62,908	Republic of Korea 218,584; Romania 94,030; Philippines 83,250.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Graphite, natural	532	722	(3)	China 345; Republic of Korea 240.
Gypsum and plaster	570	656	106	West Germany 411; China 70.
Iodine kilograms	2,895	2,803	--	Japan 1,500; West Germany 1,006.
Magnesium compounds:				
Magnesite, crude	7,007	6,329	--	Japan 3,185; China 2,852.
Oxides and hydroxides	4,258	3,945	2	Japan 2,916; China 729.
Mica, all forms	348	184	7	India 108; France 22.
Pigments, mineral:				
Natural, crude	62	192	--	China 150.
Iron oxides and hydroxides, processed	2,232	2,339	20	West Germany 1,603; India 290.
Precious and semiprecious stones other than diamond:				
Natural kilograms	170,030	152,886	8,399	Australia 72,803; Burma 45,006.
Synthetic do	33,168	49,234	24,645	Taiwan 11,331; Switzerland 4,542; West Germany 3,698.
Salt and brine	10,324	847	12	United Kingdom 452; West Germany 234.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	96,779	74,310	31,991	Romania 21,826; Kenya 7,200.
Sulfate, manufactured	12,654	22,644	7,781	China 4,120; Indonesia 3,006; Taiwan 2,470.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	5,267	3,486	(3)	Italy 2,053; Republic of Korea 634; Mozambique 375.
Worked	704	995	(3)	Italy 972.
Dolomite, chiefly refractory-grade	296	402	--	Norway 365.
Gravel and crushed rock	1,007	1,234	--	France 988; China 200.
Limestone other than dimension	36	18	--	All from Taiwan.
Quartz and quartzite	272	376	1	Italy 181; China 100.
Sand other than metal-bearing	431	156	71	Taiwan 36; Belgium-Luxembourg 20.
Sulfur:				
Elemental:				
Crude including native and by-product	41,380	54,857	--	Canada 39,336; China 10,961; Singapore 4,020.
Colloidal, precipitated, sublimed	288	136	(3)	West Germany 88; Japan 24.
Dioxide	32	72	54	Singapore 18.
Sulfuric acid	18,040	9,083	(3)	Japan 5,992; Philippines 3,035.
Talc, steatite, soapstone, pyrophyllite	17,423	18,888	22	China 9,426; Republic of Korea 8,262.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	3,784	3,223	52	Taiwan 982; Philippines 763; China 634.
Coal, all grades including briquets	190,230	282,694	105,613	Australia 135,793.
Coke and semicoke	35,375	48,031	--	Japan 29,786; China 16,100.
Petroleum:				
Crude thousand 42-gallon barrels	45,046	48,264	--	Malaysia 14,605; Brunei 11,738; Oman 11,723.
Partly refined do	5,003	2,010	--	Saudi Arabia 1,323; Italy 687.
Refinery products do	32,096	19,181	286	Singapore 13,137; China 2,231.

[1]Table prepared by Audrey D. Wilkes.
[2]Excludes unreported quantities imported from West Germany and the United Kingdom valued at $130.
[3]Less than 1/2 unit.
[4]May include other precious metals.

COMMODITY REVIEW

METALS

Antimony.—Late in 1986, the BOI issued a promotion certificate to New Siam Mineral Resources Co. for the production of 1,000 tons per year of 99.6% antimony. Ownership of the project was fully Thai and the authorized investment was to be $1.7 million.

Columbium and Tantalum.—Thai officials and Japan's Metal Mining Agency planned to set up a 1-ton-per-day pilot plant for the recovery of columbium, rare-earth minerals from tin ore milling waste, and tantalum. If the project is a success, Japan and Thailand would enter into a joint venture to erect a commercial-scale plant.[4]

On June 23, the TTIC tantalum processing plant in Phuket was destroyed by fire during riots at the plantsite. Environmental issues were the ostensible issue in the disturbance. The plant was to have begun trial operations in August and employed what was regarded as the most modern technology in both processing and pollution control. The plant was designed with technology

supplied by Hermann C. Starck Berlin KG, which was committed to buy 50% of TTIC's production.

In the months after the plant's destruction, there were accusations, claims, and recriminations from shareholders, industry, and Government officials. Questions relating to the plant's destruction—why and how it happened and whether or not the facility would be rebuilt and where—were vigorously debated in the press and trade journals. During the period, the Thai Government continued to support the project by proposing to provide equity participation if the plant was rebuilt.

By yearend, it was decided by TTIC that the $35 million plant would be rebuilt, but in southeastern Rayong Province at the Government-run Mab Ta Put industrial estate, hundreds of kilometers from the original plantsite. The plan was for Thai private interests to hold 63%; Malaysian interests, 7%; the International Finance Corp., 10%; and the Thai Government to take a 20% equity in the project. Construction was to begin in May 1987 with completion scheduled for 1989.

Gold.—The Australian Executive Service Overseas Program sponsored an Australian geologist to assess the feasibility of developing a gold prospect in southern Thailand. Thailand was not known to be a gold producer in recent years.

Lead.—Metallgesellschaft AG of the Federal Republic of Germany, which owns 46% of the Song Toh Mine in Kanchanaburi Province, reportedly planned to reduce its production of lead and mixed bulk concentrate from 43,000 tons in 1986 to a much lower level for 1987. The company was pressing for a reduction in the Thai royalty and taxes on the concentrates, which amounted to 14% of the value. The mine reported a loss of $2.4 million in 1985. The company also cut back on its exploration activity in Tak Province and in Thong Pah Phum District of Kanchanaburi Province.

The Thai Lead Co. planned the startup of a new 12,000-ton-per-year lead smelter for February 1987. It would process locally mined concentrate for domestic consumption. The privately owned company planned to expand capacity to 20,000 tons per year within 3 years. Thailand's small lead ingot production in 1986 was from secondary sources.[5]

Steel.—A small BOI-promoted steel plant began operating in March 1986. Triumph Steel Co. Ltd., with Thai and Hong Kong shareholders, was licensed to produce 60,000 tons of billet per year. The company has a 25-ton electric furnace and a three-strand billet caster. Triumph has headquarters at Tambol Samrong Tai, Amphur Prapradaeng, Samut Prakan Province.

Plans for a 400,000-ton-per-year direct-reduced iron (DRI) plant at Laem Chabang were canceled, and the Siam Ferro Industry Co. Ltd. was dissolved in June. The natural gas-based plant was to have supplied DRI to the Thai electric-furnace operators in place of expensive imported scrap. Several factors were involved, but the main problem was that the gas prices offered, $3.75 per million British thermal units, were well above that needed to make the plant economically viable.[6]

Tin.—The tin crisis of October 1985 continued to be felt throughout 1986. Losses suffered by traders on the London Metal Exchange (LME) and banks in several countries amounted to at least $200 million and probably considerably more. The market price of tin as traded in Malaysian ringgits on the KLTM dropped from $11.37 per kilogram to a record-low level of $5.40 per kilogram.

In the period following the stoppage of tin trading and severe price fall, possibly one-half of the market economy countries' primary tin-producing capacity became uneconomic.

All of the market economy countries' major tin producers were hurt by the price decline except possibly Brazil. Four of Thailand's biggest onshore mining firms suspended operations indefinitely. Two other major producers cut production and reduced their work force by 50%. The only two remaining offshore tin dredging companies, Aokam Thai Co. Ltd. and Tongkah Harbour Tin Co. Ltd., suspended their southern operations and stated that production might not resume for a year.

In an effort to aid the beleaguered tin sector, the Government reduced some of the mining fees early in the year. The mining land use fee was cut by three-quarters, the annual fee payable for suspending a mining operation was reduced 95%, the tailings disposal fee was cut 75%, and the Finance Ministry was considering reducing the business tax on tin exports from 2.2% to 1.1%.[7] Later in the year, the Department of Mineral Resources introduced a measure waiving the tax on tin purchases for stockpiling. The change if approved would tend to keep more tin off the market until prices improved.

Traders and speculators could buy tin from the Thaisarco smelter at the posted prices and hold the tin at the smelter for up to 2 years, then sell it back at the same prices without being charged the nearly 35% corporate duty.[8]

The decline in the official number of active mines has been dramatic. In 1983, there were 537 tin mines operating with 42,869 workers. The ITC's tin export quotas, which limited Thai production, brought that figure down to 472 with 24,725 employees by August 1985. The present crisis knocked the already depressed figures down to 331 active mines and 14,860 workers, believed to be the low for at least two decades and possibly since DMR records were kept. The figures were even more ominous when it was realized that many operating mines were running at greatly reduced production levels. Only the most efficient mines working the richest deposits were even marginally profitable. In addition, because of fees and paperwork involved in the formal closing of a small mine, a number of operators may not have reported the de facto closing of their operations.

Another group to be hurt by the tin prices collapse was the small suction dredger fleet that operated in the shallow waters off Phangnga and Phuket Provinces. Production from these boats, which have accounted for 20% to 30% of total output, was declining as the fleet was reduced from 4,000 boats in 1978 to between 400 and 500 by October 1985. After the price drop, most of the remaining boats were no longer profitable, and by yearend 1986, only 120 boats were in operation. Many of these surviving operators have upgraded their equipment from diver-held suction hoses to fully mechanized suction-cutter equipment capable of operating in more than 30 meters of water.

An exacerbating factor in the decline of output from these suction boats was the depletion of the high-grade ore pockets on the seafloor. These pockets had been very lucrative to the suction boat operators whose divers could exploit them at a high profit, while the big commercial dredgers had to take the full sweep of the ocean floor, regardless of the grade. The new, more sophisticated equipment on the suction boats means greatly increased costs, while losing the advantage of selectively exploiting the higher grade ore pockets. This type of suction boat may therefore find it increasingly difficult to compete with the other types of Thai tin producers.

Despite the mine closings and the low prices of tin, Thailand actually increased its tin exports 5.8% to over 18,000 tons in 1986. The export revenue, however, declined 44% to about $117 million. Much of the year's smelter feed was concentrate that had been stockpiled at mines because of the ITC quotas and low prices. With much of the stockpiled concentrate gone, most industry experts were predicting a considerable drop in mine and smelter production for 1987. Estimates ranged between 10,000 and 14,000 tons depending on how the price of tin performs on the KLTM.

The KLTM tin price moved narrowly around $6.53 per kilogram at yearend. At that price, tin traders believed that operating mines could continue working and might even extend their working hours or days. Mines already shut down would need a price of $6.90 to $7.30 per kilogram because of a variety of fees and restart costs that would be encountered.

Also at yearend, Thaisarco was considering taking seat on the KLTM. The Government of Malaysia had already approved trading in both Thai and Indonesian tin but had until yearend only traded Malaysian tin. If accepted, the seat would allow Thaisarco to offer the miners a way of selling at the current price. The mining community would thereby help to establish the market price, rather than merely matching bids from overseas buyers.[9]

The owners of the 3,600-ton-per-year Thai Pioneer Enterprise smelter near Bangkok were attempting to reopen the plant that closed in 1982. The plant may be rented to either a Thai or a foreign party. Feed would be obtained from mines in central Thailand. The savings in transport costs were believed to be enough to operate the plant at a profit. Thaisarco reportedly was considering a nearly 15% increase in its smelting charges to bring its price in line with the Malaysian smelters. This of course would be favorable to Thai Pioneer's reopening hopes.

Tungsten.—The Thai Government has reportedly adopted a sliding-scale royalty on tungsten production in order to stimulate an increase in exports. The former flat rate of 20% of the LME price was hindering miners' incentive. The new rates range from 0.1% to 20% according to market price; at a price of $50 per ton-unit, the royalty was about 6%.

Zinc.—Padaeng Industry Co. ran its Tak

smelter at nearly 90% of its 60,000-ton-per-year design capacity for the first time in 1986. About 30,000 tons of ingot was sold to the domestic market, and the remainder was for export to Bangladesh, China, India, Indonesia, Malaysia, and Singapore. A new study of ore reserves at the Mae Sot Mine put the total at 4 million tons at 29% zinc content. The new data extends the 11-year projected life of the mine to 16 years. The plant was the first in the world to use silicate ore technology developed by the Belgian company Société des Mines et Founderies de Zinc de la Vielle-Montagne S.A.[10]

Padaeng Industry announced it would invest $1 million on a zinc alloy plant. Initial capacity would be 5,000 tons per year, expandable to 8,000 tons when necessary. Plans were to start alloy production in mid-1987.[11]

INDUSTRIAL MINERALS

Cement.—The Siam Cement Co. Ltd. was the oldest and largest Thai-owned industrial company in the country. In addition to cement, it also made a wide range of other mineral-based products under affiliated companies that form the Siam Cement Group (SCG). The company has revealed plans for an ambitious 5-year, $476 million investment program. Eight major projects were under way or were to be started in the near future. Four of the eight projects are mineral-related developments. Two cement expansions are the largest of the mineral projects. Siam Cement completed the erection of the 1.6-million-ton-per-year Kaeng Khoi No. 3 unit at yearend and closed down the old fuel-prodigal Kaeng Khoi No. 1 unit. The new investment was the construction of Kaeng Khoi No. 4 at a cost of $122 million. The new unit was to be one of the largest and most modern cement plants in Southeast Asia. Its completion was planned for 1990 and would give the SCG's Kaeng Khoi complex a capacity of 4.9 million tons of clinker per year.

The other cement investment was construction of a fourth kiln at Thung Song. The $84 million expansion would bring this plant, in southern Thailand, to a capacity of 1.9 million tons. The southern expansion would meet demand in that area for the next 8 to 10 years.

Construction Materials, Clays, and Glass.—These materials occupied important parts of the Thai industrial scene. Various types of brick were produced for local consumption, and brickworks were often important local employers in rural areas. The BOI reported in July that Kalksandstein Co. Ltd. had started operating. The Thai- and West German-owned company was licensed to produce 33,000 tons of calcium silicate brick per year. Two Thai-owned porcelain and stoneware companies were also reported by the BOI as starting operations. They were Lampang Silanakorn Co. Ltd., 1,800 tons per year, and T. G. Ceramics Co. Ltd., 2,500 tons per year. Glass of all kinds was produced completely from domestic raw material except for soda ash and some specialized chemicals that were imported. In all, over 500,000 tons of glass was produced annually in Thailand. Exports of glass accounted for 10% of production, but the proportion of exports has been increasing as companies began to tailor more of their output to the export market. The glass industry employed more than 8,000 persons in 1986 and contributed substantially to the Thai economy.

In October, the BOI issued a promotion certificate to Thai-owned Siam Plate Glass Industry Co. Ltd., headquartered in Bangkok. The new venture was to have a capacity of 29,700 tons of glass sheet and was authorized to invest $15 million. Issuance of the BOI certificate does not necessarily mean a project will be completed, as financing or marketing changes may affect construction or viability of a mine or plant.

Fertilizer Materials.—*Nitrogenous and Mixed.*—Construction of a large and expensive fertilizer complex at Mab Ta Put on the eastern seaboard continued to be debated in the agricultural, financial, governmental, and industrial circles of Thailand. Construction was nearly ready to begin on the National Fertilizer Corp. Ltd.'s first phase early in the year. Finalizing the financial arrangements grew more complex, however, as the Japanese yen-dominated project saw the exchange rate of the yen move dramatically during the year. The various currency changes affected the very complex loans and loan guarantees that had been negotiated during the many months of planning for the project.

The basic problem with the whole concept was whether the much-needed fertilizer complex could ever be viable at the relatively high cost of Thai natural gas, the major raw material and fuel for the project.

An independent review of the project conducted near yearend cast doubts on its financial viability. The study suggested that

under current conditions of low world fertilizer prices and strong yen (Y) value (Y160=US$1.00), the project would have a negative rate of return. If fertilizer prices increased by 50%, the project would be marginally viable. Since the study was conducted, the yen-U.S. dollar rate dropped another 10%, casting further doubts on the startup of construction. Thailand currently imports virtually all of its fertilizer needs.

Phosphates.—The BOI canceled its approval for a small phosphate fertilizer plant in September. A Thai-Singaporean partnership D.C.P. (Thailand) Co. Ltd., headquartered in Bangkok, had planned to produce phosphoric acid and dicalcium phosphate from mostly imported raw materials. Loss of the promotional privileges generally results in the demise of a new company.

Potash.—Development of the extensive potash deposits in northeast Thailand has been glacially slow in the last few years. Thai Potash Co. Ltd.'s ownership was revised as CRA Exploration Pty. Ltd. of Australia increased its holding to 70% of the venture. Duval Corp. of the United States dropped out. Thai Potash was apparently beginning the $3 million exploration phase of its commitment. The 2,333-square-kilometer Udon Thani concession was held by Agrico Potash Co. Ltd. It was conducting a seismic survey in its early stage of exploration. Agrico Chemical Co. of the United States was believed to want to reduce its stake in the company from 50% to 25% because of other commitments. The Minister of Industry called for tenders for rights in two other potash exploration concessions in northeast Thailand.[12]

Fluorite.—Metspar and acidspar grades of fluorite showed severe declines in both production and exports during the year. Demand from outside the country has dropped since 1984. Depressed world prices and changing currency exchange rates have made it difficult to retain former markets. Metspar and acidspar production peaked in 1985 and 1984, respectively, and dropped to probable record lows in 1986. Acidspar exports were particularly depressed—the U.S.S.R. ceased importing Thai material in 1983; India, in 1985; and Japan sharply reduced Thai imports during 1986.

The extremely low world prices and other financial problems caused Thai Fluorite Processing Co. Ltd. to close its 70,000-ton-per-year acidspar plant in Petchburi Province in June 1986. The plant had not reopened by yearend but was being maintained on a standby basis in case the acidspar market conditions improved.

Krabi International Fluorite Co. Ltd. in Klongthom District also temporarily suspended production of acidspar from its 30,000-ton-per-year plant because of low prices and high operating costs. Production was restarted, however, after some improvements were made to the plant facilities.

MINERAL FUELS

Coal and Lignite.—The Electricity Generating Authority of Thailand (EGAT) was considering the construction of a 2,640-megawatt coal-fired powerplant at Siracha on the eastern seaboard southeast of Bangkok. A new coal port would be constructed to handle the 6.5 million tons per year of coal required for the plant. The coal would be imported from New South Wales, Australia. It was difficult to see how this project could be approved in light of the heavy foreign debt burden. Plans for two large new generator units were postponed in 1985 at Mae Moh because of the debt situation, and they would have been fueled with domestic lignite.

The sixth 5-year economic plan (1987-91) proposed a more active role for the private sector in exploration and production of lignite for the growing industrial user. The Government would like to see a more rapid development of the relatively inexpensive fuel, especially for uses where it can substitute for expensive imported fuels. Use of lignite by the cement industry had increased to 14% of total production in 1984, the latest official figure. During 1985, EGAT generated about 10% of its power from lignite. Plans called for that to increase to 25% by 1990, mostly at the Mae Moh complex.

Natural Gas.—The Thai gas situation was a difficult one for both producer and consumer during 1986. The price of the Thai natural gas was based partly on the world price of crude oil. As the oil prices dropped, the price paid by the Petroleum Authority of Thailand (PTT) to the major producer, Unocal Thailand, fell to 20% less than its 1985 level. In addition, PTT's offtake dropped to 314 million cubic feet per day in 1986 compared with 327 million cubic feet per day in 1985.[13]

The lower offtake and revenue has forced Unocal to shut in 100 of its 250 wells and cut back on its exploration and drilling program. Unocal can produce more than 475 million cubic feet per day from its four

developed fields, one of which, Baanpot, was shut in completely during 1986. Unocal hoped that the lower prices of its gas would encourage the powerplants and cement plants to increase their proportion of gas usage over imported fuel oil. PTT expected a possible increase of up to 17% for its 1987 gas offtake.

In the long term, Unocal faced a gradual decline in the gas output of its developed fields starting in the 1990's. The company wanted to have new fields on-stream by then to maintain or increase its production capacity. Unocal has three undeveloped discoveries on offshore Blocks B12 and B13. Their development would depend on the results of a third round of gas sales negotiations with PTT. In light of the late 1986 low prices and consumption figures, Unocal may look for some form of assured market for its production before it undertakes additional development work.

Onshore, PTT was considering development of natural gas in the Esso Exploration and Production Khorat Inc. concession in Nam Phong District, Khon Kaen Province. Esso has an estimated reserve of 1.5 trillion cubic feet in the deposit, sufficient for the development of several major industries. As in the past, pricing negotiations could determine when, or even if, the project will be started. Texas Pacific (Thailand) Inc. and PTT were in their eighth year of negotiations over gas pricing.

Petroleum.—Drilling activity was well below that predicted for the year, mostly because of the low world prices and an uncertain outlook. Only 36 wells were drilled—2 onshore exploration, 11 onshore production, and 23 offshore production. A total of 67 had been projected at the beginning of the year.

Two exploration concessions were awarded in 1986. The United Kingdom-based Premier Consolidated Oilfield PLC was awarded offshore Block B11/7 and was committed to 600 line kilometers of seismic survey and the drilling of at least one well. Thailand Sun Oil Co. was awarded offshore Blocks B7, B8, and B9 in the disputed Thai-Malaysian Joint Development Area (JDA). Exploration there will not begin until the basic territorial problems are resolved.

Triton Oil Co. of Thailand was believed ready to resume operating in early 1987 after having operations suspended since the late 1970's because of a JDA dispute over the boundary delineation of its concession. Apparently, an agreement has been reached on the Triton block and only formal approval by the Thai and Malaysian Governments was needed to resume exploration.

Thai Shell Exploration and Production Co. Ltd. announced it was halting further onshore exploration after completing its 50th development well in the Sirikit Oilfield. Thai Shell conducted offshore seismic work in its B6/27 Block during the year. It planned to move a jackup rig on-site in early 1987. It has a three-well commitment. Placid Oil Co. planned to start drilling in Block W8 of the Andaman Sea in January 1987.[14] Most of Block W8 is in very deep water and would need a major discovery to justify the high costs of development. BP Petroleum Development Ltd. began a 2,000 line-kilometer survey of its Block B4/27 in the Gulf of Thailand.

In order to save on foreign exchange expenditures and transportation costs, Thai interests have been negotiating with Nippon Steel Corp. and Japanese trading houses for a local joint venture company to fabricate the massive drilling and production structures used in the offshore petroleum sector. Most of the platforms in use in the Gulf of Thailand were fabricated in Japan. The company's tentative name was to be Thai Nippon Steel Engineering and Construction Ltd.

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[1]Physical scientist, Division of International Minerals.
[2]Where necessary, values have been converted from Thai bahts (B) to U.S. dollars at the rate of B27.14=US$1.00 in 1985 and B26.27=US$1.00 in 1986.
[3]Mining Journal (London). Mining Annual Review, 1987. Pp. 372-376.
[4]Metal Bulletin (London). No. 7076, Apr. 11, 1986, p. 16.
[5]Metals Week. V. 59, No. 39, Sept. 29, 1986, p. 7.
[6]Metal Bulletin (London). No. 7191, July 11, 1986, p. 11.
[7]Mining Journal (London). V. 306, No. 7861, Apr. 18, 1986, p. 277.
[8]Metal Bulletin (London). No. 7128, Oct. 17, 1986, p. 19.
[9]American Metal Market. V. 95, No. 37, Feb. 25, 1987, p. 6.
[10]———. V. 94, No. 227, Nov. 20, 1986, p. 4.
[11]Metal Bulletin (London). No. 7145, Dec. 16, 1986, p. 6.
[12]International Mining. V. 3, No. 5, May 1986, p. 68.
[13]Oil and Gas Journal. V. 85, No. 5. Feb. 2, 1987, p. 16.
[14]Petroleum News. V. 17, No. 10, Jan. 1987, p. 51.

The Mineral Industry of Tunisia

By Kevin Connor[1]

The major mineral event in Tunisia in 1986 was the discovery of oil reserves, just offshore and north of Zarzis in the southeast, by Marathon Oil Co. of the United States. Government officials described the find as the most promising since the 1971 discovery of the offshore Ashtart Oilfield. Austerity measures were enforced by the Government throughout the year, and with the sharp fall in Tunisia's oil export revenues starting early in the year, the Government's scope of financial belt-tightening measures widened. Stagnant prices for phosphate rock and derived products were also aggravating the shrinking export revenues. The Government was preparing amendments to the country's petroleum exploration laws for the second time in 3 years, in hopes of further encouraging international companies to consider additional exploration programs for the country as well as accelerate present exploration programs and reconsider marginal known deposits still undeveloped because of unfavorable economics.

The Government announced cuts in investment spending in the revised 1986 budget approved on August 30. Several new moderate- to large-scale projects were being deferred, with additional feasibility studies to be carried out on some of them. The balance of payments deficit was a record high $678 million.[2] Late in the year, the International Monetary Fund approved a $260 million credit to the Government to support the balance of payments and initiate a package of economic reforms agreed to by the Government.

PRODUCTION AND TRADE

Tunisia's trade deficit increased by 6% in 1986 to $1.12 billion, mainly as a result of the fall in petroleum export prices that cut energy export revenues by 44%. An agricultural drought also caused a 40% increase in cereal imports. The overall deficit would have been greater except for the increases in exports in the textile and fertilizer sectors. The country's gross domestic product shrank 1% during the year. Crude petroleum production was slightly above that of 1985, with established fields holding production rates steady. Phosphate rock production was at a record-high level, although poor rock quality and declining underground productivity continued to hamper the industry's overall financial situation. The lead portion of the lead-zinc industry continued its downward production slide. The industry's hopes of revitalization were stalled for yet another year as problems surrounding the dilapidated Megrine smelter and financing for a new smelter were still unresolved. Fluorspar production and trade was steady for the year, iron ore production remained level, and subsequent steel manufacture increased slightly.

Table 1.—Tunisia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Iron and steel:					
Iron ore and concentrate, gross weight thousand tons	275	316	308	309	300
Metal:					
Pig iron do	97	147	150	e150	150
Steel, crude[e] do	r107	r163	r169	r170	3181
Lead:					
Mine output, Pb content	4,988	4,570	4,056	2,484	2,500
Metal:					
Primary[4]	15,320	10,398	8,400	2,040	2,000
Secondary[e]	500	500	500	500	500
Total[e]	15,820	10,898	8,900	r2,540	2,500
Silver metal, primary thousand troy ounces	115	90	e85	26	50
Zinc, mine output, Zn content	8,388	7,548	6,660	5,500	5,500
INDUSTRIAL MINERALS					
Barite	30,654	20,250	12,100	20,000	20,000
Cement, hydraulic thousand tons	1,783	2,850	2,777	3,059	3,300
Clays, construction[e] do	350	350	350	350	350
Fluorspar, chemical- and metallurgical-grade	33,209	34,013	44,510	40,612	40,000
Gypsum[e]	75,000	80,000	85,000	90,000	100,000
Lime thousand tons	e500	580	600	e600	650
Phosphate rock, gross weight do	4,196	5,924	5,346	4,530	35,951
Salt, marine do	421	375	330	405	400
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural:					
Gross[e] million cubic feet	28,000	28,000	28,000	28,000	28,000
Marketed do	14,883	14,503	14,080	14,000	14,000
Petroleum:					
Crude thousand 42-gallon barrels	39,324	42,649	42,251	r e41,000	42,000
Refinery products:					
Gasoline do	1,498	1,546	1,794	e1,800	1,800
Kerosene do	2,277	2,085	2,402	e2,400	2,400
Distillate fuel oil do	3,025	2,988	3,156	e3,000	3,000
Residual fuel oil do	3,545	3,937	3,936	e4,000	4,000
Other do	445	460	394	e400	400
Refinery fuel and losses do	197	235	160	e200	200
Total do	10,987	11,251	11,842	e11,800	11,800

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

[1]Table includes data available through June 1, 1987.

[2]In addition to the commodities listed, a variety of crude construction materials (common clays, sand and gravel, and stone) is produced, but output is not reported, and available information is inadequate to make reliable estimates of output levels. Limestone quarried for cement manufacture is substantial; however, information is inadequate to make accurate estimates of output levels.

[3]Reported figure.

[4]From domestic and imported ores.

COMMODITY REVIEW

METALS

Iron and Steel.—In September, three international companies were prequalified for an estimated $85 million contract to build a steel mill at Ouardanine, near Sousse. Project proposals and cost estimates were originally submitted in 1985. W. S. Atkins & Partners of the United Kingdom assisted the Government in evaluating the proposals. The three companies prequalified were Korf Engineering GmbH from the Federal Republic of Germany, Danieli Engineering of Italy, and BBC Brown, Boveri & Co. of Switzerland.

The proposed project called for the supply and installation of steelmaking and continuous casting equipment, rolling mills, and equipment support services. Planned capacities for the plant were estimated at 200,000 tons per year of reinforcing bars, plus 50,000 tons of light-section steel. A decision about when or whether to move ahead with the project, originally due to be awarded early in 1986, was pending a final financial assessment by the Government.

Lead and Zinc.—The Sidi Bouaouane lead mine near Bou Salem was closed down late in the year. The mine had been operated since 1962 by the Government's Société Tunisienne d'Expansion Minière (SOTEMI) and employed 620 people in 1986. The mine management had, earlier in the year, announced plans to lay off a major portion of the mine's work force. The mine's financial losses for the first 10 months of 1986 were $1.1 million. SOTEMI was hoping at yearend to attract foreign investors to help support the woodworking and metalworking facilities at Sidi Bouaouane, as well as the nearby stone quarry operations.

INDUSTRIAL MINERALS

Cement.—In late 1986, Société des Ciments de Djebel Oust finished construction on its 400,000-ton-per-year cement plant at Tadjerouine. The major plant equipment consists of a five-stage preheated kiln with precalciner. Construction work continued on a 210,000-ton-per-year-capacity white cement plant at Feriana in the southwest. The plant was a joint venture project between Algeria and Tunisia, under the control of Société Tuniso-Algerienne de Ciment Blanc, a special company formed by the two country Governments. The plant's white cement production was to be shared equally between Algeria and Tunisia. The plant's scheduled startup date was the last half of 1987.

Phosphate Rock.—Spending on new fertilizer projects was halted at midyear pending an evaluation and possible reorganization of the state companies that operate the business. The sector had become financially insecure because of continued low world prices for phosphate rock and derivatives. There were difficulties in attracting new capital, primarily from the Gulf States. The Government adopted a reorganization plan after midyear 1986 that included urgent measures to deal with the financial problems of the chemicals sector as a result of the depressed international prices for chemical fertilizers.

Complete details on the reorganization had not been released by yearend; however, the plan was understood to call for a halt in spending on phosphate and other fertilizer projects until the reorganization was implemented. The management structure of Groupe Chimique Tunisien, the umbrella Government agency for the various parastatal fertilizer manufacturers, was to be reformed. Several Gulf States including Kuwait and Abu Dhabi were expected to become involved as financial partners within the new agency organizations formed.

Two main projects affected by the cessation in funding were the program to extract potassium sulfate from brine deposits in the Zarzis area and the mining program for the Sra Ouertane phosphate deposits in the northwest. Both were politically attractive projects because they were to be situated in poorer regions of the country that needed an infusion of local industry, although there had been doubts about their economic viability before the Government's decision to stop project funding.

Feasibility studies on the Zarzis project were conducted by three French companies: Spie Batignolles S.A., Mines de Potasse d'Alsace S.A., and Compagnie des Salins du Midi et des Salines de l'Est S.A. A pilot plant operation was set up at Zarzis and had been operating since late 1983. Two different project scenarios, of 60,000-ton-per-year and 120,000-ton-per-year potassium sulfate plants, had each been proposed during the 3 years since the pilot plant's startup. The Tunisian agency responsible for developing the brines, Société de Developpement des Industries Chimiques du Sud (SDICS), needed private financial backing in 1986 to go ahead with any large-scale development plans. As of yearend, this funding had yet to be secured. One positive development in the Zarzis area in 1986 was construction work on a new ocean port for Zarzis to accommodate industry and trade transport needs in the area.

The Sra Ouertane phosphate project was similarly impeded during the year by a major lack of financing. Zellars Williams Inc. of the Jacobs Engineering Group Inc. of the United States, the feasibility engineering contractor, was ordered to suspend further engineering studies. The development project's preliminary feasibility study, completed by Jacobs Engineering and summarized in a 1985 report, outlined the phase 1 construction of a mine with an annual production of 1.2 million tons of concentrated phosphate for conversion into chemical fertilizer. The estimated cost of phase 1 was expected to be about $200 million. Kuwait's Petrochemical Industries Co. held a 49% stake in the company organizing the scheme, Société d'Études des Mines des Phosphates du Sra Ouertane. New spending by the state agency, Compagnie des Phosphates de Gafsa, which controlled all of the country's phosphate mining operations in 1986, was also expected to be curtailed.

MINERAL FUELS

Petroleum.—*Exploration.*—The discovery of light crude oil in an exploratory well drilled onshore near Zarzis in the southeast was confirmed by the U.S. company Marathon Oil. Tests at the company's onshore Ezzaouia-2 well, about 6 kilometers northwest of the town of Zarzis, flowed at a combined rate of 10,465 barrels per day (bbl/d). This was equivalent to about 10% of Tunisia's total crude production in 1986, running at yearend at approximately 107,000 bbl/d. The Government of Tunisia had hoped for a new petroleum discovery of at least this magnitude for some time, to halt the country's decline in oil production that peaked at just 5.5 million tons in 1983. Without new oilfield developments, the country could become a net oil importer by the early 1990's.

News of the oil find aroused keen local and national interest, but Marathon Oil was reluctant to comment on the future of the Zarzis discovery until further exploration work was completed. Final estimates of the field's size were to depend on the results of a third and fourth well to be drilled and tested within Marathon Oil's permit zone during 1987.

Ezzaouia-2 was drilled to 8,580 feet and tested for oil and gas at three separate intervals. The interval between 7,354 and 7,301 feet flowed through an 80/64-inch choke at a rate of 4,365 bbl/d, producing 41° API oil and 77,000 cubic feet of gas per day. The well was about 1 kilometer west of Ezzaouia-1, which was drilled in mid-1986. Ezzaouia-1 had a limited duration test at a rate of 625 bbl/d.

The Zarzis permit was awarded to Marathon Oil in 1984 and covers 2,820 square kilometers onshore and offshore around the city of Zarzis. The permit was operated by Marathon Petroleum Zarzis, a division of Marathon Oil. Marathon Oil held 31.4% of the permit at yearend, with Tunisia's state petroleum agency, Entreprise Tunisienne des Activities Petroliers (ETAP), holding 55%. Elf Aquitaine Tunisie (EAT) had 9% holdings, and the Netherlands' Oranje Nassau Zarzis, the remaining 4.6%. Marathon Oil originally discovered oil in 1982 during offshore drilling near Zarzis on a separate permit, but the company later announced that the find was unlikely to be commercial.

Several oil exploration permits in Tunisia were extended in 1986, with new partners brought into some of the concessions to help finance exploration. The permits affected were as follows:

1. The offshore Kerkennah Quest concession, held since 1979 by the Houston Oil & Minerals Corp. of the United States. The permit was extended until May 1988. The U.S. company had a 49% stake in the 1,724-square-kilometer area; the Government's ETAP holds the rest.

2. The offshore Gabes Septentrional Ouest permit, held by Marathon Oil (45%) and ETAP (55%). Exploration rights in the 1,716-square-kilometer area were extended until December 1987.

3. Two companies, the Murphy Oil Corp. of the United States and the Canam Co. of the United Kingdom, relinquished their interests in the 7,972-square-kilometer Kirchaou concession, which they held since 1983. The onshore permit south of Zarzis was held at yearend by EAT, 38.6%; and ETAP, 55%. Their rights were scheduled to expire in November 1987.

4. The offshore Cap Bon-Gulf of Hammamet permit. The 1,425-square-kilometer concession was held by EAT, 13.33%; Shell-Tunirex, 20%; and two U.S. concerns, Samedan Oil Corp. and Petrex Corp. at yearend, 33.33% each. Shell-Tunirex, a local subsidiary of the Royal/Dutch Shell Group, bought a stake in the permit from EAT. The permit was extended to July 1988.

5. The onshore Bir Aouine permit, in the southwest. The Shell/Pecten consortium of the United States sold a 60% stake in the concession to Italy's Azienda Generali Italiana Petroli S.p.A. Shell/Pecten won a 3-year extension to the permit, in which it was to retain a 40% interest.

Legislation.—The Government of Tunisia was drawing up new hydrocarbons legislation in late 1986 in an effort to further intensify international interest in exploration. Existing law, passed in 1985 before the sudden collapse of oil prices in 1986, was considered no longer sufficiently attractive to foreign oil companies. In an attempt to reverse the ensuing decline, the Government was trying to get oil companies to develop the more marginal discoveries made in the past few years. Tunisia also hoped to encourage the use of advanced technology in exploration efforts, in the hopes such studies would reveal new deposits in areas already examined.

The national cabinet approved the draft of the new law in November. The draft was to go to parliament for final ratification. It included the following important points:

1. Changes in the royalty system.—The

proposal was for a range of royalties, depending on the ratio of total expenses to the company's net cumulated income, from a low of 2% to a high of 15%. In 1986, this royalty ranged from 10% to 20%.

2. More favorable taxation clauses.—The range of profits at which different rates of tax become due would be shifted upwards. The minimum rate of 50% would be due when the ratio of total income to expenses stood at 1.5:1, rather than the incumbent ratio of 1.1:1, and the top rate of 75% would fall due at a ratio of 3.5:1, not 3:1. The fixed asset depreciation rate would remain at 30%.

3. Extensions to exploration permits.—ETAP would have power to extend oil exploration permits by 2 years instead of a maximum of 1, and grant permit area expansions by 50%, instead of the incumbent 30% area increase limit. This was expected to eliminate some of the oil companies' complaints about lengthy waiting periods of 6 to 12 months for parliamentary approval for extensions. The old law required companies to increase expenditure and work obligations in proportion to any increase in the duration or area of a permit. The proposed law would make this a matter for negotiation, so a license holder genuinely unable to complete the work planned by the original deadline would not be forced to engage in pointless extra spending.

4. Relaxation of development rules.—The rules on going ahead with development would also be more flexible. ETAP was able previously to revoke a concession if development work had not begun within 2 years or if a company had not started exploiting an oil find within 6 years of discovery and a gas find within 8 years. The companies would, under the proposed law, be able to negotiate extensions beyond these periods.

5. Changes to gas production regime.—The intention was to increase supplies from domestic sources. The draft law proposed that gas royalties should no longer be based on quantity but on the ratio of accumulated income to expenses. This would encourage offshore gas development, where costs for development were much higher. The lowest royalty rate would be 2%; when the ratio of income to expenses is 0.5:1, the higher rate of 15% would apply when the ratio was more than 3.5:1. Gas producers therefore would have an advantage over oil producers, for which the top rate applies at a ratio of 2.5:1. The tax rates on gas production was to be shifted upwards, to apply the maximum rate of 65% at a ratio of 3.5:1, not 3:1, as now. Producers would be allowed to negotiate with the distributors for payment in other currency besides Tunisian dinars, giving them more rapid access to foreign exchange.

6. Changes to the system for employing expatriates.—Because of the relatively high rate of expatriate remuneration, expatriate workers would pay a flat 20% under the new law rather than paying ordinary Tunisian taxes. Social security payments could be made at Tunisian rates or according to another system, whichever the oil company preferred.

Refining.—In late 1986, four international companies submitted revised project cost proposals for a contract to expand the country's sole petroleum refinery at Bizerte. The bidders were Technipetrol and Snamprogetti S.p.A., both of Italy, Technoexport from Czechoslovakia, and Triad Engineering of Canada. Bid details were not available at yearend but Technipetrol was the low bidder when proposals were first submitted in early 1986. Société Tunisienne des Industries de Raffinage, the Government agency that operated the Bizerte refinery, had plans to double the refinery's capacity by installing an additional 1.5-million-ton-per-year distillation unit.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Tunisian dinars (D) to U.S. dollars at the rate of D0.80=US$1.00.

The Mineral Industry of Turkey

By Kevin Connor[1]

The fall in petroleum prices in 1986 helped Turkey to reduce energy import costs by almost 47%. During the same time, mineral exports by the state mining agency, Etibank, improved approximately 7%, and exports of finished steel products improved by about 20%, making 1986 an excellent year for Turkey's mineral industry. However, lower total exports for all industries combined, an increased balance of trade deficit account, and a less-than-expected rate of foreign investment in the country all contributed to an overall erosion of economic gains made by Turkey during 1984-85. One improvement in the general economy during 1986 was a 33% decrease in the inflation rate. Another promising economic indicator was a 7.5% increase in the country's gross domestic product. However, imports rose almost 7%, and the International Monetary Fund advised the Government of Turkey at yearend that the country's economy was growing too rapidly and suggested a more cautious Federal budget for 1987.

Privatization of the State Economic Enterprise (SEE), which accounted for 50% of the country's industrial output in 1986 and most of the raw materials produced, was under review throughout the year. A preliminary report regarding SEE privatization prospects was submitted by a contractor, Morgan Guaranty and Trust Co. of the United States, to the State Planning Organization (SPO). The report recommended that the Turkish Petroleum Refineries Corp. was suitable for privatization, as were other SEE's. Etibank was considered to need restructuring before any privatization could take place.

Phelps Dodge Corp. of the United States sold its 49% share in the Cayeli copper deposit to Metallgesellschaft AG of the Federal Republic of Germany early in the year for a reported $7 million profit, as well as an additional $13 million[2] tax refund. The FMC Corp. of the United States submitted a final proposal for developing a natural soda ash mine near Beypazari, west of Ankara. Under the proposal, both FMC and Etibank were to take 35% of the shares in the mine project, the International Finance Corp. was to take 10%, while the remaining 20% was to be held by private Turkish companies. The estimated total cost of the project was $50 million. Etibank reached an agreement in 1986 with Preussag Metall AG of the Federal Republic of Germany to develop deposits containing gold, silver, and lead near Bolkardagi. Preussag was also investigating the development of copper deposits at Siirt-Madenkiy. Another West German company, Klöckner Industrie Anlagen GmbH, finalized an agreement to evaluate a project to upgrade the Kayseri zinc mine and beneficiation plant, operated by the state agency Cinko-Kursun Metal Sanayii AS (Cinkur).

Promising reserves of sulfur were reported to have been discovered by the state agency for mineral exploration, Mineral Research and Exploration Institute of Turkey (MTA). The deposits were discovered near Fatsa in northern Anatolia. In 1986, Turkey produced only a small fraction of its sulfur requirements from primary sulfur deposits, and a major portion of the country's requirements were imported.

PRODUCTION AND TRADE

Etibank registered an estimated 7% increase in mineral export revenues for the year, even though total export sales of all Turkish products were down owing to the depressed Middle Eastern markets due to falling international oil prices and the ongoing Gulf war between Iran and Iraq, historically Turkey's main trading partners. Exports of finished steel products continued to increase dramatically, with a 20% increase in 1986 amounting to an estimated $604 million in revenues. Savings on lower petroleum import prices amounted to over $1.5 billion, approximately one-half of the petroleum import bill in 1985. However, export revenues declined by almost 9%, approximately $6 billion, offsetting the economic gain of a buyers' market in the petroleum sector. Cement imports increased to approximately 60,000 tons, while Turkish exports of cement decreased by approximately the same amount.

Table 1.—Turkey: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum:					
Bauxite	508,392	306,360	131,568	213,744	220,000
Alumina	84,204	57,420	75,120	113,303	120,000
Al content	36,300	30,400	37,900	54,100	50,000
Antimony:					
Ore, mine output:					
Gross weight	35,982	27,901	35,525	42,340	42,300
Sb content[e]	1,079	840	1,017	1,100	1,100
Smelter	1,454	1,267	1,821	[e]1,900	1,900
Regulus	141	198	42	300	300
Chromite:					
Gross weight (34% to 43% Cr_2O_3)	618,028	514,992	688,917	877,452	900,000
Salable product	452,445	345,610	487,405	[r e]600,000	600,000
Copper:					
Mine output, gross weight	2,699,619	2,184,872	2,466,158	2,209,020	2,200,000
Cu content:					
Smelter	25,683	19,113	32,023	33,984	35,000
Refined	32,200	31,800	39,000	[r e]30,000	30,000
Iron and steel:					
Iron ore, gross weight thousand tons	3,055	4,151	4,037	3,425	4,000
Metal:					
Pig iron and ferroalloys:					
Ferrochromium	39,862	30,175	48,081	[e]48,000	50,000
Ferrosilicon	4,300	[e]4,500	6,902	[e]6,900	7,000
Pig iron and other ferroalloys thousand tons	2,174	2,719	2,902	3,193	[2]3,666
Steel, crude including castings do	[r]3,183	[r]3,834	4,330	4,961	[2]5,376
Lead:					
Mine output, Pb content	10,700	9,100	14,600	10,000	--
Pb content, smelter, primary	[r]2,000	[r]2,000	(3)	(3)	--
Manganese ore, gross weight	7,310	3,204	42,796	13,800	15,000
Mercury 76-pound flasks	7,129	4,680	5,272	[e]6,000	6,000
Silver, mine output, Ag content[e] thousand troy ounces	220	220	220	220	220
Tungsten, W content of concentrate[e]	150	[r]390	[r]153	[r]100	50
Zinc:					
Mine output, Zn content	33,500	31,100	50,400	37,400	33,800
Zn content, smelter, primary	14,900	14,300	19,900	22,200	20,000
INDUSTRIAL MINERALS					
Abrasives, natural: Emery	35,164	22,846	21,145	15,648	16,000
Asbestos	958	1,510	1,499	[e]1,500	1,500
Barite	114,928	78,974	198,031	166,212	175,000
Boron materials thousand tons	787	702	895	1,537	1,700
Cement, hydraulic do	15,778	13,595	15,738	17,581	18,000
Clays:					
Bentonite	[e]31,000	31,000	28,093	46,855	50,000
Kaolin	[r e]45,000	[r e]55,000	54,932	69,390	70,000
Other	76,188	21,865	71,777	168,719	170,000
Total	152,188	107,865	154,802	284,964	290,000

See footnotes at end of table.

Table 1.—Turkey: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
INDUSTRIAL MINERALS —Continued					
Diatomite	[e]10,000	9,600	2,540	[e]3,000	3,000
Feldspar[e]	70,000	[2]9,212	10,000	20,000	20,000
Fluorspar[e]	2,000	2,000	2,000	2,000	2,000
Graphite	3,360	4,805	NA	NA	NA
Gypsum	90,500	75,572	57,875	78,058	80,000
Lime thousand metric tons	900	1,000	[e]1,000	[e]1,000	1,000
Magnesite, crude ore	919,572	719,124	723,264	1,042,584	1,000,000
Meerschaum kilograms	12,850	8,850	15,000	15,800	16,000
Nitrogen: N content of ammonia	254,900	278,700	290,000	[r e]217,100	225,000
Perlite	121,527	28,693	60,452	[e]60,000	60,000
Phosphate rock	26,300	50,400	95,600	37,400	3,000
Pyrites, cuprous, gross weight	5,232	4,238	--	--	--
Salt, all types thousand tons	1,314	1,261	1,290	1,066	1,200
Sodium compounds, n.e.s.:					
Carbonate[e]	60,000	[r]120,000	[r]200,000	[r]300,000	350,000
Sulfate	65,188	61,942	83,026	[e]85,000	90,000
Stone, sand and gravel, n.e.s.:					
Limestone thousand tons	338	343	[e]350	[e]350	350
Marble	24,110	39,110	[e]40,000	[e]40,000	40,000
Quartzite	[e]200,000	239,201	[e]240,000	318,450	320,000
Sand, siliceous[e]	110,000	110,000	110,000	110,000	110,000
Strontium minerals: Celestite[e]	15,000	[2]38,835	35,000	35,000	35,000
Sulfates, natural, n.e.s.: Aluminum sulfate (alunite)	[e]11,500	14,682	13,971	11,578	12,000
Sulfur:					
Native, other than Frasch	31,805	34,899	40,722	37,500	35,000
S content of pyrites[e]	2,260	1,831	--	--	--
Byproduct[e]	75,000	75,000	78,000	80,000	80,000
Total[e]	109,065	111,730	118,722	117,500	115,000
MINERAL FUELS AND RELATED MATERIALS					
Asphalt, natural[e] thousand tons	[2]523	750	750	750	750
Carbon black[e]	[2]19,922	20,000	20,000	20,000	20,000
Coal:					
Anthracite thousand tons	7,223	6,122	7,103	8,526	8,500
Bituminous do	NA	750	225	523	500
Lignite do	20,542	23,847	27,199	35,833	36,000
Coke and semicoke:					
Metallurgical do	2,102	2,380	2,401	[e]2,400	2,400
Gashouse do	[e]300	121	100	[e]100	100
Breeze do	[e]125	260	174	[e]170	200
Total do	[e]2,527	2,761	2,675	[e]2,670	2,700
Gas, natural:[e]					
Gross million cubic feet	[2]26,050	27,000	27,000	27,000	27,000
Marketed do	[2]3,500	3,500	3,500	3,500	3,500
Petroleum:					
Crude thousand 42-gallon barrels	16,697	15,779	14,941	15,110	15,000
Refinery products:					
Gasoline do	15,140	16,956	18,380	18,681	19,000
Jet fuel do	2,360	2,263	2,472	2,875	3,000
Kerosene do	2,035	2,375	2,593	3,585	4,000
Distillate fuel oil do	43,580	47,664	50,570	50,537	50,000
Residual fuel oil do	26,490	34,178	38,433	37,962	40,000
Lubricants do	[e]1,100	1,563	1,486	1,174	1,000
Liquefied petroleum gas do	3,430	4,865	5,585	5,379	5,500
Naphtha do	[e]210	226	58	205	500
Asphalt do	1,875	2,534	2,960	3,405	3,500
Unspecified do	4,480	7,532	9,787	8,271	8,000
Refinery fuel and losses do	1,200	1,905	2,248	2,388	2,500
Total do	101,900	122,061	134,572	134,462	137,000

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

[1]Table includes data available through July 15, 1987. Limestone quarried for cement manufacture is substantial; however, information is inadequate to make accurate estimates of output levels.

[2]Reported figure.

[3]Revised to zero.

COMMODITY REVIEW

METALS

Chromite.—Because of market flooding by low-priced chromite ores and concentrates, particularly from Albania, Etibank was critically reassessing its nonmetallurgical markets in 1986. In April, construction was completed on a concentration plant at Kuluncak. Bilfer Madencilik AS was the state agency responsible for the project and operator of the new plant. The plant capacity was 30,000 tons per year upon completion and startup, although eventually the plant could be expanded to 60,000 tons per year. Another concentrator was under construction at Eskikoy. The plant project, also under Bilfer Madencilik control, was to have the same capacity as the Kuluncak plant, and production from both concentrators was expected to supply refractory-grade markets in Western Europe. The United Kingdom was Turkey's most important refractory-grade customer in 1986.

Another major Turkish exporter of chromite ore was Egemetal Madencilik AS, which also controlled some of the producing mines. Egemetal was participating in a joint venture with Etibank and Bomar Resources Inc. of the United States to develop a chromite deposit in the Bursa region. The project, known as the North Western Anatolian Project, was to develop a mine that would produce both nonmetallurgical and metallurgical grades of ore. Potential shareholders at yearend were Etibank, Egemetal, Eytas AS, and Bomar. Initial planned capacity of the operation was 20,000 tons per year of acceptable run-of-mine ore and 8,000 tons per year of 53% chromite concentrate. Eventually, Egemetal hoped the operation would increase to 80,000 tons per year of run-of-mine ore and 35,000 tons per year of concentrate.

Over the course of the year, Etibank also was continuing with its expansion project for high-carbon ferrochrome production at Elazig. Work was nearing completion on a new ferrochrome plant that was to have an expected initial capacity of 100,000 tons per year, with the potential for an additional 50,000 tons. Turkey's only existing ferrochrome plant was at Elazig and had a capacity of 50,000 tons in 1986. With the new plant expected on-line in 1987, Turkey's ferrochrome capacity would be 150,000 tons per year. The new plant was expected to use ore produced by Etibank.

Copper.—The annual demand for blister copper in Turkey in 1986 stood at 70,000 tons. Approximately 50% of this was produced domestically, mostly at the Black Sea Copper Works Karadeniz Bakir Isletmeleri (KBI) Samsun complex, with the remainder imported. However, starting in 1987, this complex was due for major renovation work and the percentage of imported blister copper was expected to rise dramatically. Late in 1985, a 30-month feasibility study was completed on rehabilitation of the Murgul copper mine and concentrator in northeast Turkey. Based on the study's recommendations, the mine, which began production in 1973, was expected to increase its concentrates production to 170,000 tons per year. Plans for rehabilitating the Samsun gas plant were being carried out by Furukawa Co. Ltd. of Japan.[3]

Gold.—The Bolkardagi gold-silver-lead project still required SPO approval at yearend. The joint-venture project between Etibank and Preussag was to be a 70-30 split of shares with Preussag being the major shareholder. The Bolkardagi area was mined previously, but had been closed down and inactive since the turn of this century. The remaining ore body was estimated at 250,000 tons with available data showing grades of 10 grams of gold per ton and 350 grams of silver per ton. Actual production from the planned project was not expected to occur until the early 1990's.

Iron Ore.—To meet the demands of Turkey's rapidly growing steel industry, the state-owned corporation Turkiye Demir ve Celik Isletmeleri (TDCI) started commercial production on May 1, 1986, at its new 1.3-million-ton-per-year iron ore pelletizing facility at Divrigi, in the Anatolia region, where the complex's new beneficiation plant was started up in September of 1985. Construction and completion had been delayed several years to better coordinate with new iron ore mining facilities in the area. The 1986 value of the construction was estimated at $300 million.

During 1986, approximately 500,000 tons of pellets was supplied to the Turkish steel industry, with production expected to reach 1 million tons per year in 1987 and design capacity of 1.3 million tons by 1988. The iron ore pellets produced in 1986 were of high quality, with an average iron ore content of 67.3% and silica content of 1.36%. In addition to the 500,000 tons of pellets produced, TDCI shipped 450,000 tons of coarse concentrate from Divrigi's new beneficiation plant, and an additional 300,000 tons of lump ore from its mines,

totaling 1,250,000 tons of product sold. TDCI operated iron ore mines at Divrigi and Hekimhan, two iron and steel complexes at Iskenderun and Karabuk, and a steel structures and equipment fabrication plant at Gerede.

In 1986, a new record-high iron ore production of approximately 2 million tons occurred at the Divrigi A and B ore bodies. The separate A and B ore bodies were mined from adjoining but different open pits, from which approximately 3.0 million cubic meters of stripping was necessary. For 1987, TDCI was predicting 2.4 million tons would be mined from these two ore bodies: 1.8 million from ore body A, and 0.6 million from ore body B. Ore body A, a pyrometasomatic-type deposit of magnetite, had known reserves of 40 million tons averaging 54% to 55% iron, with high sulfur content averaging 2% to 2.5%. Reserve figures were calculated to a projected depth of 1,284 meters, with the ore body known to occur down to 1,100 meters. Ore body B, a hydrothermal deposit, had calculated reserves of 14 to 15 million tons of hematite, grading 55% iron content and low in sulfur at 0.2% to 0.3%.

At 1986 production rates, the mine life of both deposits was approximately 20 years. However, the production of the mine was scheduled to steadily increase, and based on 1986 reserve figures, the mine life was expected to be closer to 10 years. To expand iron ore reserve figures for Divrigi, exploration drilling was quadrupled in 1986 to 4,500 meters, with another 5,000 meters planned for 1987. Exploration drilling efforts were being directed west of the known deposits to look for lateral extensions of the A and B ore bodies, rather than investigating below the presently defined ore body areas.

Steel.—Production of finished steel products in 1986 increased by approximately 500,000 tons, to a total of about 5 million tons. Turkey had three blast furnace works operating during the year, as well as an electric arc industry that had a production capacity of 1.5 million tons of raw steel. TDCI's Iskenderun steelworks, the largest of the blast furnace complexes, produced an estimated 1.5 million tons of finished products. Expansion construction work at Iskenderun, slated to get under way in 1987, was to increase output to 2.2 million tons, with further expansion planned to increase the output to 3 million and then possibly 4 million tons per year.

TDCI's Karabuk iron and steel works near the coast of the Black Sea produced about 550,000 tons of finished product in 1986. An expansion program under way was to increase the plant's capacity from 600,000 tons per year to 900,000 tons per year of steel ingots by 1988.

Zinc.—During 1986, a feasibility study to investigate upgrading of the Kayseri zinc mine and processing plant was begun by Klöckner of the Federal Republic of Germany. The complex was operated by Cinkur and had a capacity of 40,000 tons per year. The feasibility study was to concentrate on evaluating the viability of expanding the output to 70,000 tons per year of concentrate and constructing a nearby smelter facility. Klöckner was to investigate ways of financing the operation as well as preparing preliminary engineering and construction plans and cost estimates. One other task of the study was for Klöckner to evaluate deposit exploration information and assess the possibility of further zinc reserves in the area.

INDUSTRIAL MINERALS

Asbestos.—Small quantities of tremolite asbestos continued to be produced for local markets in Turkey by Amyanyl Sanayii SA. Because of demand far exceeding this production, Turkey imported almost 20,000 tons of asbestos in 1986. To increase domestic production, Bilfer Madencilik was investigating chrysotile deposits at two locations near Sivas. Reserve estimates of 18 million tons of ore were defined at Cavdar, one of the locations. Pilot tests on the Cavdar ore as well as on the deposits nearby at Koroglu had been conducted in the past. Estimates of a potential domestic market in 1986 of 30,000 tons as well as substantial Middle Eastern and north African markets that were projected would sustain a 100,000-ton-per-year mining operation. Although early development at Cavdar would be open pit, both sites were considered underground operations.

Cement.—Cement consumption in Turkey increased over 20% in 1986 to approximately 18 million tons. Production of cement also increased approximately 2.4% to about 18 million tons. Although production still exceeded consumption, some cement was imported during the year, mainly from Romania and the Soviet Union. The Government had expected that consumption might exceed production, so to assist in meeting any shortage through imports, the Government abolished the 5% harbor and 4% stamp duty taxes on imported cement.

Several new plants came on-line in 1986,

while others were still under construction. In March, the Urfa cement plant, with a capacity of 552,000 tons, went on-line. The project was managed by Dyckerhoff Engineering GmbH of the Federal Republic of Germany. A project to convert the Eskisehir cement plant was completed, which raised the plant's clinker capacity from 700 to 1,000 tons per day. Polysius Ltd. of France was the construction contractor. Polysius also supplied the equipment for the Izmir Cemento SA plant, adding a 200-ton-per-hour high-pressure grinding roller for clinker operation.

The Bursa Cimento Fabrikasi AS cement plant project to add a cement mill and air separator for its new grinding facility was behind schedule, as was the completion of Denizli's 600,000-ton-per-year plant. Both projects were expected to be on-line by yearend. Bati Anadolu Cimento Sanayii AS was upgrading its No. 2 kiln at its Izmir plant from 1,300 to 1,700 tons per day. The work, which included installation of a roller press, was being performed by KHD Humboldt Wedag AG of the Federal Republic of Germany. Turkiye Cimento Sanayii TAS was moving ahead with plans during the year to install a new grinding facility at its plant, complete with a mill, roller press, and air separator. F. L. Smidth of the United Kingdom was to supply the equipment.

Clays.—Turkey's clay industries, particularly its well-developed ceramics sector, was largely raw material self-sufficient in 1986, with mining of refractory clays, kaolin, and feldspar more than sufficient for domestic market needs. Approximately 50,000 tons of refractory clay was exported to Romania. Approximately 40,000 to 50,000 tons of kaolin was also exported, mainly to Near Eastern countries. Approximately 25,000 tons of feldspar was exported, but this figure was expected to increase as a new flotation plant in southwestern Anatolia comes on-stream. The two largest ceramic producers in Turkey in 1986 were Canakkale Seramik and Eczacibasi.

Fertilizer Materials.—At yearend, a contract award for construction of the fourth fertilizer complex near Mersin was considered imminent. Construction of the complex was being financed by a Middle Eastern consortium of Tunisian, Kuwaiti, and Saudi Arabian parastatal companies. The value of the contract was estimated at $120 million. The complex was expected to have a production capacity of 450,000 tons of ammonium nitrate and 420,000 tons per year of diammonium nitrate. During the year, capacities for the complex's planned sulfuric and phosphoric acid plants were increased so that other existing fertilizer plants in the Mersin area could increase their product outputs. The Government agency handling the project was Turk Arab Gubre AS (TAGAS). Work on the complex was to get under way by mid-1987 and was expected to take 30 months to complete.

Etibank started operation of a phosphate concentrator for the new Mazidag phosphate mine in 1986. The concentrator had a capacity of 125,000 tons per year. Completing development of the mine and building the concentrator finished phase 1 of a project that was to eventually incorporate construction of a fertilizer complex with a capacity of 430,000 tons of triple superphosphate per year, 150,000 tons of phosphoric acid per year, and 420,000 tons of sulfuric acid per year. Total investment in the Mazidag complex was expected to reach over $100 million when finally completed. Preliminary bids on construction of the complex were being evaluated at yearend.

Magnesite.—Turkey's magnesite industry was restructured in 1986 and had two public sector producers, Etibank and Citosan. Citosan held the controlling interest with Kütahya Manyezit Isletmeleri (Kumas) and Sumerbank, the actual mine operators for Citosan. Kumas was Turkey's largest magnesite producer, operating three mines in the Kütahya and Eskisehir Districts, with a total mine production capacity of 541,000 tons of crude magnesite. The crude mine output was upgraded at the Kütahya beneficiation plant, which had a capacity of 144,000 tons per year. Planned production for 1986 was 100,000 tons, all of which was refractory grade, for both domestic and international markets.

Marble.—The Marmara Island marble project continued its steady progress, slowly expanding production output and variety of products. Both wide blocks and sheets were produced on Marmara, with annual production capacities at 3,000 tons of block and 30,000 tons of sheet in 1986. The project, begun in 1983 by Etibank, Narol AS of Turkey, and other foreign and domestic companies, had a total investment at yearend 1986 of $500,000. The estimated cost of the entire project was expected to reach $9 million. Turkey has considerable reserves of both marble and travertine.

Perlite.—Etibank was Turkey's major perlite producer in 1986. The state agency was also developing a new tuff deposit of

perlite during the year in the Mezarkya region of Cumaovasi-Izmir. The reserves of this deposit were estimated at 20 million tons of ore. The mine project was expected to cost approximately $7.5 million by the time of completion of facilities and startup of the mine. Total crude perlite production capacity for Turkey in 1986 was approximately 200,000 tons.

Soda Ash.—FMC of the United States made a final proposal to the Government of Turkey for development by FMC of the natural soda deposits at Baypazari west of Ankara. The proposed project was based on a 2-year feasibility study by FMC. The U.S. company was hoping that solution mining techniques would be applicable at the Baypazari deposit.

Over the 10-year period 1976-86, the Mersin synthetic soda ash plant operated by Soda Sanayii AD, a joint venture between Turkiye Sise Cam Fabrikalari AD and two Turkish banks, had been Turkey's only soda ash producer. The capacity of the plant has steadily risen over this period to 350,000 tons per year. The plant was operating at full capacity in 1986 and was estimated to have produced 350,000 tons of product for the year. Production in 1985 was only slightly less; however, more light and dense soda ash was produced but there was less refined sodium bicarbonate output.

MINERAL FUELS

Coal.—During 1986, Turkey had one coal-fired powerplant under construction. The small 20-megawatt (MW) plant was at Yenicatalagzi and was expected to be operational by the beginning of 1988. The coal was to be supplied by the state coal agency, Turkiye Komuleri Isletmeri (TKI), with 800,000 tons of anthracite coal from the mines at Zonguldak. TKI was investigating expansion of Turkey's anthracite production in 1986 with an exploration program well under way at Gobu-Kazkoy, where anthracite reserves were estimated at yearend to be 132 million tons. During early 1986, two large international consortia signed coal-fired power project agreements with the Government. One consortium, which included the Swiss company Brown, Boveri & Cie. and Babcock & Wilcox Canada Ltd., was proposing to build a 400-MW powerplant at Ambarli, approximately 50 kilometers west of Istanbul. The other consortium was led by the Bechtel Corp. of the United States and was proposing to build a 480-MW powerplant at Tekirdag, about 150 kilometers west of Istanbul. Construction plans of both groups called for building seaports and terminals to handle an estimated 15 million tons of imported coal to fuel the two powerplants. A third agreement for a 1,400-MW coal-fired powerplant in southern Turkey was being negotiated at yearend between Australia's Sea-Pac Corp. and the Energy and Natural Resources Ministry of Turkey.

During 1986, the Government imposed a $10-per-ton tax on imported coals destined for end uses other than in the steel industry in order to improve usage of domestically produced coals, which were being increasingly stockpiled. The falling prices on the international coal market had been attracting an increasing percentage of Turkish customers. Coal imports for powerplants built under the Government's build-operate-transfer (BOT) schemes were exempted from the duty.

Planning continued throughout the year for expansion of three of Turkey's anthracite mines, Amasra, Gobu-Kazkoy, and Baglik. The Government expected to increase production by 2.8 million tons per year, which would be approximately a 75% increase in annual production of anthracite. The modernization and expansion program was to include building rail and harbor facilities for the Amasra Mine.

Natural Gas.—Construction of the natural gas pipeline from the Bulgarian border to Ankara was ongoing in 1986 and scheduled for completion in mid-1988. The planned 847-kilometer-long supply line was expected to start transporting natural gas under a long-term contract with the U.S.S.R. during 1987, even though only partially finished. The Government of Turkey signed a 25-year agreement with the U.S.S.R. in 1984, for buying 5 to 6 billion cubic feet of natural gas per year from the U.S.S.R.

Petroleum.—*Exploration.*—The state agency Turkiye Petrolleri Anonim Ortakliki (TPAO) held 65% of the exploration concession lands under license in 1986. TPAO held 147 out of a total of 287 exploration licenses active at the end of 1986. The remainder of the licenses were held by international companies. The concessions were scattered over 16 regions of both onshore and offshore territory. Proven crude reserves for Turkey were estimated at 160 million barrels at yearend.

Production.—TPAO produced a record-high 8.75 million barrels of crude oil from approximately 25 fields and became the country's biggest oil producer. TPAO also had the biggest exploration and develop-

mentprogram, drilling 92 wells during the year. The other two major petroleum producers in the country were private operators, the Royal Dutch/Shell Group, and a consortium of the Mobil Oil Corp. and Dorchester Group. Royal Dutch/Shell also increased crude output approximately 10% from its 15 operational fields to almost 3.7 million barrels per year. Mobil and Dorchester, however, experienced a 9% decline in production to 1.1 million barrels.

Refining.—The country's fifth oil refinery was commissioned late in October. The new refinery, situated at Kirrikale near Ankara, had a capacity of 40 million barrels per year and raised the country's total refining capacity to 230 million barrels annually. Along with the new refinery, operation of 450 kilometers of supply pipeline transporting crude oil feedstock from Adana on the coast began. The pipeline was designed to eventually double its carrying capacity from 40 to 80 million barrels per year, to match an expected increase in refining capacity at Kirrikale in coming years. Construction of facilities for another 40 million barrels per year of refinery capacity was expected to be completed and commissioned at Izmir during 1987, increasing Turkey's total refining capacity to over 264 million barrels per year.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Turkish lira (TL) to U.S. dollars at a rate of TL675=US$1.00.

[3]Mining Magazine (Turkey). Min. Ann. Rev., Aug. 1987.

The Mineral Industry of the U.S.S.R.[1]

By Richard M. Levine[2]

The U.S.S.R. was the only major industrial country whose policy was to promote continuous absolute growth in mineral production. Nevertheless, the rate of growth had slowed or even stopped in some areas because of increasingly difficult mining conditions.[3] More than 40% of capital investment was directed toward the mineral sector, with the proportion increasing in 1986. Soviet mineral policy aimed at self-sufficiency for the Soviet Union and its allies and, in addition, producing minerals to export for hard currency. This policy was not guided primarily by aspects of comparative advantage or fluctuations in the world market price for minerals and resulted in the Soviet Union being the world's leading mineral producer. According to a recently published Soviet analysis, the policy hastened the depletion of Soviet reserves, with mining being conducted at rising costs under increasingly more difficult operating conditions.[4]

The U.S.S.R. reported improved economic performance in 1986, with national income increasing 4.1% in comparison with 3.1% in 1985 and gross industrial output increasing 4.9% in comparison with 3.9% in 1985.[5] This improvement in performance was also reflected in reported statistics for mineral commodity production. However, the Soviet Union published only a very limited number of mineral production statistics, and the trends for these mineral commodities were not necessarily indicative of production for the vast majority of unreported mineral commodities.

In 1986, the Soviets were able to increase production of coal, petroleum, and steel in comparison with the 1985 levels and continued to register a large increase in natural gas production. After 2 years of declining output, petroleum production rebounded to 4.52 billion barrels, which almost equaled the peak production of 4.53 billion barrels achieved in 1983. However, as a result of the sharp drop in world petroleum prices, the Soviet Union suffered a decline in export revenue from petroleum, which in recent years had provided over 60% of Soviet hard currency earnings. The Soviet program to substitute coal and natural gas for petroleum as a fuel in order to conserve petroleum for both petrochemical use and for export was aided by increases in coal and natural gas production. Nevertheless, the U.S.S.R. could not adequately compensate for the decrease in hard currency earnings with increased petroleum exports because the fall in world oil prices was too steep. Although an improved performance in steel production was reported, outputs still lagged far behind the goal to produce the specialized steels needed to modernize the economy, which were being imported from market economy countries.

Again, in 1986, significant personnel changes occurred in the mineral production sector as new Ministers of Nonferrous Metallurgy and of Mineral Fertilizer Production were appointed. The retiring Minister of Nonferrous Metallurgy had been the longest serving Soviet minister in office, having been appointed in 1940. He was replaced by the former Deputy Chief of Heavy Industry of the Communist Party of the Soviet Union (CPSU) Central Committee. The new Minister of Mineral Fertilizer Production was formerly a Deputy Head of the CPSU's Central Committee Chemical Industry Department and was appointed following the death of the former Minister.

Despite improved performance in some sectors, the U.S.S.R. had entered a period

where the economic indicators for mining were deteriorating. Production costs were rising, the output-capital ratio was falling, and labor productivity was not keeping pace with the increasing capital-labor ratio. At the same time, the deterioration in these indicators exceeded that of the industrial sector as a whole.[6]

Technical progress had been geared in the past to increasing the quantity of output without increasing efficiency, but the current situation required new technologies to promote efficiency.[7]

Owing to the increasing costs of developing new mineral deposits and metallurgical facilities in remote areas as well as the need for higher quality metal products, increased emphasis was to be given during the 1986-90 plan period to completing development at existing mining and metallurgical enterprises and modernizing existing facilities rather than developing new deposits and facilities.

Table 1.—U.S.S.R.: Percentage of capital investment assigned to technical reequipping and renovation, 1987-90

Sector	Percent
Aluminum	41.0
Cobalt and nickel	68.4
Copper	74.7
Diamond	69.0
Fluorspar	100.0
Gold	48.6
Lead and zinc	65.8
Magnesium, rare-earth metals, titanium	65.7
Molybdenum and tungsten	54.3
Steel	52.0
Tin	63.4

Sources: Tsvetnye metally (Nonferrous Metals), Moscow, No. 4, Apr. 1987, pp. 15-19. Stal' (Steel), Moscow, No. 4, Apr. 1987, p. 2.

Also, increased efforts were to be made at conservation; it was recommended that emphasis be placed on developing technologies that improved minerals recovery and increased the utilization of all the useful components of an ore.[8] The U.S.S.R. planned a program of resource conservation. In 1986, resource savings were to cover 67% of the growth in demand for rolled steel, 51% for fuel and energy resources, and 93% for cement. During the 1986-90 period, it was planned to save 200 to 300 million tons of standard fuel, calculated at 7,000 kilocalories per kilogram, including saving 75 to 90 million tons, primarily through the development of atomic power. The Soviet Union planned to conserve 12 to 14 million tons of rolled steel and to reduce the intensity of steel use in machine manufacturing by 12% to 18%. It was estimated that expenditures of steel per unit of national income produced was 50% higher than in other advanced industrial countries; for cement it was 150% higher.[9] Plans for steel conservation included expanding the development of continuous casting and powder metallurgy.

For nonferrous metals, a much greater effort was to be made toward recovering secondary metals. However, problems were reported in processing secondary nonferrous metals. More than 60% of copper and aluminum wastes and 70% of brass and bronze wastes arrived at the State Trust for the Procurement and Processing of Secondary Nonferrous Metals (Vtortsvetmet) mixed as to types and grades with inclusions of ferrous metals and trash and were thus unsuitable for producing high-quality alloys.[10]

Problems with inadequate production of flotation reagents continued to trouble the nonferrous metallurgical sector because over 95% of all nonferrous, rare, and precious metal ores were treated by flotation processes. For more than 10 years, the chemical and petrochemical industries failed to produce the needed amounts of flotation reagents. Problems were considered most serious regarding reagents needed to recover tungsten and molybdenum; there were serious problems also for barite, copper, fluorite, and lead-zinc.[11]

The most serious event of 1986 was the accident that occurred at the No. 4 unit of the Chernobyl nuclear powerplant in the Ukraine on April 26. This resulted in the destruction of the reactor core and part of the building in which it was housed. The accident, which involved the loss of life and the emission of contaminants into the environment, caused all four operating units of the Chernobyl powerplant to be shut down. Before yearend, the fourth unit where the accident occurred had been entombed, and units Nos. 1 and 2 were back in operation. Owing in part to the accident at Chernobyl, the Soviet Union faced increased power shortages during the unusually severe winter of 1986-87. The accident also affected power supplies to other countries in Eastern Europe, particularly Hungary and Bulgaria.

The 1987 Plan.—The plan for 1987 called for oil extraction to increase to 4.53 billion barrels, which was approximately equal to the peak production achieved in 1983. Increased production was planned to come

primarily from the major producing region of Tyumen' Oblast' in West Siberia with some increase also planned from the Pre-Caspian Depression, and in particular the Tengiz deposit in Kazakhstan. Natural gas production was planned to increase by almost 4% to 25.14 trillion cubic feet, which was about one-half the rate of growth achieved during the preceding years of the 1980's. Nevertheless, the U.S.S.R. still planned to significantly increase its natural gas production, with most of the planned increase coming from the commissioning of the Yamburg deposit in West Siberia, north of the large Urengoi deposit developed during the 1981-85 period. Some increase in natural gas production was also planned in Turkmenistan. Coal production was planned to increase by 10 million tons to 743.6 million tons. The 1987 plan, which was published in November, did not take into account the final 1986 production figures because reported coal production in 1986 was 751 million tons and well above the plan figure for 1987. Rolled steel production in 1987 was planned to increase less than 1%, compared with the reported 1986 production figure.

Exploration and Geology.—During the 1986-90 period, the State budget allocated a 40% increase in expenditures for exploration, with 70% of the allocation directed toward oil and gas. In Tyumen' Oblast' in West Siberia, the country's main oil and gas producing region, the plan called for drilling 14,000 kilometers of exploration wells. This was almost double the amount drilled during the 1981-85 period and could only be accomplished by introducing new equipment and technology. It was necessary to map an area of Tyumen' Oblast', which could not be investigated by drilling alone and for which the aid of seismic prospecting was required. To engage in this amount of seismic prospecting required a new generation of computers at data processing centers and advanced exploration equipment not available from domestic suppliers.[12] One indication of this was that the Soviet Union reportedly contracted with Compagnie Générale de Géophysique of France for sophisticated seismic equipment and technical backup for delivery in 1987.

PRODUCTION

Statistics on output, enterprise capacity, and production plans in physical units of output for nonferrous, precious and rare metals, and some industrial minerals were classified as state secrets. Soviet trade data on precious metals had not been available for decades, and in 1976, the Soviets stopped publishing trade statistics for nonferrous metals. Production and trade data were available for some ferrous metals and some industrial minerals.

Table 2.—U.S.S.R.: Estimated[1] production of mineral commodities[2]

(Thousand metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
METALS					
Aluminum:					
Ore and concentrate:					
Bauxite, 26% to 57% alumina	4,600	4,600	4,600	4,600	4,600
Nepheline concentrate, 25% to 30% alumina	2,500	2,500	2,500	2,500	2,500
Alunite ore, 16% to 18% alumina	600	615	615	615	620
Alumina	3,000	3,200	3,300	3,500	3,500
Metal, smelter:					
Primary	[r]1,900	2,000	2,100	2,200	2,300
Secondary	190	200	210	215	220
Total	[r]2,090	2,200	2,310	2,415	2,520
Antimony, mine output, recoverable Sb content tons	9,000	9,200	9,300	9,400	9,500
Arsenic, white (As_2O_3) do	7,800	7,900	8,000	8,100	8,100
Beryllium: Beryl, cobbed, 10% to 20% BeO do	1,850	1,900	1,900	1,900	2,000
Bismuth, mine output, recoverable Bi content do	78	80	82	83	84
Cadmium metal, smelter do	[r]2,900	3,000	3,000	3,000	3,000
Chromium:					
Chrome ore, crude	3,350	3,350	3,350	[3]3,360	3,570
Chrome ore, marketable	2,940	2,940	2,940	2,950	3,100

See footnotes at end of table.

Table 2.—U.S.S.R.: Estimated[1] production of mineral commodities[2] —Continued

(Thousand metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
METALS —Continued					
Cobalt:					
Mine output, recoverable Co content tons	2,300	2,400	2,600	2,700	2,800
Metal, smelter do	4,300	4,400	4,700	4,800	5,300
Copper:					
Ore:					
Gross weight, 0.5% to 2% Cu	83,000	84,000	85,000	86,000	89,000
Cu content, recoverable	560	570	590	600	620
Metal:					
Blister:					
Primary	680	700	735	750	770
Secondary	138	139	141	143	145
Refined:					
Primary	759	776	790	810	820
Secondary	138	139	141	143	145
Gold, mine output, Au content thousand troy ounces	8,550	8,600	8,650	8,700	8,850
Iron and steel:					
Iron ore, 55% to 63% Fe[3]	244,411	245,200	247,104	r247,639	250,000
Iron ore, Fe content[3]	132,055	133,563	134,809	r136,000	137,000
Agglomerated products:[4]					
Sinter	151,846	151,000	151,000	e148,000	148,000
Pellets	55,826	59,800	63,100	e65,000	66,000
Metal:					
Pig iron and blast furnace ferroalloys:					
Pig iron for steelmaking[3]	99,706	102,958	103,469	r102,840	107,000
Foundry pig iron[4]	6,400	6,700	r6,800	r6,500	6,400
Spiegeleisen[5]	50	50	50	50	50
Ferromanganese[5]	550	650	550	550	550
Total[3 6]	106,723	110,453	r110,869	r109,940	114,000
Electric-furnace ferroalloys	r2,000	r2,100	r2,300	r2,300	2,400
Steel, crude[3]	147,165	152,514	154,238	r154,668	161,000
Steel, rolled[3]	102,306	106,443	107,299	r108,274	112,000
Semimanufactures:					
Wire rods[4]	7,880	e8,300	e8,400	e8,400	8,500
Pipe stock[4]	6,245	e6,400	e6,400	e6,600	6,700
Tubes from ingots[3]	r1,848	r1,862	r1,931	r1,930	1,963
Selected end products:					
Total pipes and tubes[3]	17,944	18,732	18,883	r19,354	19,800
Cold-rolled sheet[3]	r7,818	8,774	9,396	9,602	9,915
Lead:					
Mine output, recoverable Pb content	430	435	r440	440	440
Metal, smelter:					
Primary	485	490	495	500	500
Secondary	245	255	260	265	270
Magnesium metal, including secondary	81	83	85	87	89
Manganese concentrate:[3]					
Gross weight	9,821	9,876	10,089	9,900	9,300
Mn content	2,957	2,976	2,994	2,900	2,800
Mercury metal, including secondary 76-pound flasks	64,000	64,000	64,000	65,000	66,000
Molybdenum, mine output, Mo content tons	11,000	11,100	11,200	11,300	11,400
Nickel:					
Mine output, Ni content	165	170	175	180	185
Metal, smelter	180	185	191	198	203
Platinum-group metals, mine output, Pt content thousand troy ounces	3,500	3,600	3,700	3,800	3,850
Silver metal including secondary do	46,900	r47,200	47,400	47,900	48,200
Tin:					
Mine output, recoverable Sn content tons	r21,000	22,000	23,000	23,000	23,500
Metal, smelter:					
Primary do	24,000	24,000	25,500	25,500	26,000
Secondary do	12,000	12,000	12,000	12,000	12,000
Total do	36,000	36,000	37,500	37,500	38,000
Titanium:					
Concentrates:					
Ilmenite do	430,000	435,000	440,000	445,000	450,000
Rutile do	10,000	10,000	10,000	10,000	10,000
Metal do	40,000	41,000	41,500	43,000	43,500
Tungsten concentrate, W content do	9,000	9,100	9,100	9,200	9,200

See footnotes at end of table.

Table 2.—U.S.S.R.: Estimated[1] production of mineral commodities[2] —Continued

(Thousand metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
METALS —Continued					
Vanadium ---------- tons	9,500	9,500	9,500	9,500	9,600
Zinc:					
Mine output, recoverable Zn content ----------	800	805	810	810	810
Metal:					
Primary ----------	[r]860	[r]875	[r]900	900	900
Secondary ----------	90	95	95	100	105
Zirconium metal ----------	80	80	80	85	85
INDUSTRIAL MINERALS					
Asbestos ----------	[r]2,600	[r]2,650	[r]2,500	[r]2,400	2,400
Barite ----------	520	520	530	540	540
Boron minerals and compounds:					
Gross weight ----------	200	200	200	200	200
B_2O_3 content ----------	40	40	40	40	40
Bromine ----------	68	68	70	70	65
Cement, hydraulic[3] ----------	123,681	128,156	129,866	[r]130,722	135,000
Clays: Kaolin including china clay ----------	[r]2,600	2,600	2,800	2,900	3,000
Corundum, natural ---------- tons	8,600	8,700	8,700	8,700	8,700
Diamond:					
Gem[7] ---------- thousand carats	2,100	3,700	4,300	4,400	4,500
Industrial ---------- do	8,500	7,000	6,400	6,400	6,500
Total ---------- do	10,600	10,700	10,700	10,800	11,000
Diatomite ----------	235	235	240	245	250
Feldspar ----------	330	330	330	340	340
Fluorspar ----------	540	540	550	560	560
Graphite ----------	75	80	80	82	83
Gypsum ----------	4,900	4,900	4,900	4,900	5,000
Iodine ---------- tons	2,000	2,000	[r]2,000	[r]2,000	2,000
Lime: Quicklime and hydrated including dead-burned dolomite[3] ----------	28,700	29,500	29,500	29,200	29,200
Lithium minerals, not further specified ----------	[r]55	[r]55	[r]55	[r]55	55
Magnesite:					
Crude ----------	4,900	5,000	5,000	5,000	5,000
Marketable product ----------	2,450	2,500	2,500	2,500	2,500
Mica ----------	48	49	49	50	50
Nitrogen: N content of ammonia ----------	[r]14,000	[r]15,500	[r]15,800	[r]16,700	17,200
Perlite ----------	600	600	600	600	600
Phosphate rock:					
Crude ore:					
Apatite, 15% P_2O_5 ----------	[3]48,000	49,000	[r]50,000	[r]52,000	55,000
Sedimentary rock ----------	26,000	26,200	26,400	26,400	26,400
Total ----------	74,000	75,200	[r]76,400	[r]78,400	81,400
Concentrate:					
Apatite, 38.2% to 39.6% P_2O_5 ----------	[r]19,000	[r]19,100	[r]19,300	[r]19,400	19,600
Sedimentary rock, 19% to 30% P_2O_5 ----------	13,000	13,100	13,200	13,200	13,200
Total ----------	[r]32,000	[r]32,200	[r]32,500	[r]32,600	32,800
Potash:					
Ore, gross weight ----------	66,000	70,000	71,000	72,000	71,000
K_2O equivalent[3] ----------	8,079	9,294	9,776	[r]10,367	10,200
Pyrite, gross weight ----------	7,800	7,600	7,600	7,500	7,400
Salt, all types[3] ----------	15,800	16,200	16,500	[r]16,100	16,100
Sodium compounds, n.e.s.:					
Carbonate[3] ----------	4,763	5,099	5,116	[r]4,916	5,032
Sulfate:					
Natural ----------	360	360	360	[r]360	360
Manufactured ----------	250	250	250	260	260
Sulfur:					
Frasch ----------	800	800	800	850	875
Other native ----------	1,800	1,800	1,800	1,700	1,700
S content of pyrite ----------	3,500	3,400	3,400	3,350	3,300
Byproduct:					
Of metallurgy ----------	425	450	450	475	500
Of natural gas ----------	2,700	2,750	2,800	2,900	3,000
Of petroleum ----------	425	450	450	450	450
Total ----------	9,650	9,650	9,700	9,725	9,825
Sulfuric acid[3] ----------	23,801	24,714	25,338	[r]26,037	27,847

See footnotes at end of table.

Table 2.—U.S.S.R.: Estimated[1] production of mineral commodities[2] —Continued

(Thousand metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
INDUSTRIAL MINERALS —Continued					
Talc	510	510	520	520	520
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Anthracite	67,000	67,000	67,000	67,000	67,000
Bituminous	488,400	490,800	489,500	[r]502,000	521,000
Lignite and brown coal[3]	162,700	158,300	155,800	157,000	163,000
Total[3 8]	718,100	716,100	712,300	726,000	751,000
Coke: Coke oven, beehive, breeze, gas coke	86,000	86,000	86,000	86,000	86,000
Fuel briquets:					
From anthracite and bituminous coal	600	600	600	600	600
From lignite and brown coal	5,800	4,800	4,900	[r]4,300	4,300
Total[3]	6,400	5,400	5,500	4,900	4,900
Gas, natural, marketed:					
As reported[3] million cubic meters	500,700	535,700	587,400	643,000	686,000
Converted million cubic feet	17,700,000	18,900,000	20,700,000	22,700,000	24,200,000
Oil shale[3]	35,236	33,256	33,204	32,076	30,500
Peat:					
Agricultural use	180,000	180,000	180,000	180,000	190,000
Fuel use	60,000	[r]55,000	[r]50,000	[r]45,000	50,000
Petroleum:					
Crude:					
As reported, gravimetric units[3]	[r]612,551	[r]616,343	[r]612,710	595,291	615,000
Converted, volumetric units thousand 42-gallon barrels	4,500,000	4,530,000	4,500,000	[r]4,380,000	4,520,000
Refinery products[9]	453,200	451,200	450,200	450,000	460,000

[p]Preliminary. [r]Revised.
[1]Production estimated unless otherwise specified.
[2]Includes data available through Sept. 5, 1987.
[3]Reported in Soviet sources.
[4]Reported in United Nations sources.
[5]Estimate based on total of spiegeleisen and blast furnace ferromanganese reported by United Nations sources.
[6]Data may not add to totals shown because not all items comprising total are listed.
[7]Series changed in 1983 to include near gem and cheap gem quality.
[8]Run-of-mine coal.
[9]Not distributed by type and, therefore, not suitable for conversion to volumetric units. Data include all energy products and some nonenergy products as well as refinery fuel and exclude petrochemical feedstocks, paraffin, petroleum coke, white spirit, unspecified minor nonenergy products, and refinery losses.

TRADE

The U.S.S.R. changed the previous system whereby all foreign trade was conducted by Foreign Trade Organizations subordinate to the Ministry of Foreign Trade. Under the new system, some ministries, departments, and enterprises would be able to engage directly in foreign trade. Beginning in January 1987, the reform will be introduced on a trial basis in a limited number of areas in an attempt to improve Soviet competitiveness in hard-currency-earning foreign trade. In 1986, Soviet manufactured goods accounted for only a small proportion of hard-currency-earning exports. Over 80% of earnings came from the sale of minerals and other raw materials. Foreign trade in some petroleum products, petrochemicals, and construction materials would be part of the new system, but foreign trade in ferrous and nonferrous metals would still be directly administered by the Ministry of Foreign Trade.

A new regulation would permit foreign firms to engage in joint ventures in the U.S.S.R. with the goal of producing goods for export as well as goods for the Soviet market being imported by the Soviet Union. In this way, the Soviet Union hoped to generate additional hard currency exports, to eliminate some hard currency imports, and to produce state-of-the-art equipment for the Soviet economy. The U.S.S.R. would permit foreign firms to have up to a 49% interest in joint venture projects. Although the Soviets stated that they would not want to engage in joint mining ventures with market economy countries, it does not appear to be prohibited by the new regulation,

and the Soviets have shown signs of flexibility in this matter.

In late March 1986, the Soviet Union stated that it would seek observer status in the General Agreement on Tariffs and Trade (GATT), and in mid-August requested to participate in a GATT round in a letter delivered to the GATT Secretariat expressing an interest in deciding whether or not to seek accession to the GATT and mentioning prospective changes in the Soviet foreign trade regime. The GATT trade ministers, however, did not formally act upon the request, and the Soviet Union was not able to participate.

At a meeting of the U.S.-U.S.S.R. Joint Commercial Commission (JCC) held in December, the United States and the Soviet Union reached a preliminary agreement that should lead to ending the U.S. embargo of nickel imports from the Soviet Union, but a final agreement was not concluded. The embargo was imposed in late 1983 when the U.S.S.R. would not certify that its nickel exports contained no Cuban nickel. During 1986, the Soviet Union increased nickel sales to market economy countries. Depressed oil prices in 1986 were viewed as spurring Soviet sales of nickel, gold, and other mineral commodities in an attempt to recover some of the country's hard currency losses. There was a dramatic increase in Soviet gold exports to the United States, making gold the leading Soviet export to the United States in terms of U.S. dollar value.

During the 1986-90 period, the Soviets would be increasing exploration and development of oil and gas resources in Siberia, which would require the use of additional advanced technology and equipment not available from domestic suppliers.

Table 3.—U.S.S.R.: Mineral trade with the United States in 1986

Commodity[1]	Quantity (metric tons unless otherwise specified)	Value (thousands)
Leading U.S. exports:		
Fertilizers and fertilizer materials[2]	NA	$261,478
Petroleum refinery products:		
Automotive, diesel, marine engine lubricating oils, barrels	253,358	14,562
Insulating or transformer oils, do.	105,738	13,898
Lubricating oils, not specified, except white mineral oil, do.	109,761	5,106
Petroleum coke, calcined	105,738	13,898
Leading U.S. imports:		
Aluminum:		
Unwrought and alloyed	2,997	3,246
Waste and scrap	19,906	18,571
Ammonia, anhydrous	672,203	79,641
Ferrosilicon (containing 30% to 60% by weight of silicon, not containing over 2% by weight of magnesium)	8,315	1,993
Gold bullion, refined, kilograms	14,052	154,284
Petroleum refinery products:		
Oil, heavy fuel, testing under 25° API, barrels	6,671,243	66,100
Petroleum and shale oil, crude testing under 25° API, do.	558,594	5,622
Platinum-group metals:		
Palladium:		
Pd content, kilograms	6,039	23,254
Semimanufactured, Pd content, do.	1,647	6,995
Platinum:		
Semimanufactured, Pt content, do.	893	13,734
Sponge, Pt content, do.	507	7,833
Rhodium, Rh content, do.	791	29,226
Urea	765,097	58,209

NA Not available.

[1]Leading items selected based on value in U.S. dollars.

[2]To avoid disclosing company proprietary information, the Bureau of the Census, effective July 1985, established the category "Fertilizers and fertilizer materials" by combining U.S. export data previously contained in other Schedule B classifications. In previous years, the major U.S. export to the U.S.S.R., which would be in the "Fertilizers and fertilizer materials" category, was superphosphoric acid, over 65% P_2O_5 content, with over 700,000 tons per year being exported to the U.S.S.R. in accordance with a long-term trade agreement.

Table 4.—U.S.S.R.: Estimated production, trade, and consumption of mineral commodities in 1986

(Thousand metric tons unless otherwise specified)

Commodity	Production	Exports	Imports	Apparent[1] consumption
METALS				
Aluminum:				
Bauxite	4,600	--	4,600	9,200
Nepheline concentrate	2,500	--	--	2,500
Alunite	620	--	--	620
Alumina	3,500	--	1,600	5,100
Metal:				
Unwrought and semimanufactured	2,300	800	--	1,500
Secondary	220	15	--	205
Antimony tons	9,500	700	500	9,300
Arsenic, white (As_2O_3) do	8,100	(2)	--	8,100
Beryllium, 10% to 20% BeO do	2,000	(2)	(2)	2,000
Bismuth do	84	--	200	284
Cadmium do	3,000	100	500	3,400
Chrome ore, marketable	3,100	[3]474	--	2,626
Cobalt tons	2,800	--	2,500	5,300
Copper:				
Mine output, Cu content	620	(2)	150	770
Unwrought, unalloyed, semimanufactured	770	200	50	620
Secondary	145	35	(2)	110
Gold thousand troy ounces	8,850	9,650	--	(4)
Iron and steel:				
Iron ore	[3]250,000	[3 5]46,948	(2)	203,052
Pig iron and ferroalloys	110,000	4,000	(2)	106,000
Steel:				
Crude	[3]161,000	1,000	(2)	160,000
Rolled	[3]112,000	7,000	9,000	114,000
Lead:				
Mine output, Pb content	440	--	60	500
Primary	500	100	80	480
Secondary	270	--	--	270
Magnesium metal	89	5	2	86
Manganese ore	[3]9,300	[3]1,101	300	8,499
Mercury 76-pound flasks	66,000	8,000	--	58,000
Molybdenum tons	11,400	(2)	1,200	12,600
Nickel:				
Mine output, Ni content	185	--	18	203
Smelter	203	75	--	128
Platinum-group metals thousand troy ounces	3,850	1,700	(2)	2,150
Silver do	48,200	--	4,000	52,200
Tin:				
Mine output, Sn content tons	23,500	--	2,500	26,000
Primary do	26,000	--	15,000	41,000
Secondary do	12,000	--	--	12,000
Titanium metal do	43,500	5,500	--	38,000
Tungsten do	9,200	(2)	7,200	16,700
Zinc:				
Mine output, Zn content	810	--	90	900
Primary	900	80	50	870
Secondary	105	--	--	105
INDUSTRIAL MINERALS				
Asbestos	2,400	500	(2)	1,900
Barite	540	--	540	1,080
Cement	[3]135,000	[3]2,771	[3]1,110	133,339
Clays	3,000	(2)	(2)	3,000
Diamond:				
Gem thousand carats	4,500	2,700	(2)	1,800
Industrial stones do	6,500	700	(2)	5,800
Diatomite	250	(2)	(2)	250
Feldspar	340	--	50	390
Fertilizer materials:				
Nitrogen: N content	17,200	6,000	100	11,300
Phosphate rock	32,800	3,250	--	29,550
Potash, K_2O equivalent	[3]10,200	[3]2,133	--	8,067
Fluorspar	560	--	630	1,190
Graphite	83	(2)	(2)	83
Gypsum	5,000	--	(2)	5,000
Lime, dead-burned dolomite	29,200	(2)	(2)	29,200
Magnesite, crude	5,000	(2)	800	5,800
Mica	50	--	7	57
Perlite	600	110	--	490
Salt, all types	16,100	[3]418	(2)	15,682
Sulfur, all types	9,825	300	1,200	10,725
Sulfuric acid	27,847	[3]231	150	27,766
Talc	520	(2)	(2)	520

See footnotes at end of table.

Table 4.—U.S.S.R.: Estimated production, trade, and consumption of mineral commodities in 1986 —Continued

(Thousand metric tons unless otherwise specified)

Commodity	Production	Exports	Imports	Apparent[1] consumption
MINERAL FUELS AND RELATED MATERIALS				
Coal:				
Anthracite and bituminous	588,000	29,000	14,000	573,000
Lignite and brown coal	[3]163,000	([2])	([2])	163,000
Gas, natural million cubic meters	[3]686,000	80,000	5,000	611,000
Oil shale	30,500	--	--	30,500
Peat:				
Agricultural	190,000	([2])	--	190,000
Fuel use	50,000	--	--	50,000
Petroleum:				
Crude	[3]615,000	120,000	15,000	510,000
Refinery products	460,000	65,000	1,000	396,000

[1]Includes amount available for consumption and stockpiling based on 1986 production and trade and excludes consumption from stockpiles from previous years.
[2]Less than 1/2 unit.
[3]Reported in Soviet sources.
[4]Exports exceeded production.
[5]Includes concentrates and pellets.

Table 5.—U.S.S.R.: Apparent exports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals	--	34	--	West Germany 24; Italy 10.
Aluminum:				
Oxides and hydroxides	3,021	NA		
Ash and residue containing aluminum	1,631	34,788	--	West Germany 28,654; Italy 6,134.
Metal including alloys:				
Scrap	4,012	12,479	6,882	West Germany 4,407; Italy 1,183.
Unwrought	490,008	428,522	1,599	Hungary 162,698; Japan 78,214; Czechoslovakia 70,000.
Semimanufactures	17,315	16,660	--	Yugoslavia 9,289; Poland 4,179; Austria 2,821.
Antimony:				
Oxides	451	100	--	All to Austria.
Metal including alloys, all forms	17	NA		
Chromium:[2]				
Ore and concentrate thousand tons	442	471	--	Czechoslovakia 129; Poland 128; Yugoslavia 73.
Oxides and hydroxides	5,722	4,320	--	Czechoslovakia 450; Bulgaria 377; Japan 350.
Copper:				
Matte and speiss including cement copper	--	130	--	All to Greece.
Sulfate[2]	23,013	23,356	21	Bulgaria 7,967; Hungary 3,550; Netherlands 1,303.
Ash and residue containing copper	214	644	--	Italy 403; West Germany 241.
Metal including alloys:				
Scrap	18,116	33,865	--	Austria 22,950; West Germany 7,659; Switzerland 2,379.
Unwrought	96,126	78,173	--	Czechoslovakia 40,000; Hungary 13,429; West Germany 10,784.
Semimanufactures	847	415	--	Poland 186; Yugoslavia 154; Pakistan 25.
Germanium: Metal including alloys, all forms	--	([3])	--	All to West Germany.
Gold:				
Ore and concentrate value, thousands	--	$37	$37	
Metal including alloys, unwrought and partly wrought do.	$226,309	$163,419	$1,434	Italy $104,949; West Germany $56,840.

See footnotes at end of table.

Table 5.—U.S.S.R.: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite[2] thousand tons	45,922	43,880	--	Czechoslovakia 13,375; Poland 10,981; Romania 7,499.
Metal:				
Scrap[2] do	3,407	3,315	(3)	Yugoslavia 705; Japan 521; Italy 500.
Pig iron, cast iron, related materials do	2,872	1,616	--	Czechoslovakia 867; Bulgaria 363; Hungary 250.
Ferroalloys:				
Ferrochromium	17,506	6,270	--	Belgium-Luxembourg 3,412; West Germany 2,799; Spain 59.
Ferromanganese	25,277	27,855	--	Hungary 27,537; West Germany 168; Thailand 150.
Ferrosilicochromium	882	NA		
Ferrosilicomanganese	20,157	20,448	--	Romania 20,195; Italy 252; Thailand 1.
Ferrosilicon	37,510	22,134	11,473	West Germany 9,387; Switzerland 935.
Silicon metals	6	NA		
Unspecified	23,548	54,736	--	Hungary 22,806; Japan 9,827; Austria 7,458.
Steel, primary forms thousand tons	697	713	--	Hungary 409; Yugoslavia 217; Italy 33.
Semimanufactures:				
Bars, rods, angles, shapes, sections do	671	700	--	East Germany 471; Hungary 158; Bulgaria 50.
Universals, plates, sheets do	1,391	1,466	(3)	Cuba 587; East Germany 474; Hungary 238.
Hoop and strip do	10	11	--	Yugoslavia 9; Bulgaria 2.
Rails and accessories do	3	4	--	All to Yugoslavia.
Wire do	8	5	--	Hungary 3; West Germany 1.
Tubes, pipes, fittings do	75	80	--	Cuba 46; Poland 12; West Germany 9.
Castings and forgings, rough do	38	11	--	Poland 9; West Germany 1.
Unspecified do	429	1,769	--	All to Poland.
Lead: Metal including alloys:				
Scrap	--	3,889	--	All to Austria.
Unwrought	23,987	14,498	--	Czechoslovakia 9,000; Hungary 5,125; Pakistan 373.
Semimanufactures	15	20	--	All to Yugoslavia.
Lithium: Oxides and hydroxides	--	25	--	Netherlands 15; Spain 10.
Manganese: Ore and concentrate, metallurgical-grade[2] thousand tons	1,081	1,126	--	Poland 524; Czechoslovakia 323; Bulgaria 78.
Molybdenum: Ore and concentrate	--	22	--	All to West Germany.
Nickel:				
Ore and concentrate	25	NA		
Matte and speiss	215	146	--	All to Austria.
Metal including alloys:				
Scrap	369	24	--	All to Italy.
Unwrought	35,759	26,612	--	West Germany 11,663; Japan 4,598; Czechoslovakia 3,684.
Semimanufactures	290	239	--	Yugoslavia 223; Pakistan 13; Venezuela 3.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$320,306	$236,218	$48,981	Japan $124,599; West Germany $35,781.
Rare-earth metals including alloys, all forms	1	107	1	Austria 101; Spain 5.
Selenium, elemental	--	2	--	All to United Kingdom.
Silicon, high-purity	2	NA		
Silver:				
Ore and concentrate value, thousands	[4]$528	$215	--	All to West Germany.
Waste and sweepings do	$1,135	NA		
Tellurium, elemental and arsenic	13	6	--	West Germany 4; Spain 2.

See footnotes at end of table.

Table 5.—U.S.S.R.: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Tin:				
Oxides	--	18	--	All to Spain.
Metal including alloys, unwrought	--	14	--	All to West Germany.
Titanium: Metal including alloys, all forms	655	1,065	--	United Kingdom 585; West Germany 454; Netherlands 26.
Uranium and thorium: Oxides and other compounds	15	NA		
Zinc:				
Ore and concentrate	--	5,159	--	All to United Kingdom.
Oxides	100	250	--	All to Yugoslavia.
Metal including alloys, unwrought	31,392	12,029	--	Hungary 4,087; Czechoslovakia 4,000; Poland 3,106.
Other:				
Oxides and hydroxides	213	10	--	All to Switzerland.
Ashes and residues	96,639	76,053	--	Austria 76,028; Belgium-Luxembourg 25.
Base metals including alloys, all forms	11,953	17,570	70	Czechoslovakia 11,000; Poland 5,046; Austria 1,347.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	--	1	--	All to Yugoslavia.
Artificial:				
Corundum	6,723	8,418	--	West Germany 4,980; France 2,349; Japan 740.
Silicon carbide	7,002	6,753	--	West Germany 4,936; Italy 1,337; Spain 418.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$1,616	$1,937	$131	Canada $518; Yugoslavia $460; Italy $440.
Grinding and polishing wheels and stones	78	52	--	Belgium-Luxembourg 25; Yugoslavia 24; Greece 2.
Asbestos, crude	256,839	257,951	--	Poland 62,249; Japan 45,493; Yugoslavia 40,863.
Boron materials: Oxides and acids[2]	14,418	11,249	95	Yugoslavia 1,450; West Germany 1,003; Hungary 800.
Bromine	132	179	--	All to Hungary.
Cement[2] thousand tons	2,543	2,313	--	China 565; Egypt 489; Hungary 294.
Clays, crude:				
Chamotte earth	--	5,534	--	All to Poland.
Kaolin	32,960	32,611	--	Poland 28,793; Austria 3,818.
Unspecified	10,949	16,016	--	Yugoslavia 14,033; Hungary 1,968; West Germany 15.
Cryolite and chiolite	--	2	--	All to Indonesia.
Diamond:				
Gem, not set or strung value, thousands	$374,393	$353,573	$17	Belgium-Luxembourg $264,832; West Germany $32,092; Switzerland $22,377.
Industrial stones do	$602	$108	--	All to Belgium-Luxembourg.
Feldspar, fluorspar, related materials	1,053	NA		
Fertilizer materials:				
Crude, n.e.s	950	1,452	--	West Germany 852; Yugoslavia 600.
Manufactured:				
Ammonia thousand tons	2,140	1,269	720	Sweden 157; Italy 84.
Nitrogenous[2] do	4,657	5,048	474	China 788; Hungary 732.
Phosphatic[2] do	696	753	--	Cuba 270; Bulgaria 211; Hungary 133.
Potassic[2] do	5,435	5,456	--	Poland 1,704; Hungary 709; Yugoslavia 328.
Unspecified and mixed do	45	116	(3)	Austria 64; Hungary 40; West Germany 4.
Gypsum and plaster	--	141	103	Denmark 20; Sweden 18.
Iodine	32	31	--	All to Hungary.
Kyanite and related materials	1,115	NA		
Lime	5	NA		
Magnesium compounds	8,615	9,657	--	Hungary 7,323; Netherlands 1,980; West Germany 354.
Phosphates, crude thousand tons	3,112	2,698	--	Bulgaria 800; Poland 571; Hungary 402.
Phosphorus, elemental[2]	55,474	56,811	--	Poland 15,337; Romania 1,625; Japan 1,165.

See footnotes at end of table.

Table 5.—U.S.S.R.: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Pigments, mineral:				
Natural, crude	210	NA		
Iron oxides and hydroxides, processed	589	449	--	All to Yugoslavia.
Precious and semiprecious stones other than diamond:				
Natural, value, thousands	$296	$625	$21	West Germany $223; Hong Kong $146; Singapore $114.
Synthetic, do.	$572	$826	--	Austria $308; Singapore $276; Switzerland $88.
Pyrite, unroasted[2], thousand tons	273	294	--	Bulgaria 238; Italy 18; West Germany 15.
Salt and brine[2]	375,181	398,970	--	Hungary 150,117; Czechoslovakia 120,065; Denmark 63,923.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	100	3,172	--	Yugoslavia 3,004; United Kingdom 118; Italy 50.
Sulfate, manufactured[2]	37,595	29,125	--	Italy 7,580; Yugoslavia 5,103; Sweden 4,635.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	12,073	9,912	--	Italy 2,980; West Germany 2,949; Japan 2,645.
Worked	454	19	3	France 9; Japan 3.
Dolomite, chiefly refractory-grade	937	NA		
Gravel and crushed rock	6,370	NA		
Limestone other than dimension	15,750	NA		
Sulfur:				
Elemental: Crude including native and byproduct	33,994	33,957	--	Hungary 30,763; Yugoslavia 3,194.
Sulfuric acid[2]	230,140	221,653	--	Czechoslovakia 164,675.
Talc, steatite, soapstone, pyrophyllite	1,203	1,156	--	All to Hungary.
Vermiculite	130,930	98,395	--	Belgium-Luxembourg 51,311; Spain 29,660; Italy 17,424.
Other:				
Crude	36,108	42,785	--	West Germany 19,323; France 13,375; Italy 4,096.
Slag and dross, not metal-bearing	46	752	--	Japan 557; West Germany 195.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black[2]	92,542	98,268	15	Bulgaria 28,704; Hungary 26,891; East Germany 19,543.
Coal:				
Anthracite and bituminous, thousand tons	19,526	22,791	--	Bulgaria 5,226; Japan 3,890; Czechoslovakia 3,252.
Briquets of anthracite and bituminous coal, do.	--	5	--	All to Cyprus.
Lignite including briquets, do.	149	173	--	Yugoslavia 146; Japan 26; Belgium-Luxembourg 1.
Coke and semicoke, do.	1,433	1,290	--	East Germany 1,115; Bulgaria 143; Hungary 29.
Gas, natural: Gaseous, million cubic feet	1,652,084	1,496,413	--	Czechoslovakia 381,043; Italy 226,798; East Germany 218,985.
Peat including briquets and litter	146,578	151,581	16	West Germany 38,337; Italy 22,554; France 19,182.
Petroleum:				
Crude, thousand 42-gallon barrels	495,886	437,883	--	East Germany 125,501; Poland 94,631; Hungary 49,216.
Refinery products:				
Liquefied petroleum gas, do.	2,247	2,677	--	West Germany 1,166; France 368; Austria 363.
Gasoline, do.	35,241	46,523	1,568	West Germany 19,267; Netherlands 9,297; France 6,567.
Mineral jelly and wax, do.	9	9	--	Hungary 8.
Kerosene and jet fuel, do.	1,337	1,865	--	Hungary 928; Ireland 455; Netherlands 336.
Distillate fuel oil, do.	98,706	109,1479	1,124	Netherlands 36,364; West Germany 17,499; Switzerland 12,333.
Lubricants, do.	1,751	1,649	--	Sweden 722; Denmark 508; Austria 174.

See footnotes at end of table.

Table 5.—U.S.S.R.: Apparent exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum —Continued				
Refinery products —Continued				
Residual fuel oil thousand 42-gallon barrels	76,214	89,760	742	Italy 18,636; Belgium-Luxembourg 13,381; Netherlands 13,193.
Bitumen and other residues do.	(3)	NA		
Petroleum coke do.	1,430	1,374	--	Italy 798; Japan 457; Greece 87.
Unspecified do.	18,446	16,943	--	All to Poland.

[p]Preliminary. NA Not available.

[1]Table prepared by Jozef Plachy. Owing to a lack of official trade data published by the U.S.S.R., this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the trading partner countries.

[2]Official Trade Statistics of the U.S.S.R.

[3]Less than 1/2 unit.

[4]May include other precious metals.

Table 6.—U.S.S.R.: Net exports of selected minerals and metals as a percent of consumption in 1986[1]

Commodity	Percent of consumption
Aluminum	48
Asbestos	26
Chromium ore	18
Diamond, gem	150
Gas, natural	13
Gold	(2)
Iron ore and concentrate	23
Manganese concentrate	9
Mercury	14
Nickel, smelter	45
Nitrogen	52
Perlite	22
Petroleum, crude and refinery products	33
Phosphate rock	11
Platinum-group metals	79
Potash	26
Titanium metal	14

[1]Selection made from commodities for which exports comprise 5% or more of consumption. Includes consumption of secondary metal.

[2]Exports exceeded production.

Table 7.—U.S.S.R.: Net import reliance of selected minerals and metals as a percent of consumption in 1986[1]

Commodity	Percent of consumption	Principal sources
Barite	50	Bulgaria, North Korea, Yugoslavia.
Bauxite and alumina	55	Greece, Guinea, Hungary, India, Jamaica, Japan, Yugoslavia.
Bismuth	70	Japan, Peru.
Cadmium	15	Italy, Japan.
Cobalt	47	Cuba, Zaire.
Feldspar	13	Thailand.
Fluorspar	53	China, Mongolia, Thailand.
Iron and steel, high-quality products	5	Austria, Belgium-Luxembourg, France, West Germany, Italy, Japan, Spain.

See footnote at end of table.

Table 7.—U.S.S.R.: Net import reliance of selected minerals and metals as a percent of consumption in 1986[1] —Continued

Commodity	Percent of consumption	Principal sources
Lead	5	Argentina, Bulgaria, Greece, Peru, Spain, Sweden.
Magnesite	14	North Korea.
Mica	12	India.
Molybdenum	10	Mongolia.
Silver	8	Switzerland, United Kingdom.
Sulfur	8	Poland.
Tin	33	Malaysia, Singapore, United Kingdom.
Tungsten	43	China, Mongolia.
Zinc	6	Bulgaria, Finland, Greece, Netherlands, Norway, Poland, Spain, Sweden.

[1]Includes consumption of secondary metal.

Table 8.—U.S.S.R.: Apparent imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate thousand tons	1,733	1,163	--	Jamaica 803; Yugoslavia 360.
Oxides and hydroxides	755,514	697,588	30	Yugoslavia 380,432; Hungary 315,691; West Germany 691.
Metal including alloys:				
Unwrought	25	67	--	United Kingdom 57; Netherlands 10.
Semimanufactures	5,933	4,502	--	Austria 2,050; West Germany 1,151; Italy 676.
Bismuth: Metal including alloys, all forms	33	NA		
Cadmium: Metal including alloys, all forms	148	79	--	All from Italy.
Chromium: Oxides and hydroxides	330	467	--	All from United Kingdom.
Cobalt: Metal including alloys, all forms	3	4	--	All from Netherlands.
Columbium and tantalum: Ore and concentrate	71	154	--	Do.
Copper:				
Ore and concentrate	450	11,209	--	All from Sweden.
Matte and speiss including cement copper	1,022	492	--	All from Cyprus.
Metal including alloys:				
Scrap	45	NA		
Unwrought	1	NA		
Semimanufactures	21,426	17,675	--	Poland 11,451; West Germany 3,555; Japan 1,372.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	32	NA		
Iron and steel: Metal:				
Scrap	44,208	25,688	--	Mongolia 24,950; Netherlands 738.
Pig iron, cast iron, related materials	4,001	3,442	--	Sweden 3,224; West Germany 197; France 15.
Ferroalloys:				
Ferromolybdenum	50	60	--	All from Italy.
Ferrosilicon	--	3,408	--	All from North Korea.
Silicon metal	16,329	9,608	--	All from Yugoslavia.
Unspecified	2,069	1,060	--	Austria 809; West Germany 181; Sweden 70.
Steel, primary forms	56,825	82,391	--	West Germany 73,890; Spain 4,550; Italy 3,227.

See footnotes at end of table.

Table 8.—U.S.S.R.: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel: Metal —Continued				
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	1,159	1,041	(2)	Spain 381; Italy 188; Japan 150.
Universals, plates, sheets do	2,912	3,647	--	West Germany 1,008; Italy 581; Austria 500.
Hoop and strip do	251	213	--	West Germany 157; Japan 17; France 14.
Rails and accessories do	(2)	(2)	--	Mainly from Austria.
Wire do	15	21	--	Yugoslavia 12; Italy 4; West Germany 2.
Tubes, pipes, fittings do	4,750	4,880	(2)	West Germany 1,509; Japan 1,493; Italy 567.
Castings and forgings, rough do	3	5	--	West Germany 3; Italy 2.
Lead:				
Ore and concentrate	24,954	29,245	--	Spain 15,030; Argentina 8,503; Morocco 3,075.
Oxides	2,479	2,498	--	Italy 1,250; West Germany 800; United Kingdom 446.
Metal including alloys:				
Unwrought	57,851	62,058	--	Spain 34,450; Sweden 20,253; United Kingdom 5,002.
Semimanufactures	554	17	--	Yugoslavia 15; West Germany 2.
Magnesium: Metal including alloys, unwrought	1,300	1,952	--	Japan 1,920; United Kingdom 32.
Manganese:				
Ore and concentrate, metallurgical-grade	100,896	NA		
Oxides	5	527	--	Spain 513; Switzerland 14.
Molybdenum:				
Ore and concentrate	282	69	--	All from West Germany.
Metal including alloys, all forms	1	NA		
Nickel:				
Matte and speiss, Ni content	338	65	--	All from Cuba.
Oxides and hydroxides	1,409	3,050	--	Do.
Ash and residue containing nickel	--	560	--	All from Greece.
Metal including alloys:				
Unwrought	--	1	--	All from West Germany.
Semimanufactures	224	545	--	Japan 477; Sweden 36; France 26.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$2,429	$52	--	West Germany $49; Japan $1; Switzerland $1.
Silver:				
Ore and concentrate do	$110,123	NA		
Metal including alloys, unwrought and partly wrought do	--	$881	--	West Germany $869; France $5; United Kingdom $5.
Tin:				
Ore and concentrate	1,319	2,020	--	All from Singapore.
Metal including alloys:				
Unwrought	13,479	11,415	--	United Kingdom 4,974; Singapore 3,741; Malaysia 2,200.
Semimanufactures	1	2	--	All from United Kingdom.
Titanium:				
Ore and concentrate	24,684	3,400	--	All from Netherlands.
Oxides	1,760	3,446	--	West Germany 2,214; France 730; Spain 500.
Tungsten:				
Ore and concentrate	--	1,022	--	Hong Kong 606; Netherlands 266; Singapore 149.
Metal including alloys, all forms	132	43	18	Japan 25.
Uranium and thorium:				
Oxides and other compounds	224	NA		
Metal including alloys, all forms	1,344	NA		
Zinc:				
Ore and concentrate	88,117	31,288	--	Sweden 15,338; Spain 9,666; Greece 6,284.
Oxides	1	1	--	All from Yugoslavia.
Blue powder	--	518	--	Spain 500; United Kingdom 18.
Metal including alloys:				
Unwrought	27,403	19,861	--	Spain 12,704; Belgium-Luxembourg 3,057; France 2,800.
Semimanufactures	1,243	9,114	--	Australia 6,700; Poland 1,148; Yugoslavia 963.

See footnotes at end of table.

Table 8.—U.S.S.R.: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Other:				
Ores and concentrates	105,638	91,961	--	Australia 91,862; West Germany 99.
Oxides and hydroxides	3,595	105	--	Austria 70; Switzerland 35.
Ashes and residues	--	1,021	--	France 508; Greece 304; Japan 170.
Base metals including alloys, all forms	104	1,912	--	France 1,299; Austria 401; Japan 201.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	--	6	--	West Germany 4; Italy 2.
Artificial: Corundum	2,100	3,157	--	Hungary 2,016; West Germany 861; Japan 280.
Dust and powder of precious and semi-precious stones including diamond kilograms	(2)	NA		
Grinding and polishing wheels and stones	2,671	1,753	6	Austria 810; France 284; Italy 238.
Asbestos, crude	73	--		
Barite and witherite	75,318	4,000	--	All from Yugoslavia.
Boron materials:				
Crude natural borates	20	NA		
Oxides and acids	1	NA		
Cement	[3]563,000	[3]945,000	--	Poland 629,029; North Korea 263,000; Hungary 19,390.
Chalk	24	NA		
Clays, crude:				
Chamotte earth	6	NA		
Kaolin	--	20	--	All from United Kingdom.
Unspecified	2,263	63	--	Austria 37; France 26.
Diamond:				
Gem, not set or strung value, thousands	$460	$7,562	--	West Germany $7,334; Belgium-Luxembourg $122; Switzerland $79.
Industrial stones do	$1,482	$481	--	Belgium-Luxembourg $455; United Kingdom $26.
Diatomite and other infusorial earth	436	191	--	Iceland 182; France 8; West Germany 1.
Feldspar, fluorspar, related materials:				
Fluorspar	16,198	37,528	--	Thailand 25,500; Mexico 12,028.
Fertilizer materials:				
Crude, n.e.s	10,000	NA		
Manufactured:				
Nitrogenous	105	50,433	--	Afghanistan 40,000; North Korea 10,200; Switzerland 210.
Phosphatic[3]	88,500	702,725	--	Morocco 303,600; Turkey 149,725; Tunisia 51,700.
Potassic	--	50	--	All from West Germany.
Unspecified and mixed	39	16,442	--	Sweden 9,000; Yugoslavia 7,429; West Germany 7.
Gypsum and plaster	132	46	--	Yugoslavia 44; West Germany 2.
Iodine	15	NA		
Lime	246	23	--	All from Yugoslavia.
Magnesium compounds:				
Magnesite, crude	--	76	--	Do.
Oxides and hydroxides	48,929	2,405	--	Netherlands 1,402; West Germany 520; Japan 398.
Mica: Worked including agglomerated splittings	--	1	--	All from Austria.
Nitrates, crude	1,950	NA		
Phosphates, crude	20	NA		
Pigments, mineral: Iron oxides and hydroxides, processed	734	1,110	--	West Germany 710; Japan 400.

See footnotes at end of table.

Table 8.—U.S.S.R.: Apparent imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Precious and semiprecious stones other than diamond:				
Natural ____ value, thousands__	--	(2)	--	All from Thailand.
Synthetic ____ do____	$47	$304	--	Belgium-Luxembourg $303; Austria $1.
Pyrite, unroasted____	--	1	--	All from Switzerland.
Salt and brine____	--	54	--	Austria 23; United Kingdom 20; Italy 10.
Sodium compounds, n.e.s.: Carbonate, manufactured ____	553,898	522,181	--	Bulgaria 466,769; Poland 55,412.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked ____	9,459	8,638	--	Hungary 8,544; Yugoslavia 74; Italy 20.
Worked____	956	435	--	Yugoslavia 311; Italy 124.
Dolomite, chiefly refractory-grade __	19	24	--	All from Sweden.
Gravel and crushed rock ____	13,013	2,498	--	Yugoslavia 2,412; Japan 60; Italy 26.
Quartz and quartzite____	2	147	--	All from Italy.
Sand, other than metal-bearing ____	330	40	--	France 24; Austria 10; West Germany 5.
Sulfur:				
Elemental: Crude including native and byproduct __ thousand tons__	1,143	1,162	--	Poland 868; Canada 294.
Dioxide____	--	16	--	All from United Kingdom.
Sulfuric acid____	824	98,178	--	Poland 97,709; West Germany 245; Japan 200.
Talc, steatite, soapstone, pyrophyllite __	--	6	--	All from West Germany.
Other:				
Crude____	33	1,211	--	Hungary 1,100; Italy 108; Japan 3.
Slag and dross, not metal-bearing ___	--	115	--	All from West Germany.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural ____	40	NA		
Carbon black ____	[3]578	[3]533	68	West Germany 186; Japan 151.
Coal:				
Anthracite and bituminous thousand tons__	12,834	10,373	--	All from Poland.
Lignite including briquets __do____	16	17	--	All from Hungary.
Coke and semicoke____ do____	787	843	--	Poland 714; Japan 111; Italy 18.
Gas, natural____ million cubic feet__	368	735	--	All from Hungary.
Peat including briquets and litter____	22	45	--	France 18; Japan 15; West Germany 12.
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels__	(2)	(2)	--	All from West Germany.
Gasoline ____ do____	3	94	--	All from Spain.
Mineral jelly and wax ____ do____	2	1	--	Mainly from Netherlands.
Kerosene and jet fuel ____ do____	45	24	--	Yugoslavia 21; West Germany 2; Belgium-Luxembourg 1.
Distillate fuel oil ____ do____	185	649	--	Singapore 447; Italy 180; France 12.
Lubricants____ do____	1,534	1,484	584	France 232; West Germany 154.
Residual fuel oil ____ do____	208	273	--	Singapore 243; Spain 22; Yugoslavia 5.
Bitumen and other residues __do____	27	12	--	All from Hungary.
Bituminous mixtures ____ do____	(2)	1	--	Mainly from Sweden.
Petroleum coke____ do____	--	1,169	994	Japan 143; United Kingdom 32.

[p]Preliminary. NA Not available.

[1]Table prepared by Jozef Plachy. Owing to a lack of official trade data published by the U.S.S.R., this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the trading partner countries.

[2]Less than 1/2 unit.

[3]Official Trade Statistics of the U.S.S.R.

COMMODITY REVIEW

METALS

Aluminum.—The 1986 plan for aluminum production was reportedly fulfilled.[13] The two major aluminum projects planned for development during the 1986-90 plan period, the Tadzhik aluminum plant in Tadzhikistan and the Sayansk aluminum plant in East Siberia, were both experiencing difficulties in 1986. Problems were occurring at the Tadzhik plant, where production was planned to increase 12.6%. Reportedly, problems with anodes falling into pots and leaking pots at times resulted in metal spilling onto the floor in the potline area and solidifying. According to a Soviet journalist who visited the plant, the entire span of the potline area was immersed in hardened aluminum.[14] Environmental problems were also occurring at the Tadzhik plant. Despite the installation of equipment for collecting and purifying gaseous emissions, the gas was leaking in large quantities into the atmosphere, and a greenish haze was visible around the plant.[15] Plans for the Tadzhik plant called for the renovation of potline No. 3 to be completed by yearend. Like potline No. 4, renovated in 1985, the number of pots was to be increased to 98 with the addition of 32 pots. Despite difficulties, the Tadzhik plant, as of November, reportedly was fulfilling its 1986 plan after having failed to fulfill its goals for the 1981-85 plan period.[16]

At the other major aluminum project, the Sayansk plant in East Siberia, the pace of construction was quite slow. Construction began in 1976, and the plant was commissioned in 1985. Plans called for Sayansk to be the country's third largest aluminum producer and the country's leading plant in technology with the highest capacity potlines. The Sayansk and Tadzhik plants were the only two aluminum plants in the country using the prebaked anode system of production. Similar problems with aluminum production were occurring at Sayansk as at Tadzhik. A large number of potlines were down for repair, much of the work that was to be automated had to be done manually, molten metal from the potlines spilled onto the floor of the shop, and the quality of metal produced was described as poor.[17] A baked anode shop at Sayansk was scheduled to be commissioned in 1986. The Sayansk plant had been receiving its baked anodes from the Tadzhik plant.

In Azerbaidzhan, the only region where mining and processing of alunite ore took place, development of a new alunite open pit at 2,100 meters above sea level began not far from Dashkesan. Reserves were estimated to be sufficient for many decades. The new open pit would be connected by a 3.5-kilometer road to the crusher of the Zaglikskiy alunite mining directorate. In addition, new capacities were commissioned at the Kirovabad alumina plant in Azerbaidzhan for the processing of alunite ore, which would enable the output of alumina to increase by 10%.

Geologists were conducting a detailed exploration of the Katugino River natural cryolite deposit in Chitinskaya Oblast' in East Siberia; exploration was to be completed during the 1986-90 plan period. The country used relatively expensive synthetic cryolite in aluminum production. Before the completion of the Baikal-Amur Mainline Railroad (BAM) in 1984, this cryolite deposit was considered inaccessible.

In foreign trade, the Soviet Union renegotiated its terms for assisting in the construction of the Delphi alumina refinery in Greece; the Soviet Union agreed to take the entire 600,000-ton-per-year output of the refinery for a 10-year period instead of the originally agreed-upon 380,000 tons. Bulgaria was originally to take the remaining 220,000 tons, but did not come to an agreement regarding its purchase. In addition, India and the Soviet Union signed a contract for the development of a bauxite mining project in Andhra Pradesh.

Antimony.—Plans called for increasing capacity at the Anzob antimony and mercury mining and beneficiation plant in Tadzhikistan, making it one of the country's largest antimony and mercury producers. In 1986, the U.S.S.R. reportedly exported over 500 tons of antimony, all or part of which could have been reexported Chinese material.

Bismuth.—The U.S.S.R. was significantly dependent on bismuth imports, although indications were that domestic production was increasing. Reportedly, byproduct production of bismuth from tungsten-molybdenum ore increased 13% in 1985 compared with that of 1980.[18]

Chromium.—Preliminary results for 1986 indicated that the chrome ore produc-

tion goal was exceeded by 150,000 tons. Reportedly, 76.2% of chrome ore production was extracted from open pits, and 850,000 tons of chrome ore was extracted from underground mines,[19] which would indicate that national chrome ore production in 1986 was about 3.6 million tons. The Donskoye mining and beneficiation complex in Kazakhstan, which exploited deposits in the southern part of the Kempirsay Massif, produced over 95% of Soviet chromite. Development was proceeding at the Donskoye complex of the Molodezhnaya underground mine with a final design capacity of 2 million tons of crude ore per year. The first stage of the Molodezhnaya Mine with a capacity of 800,000 tons per year was commissioned in 1982. By the year 2000, plans called for the Donskoye complex to switch entirely to underground mining. To accomplish this, during the 1986-90 plan period, underground mining at the Donskoye complex was to increase more than sixfold in comparison with the 1981-85 plan period.[20]

Cobalt.—The Noril'sk mining and beneficiation complex in East Siberia, which exploited a rich polymetallic deposit and was a major site for the expansion of Soviet cobalt production, reported fulfilling its 1986 production goals. Cobalt was one of the few metals for which the U.S.S.R. was significantly dependent on imports, importing a large percentage of its cobalt from Cuba in barter exchange for economic assistance. The U.S.S.R. was further assisting Cuba in developing large additional nickel-cobalt deposits in exchange for these metals. In February, the first of three 10,000-ton-per-year nickel-cobalt sinter production lines began operating at Cuba's new Comandante Che Guevara Punta Gorda plant. Construction of the plant, which was proceeding slowly, was to be completed by about 1990. This would increase the Soviet supply of Cuban cobalt. The U.S.S.R. also customarily purchased large amounts of cobalt from Zaire and possibly made very large purchases in 1986.

Copper.—For the first 10 months of 1986, the national plan for blister copper production was exceeded by 1.6%.[21] In Kazakhstan, one of the country's major copper producing regions, the 9-month plan for the production of refined copper was not fulfilled.[22] In the Dzhezkazgan copper ore basin, development began at the abandoned Petrokholm underground mine, which was to be reworked by open pit mining; at least 25% of the ore remained. At Dzhezkazgan, the majority of ore was mined underground, but two open pits, the Zlatoust-Belovskiy and Akchiy-Spasskiy, were also under exploitation. At Dzhezkazgan, a new fluidized-bed smelter capable of processing very low-grade ores was commissioned. During the 1986-90 plan period, the country planned to increase autogenous, fluidized-bed smelter use by 150% to 200%; autogenous smelters would then account for 35% of the country's copper output. Output at Dzhezkazgan peaked during the 1976-80 plan period. Since then, efforts had been directed toward maintaining production levels, although the plan for 1986-90 called for an increase in production. At the Ust'-Kamenogorsk lead-zinc complex in Kazakhstan, plans for 1987 called for installing a fluidized-bed smelter for copper production, and during the 1986-90 period, copper production at Ust'-Kamenogorsk was planned to increase 29% in comparison with that of 1985.[23]

The Noril'sk complex in East Siberia, the site of a major rich polymetallic complex producing cobalt, copper, nickel, platinum-group metals, and numerous other byproducts, reported fulfilling its 1986 goals. A new fluidized-bed copper smelter was reportedly put into operation at Noril'sk.

The Alaverdi Mine at the Alaverdi mining and beneficiation complex in Armenia was undergoing renovation that would significantly increase the ore supply during the 1986-90 period. The Zangezur copper-molybdenum complex in Armenia was undergoing wide-ranging renovation to permit the mining of leaner ores.

Ferroalloys.—The U.S.S.R. reportedly possessed the world's largest capacity for manganese ferroalloys production.[24] However, the U.S.S.R. had to contend with lower grade manganese ores containing larger amounts of silica and phosphorus than those of foreign producers. Thus, ferroalloys production in the Soviet Union required more raw materials and energy than in foreign countries, especially for producing low phosphorus and low silica ferroalloys.[25] The ferroalloys industry was awaiting the introduction into production of low-phosphorus manganese concentrate from the Ushkatyn 3 deposit under development in Kazakhstan.[26]

The Yermak ferroalloy plant in Kazakhstan, one of the country's largest producers of ferrochrome and ferrosilicon, was reportedly utilizing only 69% of its capacity in 1986, and efforts were being made to increase this rate.[27] The Yermak ferroalloy

plant was undergoing renovation that, according to plans, would increase output by 40% by 1990, making Yermak the country's largest ferroalloy producer. Production at Yermak was reportedly not being interrupted by the renovation. During the 1986-90 plan period, plans called for production of high-carbon ferrochrome and 75% ferrosilicon to begin at Yermak.

In Georgia, the Chiatura complex was sending low-grade ore from dumps to the Zestafoni ferroalloy plant in Georgia, which had installed furnaces for processing this ore. Reportedly, the Zestafoni ferroalloy plant produced 2,100 tons of silicomanganese in the first 3 days of 1986. Based on this figure, it was possible to project that the Zestafoni plant was producing more than 150,000 tons per year of silicomanganese, making it one of the country's largest silicomanganese producers.

Gold.—The 1986 plan for precious metals production was reportedly fulfilled.[28] The Kirgiz gold mining complex, one of two new gold mining complexes planned for development in Soviet Central Asia during the 1986-90 plan period, was commissioned. The Kirgiz complex is in the Toguz-Toro intermontane basin of the Tien Shan Mountains, on the upper course of the Naryn River. Preparation of the site began in 1977 and actual development started in 1979. The complex consisted of an open pit at an elevation of about 3,000 meters and a mill located about 20 kilometers away in the valley. In Mongolia, which exported practically all of its metals to the U.S.S.R. and where the U.S.S.R. claimed to control over 90% of Mongolia's nonferrous and precious metals production, the development of a gold mining complex in the Zaamar region was to begin during the 1986-90 plan period.

Soviet gold sales increased significantly in 1986 to about 9.65 million troy ounces. The increase in gold sales could be viewed, in part, as an effort to recoup hard currency lost from oil exports owing to the sharp fall in world oil prices. Soviet exports of gold bullion to the United States increased dramatically, making gold bullion the leading Soviet export to the United States in U.S. dollar value. U.S. gold bullion imports from the Soviet Union increased to $154.3 million in comparison with $1.4 million in 1985. As part of the Comprehensive Anti-Apartheid Act of 1986, as of October 2, 1986, a ban was imposed on the importation into the United States of gold coins minted in or offered for sale by the U.S.S.R.; the ban was imposed with the intent of applying the same standards regarding human rights to the U.S.S.R. as to the Republic of South Africa. The principal type of gold coin imported from the U.S.S.R. had been the Chervonets, a one-quarter-ounce coin; it was not legal tender and was purchased more by collectors than investors. U.S imports of Soviet gold coins totaled $103,000 during 1986.

Iron Ore.—In 1986, the iron content of marketable iron ore was reportedly 59.8%, which was 0.24% higher than that of 1985. Plans for the 1986-90 period called for this to increase to 60.5% and for increasing the production of concentrate, with an iron content of 65%, to between 90 and 95 million tons per year. In 1986, open pit mining accounted for 86% of iron ore production. The average depth of an open pit was 200 meters, with the maximum depth being 330 meters. During the 1986-90 period, the average depth of open pit mines would increase to 240 meters. The average capacity of dump trucks used in iron ore mining in 1986 was 61.4 tons in comparison with 41.4 tons in 1981, and in 1986, 36% of dump trucks had a 75-ton or greater capacity, in comparison with 4% in 1981.

In 1986, the average capacity of underground iron ore mines was 1.9 million tons of ore per year, but of special significance were mines with a capacity of 2 to 4.6 million tons per year, which produced 80% of the output from underground mining. The depth of underground mines in the Krivoy Rog Basin, the Gornaya Shoriya, and the Urals reached 800 to 1,000 meters. In the Krivoy Rog Basin, the country's largest iron ore producing region, new horizons for development of rich ores were at a depth of 1,200 to 1,400 meters.

The Krivoy Rog Basin in the Ukraine produced over 40% of the country's iron ore. During the 1981-85 period, the increase in reserves in the Krivoy Rog Basin was only able to compensate for depleted ore. Because of increasingly difficult mining conditions, plans called for increasing investment at Krivoy Rog by 50% in the 1986-90 period to sustain output levels. In the Krivoy Rog Basin, new horizons for development of rich ores with an iron content exceeding 46% are at a depth of 1,200 meters to 1,400 meters, and in 1986, consideration was being given to developing lower grade, more accessible ores. Large reserves of lower grade iron quartzites at Krivoy Rog were already being exploited by open pit mining. However, underground mining of rich ores

at Krivoy Rog had decreased from about 45 million tons per year in 1965 to 35 million tons per year in 1985.

At the Kachar iron ore mining and beneficiation complex in Kazakhstan (one of the major iron ore mining complexes to be developed during the 1986-90 period), the second stage with a capacity of 2 million tons of ore per year was put into operation. The first stage, with a capacity of 3 million tons per year, was commissioned in 1985. The Kachar complex was planned to achieve its final design capacity of 7 million tons of ore per year by 1990.

Enterprises of the Kursk Magnetic Anomaly (KMA), which ranked first in the country in iron ore reserves and produced about 15% of the national output, reportedly exceeded their 1986 production plan. The KMA accounts for about 30% of the Soviet Union's iron ore reserves, and a large portion of the reserves in the KMA contain higher grade ores suitable for direct shipping. However, about 60% of the higher grade ore is at a depth of over 500 meters. The question had been raised concerning the economic desirability of developing underground mines in the KMA to exploit this rich ore rather than pursuing the current strategy of surface mining. Over 80% of the surface ore mined was lower grade quartzites that had to be beneficiated.

Iron and Steel.—During the 1986-90 period, steel production was planned to increase by 7.7%, rolled steel by 9.4%, and steel pipe by 13.9% in comparison with those of 1985. Pig iron production, however, was not planned to increase, and coke expenditure was to be reduced. The U.S.S.R. was engaged in a major effort to increase the output of specialty steels and to upgrade technology in steelmaking. In 1986, production of low-alloy steel was 17.4 million tons in comparison with 12.9 million tons in 1980. Production of heat-hardened steel was 10.7 million tons in 1986 in comparison with 6.7 million tons in 1980. During the 1986-90 period, production of cold-rolled sheet was planned to increase by 23%, low-alloy steel by 39%, and heat-hardened steel by 42%. Plans called for increasing steel production in electric arc and oxygen converter furnaces by 30% to 40%, doubling the amount of continuously cast steel and tripling the output of metallurgical powders. In 1986, the plan for the production of cold-rolled steel, finished cast billets produced by continuous casting, pickled steel, high-impact drill pipes, and other high-quality steel products was not fulfilled.[29]

The steel industry had been slow to replace open-hearth furnaces with oxygen converter and electric arc furnaces and to introduce continuous casting as well as improved rolling mills for producing high-quality steels. In 1984, open-hearth furnaces accounted for 57% of steel production; oxygen converter furnaces, for 32%; and electric arc furnaces, for 11%. In 1986, open-hearth furnaces accounted for 54% of steel production; oxygen converter furnaces, for 33%; and electric arc furnaces, for 13%. In addition, the country did not possess enough sufficiently powerful rolling mills to produce the needed quantities of high-quality steel. Technical progress in the iron and steel sector was directed toward two goals, the first being the lowering of raw material expenditures in metal production and the second being increasing the quality of steel produced. The plan for the year 2000 called for considerable savings in metal usage. A large opportunity for metal savings was considered possible in machine manufacturing.[30]

At the Cherepovets steel mill, northwest of the U.S.S.R., the first output was reported in April 1986 from the new 5,500-cubic-meter-capacity No. 5 blast furnace. This was the largest in the Soviet Union with a planned total production capacity of 4.5 million tons of pig iron per year. During the 1986-90 period, plans called for retiring 19 obsolete blast furnaces and renovating 32 others. The Soviet Union planned eventually to phase out all blast furnaces of under 2,000-cubic-meter capacity, which accounted for about 35% of the country's pig iron production.

The Oskol metallurgical plant under construction in the KMA mining region was planned to be the world's largest direct-reduction steel plant with a capacity to produce 4.8 million tons of steel per year. In 1986, the No. 4 electric furnace was put into operation at the Oskol plant with a design capacity to produce 362,500 tons of steel per year.

Lead and Zinc.—For the first 10 months of 1986, the national plan for lead production was reportedly exceeded by 1%.[31] In Kazakhstan, which produced 70% of the country's lead and 50% of the country's zinc, the 9-month plan for January through September for putting new lead and zinc mining capacity into operation was not fulfilled.[32] The country had been experiencing increasing shortages of lead and zinc

owing to the depletion of reserves and lowering of ore grades. As a result, the country had switched from being a net exporter to a small net importer of lead and zinc.

Reportedly, in 1986, the Irtysh lead-zinc complex in Kazakhstan failed to produce the several thousand tons of lead and zinc called for in the plan.[33] At the Leninogorsk lead-zinc complex in Kazakhstan, plans were formulated to develop the Chekmar' mining directorate at the Chekmar' deposit, which would expand output at Leninogorsk. During the year, the U.S.S.R. signed an agreement with the Congo to develop the Yanga-Koubenza zinc deposit there.

Magnesium.—The Ust'-Kamenogorsk titanium-magnesium complex in Kazakhstan was one of the country's leading magnesium producers. Plans called for the installation of higher capacity electrolytic cells in the No. 1 electrolysis building, which would increase magnesium production by 12% to 15%. Renovation was also planned for the No. 2 electrolysis building during the 1986-90 plan period, and magnesium production at Ust'-Kamenogorsk would increase significantly.

Manganese.—The Soviet Union was the world's largest manganese producer, with more than twice the output of the world's next largest producer, the Republic of South Africa, in 1986. Nevertheless, it was facing a chronic shortage of high-grade ore for ferroalloy production owing to decreasing reserves at the Chiatura deposit in Georgia, the country's major source of high-grade ore. Production at Chiatura fell by 20% to 2.2 million tons. Nevertheless, Chiatura exceeded its yearly production plan target by 2%, indicating that the Government was taking into account in its planning the diminishing reserves at Chiatura. In an effort to increase manganese production, poor ore from dumps at Chiatura was being sent to the Zestafoni ferroalloy plant in Georgia where furnaces were installed for processing this material.

Future increases in manganese ore production would be based primarily on developing lower grade carbonate deposits, the chief one being the Bol'shoy Tokmak deposit in the Nikopol' Basin in the Ukraine where the Tavricheskiy mining and beneficiation complex was under development. In 1986, first output was reported from Tavricheskiy. Plans there called for developing five underground mines, each with a capacity of 1.5 to 2 million tons per year of run-of-mine ore.

The Nikopol' Basin was the country's largest manganese-producing region and contained the Marganets and Ordzhonikidze mining and beneficiation complexes. The ore at Nikopol', however, was not as high grade as at Chiatura. In 1985, when manganese production in the Ukraine decreased, production was not reported, as had been customary, in the yearly statistical summary for the Ukraine, published in January of each year in the newspaper Sovetskaya Ukraina (Soviet Ukraine). Manganese production also was not published in 1986, and indications were that production in the Nikopol' Basin could be again decreasing.

A small amount of manganese ore was produced in Kazakhstan, totaling less than 5% of national output. Efforts were under way, however, to increase production there. In 1986, at the Atasuyskiy mining and beneficiation complex, development began of a new underground mine and plans called for doubling output at Atasuyskiy by the year 2000.

The U.S.S.R. was negotiating with Brazil's Cia. Vale do Rio Doce to aid in the construction of a ferromanganese plant in northern Brazil with over 150,000 tons per year of capacity. The Soviet Union was to aid in the construction and to receive at least 50% of the output for a 12-year period. These negotiations could be viewed as another indication of the serious shortfall of high-grade manganese ore developing in the Soviet Union. In recent years, the Soviet Union had been importing several hundred thousand tons per year of high-grade manganese ore while still maintaining exports of manganese ore and ferromanganese—primarily to Eastern Europe. The need to import high-grade ore was fueled not only by the decline at Chiatura but also by the fact that, in the past 5 years, the Soviet Union significantly expanded ferromanganese production capacity with the addition of electric furnaces from Japan.

Mercury.—The Soviet Union reportedly was selling large amounts of mercury in 1986, and an antidumping complaint was lodged with the European Economic Community (EEC) by the Spanish mercury producer Minas de Almadén y Arrayanes S.A. The depressed world market price of mercury in 1986 was attributed, in part, to large Soviet sales. The Soviet Union was expanding mercury production. Plans called for increasing capacity at the Anzob antimony-

mercury complex in Tadzhikistan, resulting in a doubling of output and making the Anzob complex one of the country's largest mercury producers. The Nikitovskiy mercury complex in the Ukraine, also one of the country's largest mercury producers, consisted of an underground mine, three open pits, a metallurgical plant, and auxiliary facilities. Nikitovskiy had been exploited for 100 years, but intensive development during the past 25 years severely depleted reserves. Geologists had not discovered new ore bodies to compensate for the depleted reserves except for the Podcherganskaya ore zone, which was being mined underground. One solution was to lower the minimum standard for metal content of the ore to permit mining lower grade ores, which would raise the production cost but prolong the viability of the Nikitovskiy complex. Another solution was to rework the upper portions of underground mines through surface mining. This method had already been successfully employed in the Nikitovskiy central section. Plans also called for expanding exploration to compensate for depleted reserves.

Molybdenum.—In the Armenian S.S.R., one of the country's major molybdenum-producing regions, containing the Zangezur copper-molybdenum complex, plans for the 1986-90 period and the period to the year 2000 called for renovating and enlarging Zangezur, which required unprecedented renovation. The program called for increasing metal production, and one way suggested was to mine lower grade ores at the Gandzasar ore body. However, to increase molybdenum concentrate production 16% by 1995 by mining lower grade ores would necessitate increasing ore extraction by 45% to 50%, which would be three times the increase in molybdenum production. Plans called for introducing 110-ton-capacity dump trucks and 12.5-cubic-meter-capacity shovels at the Gandzasar open pits during the 1986-90 period. Increased ore production at Gandzasar necessitated a new conveyor route to the Kadzharan concentrator, construction of which had already begun.

Nickel.—For the first 10 months of 1986, the national plan for nickel production was exceeded by 0.3%.[34] The major expansion of Soviet nickel production was under way at the Noril'sk complex in East Siberia, which reportedly fulfilled its 1986 plan.[35] Noril'sk is the site of a rich copper-nickel deposit that also contains cobalt, platinum-group metals, silver, and other metals. Plans called for increasing exploration for nickel reserves in the Ukraine to compensate for depleted reserves of the Pobuzhskiy Mine, and efforts were undertaken to search for commercial deposits of nickel sulfide ores in the Ukraine.

In addition, the Soviet Union was engaged in developing Cuban nickel-cobalt resources in exchange for these metals and was importing 15,000 to 20,000 tons of nickel per year from Cuba. The U.S.S.R. was assisting in developing Cuba's new Comandante Che Guevara nickel processing plant at Punta Gorda. The first of three 10,000-ton-per-year production lines was commissioned in 1986, and the other two lines were scheduled to begin operation by 1990. During the 1986-90 period, Soviet nickel imports from Cuba were planned to double.[36]

The U.S.S.R. enjoyed a favorable supply situation regarding nickel; domestic production was increasing at Noril'sk, and the country was importing up to 20,000 tons of nickel per year from Cuba in barter exchange, which was planned to double in the next 5 years. The weakened world market price for nickel in 1986 was attributed, in part, to increased Soviet nickel sales. The increase in sales was probably spurred, to some degree, by an effort to recoup hard currency losses incurred because of the sharp fall in the price of oil. Phillip Bros. Inc. was the prime sales agent for Soviet nickel to market economy countries in 1986.

The Finnish company Outokumpu Oy signed a contract with the Soviet Union for the modernization of the Pechenga concentrator in the Kola Peninsula. Outokumpu was to deliver equipment for the grinding, flotation, and chemical preparation plants.

Prospects for increasing Soviet nickel sales improved when, in December 1986, the U.S.-U.S.S.R. JCC agreed in principle on the resolution of the U.S. embargo on Soviet nickel, which was imposed in 1983 when the Soviet Union refused to certify that their nickel exports contained no Cuban nickel. However, a final agreement had not been reached.

Platinum-Group Metals.—The 1986 plan for precious metals mining was reportedly fulfilled.[37] The Noril'sk complex in East Siberia, which was under development, was the major mining site for the expansion of platinum-group metals production in the country. The Noril'sk complex exploited a

rich copper-nickel deposit with significant amounts of cobalt, platinum-group metals, silver, and other byproducts. The Noril'sk complex reported fulfilling its yearly plan in 1986.

Soviet platinum sales to market economy countries increased in 1986, and U.S. imports of platinum-group metals from the Soviet Union almost doubled in value in 1986, increasing from $48 million in 1985 to $81 million in 1986.

Silver.—The U.S.S.R. was a net importer of silver, and the majority of silver used in photography in the country was not recovered. As one step toward alleviating the silver shortage, the Omsk Foto Association established a collection station for recycling photographic material that paid individuals 1 ruble per gram of silver returned to the collection point.[38]

Tin.—Tin mining was concentrated in the far eastern regions of the country, where mining capacity was being expanded, especially at the Deputatskiy tin mining and beneficiation complex in Yakutia. Placer mining had been conducted at Deputatskiy for over 40 years, and in 1979, development began of a lode mine and concentrator. In 1986, the new concentrator was commissioned at the Deputatskiy complex, and in 1988, the first stage of the lode mine and concentrator was planned to be in operation. With the commissioning of these facilities, the Deputatskiy complex was facing a power shortage owing to delays in constructing the Adycha hydroelectric plant. The commissioning of the second stage of Deputatskiy, scheduled for 1995, would reportedly increase tin production to the point where the country would no longer have to import tin.[39] In 1986, the country imported about 33% of its requirements.

Titanium.—In the U.S.S.R., plans called for significantly increasing production of pigment-grade titanium dioxide. At the Ust'-Kamenogorsk titanium-magnesium complex in Kazakhstan, one of the country's major producers of titanium metal, plans called for the introduction of a two-stage smelting process for ilmenite concentrate that would enable the plant to utilize nearby sources of ore. At present, titanium production at Ust'-Kamenogorsk was based on raw material imported long distances from other regions of the country and from foreign sources. In 1986, the Soviet Union significantly increased exports of ferrotitanium to Western Europe to between 4,000 and 5,000 tons, following a sharp cutback in exports in 1985. The fall in the market price of ferrotitanium was attributed, in part, to Soviet exports, and EEC producers were in the process of preparing a dumping complaint against the Soviet Union.

Vanadium.—In 1986, the Kirovabad alumina plant in Azerbaidzhan, the country's only facility that utilized alunite ore in the production of alumina, installed facilities for the production of byproduct vanadium.

INDUSTRIAL MINERALS

Barite.—The U.S.S.R. produced approximately one-half of its barite consumption from domestic sources and imported the remainder.[40] Practically all domestically produced barite used for oil and gas drilling was obtained as a byproduct of processing complex nonferrous ores in the Kazakh S.S.R., with the major supplier being the Achisay lead-zinc complex in Kazakhstan, which processed local and imported material. Barite produced at Achisay was not of the highest quality, but was needed owing to the barite shortage. The shortage of barite resulted in iron ore concentrates being used in place of barite as a weighting material, which caused additional wear on drilling equipment and particularly on pumps, which were also in short supply. The recommendation was made to begin mining primary barite deposits because reserves of primary barite in central and southern Kazakhstan were considered adequate for supplying the country for decades. The Mirgalimskoye deposit in southern Kazakhstan was considered of particular importance. The development of primary barite deposits, however, was still in the experimental stage. The Ministry of the Petroleum Industry was responsible for developing primary barite deposits; it was stated, however, that the Ministry of Nonferrous Metallurgy, which was already recovering barite from complex ores, would be better qualified to undertake the development of primary barite deposits.[41]

Bromine and Iodine.—The Republic of Turkmenistan, the country's major bromine and iodine producing region, reported not fulfilling its 1986 bromine and iodine production plan.[42] Problems continued at the Nebit-Dag iodine-bromine plant in Turkmenistan, one of the country's leading producers, which was falling considerably behind its delivery schedule. Production at Nebit-Dag in 1986 was 23% below the 1980 level.[43] In 1986, a major problem for the Nebit-Dag plant was breakdowns on the 50-kilome-

ter Boya Dag-Vyshka pipeline feeding the plant. Also, plans to develop the new Monzhuklinskoye deposit closer to the plant were far behind schedule.

Diamonds.—The 1986 plan for diamond mining was reportedly fulfilled.[44] The U.S.S.R. was one of the world's leading diamond producers, and diamond exports were a significant source of hard currency. Practically all significant resources of diamonds are in Yakutia. The Mir open pit in Yakutia, which had been exploited for 30 years, was almost depleted. However, further investigations determined that it was possible to renovate the open pit and deepen it to 500 meters. This would extend the life of the open pit by several years and renovation had begun. Regarding equipment, a new 120-ton dump truck was developed by a Byelorussian truck plant to replace its 110-ton predecessor, and the first group of these 120-ton trucks was sent to the Yakut diamond production association.

Fluorspar.—The U.S.S.R. was dependent on imported fluorspar for over 50% of its domestic consumption with practically all fluorspar imports coming from Mongolia, a close ally of the U.S.S.R. and a member of the Council for Mutual Economic Assistance (CMEA).[45] The U.S.S.R. had developed the Mongolian fluorspar industry through the joint Soviet-Mongolian nonferrous metallurgy association Mongolsovtsvetmet, in which the Soviets had a declared 92% interest. During the 1986-90 period, the Mongolsovtsvetmet association planned to increase Mongolian fluorspar production by 30%.[46]

Nitrogen.—From 1980 to 1985, significant changes occurred in the structure of nitrogen fertilizer consumption in the U.S.S.R. The Soviet Union was rapidly expanding urea production. In 1986, seven 152,000-ton-per-year plants were scheduled to be commissioned. In addition, the U.S.S.R. was in the process of expanding capacity at 16 ammonia plants from 1,300 tons per day to 1,700 tons. Emphasis was on the renovation of older plants, and a feasibility study was conducted concerning the renovation of 12 ammonia facilities with the assistance of Japanese and French firms.

Despite depressed world market prices for urea and ammonia, the U.S.S.R. aggressively marketed these commodities in 1986, spurred on possibly by an interest in trying to recoup some losses in hard currency earnings from the fall in oil prices. In August, the U.S. International Trade Commission voted unanimously in favor of a petition by the Ad-Hoc Committee of Domestic Nitrogen Producers that U.S. industry was being materially injured by urea imported into the United States from East European suppliers, including the U.S.S.R.

Table 9.—U.S.S.R.: Nitrogen, by type of fertilizer

Type of fertilizer	Percent consumed	
	1980	1985
Single component	84.1	75.7
Ammonium nitrate	43.8	37.5
Urea	20.4	21.7
Liquid ammonia	2.6	7.3
Ammonia liquor	12.1	9.3
Mixed fertilizer	15.9	24.3
Liquid mixed fertilizer	.2	2.4

Source: Khimiya v sel'skom Khozyaystve (Chemistry in Agriculture), Moscow, No. 9, Sept. 1986, p. 22.

Phosphate.—The U.S.S.R. reported phosphate reserves of about 2 billion tons of phosphorus pentoxide, 70% of which consists of apatite in the Khibiny and Kovdor deposits on the Kola Peninsula and phosphorite deposits in the Karatau and Aktyubinsk Basins in Kazakhstan. Of the total reserves, 44% is apatite and 56% is phosphorites. Reserves of high-quality, easy to concentrate apatite ore were being depleted, and phosphorite resources, although large, were difficult to process and would, at best, be considered of secondary importance.

Table 10.—U.S.S.R.: Phosphate, by type of fertilizer

Type of fertilizer	Percent consumed	
	1980	1985
Single component	48.4	36.4
Normal superphosphate	20.3	10.9
Concentrated superphosphate	12.2	14.3
Finely ground phosphate for direct application	14.8	10.2
Other	1.1	1.0
Mixed fertilizer	51.6	63.6
Ammonium phosphate	36.3	34.0
Liquid mixed fertilizer	.6	11.1
Nitrogen ammonium phosphate and nitrogen phosphate	8.0	8.0
Nitrogen ammonium phosphate and nitrogen phosphate (complete fertilizers)	6.4	3.5
Other	.3	7.0

Source: Khimiya v sel'skom Khozyaystve (Chemistry in Agriculture), Moscow, No. 9, Sept. 1986, p. 22.

In the U.S.S.R., approximately 65% of the phosphorus used in agriculture was contained in complex fertilizer. During the 1981-85 period, the percentage of simple phosphate fertilizer in the total consumed decreased,

and the production of normal and concentrated superphosphate did not increase. The increase in concentrated superphosphate consumption was based on imports.

At the Khibiny apatite complex on the Kola Peninsula, which produced about 80% of all phosphate used in fertilizer production, capacities for the extraction of an additional 2.5 million tons of ore including a new mine shaft, were commissioned in 1986. In October, the Khibiny complex was operating at above planned production levels, but the original yearly production goal had been reduced. In 1986, the Khibiny complex extracted about 55 million tons of crude ore to produce almost 19 million tons of concentrate. Some byproduct apatite concentrate was also produced at the Kovdor iron ore complex on the Kola Peninsula. The Khibiny complex was experiencing worsening mining conditions and decreasing ore grades, necessitating the addition of new mining capacities and improved technology and equipment to maintain and increase production. Projections to the year 2000 based on reserves at Khibiny indicated that the complex would be able to increase production only until 1990. Between 1990 and 1995, production would stabilize; after that time, production would decline. The cost of production, however, would double by the year 2000.[47]

Potash.—In 1986, potash production fell short of the plan. At the Uralkaliy potash association in the central Urals that produced about one-half of the country's potash, flooding reportedly occurred at the Berezniki No. 3 Mine, which would reduce Soviet potash production capacity. Reported production, however, was only slightly reduced. It did not appear likely that production could resume in the near future at this mine. The loss of this mine raised concerns about the amount of Soviet potash available for export to world markets, but reported exports also were only slightly reduced. Completion of the second stage of a potassium salts loading facility at the Baltic port of Ventspils in Latvia was announced, raising capacity to 1.5 million tons per year and making it possible for several large tonnage vessels to enter the port simultaneously.

Sulfur.—First sulfur output was reported from the Astrakhan sour gas processing plant commissioned at the end of 1986. The Astrakhan deposit, north of the Caspian Sea, is one of the most saturated in hydrogen sulfide of all natural gas deposits in the U.S.S.R., and the processing of sulfur from this deposit, the Government claimed, would end the country's "severe deficit" in sulfur production. The first stage of the complex was projected to produce over 2 million tons of sulfur per year from processing 106 billion cubic feet of sour gas per year. Final projected output was 4.5 million tons of sulfur per year. The U.S.S.R. envisaged that it would be able to discontinue Western imports of sulfur and begin exporting 1 million tons of sulfur per year when Astrakhan reached its final projected capacity.

In 1986, native sulfur production from the Gaurdak complex in Turkmenistan was reportedly 490,000 tons; plans for 1987 called for production to reach 500,000 tons. At the Gaurdak complex, development of the new Severozapadnyy open pit began, which was being developed reportedly with all necessary environmental protection measures.

In October, production began at the Tengiz Oilfield in Kazakhstan from well No. 37, which was targeted to produce 10 million tons of oil and 770,000 tons of sulfur in 1990. In mid-1986, the Soviet Union was finally able to extinguish the largest oil well fire in Soviet history, which began in June 1985 at the Tengiz Field and could not be extinguished by conventional methods owing to the high concentration of hydrogen sulfide in the associated gas.

MINERAL FUELS

In 1986, the plan for electric power generation was not fulfilled. Of the total quantity of electric power generated, thermal electric powerplants accounted for 76% of the total, which was slightly more than in 1985; nuclear powerplants accounted for 10.6%, and hydroelectric powerplants, 13.4% of the total, both of which decreased slightly in comparison with those of 1985. The failure to meet the plan along with the reduction in the total share of nuclear and hydroelectric power generation resulted from the major accident at the Chernobyl nuclear powerplant, the failure to commission new capacity at the Kalinin, Zaporozh'ye, and Rovno nuclear powerplants, and the low water levels of rivers in certain parts of the country, which affected hydroelectric power generation. As part of the program of resource conservation, 42% of the increase in requirements for fuel and energy were met in 1986 through conservation, although the plan called for 51%.

Table 11.—U.S.S.R.: Electric power generation, by type

Type	Billion kilowatt hours			Percent growth	
	1980 (reported)	1985 (reported)	1990 (planned)	1985 compared with 1980	1990 compared with 1985
Thermal electric	1,037.1	1,162.3	1,225	12.1	5.4
Hydroelectric	183.9	214.5	245	16.6	14.2
Nuclear	72.9	167.4	390	130.0	133.0
Total or average	1,293.9	1,544.2	1,860	19.3	20.5

Source: Teploenergetika (Heat and Power Engineering), Moscow, No. 12, Dec. 1986, pp. 2-5.

Table 12.—U.S.S.R.: Estimated primary energy balance in 1986

(Million metric tons of standard coal equivalent)

	Production	Exports	Imports	Apparent consumption
Coal (lignite, anthracite, bituminous, coke)	504	29	14	489
Electric[1] (hydropower and nuclear power)	41	3	--	38
Fuelwood	22	--	--	22
Natural and associated gas	811	94	6	723
Oil, crude and petroleum products	904	278	38	664
Oil shale	9	--	--	9
Peat	8	--	--	8
Total	2,299	404	58	1,953

[1]Electricity exports and imports calculated on energy generated from all sources.

Coal.—The 1986 increase in coal production was the greatest in 20 years, exceeding the 1985 level by 3.4%. The growth in coal production occurred at all the major coal basins in the country. Open pit mining accounted for 42.9% of the total output.

Plans were under way to improve coal mining equipment. Only one-third of domestically produced coal mining equipment reportedly met world standards.[48] The demand for large shovels and other equipment for open pit mining was being poorly satisfied. In terms of introducing new equipment, the coal industry was described as 2 to 5 years behind schedule. A check of 350 mines and washeries revealed that only 20% of these were operating with state-of-the-art equipment. The coal industry was also faulted for too slow progress in improving mine safety. It was stated that "methane explosions and fires are still all too frequent in mines and the injury rate is declining at a slow pace."[49]

Coal quality in the U.S.S.R. was deteriorating. During the past 20 years, the ash content of coal mined, shipped, and consumed had risen continuously, with only the ash content of washed coking coal remaining relatively stable. In 1986, however, the ash content of coal decreased slightly in comparison with that of 1985. The moisture content in run-of-mine coal was also increasing, and the country was producing a larger percentage of small sizes.

Approximately 63% of all coal mined was processed at washeries, briquetting plants, and sorting facilities. Practically all anthracite and coking coal was beneficiated. The largest washeries included the new Neryungri in Yakutia with a capacity to treat 9 million tons of raw coking coal per year. The average capacity at washeries in 1985 was 2.26 million tons of raw coal per year. In 1986, coal washeries processed 324.4 million tons of raw coal yielding 181.5 million tons of concentrate, which was a 4.2% increase in the amount of coal processed and a 3.8% increase in the amount of concentrate produced in comparison with those of 1985.

The 12th 5-year plan (1986-90) called for coal production to increase to between 780 million tons and 800 million tons per year by 1990; this was approximately the same level of output as was originally planned for the 1981-85 period, for which production fell far short of the goal. Reported coal production in 1986 of 751 million tons, however, was well above the 1986 planned level of 733.9 million tons.

Table 13.—U.S.S.R.: Ministry of the Coal Industry[1] production at leading coal-producing basins in 1986, by basin

Basin	Planned production (thousand metric tons)	Actual production (thousand metric tons)	Percent change from 1985 production
Donetsk	193,750	200,614	1.8
Kuznetsk	145,500	147,384	4.2
Ekibastuz	83,900	85,729	6.6
Karaganda	49,250	51,185	2.7
Kansk-Achinsk	43,050	43,476	6.7
Pechora	28,660	30,174	1.3
Podmoskovnyy	18,500	18,910	-1.8
Other	163,460	164,710	--
Total or average	726,070	742,182	3.4

[1]Approximately 9 million tons of coal in 1986 was produced by enterprises not subordinate to the Ministry of the Coal Industry.

Source: Ugol' (Coal), Moscow, No. 3, Mar. 1987, pp. 53-56.

Table 14.—U.S.S.R.: Ash content of coal

(Percent)

Year	Coal mined		Coal shipped	Coal dressed at preparation plants		Washed product	
	Estimated	Actual[1]		Estimated	Actual	Coking coal	Steam coal
1965	21.6	21.8	19.3	22.4	23.1	7.9	12.0
1975	23.3	25.6	20.2	24.6	29.8	7.9	13.9
1980	24.9	27.8	21.6	26.2	32.8	8.0	15.1
1985	26.7	30.3	22.8	28.3	35.7	8.2	17.0

[1]The actual ash content is calculated to take into account rock that is not counted in the coal mined and processed.

Source: Ugol' (Coal), Moscow, No. 10, Oct. 1986, p. 45.

One of the major areas for the expansion of open pit production was the Ekibastuz subbituminous coal basin in Kazakhstan. It was the third largest coal-producing region in the country, producing over 10% of the country's coal and 26% of the country's open pit production. The coal from Ekibastuz, however, had an ash content of nearly 50% and was used primarily by powerplants. Special electric powerplants were constructed to burn Ekibastuz coal with an ash content of 47% to 53%, but these powerplants were encountering serious technical problems.[50] Development was taking place at the Ekibastuz Basin of the Vostochnyy open pit with a planned capacity of 30 million tons per year. The first stage with a capacity of 7.5 million tons per year was commissioned in 1985 and development of Vostochnyy was planned to be completed by 1990. The Ekibastuz coal association reported successfully fulfilling its 1986 plan, producing 85.7 million tons of coal, which was more than a 5-million-ton increase over that of 1985.

As of January 1, 1985, the country's economic reserves of coking coal in categories $A+B+C_1$[51] reportedly equaled 69.4 billion tons, of which 39.3 billion tons was classified as caking coal.[52] The Kuznetsk Basin (Kuzbas) and Donetsk Basin (Donbas) contained 73% of the country's explored reserves of coking coals. The Kuzbas appeared to be the more promising for future development because only 29.3% of explored coking coal reserves in the Kuzbas were under or being prepared for exploitation while the percentage was 54% in the Donbas.

Reportedly, the Kuzbas exceeded its production plan in 1986. Total coal output in the Kuzbas was targeted to increase from 141.4 million tons in 1985 to 160 million tons in 1990—70 million tons of which was to be coking coal. Open pit mining in the Kuzbas was planned to increase from 52.2 million tons in 1985 to 65.8 million tons by 1990, and plans also called for increasing the volume of underground production in the Kuzbas by 20% by the year 2000 in

comparison with that of 1985.

The Donbas in the Ukraine was presently the largest coal-producing region; in 1986, coal production increased in comparison with that of 1985, exceeding the production plan by 3.5%. Nevertheless, mining in the Donbas was now deeper and the seams were thinner than formerly. The average depth of mines in the Donbas exceeded 600 meters, with some mines more than 1,000 meters deep. The quality of coal mined in the Donbas was also falling, and the ash content was projected to increase significantly in the future. A debate was under way concerning the wisdom of allocating additional resources to further develop underground coal mining in the region.

Plans to develop the Kansk-Achinsk lignite basin in Siberia, the country's largest lignite deposit, were considerably delayed, and methods for utilizing Kansk-Achinsk lignite still had not been resolved. Initial plans envisaged constructing a series of powerplants in the region, each with a 6,400-megawatt capacity, but economic, technological, and environmental problems were impeding construction. Only one powerplant, the Berezovskaya, was under construction, and the first stage was scheduled to be commissioned in August 1987.

Table 15.—U.S.S.R.: Coking coal production, by basin

(Percent)

Basin	1965	1970	1975	1980	1985
Donetsk	58.2	51.1	48.9	41.6	36.9
Kuznetsk	27.0	28.5	31.0	30.9	31.0
Karaganda	7.9	10.3	10.0	15.0	15.8
Pechora	3.4	7.7	8.0	9.9	10.2
South Yakutia	--	--	--	--	2.6
L'vov-Volyn'	--	--	--	1.1	2.3
Georgian deposits	1.5	1.1	1.0	.8	.7
Kizel	2.0	1.3	1.1	.7	.5
Total	100.0	100.0	100.0	100.0	100.0

Source: Planovoye Khozyaystvo (Planned Economy), Moscow, No. 4, Apr. 1987, pp. 89-93.

A major problem existed in making the energy in the country's vast coal reserves in the eastern part of the country available to consumers because the railroads were not equipped to handle large increases in the volume of coal shipments, much of which would be lignite, which is difficult to transport. The U.S.S.R. was studying alternative methods for transporting coal including developing coal slurry pipelines, coal gasification and liquefaction, and constructing large electric powerplants at deposits connected to long-distance electricity transmission networks. Progress was being made as reportedly the U.S.S.R. reopened its coal gasification project at Angren in Uzbekistan. Coal was gasified in a seam 300 meters deep, and the gas was delivered to the Angren electric powerplant. The reopening was part of an effort to revive the country's in situ coal gasification program. There was only one other coal gasification project operating, in the Kuzbas, although at one time the country had six such projects.

Natural Gas.—In 1986, natural gas production increased by 7%, and the U.S.S.R. increased its lead as the largest natural gas producer with over 36% of the world's output. The U.S.S.R.'s share could increase to over 40% by 1990. Soviet natural gas production had increased dramatically for several decades; in 1960, the U.S.S.R. produced only 9% of the world's output. In 1986, all production associations of the Ministry of the Gas Industry reportedly fulfilled their 1986 production plans.[53] In Tyumen' Oblast' in West Siberia, the country's main oil and natural gas producing region, natural gas production reached 14.6 trillion cubic feet, which equaled 60% of the country's natural gas production.

Plans for 1987 called for increasing national natural gas production to 25.5 trillion cubic feet. To accomplish this, it would be necessary to increase production at the Yamburg deposit in West Siberia, the Karachaganak deposit in Kazakhstan, the Sovetabad deposit in Turkmenistan, the 28th of April Field offshore in the Caspian Sea, and the Astrakhan deposit north of the Caspian Sea.

The major expansion of natural gas production during the 1986-90 period was planned to come from the Yamburg deposit north of the Urengoi deposit in West Siberia. Plans called for the country's natural

gas production to increase by 1990 to about one-third over the 1985 production level.

In September 1986, the first commercial shipment of gas from Yamburg to the European part of the country was reported via the Yamburg-Yelets-I gas pipeline, the first of six trans-Siberian pipelines planned from Yamburg. Development of the Yamburg deposit would increase gas production in Tyumen' Oblast' in West Siberia to about 20 trillion cubic feet by 1990, which would equal about two-thirds of the U.S.S.R.'s natural gas production.

Natural gas from Yamburg was to be for export to Eastern Europe as well as for domestic consumption. One of the six trans-Siberian pipelines from Yamburg, the Yamburg-Uzhgorod "Progress" pipeline to the Czechoslovak border, planned for completion in 1987, was intended for exporting gas to Eastern Europe. The Progress pipeline would be able to deliver between 706 and 777 billion cubic feet per year of natural gas to Eastern Europe. The Progress pipeline was being built with the cooperation of the East European CMEA countries, which would receive natural gas in exchange for their assistance.

Soviet natural gas exports increased in 1986 as the Soviet Union became Western Europe's largest natural gas supplier, overtaking Norway. Soviet gas exports to the EEC increased 24% with France, the Federal Republic of Germany, and Italy taking substantial increases.

Iran announced it would resume natural gas exports to the Soviet Union after a 7-year suspension. Iran would start by supplying the Soviet Union with a small quantity of natural gas in 1986, increasing to a much higher level by 1990.

Petroleum.—In 1986, oil and gas condensate production increased to 4.52 billion barrels after declining for 2 years; oil production had peaked in 1983 at 4.53 billion barrels. This decline in oil production seriously affected the Soviet economy, which in recent years derived over 60% of its hard currency earnings from oil exports. Although the increase in production in 1986 provided a greater quantity of oil for domestic consumption and export, it was not sufficient to bolster hard currency earnings to former levels because of the sharp decline in oil prices that caused hard currency earnings from oil exports to fall by 35% or more in comparison with those of 1985. By August, oil production had reached the planned daily level as oil-producing regions in West Siberia began achieving their planned level of production.

The success of the oil industry in 1986 was due, in part, to additional large investments in that sector. Capital investment in the oil industry increased 31% in comparison with the 1985 level.

During the past 10 years, the quality of reserves worsened as older fields became depleted and less productive fields with geologically more complex conditions were put into operation. Nationally, the average yield of wells put into operation during the past 10 years declined by 50%, and in West Siberia, by 75%.[54] One of the central features increasing the difficulty of oil development in West Siberia was the peaking of production at the large Samotlor, Fedorovskoye, Ust' Balykskoye, Angara, Vatinskoye, and other fields.

Production in 1987 was planned at 4.53 billion barrels, and by 1990, oil and gas condensate production was to increase to between 4.6 billion barrels and 4.7 billion barrels. Increased oil production was planned to come primarily from Tyumen' Oblast' in West Siberia, the country's major oil-producing region, with some increase in production also planned from the Pre-Caspian Depression, particularly the Tengiz oil deposit in Kazakhstan. Plans called for oil and gas condensate production in Tyumen' Oblast' to increase to between 3.1 billion barrels and 3.2 billion barrels per year by 1990 compared with 2.7 billion barrels in 1985.

During the 1986-90 period, plans called for developing fields in new and difficult areas of West Siberia, Kazakhstan, and the northern European part of the country. In 1987, plans called for putting 17 new oilfields into operation in Tyumen' Oblast' in West Siberia. Labor productivity in the oil-producing sector was declining. Given the country's labor shortage, which was particularly severe in the remote regions of West Siberia where the majority of oil production occurred, a radical increase in labor productivity was deemed necessary.[55]

The country's oil extraction industry was dispersed across a broad area with the startup of new fields planned in regions experiencing severe labor shortages. In 1986, about 40,000 persons were being periodically flown into these regions to work for limited periods of time in what was termed the "expeditionary duty" method,

including over 35,000 workers being flown in for shifts in Tyumen' Oblast', West Siberia. Workers were also being flown in for shift work in the oil industry in the northern parts of the Komi A.S.S.R., the western part of Kazakhstan, and in the Georgian, Armenian, and Turkmen Republics.

The Soviet Union began commercial bitumen recovery operations in the Tatar A.S.S.R. and the Mangyshlak Peninsula in Kazakhstan. In the Tatar A.S.S.R., which was the country's largest oil-producing region during the 1960's and early 1970's before the large West Siberian fields were commissioned, plans called for rapidly developing bitumen mines. At the Soviet Union's only heavy oil mine at Yarega in the northeastern corner of the European part of the country, plans calling for the tripling of heavy crude production to 30,000 barrels per day were set back by an explosion and fire in Yarega's underground chambers. This caused extensive damage.

In mid-1986, the Soviet Union was finally able to extinguish the largest known oil well fire in Soviet history, which began in June 1985 at the Tengiz Field in Kazakhstan near the northeast coast of the Caspian Sea. The fire could not be extinguished by conventional methods because of the high reservoir pressure and the high concentration of hydrogen sulfide in the associated gas.

During 1986, Soviet oil exports to the West rose considerably in comparison with those of 1985, owing, in part, to the need to increase exports to offset lower prices. Finland, France, the Federal Republic of Germany, Italy, and the Netherlands were the U.S.S.R.'s biggest customers. The increase in oil exports was also facilitated by an increase in Soviet oil imports from the Middle East intended for reexport.

Soviet oil shipments to East European CMEA countries remained at approximately their former levels with the exception of those to Romania, 46 million barrels of crude in 1986, which was more than three times the amount Romania received in 1985. Soviet oil exports to Romania for the 1986-90 period were planned to be at least 184 million barrels, indicating that the Soviets planned to continue supplying Romania at the new increased level. The U.S.S.R. was now one of Romania's major oil suppliers. Romania previously had been the only East European CMEA country not heavily dependent on the U.S.S.R for oil imports. The change was, in part, attributable to an attempt by Romania to avoid paying hard currency for oil imports as part of its austerity program.

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[1]This publication is based on a review of sources published in the U.S.S.R.
[2]Foreign mineral specialist, Division of International Minerals.
[3]Voprosy ekonomiki (Problems in Economics) (Moscow). No. 1, Jan. 1987, pp. 33-42.
[4]Work cited in footnote 3.
[5]The reported improvement in Soviet aggregate economic performance in 1986 was called into question by some Western economists studying the Soviet economy who believed that growth was possibly much less (see Financial Times, London, Mar. 13, 1987, p. 1, and Wall Street Journal, New York, Mar. 16, 1987, p. 1).
[6]Voprosy ekonomiki (Problems in Economics) (Moscow). No. 4, Apr. 1986, pp. 87-115.
[7]Work cited in footnote 6.
[8]Work cited in footnote 6.
[9]Izvestiya Akademii Nauk SSSR, Seriya ekonomicheskaya (Reports of the U.S.S.R. Academy of Sciences, Economic Series) (Moscow). No. 3, May-June 1986, pp. 35-46.
[10]Economicheskaya gazeta (Economic Gazette) (Moscow). No. 31, July 1986, p. 17.
[11]Sotsialisticheskaya industriya (Socialist Industry) (Moscow). May 17, 1986, p. 2.
[12]Pravda (Moscow). Jan. 14, 1986, p. 2.
[13]Tsvetnye metally (Nonferrous Metals) (Moscow). No. 3, Mar. 1987, p. 4.
[14]Sotsialisticheskaya industriya (Socialist Industry) (Moscow). Apr. 10, 1986, p. 2.
[15]Work cited in footnote 14.
[16]Kommunist Tadzhikistana (Tadzhikistan Communist) (Dushanbe). Nov. 25, 1986, p. 2.
[17]Ekonomika i organizatsiya promyshlennoyo proizvodstva (Economics and Organization of Industrial Production) (Novosibirsk). No. 1, Jan. 1987, pp. 53-70.
[18]Tsvetnye metally (Nonferrous Metals) (Moscow). No. 11, Nov. 1986, p. 10.
[19]Gornyy zhurnal (Mining Journal) (Moscow). No. 1, Jan. 1987, pp. 3-9.
[20]———. No. 2, Feb. 1987, p. 17.
[21]Metallurg (Metallurgist) (Moscow). No. 1, Jan. 1987, inside cover.
[22]Kazakhstanskaya pravda (Kazakhstan Truth) (Alma-Ata). Oct. 26, 1986, p. 2.
[23]Narodnoye khozyaystvo Kazakhstana (National Economy of Kazakhstan) (Alma-Ata). No. 1, Jan. 1987, p. 50.
[24]Stal' (Steel) (Moscow). No. 2, Feb. 1987, p. 49.
[25]Work cited in footnote 24.
[26]Work cited in footnote 24.
[27]Narodnoye khozyaystvo Kazakhstana (National Economy of Kazakhstan) (Alma-Ata). No. 7, July 1986, p. 62.
[28]Work cited in footnote 13.
[29]Pravda (Moscow). Jan. 18, 1987, pp. 1-3.
[30]Work cited in footnote 6.
[31]Work cited in footnote 21.
[32]Work cited in footnote 22.
[33]Kazakhstanskaya pravda (Kazakhstan Truth) (Alma-Ata). Jan. 3, 1987, p. 1.
[34]Work cited in footnote 21.
[35]Izvestiya (Moscow). Jan. 2, 1987, p. 1.
[36]Foreign Trade (Moscow). No. 9, Sept. 1986, p. 11.
[37]Work cited in footnote 13.
[38]Sotsialisticheskaya industriya (Socialist Industry) (Moscow). Aug. 28, 1986, p. 2.
[39]Pravda (Moscow). Aug. 6, 1986, p. 2.
[40]Narodnoye khozyaystvo Kazakhstana (National Economy of Kazakhstan) (Alma-Ata). No. 11, Nov. 1986, pp. 70-72.
[41]Work cited in footnote 40.
[42]Turkmenskaya iskra (Turkmenistan Spark) (Ashkhabad). Jan. 27, 1986, p. 2.
[43]———. Dec. 23, 1986, p. 2.

[44]Work cited in footnote 21.

[45]Council for Mutual Economic Assistance (CMEA) was founded in Jan. 1949. The founding members were Bulgaria, Czechoslovakia, Hungary, Poland, Romania, and the U.S.S.R. Albania joined in February 1949, but ceased to take part in meetings in 1961. The German Democratic Republic was admitted in 1950, Mongolia in 1961, Cuba in 1972, and Vietnam in 1978. Yugoslavia obtained permanent observer status in 1965. Other countries now participating as observers are Afghanistan, Angola, Ethiopia, Laos, Mozambique, Nicaragua, and South Yemen.

[46]Foreign Trade (Moscow). No. 3, Mar. 1987, p. 10.

[47]Sotsialisticheskaya industriya (Socialist Industry) (Moscow). Aug. 28, 1986, p. 2.

[48]Izvestiya (Moscow). Aug. 4, 1986, p. 2.

[49]Work cited in footnote 47.

[50]Energiya, ekonomika, tekhnika, ekologiya (Energy, Economics, Technology, Ecology) (Moscow). No. 12, Dec. 1986, pp. 2-10.

[51]The $A+B+C_1$, reserves are called explored reserves and would be considered within the context of the Soviet economy similar to economic reserves.

[52]Planovoye khozyaystvo (Planned Economy) (Moscow). No. 4, Apr. 1987, pp. 89-93.

[53]Gazovaya promyshlennost' (Gas Industry) (Moscow). No. 4, Apr. 1987, pp. 6-13.

[54]Sotsialisticheskiy trud (Socialist Labor) (Moscow). No. 10, Oct. 1986, pp. 3-11.

[55]Neftyanoye khozyaystvo (The Oil Industry) (Moscow). No. 10, Oct. 1986, pp. 3-16.

The Mineral Industry of the United Arab Emirates

By Michael D. Fenton[1]

The economy of the United Arab Emirates (UAE), a loosely constituted federation of the sheikhdoms Abu Dhabi, Dubai, Sharjah, Ajman, Umm al-Qaiwain, Ras al-Khaimah, and Fujairah, continued to be based on oil and gas. The UAE had, at the beginning of 1986, the third largest reserve of natural gas in the world after those of Iran and Saudi Arabia, perhaps as much as 111.2 trillion cubic feet (Tcf), which was 10% of all proven gas reserves held by members of the Organization of Petroleum Exporting Countries (OPEC). Maximum available estimates of natural gas reserves for the UAE were Abu Dhabi, 95.4 Tcf; Dubai, 4.8 Tcf; Sharjah, 9.8 Tcf; and Ras al-Khaimah, 1.2 Tcf. Proven crude oil reserves in the UAE were 33.5 billion barrels, with 31 billion barrels in Abu Dhabi, 1.35 billion barrels in Dubai, 500 million barrels in Sharjah, and 200 million barrels in Ras al-Khaimah. The economy was highly vulnerable to fluctuations in the international oil market, and the collapse of oil prices and increasing danger from the gulf war were the major preoccupations during 1986. Abu Dhabi was the major oil producer, with important contributions from Dubai and Sharjah, and some from Ras al-Khaimah. Of these four oil-producing emirates, Sharjah and Ras al-Khaimah were affected most by the price fall, and the non-oil-producing emirates, Ajman, Fujairah, and Umm al-Qaiwain, were also hurt indirectly because of their reliance on financial assistance from their wealthier neighbors.

Oil revenues fell by more than 40%, which caused a decline in the gross domestic product of 21.0%, after a decline in 1985 of only 5.8%. Exports, mainly oil and gas, decreased by 33.5% during the year, and the 1986 trade surplus, an estimated $3.46 billion, decreased 58% since 1985. The current account surplus in 1986 was estimated to be the smallest in at least 6 years, while local investment declined to $4.08 billion from $4.606 billion. The Federal budget, 10 months overdue and late for the third consecutive year, called for spending $3.818 billion and a deficit of nearly $1.0 billion.

PRODUCTION AND TRADE

Abu Dhabi was the largest producer of oil in the UAE, followed by Dubai, Sharjah, and Ras al-Khaimah. Abu Dhabi's oil production capacity surpassed 1.5 million barrels per day (bbl/d) with the completion of work on the Upper Zakum Field; maximum sustainable capacity was 2 million bbl/d. Production rarely exceeded 1 million bbl/d because of quota restrictions imposed by OPEC. OPEC's decision in August to cut output to about 16.8 million bbl/d in September and October was expected to raise oil prices from the July low of about $8.00 per barrel. The price actually reached $13 to $14 per barrel by mid-October. The average production by the UAE of over 1.2 million bbl/d in September exceeded its quota of 950,000 bbl/d by about 300,000 bbl/d. Meeting the quota became a problem within the UAE when Dubai refused to reduce its production below 380,000 bbl/d, thereby forcing production cuts on Abu Dhabi. Abu Dhabi agreed to reduce oil production by about 100,000 bbl/d in November and December, and later claimed to be producing only what it regarded as its

share of the new UAE quota, 682,000 bbl/d. This claim was disputed by others within OPEC who estimated production to be as high as 800,000 bbl/d. Dubai continued to over-produce: 300,000 to 385,000 bbl/d compared with its share of the UAE quota of 220,000 bbl/d. Sharjah produced an average of 65,000 bbl/d of condensates and crude oil, slightly more than that of 1985. Ras al-Khaimah produced nearly 13,000 bbl/d of condensates from its Saleh Field.

The Abu Dhabi Co. for Onshore Oil Operations budgeted $287 million for 1987 compared with its estimated actual spending in 1986 of $455 million, and it planned to reduce the number of drilling rigs operating from 11 to 4 by the end of 1987. Production would decline from about 470,000 bbl/d to 425,000 bbl/d, and capital spending would be cut by over 50%. Investments and operating expenses would also be affected. Annual budgets through 1991 would be between $216 million and $231 million. Nevertheless, exploration activity continued in Abu Dhabi, as throughout the UAE, to increase reserves.

In 1986, the Abu Dhabi National Oil Co. (ADNOC) sold an average of 609,000 bbl/d of oil, of which 73% was exported and 27% went to ADNOC's refineries at Ruwais and Umm al-Nar. Sixty-two million barrels of refined products was sold; 67% was exported. Sales of granulated sulfur totaled 93,000 tons.

Exports of oil from the UAE to the United States declined from 42,667 bbl/d in 1985 to 41,936 bbl/d, even though imports of oil into the United States from worldwide sources increased 30% during the same time, from 3.454 million bbl/d to 4.479 million bbl/d. The UAE remained Japan's primary supplier of oil in 1986. Japan took 268 million barrels, slightly more than in 1985, while its total oil imports fell slightly. Idemitsu Oil Development Co. Ltd. of Japan agreed to buy, during 1986, from ADNOC 1,700,000 barrels of gasoline, 775,000 barrels of kerosene, and 746,000 barrels of gas oil. ADNOC agreed to supply 15,000 bbl/d of oil to the Indian Oil Corp. (IOC) for a year beginning in May 1986. In 1984 and 1985, the IOC imported 10,000 bbl/d. In 1986, Bangladesh renewed its annual agreement to buy from ADNOC another 4.4 million barrels of oil.

The Ruwais Fertilizer Industries Co. Ltd. operated its ammonia and urea plants at full capacity. Production was 343,000 tons (nitrogen content) of ammonia and 354,000 tons (nitrogen content) of urea. Its main buyer was India with a 131,000-ton-per-year nitrogen contract, and it had an agreement with Mitsubishi of Japan that would market 46,000 tons of nitrogen between 1986 and 1988.

Aluminum output by Dubai Aluminium Co. (DUBAL) increased in 1986 to 154,838 tons from 153,186 tons during 1985, and aluminum exports increased to 155,605 tons from 150,677 tons in 1985. The United States replaced Japan as DUBAL'S largest market in 1986 by importing 73,354 tons.

Construction activity and demand for cement in the UAE continued to decline as funds for development became scarce, and the cement companies tried again to coordinate output while producing a surplus from plants operating at less than one-half capacity. Cement production was 2.5 million tons, down from that of 1985. Cement exports were 1.5 million tons per year, and the UAE no longer imported any cement or clinker.

Table 1.—United Arab Emirates: Production of mineral commodities[1]

Emirate[2] and commodity[3]	1982	1983	1984[p]	1985[e]	1986[e]
ABU DHABI					
Cement, hydraulic thousand metric tons	[e]780	800	800	800	[4]800
Gas, natural:					
Gross million cubic feet	[r]394,200	338,000	385,600	[4]405,880	391,000
Marketed do	[r]266,500	NA	355,000	373,000	[4]359,900
Natural gas liquids thousand 42-gallon barrels	[r]60,000	65,000	[e]65,000	65,000	65,000
Petroleum:					
Crude do	[r]319,400	284,000	256,047	[4]287,700	347,200
Refinery products:					
Gasoline do	6,060	7,700	8,500	8,700	
Kerosene do	4,960	3,600	9,000	9,300	
Distillate fuel oil do	9,600	15,400	17,700	18,200	
Residual fuel oil do	8,940	11,100	15,100	15,500	NA
Naphtha do	1,930	6,000	8,000	8,200	
Refinery fuel and losses do	300	1,000	1,000	1,100	
Total do	31,790	44,800	59,300	[4]61,000	NA
Sulfur:					
Byproduct from petroleum refining metric tons	10,000	15,000	15,000	1,460	1,460
Byproduct from natural gas do	--	--	35,000	104,000	90,000
DUBAI					
Aluminum, primary ingot do	148,739	151,170	155,333	[4]153,186	[4]154,838
Cement, hydraulic thousand metric tons	350	800	800	800	[4]500
Gas, natural:[e]					
Gross million cubic feet	140,000	150,000	107,000	[r]185,500	200,300
Marketed do	70,000	120,000	43,400	[4]75,220	[4]81,220
Natural gas liquids:					
Propane thousand 42-gallon barrels	5,000	10,000	10,000	[4]4,000	4,300
Butane do	3,000	8,000	8,000	[4]2,500	2,700
Natural gasoline do	4,000	9,000	9,000	[4]2,555	2,800
Petroleum, crude do	133,850	121,830	116,400	[4]128,200	[4]127,400
FUJAIRAH					
Cement, hydraulic thousand metric tons	--	520	550	550	[4]500
RAS AL-KHAIMAH					
Cement, hydraulic do	[e]750	1,200	1,200	1,200	[4]360
Gas, natural: Marketed million cubic feet	--	--	NA	[4]4,590	4,600
Lime[e] thousand metric tons	40	45	45	45	45
Natural gas liquids thousand 42-gallor barrels	--	--	2,120	[4]3,640	[4]4,680
SHARJAH					
Cement, hydraulic[e] thousand metric tons	[4]188	685	700	700	[4]330
Gas, natural:					
Gross[e] million cubic feet	30,000	40,000	152,000	[4]219,000	219,000
Marketed do	NA	NA	31,800	[4]45,900	46,000
Petroleum, crude and condensate thousand 42-gallon barrels	[r]7,100	13,800	18,793	[4]23,400	[4]23,700

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

[1]Table includes data available through Aug. 14, 1987.

[2]In addition to the emirates listed, Ajman and Umm al-Qaiwain report no mineral production but presumably produce small quantities of crude construction materials.

[3]In addition to the commodities listed, crude construction materials such as common clays, stone, and sand and gravel presumably are produced, but output is not recorded quantitatively, and general information is inadequate to make reliable estimates of output levels.

[4]Reported figure.

COMMODITY REVIEW

METALS

Aluminum.—Progress continued on the planned expansion of the Jebel Ali smelter to 170,000 tons by 1990 from the current rated capacity of 135,000 tons. The plan to introduce new technology was announced in March 1986.

Planning continued toward the construction of the third aluminum smelter in the Persian Gulf region, the $1 billion, 240,000-ton-per-year Umm al-Qaiwain Aluminium Co. smelter. The plant would also incorporate a 595-megawatt powerplant and a 25-million-gallon-per-day water desalination plant. The prebake smelting cell, by the Aluminum Co. of America, operating at about 185,000 amperes, would be used. Sources of the required 70 million cubic feet per day (MMcfd) of gas for power would be a small offshore field that produced 41 MMcfd in 1980, Sharjah's Sajaa Field, or Oman. The viability of the project was based on access to inexpensive power and the predicted closure of U.S. smelters as a result of high energy costs and falling prices for aluminum. A 12-year agreement to sell China 65% of the output was signed.

Chromite.—Hunting Geology and Geophysics Ltd. of the United Kingdom found chromite mineralization in the Manama, Wadi Siji, Wadi al-Shoaka, Al-Hamriyah, Asil, and Masfout areas, and drilling defined quantities of chromite at Masfout and Wadi al-Shoaka that amounted to 25,000 tons.

Copper.—Hunting Geology and Geophysics located 120 copper-mineralized sites during a survey begun in 1977. Drilling was done at seven locations in the Blaida, Wadi Ham, Wadi al-Helou, Huwailat, and Mufrad areas. Additional work was planned for Mufrad and Mirbah in Fujairah.

Steel.—The Polish heavy industry group Centrozap was studying the possibility of opening an $8.2 million steel minimill in Abu Dhabi that would make reinforcing bars and manhole covers from scrap metal. A site being considered for the project was a disused government steel mill in the Musaffah industrial area. Potential markets included local industry, Egypt, India, and Pakistan. The UAE's two main rolling mills were Ahli Steel Mills in Dubai and Sharjah's Middle East Rolling Mills. Smaller facilities were in Sharjah and Ras al-Khaimah.

INDUSTRIAL MINERALS

Cement.—Nine cement plants, having an installed capacity of about 8.7 million tons per year, produced 3.3 million tons in 1986, which was far above the demand of only 1.6 million to 1.8 million tons, while operating at only 40% of grinding capacity. Intense competition and inexpensive imports from Asia and Western Europe forced the producers to try to coordinate output and to pressure the Government to impose a 10% preference margin on local products and a 4% tariff on cement imports from countries outside the Gulf Cooperation Council. They also wanted state subsidies for power and transport costs. Past efforts to fix output levels among producers failed.

Gypsum.—The UAE's Ministry of Petroleum and Mineral Resources announced that gypsum grading up to 95% was found in large quantities in the eastern areas of Abu Dhabi in the Al Ain area, primarily on the eastern slopes of Jebel Hafit. To a depth of 25 meters, reserves were estimated at about 119 million tons. Potential production was estimated at 300,000 tons per year and would be used by the local cement industry that relied heavily upon gypsum imports.

MINERAL FUELS

Natural Gas.—ADNOC was developing Khuff Formation gas in the Umm Shaif Oilfield for injection into the Uweinat Reservoir for pressure maintenance. The project consisted of wellhead platforms, each with a capacity of 150 MMcfd; an 18-inch, 6.5-kilometer submarine pipeline with a capacity of 150 MMcfd connecting two injector-producer platforms to the Umm Shaif Super Complex (USSC); the modification of the existing gas treatment facilities at the USSC; and four injection wells at Uweinat.

Bidding began for a $13 million project to lay a 24-inch, 50-kilometer pipeline between Maqtz and Taweelah that would supply gas from ADNOC installations at Habshan to the power station being built at Taweelah.

Recently built tanks for liquefied natural gas (LNG) and liquefied petroleum gas (LPG) on Das Island, 100 miles off Abu Dhabi, were scheduled to receive the first products by yearend. The new additions to the tank farm included three 88,175-ton-capacity LNG tanks and two butane and two propane tanks, each with 55,110 tons of capacity.

The Dubai government agreed in December to take up to 250 MMcfd of Sajaa gas. The previous contract called for 70 MMcfd, but actual offtake frequently exceeded 100 MMcfd. Another important customer was Emirates General Petroleum Corp., which had been taking up to 200 MMcfd for distribution in the northern emirates but had not paid for the gas since the contract was signed in 1982.

Dubai Natural Gas Co. commissioned a new pressure platform in the Dubai offshore fields Fateh and Southwest Fateh. All associated gas produced in Dubai was expected to be recovered.

In May 1986, the Sharjah Liquefaction Co.'s new $300 million LPG plant at Al-Hamriyah went on-stream, with first exports to Japan scheduled for July. The plant was not operated at full design capacity, however, because prices for butane and propane fell by more than 50% during the year. The plant was to process about 440 MMcfd of associated gas from the onshore Sajaa gas-condensate field and produce annually 2,668,000 barrels of propane, 1,972,000 barrels of butane, and 2,288,000 barrels of condensates. Average production reported in November was 7,000 bbl/d of LPG and 4,000 bbl/d of condensates. Amoco Sharjah Oil Co. was to market the condensate, and two Japanese partners would market the propane and butane. Amoco Sharjah was also considering a $100 million gas-reinjection plan for the Sajaa Field that would use byproduct gas from the LPG plant. The Sajaa Field, with reserves of 1 billion barrels of condensates and nearly 10 billion cubic feet of associated gas, was producing about 55,000 to 60,000 bbl/d of condensates and about 500 MMcfd of associated gas from more than 14 wells.

A 5-kilometer gas pipeline was being constructed to supply gas at a rate of 3 to 5 MMcfd from the Sajaa Field in Sharjah to the Sharjah cement plant, which had a 750,000-ton-per-year output.

At Ras al-Khaimah, an LPG plant was completed as the final stage of a $45 million to $50 million development program that began in 1984. Previously flared associated gas from Saleh Field began to be brought ashore in 1985 for sale to local cement producers, and onshore separation and stabilization facilities were installed in 1985 for oil-gas separation. Onshore storage facilities for the 11,000-bbl/d oil production to replace a tanker moored offshore was completed in 1986. The LPG plant was designed to process 60 MMcfd of gas to yield 1,300 bbl/d of LPG, 400 bbl/d of condensates, and 55 MMcfd of lean gas for local industries. Near yearend, the Government gave complete control of the field to five oil companies for $19.2 million, 20% royalties, and 75% of net profits.

Petroleum.—*Exploration.*—A $100 million program continued in an effort to expand output from Sharjah's offshore Mubarak Oilfield during the next decade. Production had fallen from 60,000 bbl/d in mid-1974 to 5,000 bbl/d in 1986. A new exploratory well, J-2, initially flowed at 60,000 to 70,000 bbl/d but decreased to 5,000 bbl/d. Tests were continuing at yearend.

Consolidated International Petroleum Corp. and Placid Oil Co. were drilling an offshore exploratory well to a target depth of 15,000 feet in Umm al-Qaiwain. The drilling program was based on favorable seismic data.

Production.—The sharp reduction in oil prices since December 1985 brought about significant measures by Abu Dhabi's oil companies to cut costs by as much as 15%. ADNOC dismissed 3,500 employees and cut holiday entitlements, pay, and other benefits. The onshore Bab Field, which was producing about 30,000 bbl/d of oil, was shut in during May to reduce costs. The offshore operator, Abu Dhabi Marine Operating Co., reduced its staff and employee benefits and merged its drilling operations with those of Zakum Development Co., which operated the Upper Zakum Field, and the Umm al-Dalkh Development Co., a joint venture owned by ADNOC and Japan Oil Development Co.

The Umm al-Dalkh offshore oilfield in Abu Dhabi, operated by Umm al-Dalkh Development, produced 10,000 bbl/d during 1986 and was expected to produce more than 15,000 bbl/d in 1987.

The Abu al-Bukhoush Oilfield offshore of Abu Dhabi was damaged by an air attack in November 1986, and production ceased. Two of five platforms at the 60,000-bbl/d field were destroyed.

The $100 million Bu Hasa water-injection project in Abu Dhabi continued as equipment was ordered from the United Kingdom: 39 pumps and 8 burnpit systems to dispose of liquid and vapor reliefs. Cancellation of a similar project for the Bab Field was being considered; the field was shut in owing to low oil prices.

Production from the offshore Bunduq Field at the Qatari-Emirian border was increased to 25,000 bbl/d from 22,000 bbl/d in November 1985 after the completion of

drilling in the field's Arab D reservoir. Increased production at the other main reservoir, Arab C, was being considered by the Bunduq Oil Co. Total production was sold to Japanese refineries by the field's operator, United Petroleum Development Co. of Japan.

Dubai Petroleum Co. drilled 28 development wells, drilled and tested 1 exploratory well, and did maintenance work on a further 17. The numbers of operating oil wells at its fields were 114 in Fateh Field, 81 in Southwest Fateh Field, 3 wells in Falah Field, and 8 wells in Rashid Field, of which 3 produced gas.

Five producer wells in Ras al-Khaimah yielded only about 10,000 bbl/d, which was not adequate to finance additional development.

Refining.—The plan to transfer a refinery from Wales to Ajman was canceled because potential financiers were deterred by the emirate's outstanding debts amounting to $40 million.

The new $12 million, 30,000-ton-per-year lube oil blending and packaging plant at Mina Jebel Ali, Dubai, was scheduled to start test production in October 1986 by British Petroleum Arabian Agencies. Engine, industrial, and hydraulic lube oils would be marketed in the UAE and other local markets. Mina Jebel Ali was also scheduled to be the site of a new $15 million tank farm for the storage of up to 950,000 barrels of gasoline, aviation fuel, and diesel oil.

ADNOC announced that it would start a joint venture to produce 160,000 tons of petroleum coke per year nearly 3 years after it was formally approved by the board of directors of the Gulf Organization for Industrial Consulting. ADNOC also joined Kuwait and Saudi Arabia as the only gulf producers of 380-centistoke heavy fuel oil.

Petrochemicals.—Construction began near the Sajaa Gasfield on the UAE's first methanol plant, but the plant construction was later terminated because of payments problems with contractors. The 500,000-ton-per-year export facility, which was to begin shipping to Europe and the Far East in 1989 through the new port of Al-Hamriyah, would be the fourth such facility in the region.

A $350 million complex was to be constructed in Sharjah that would have produced 1,350 tons of ammonia per day and 1,750 tons of urea per day from gas that was being flared from Sharjah's onshore field. The complex was canceled because the price of condensates, Sharjah's main source of income, fell to a low of $7.50 per barrel. Earlier, plans to relocate a used 170,000-ton-per-year ammonia plant from Taiwan to Sharjah were canceled. Plans were also put aside for a fuel-additives plant that would have produced methanol and methyl tertiary-butyl ether.

The Dow Chemical Co. of the United States closed Sharjah's polystyrene plant, Al-Miyah Chemicals Co. The local downturn in demand for insulation materials was cited as the reason for the closure.

Transportation.—The Abu Dhabi National Tanker Co., a subsidiary of ADNOC, carried a total cargo of 4.9 million tons during January-August 1986 in its eight-carrier fleet, which was 89% of average load capacity.

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The Mineral Industry of the United Kingdom

By Richard H. Singleton[1]

A decline in the United Kingdom's crude steel production in 1986 was caused primarily by the relining of Europe's largest blast furnace, the Redcar unit, owned by British Steel Corp. (BSC) at Teesside. Government-owned BSC returned to profit for the first time since 1974 as a result of a reduction in its work force and an increase in productivity. The private producers' share of steel production in the United Kingdom increased significantly to 22%, while production by BSC decreased. Modernization of mills continued as the steel industry struggled against foreign imports. The largest improvement was the renovation of a hot-strip mill in Wales. A hot-dip aluminum-zinc galvanizing line was inaugurated in Deeside, Clwyd County, Wales. However, two Scottish mills were closed.

Only two tin mines remained in operation in the United Kingdom by yearend as a result of the collapse of world tin prices. All of the concentrate was smelted on a toll basis at Capper Pass at North Ferriby in Yorkshire. Smelter modernization and capacity expansion at Capper Pass were directed toward the accommodation of higher grade concentrates from domestic and world sources. A new electrolytic tin refinery began operation at Capper Pass.

A large crushed granite quarry was started up on the west coast of Scotland. The first shipments were made to the Houston, Texas, area. Purchase of U.S. aggregrate operations by British firms continued. Norsk Hydro Fertilizers Ltd., a large Norwegian company, began expansion of its fertilizer complex at Immingham, which included the construction of two ammonium nitrate plants. Norsk Hydro closed both a 50-year-old fertilizer plant and a phosphoric acid plant as part of its overall restructuring program.

The Government privatized its natural gas industry by selling its British Gas Corp. (BGC). All five of the new advanced gas-cooled nuclear reactors (AGR) were put into operation. Importation of electrical energy from France began. The coal industry continued removing uneconomical mining capacity, improving productivity, and constructing large, modern mines, especially BSC's large Selby mining complex. Exploration for and evaluation of promising lignite reserves continued in Northern Ireland.

The world oil price drop slowed North Sea petroleum exploration and development significantly. The average size of discovered deposits continued to decrease. More gas than oil was discovered. Three new gasfields and three new oilfields came on-stream. Four new North Sea fields were scheduled to begin production in 1987. Four North Sea development projects not yet started were postponed. Onshore petroleum development activity increased, but total onshore capacity was only about 0.5% of total British capacity.

The United Kingdom enjoyed the fifth year of its longest period of economic recovery in 30 years. Growth in real gross domestic product increased by 2.3% compared with 3.5% in 1985. Although British oil company profits halved, nonoil industry profits gained by 11%. The balance of payments showed a small deficit, $2.6 billion,[2] for the first time since 1979 because of the decrease in oil exports receipts and the effect of increased consumer spending on imports. The 1985 balance of payments had shown a $5.1 billion surplus. The consumer price index gained 3.4% compared with 6% in 1985. Unemployment decreased slightly to about 11%.

About 25% of the British Government's $75 million stockpile of strategic raw materials had been disposed of by March 1986. Further disposals were curtailed because of possible shortages that could arise in international markets because of uncertain world political problems, especially possible economic reprisals in southern Africa, a major source of the strategic materials.

PRODUCTION

The 10% loss in the industrial production index incurred during the 1979-81 recession was completely regained as the index rose 1.4% in 1986. Output of ferromanganese rose to its highest level in 10 years, while refined nickel reached a 6-year high. Production of tin concentrate decreased as marginal mines closed in response to the tin price collapse.

Feldspar production and output of by-product sulfur from oil refining both increased significantly although each continued to supply only a small fraction of domestic demand.

Coal production increased further in the aftermath of the large 1984 coal strike. Production of natural gas increased for the second year to meet increased domestic demand.

Table 1.—United Kingdom: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
METALS					
Aluminum:					
Alumina from imported bauxite ---- thousand tons	88	93	105	110	e110
Metal:					
Primary	240,806	252,525	287,874	275,373	275,876
Secondary	114,612	128,258	143,949	127,595	116,406
Cadmium: Metal including secondary	354	340	390	370	364
Copper:					
Ore and concentrate, Cu content	649	652	660	596	602
Metal, refined:					
Primary	63,153	67,545	69,458	63,851	62,368
Secondary	70,979	76,821	67,376	61,575	63,206
Total	134,132	144,366	136,834	125,426	125,574
Iron and steel:					
Iron ore:					
Gross weight ---- thousand tons	470	384	379	274	289
Iron content ---- do	103	81	82	60	61
Metal:					
Pig iron ---- do	8,327	9,477	9,487	10,381	9,686
Ferroalloys, blast furnace: Ferromanganese ---- do	61	83	75	77	100
Steel, crude ---- do	13,704	14,986	15,121	15,722	14,725
Rolled products ---- do	11,664	12,442	12,634	12,818	e12,800
Lead:					
Mine output, Pb content	3,993	3,797	2,431	3,994	e3,200
Metal:					
Smelter:					
Bullion from imported concentrate	r34,079	40,740	36,071	35,994	37,798
Secondary (refined)[2]	175,210	185,288	191,252	179,064	173,776
Total	r209,289	226,028	227,323	215,058	211,574
Refined:					
Primary[3]	130,984	136,908	147,122	148,133	156,093
Secondary[2]	175,210	185,288	191,252	179,064	173,776
Total	306,194	322,196	338,374	327,197	329,869
Magnesium metal, secondary including alloys[e]	41,758	1,700	r1,000	900	1,000
Nickel metal, refined	6,900	23,200	22,300	17,800	29,900
Silver metal ---- thousand troy ounces	105	85	82	55	51
Tin:					
Mine output, Sn content	4,208	4,025	5,216	5,204	4,594
Metal:					
Primary	8,164	6,467	7,105	7,548	e6,500
Secondary (refined)	5,419	6,870	6,743	7,265	e6,500

See footnotes at end of table.

Table 1.—United Kingdom: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
METALS —Continued					
Zinc:					
Ore and concentrate, Zn content	10,186	8,906	7,478	5,344	[e]5,900
Metal, smelter	79,278	87,651	85,604	74,278	85,902
INDUSTRIAL MINERALS					
Barite thousand tons	81	36	63	107	[e]100
Bromine	29,800	25,800	28,500	29,850	[e]26,000
Cement, hydraulic thousand tons	12,962	13,396	13,481	13,339	13,443
Clays:					
Fire clay do	850	689	757	831	[e]800
Fuller's earth[5] do	187	192	202	216	[e]225
Kaolin (china clay)[6] do	2,421	2,722	2,990	3,150	[e]2,900
Ball clay and pottery clay[e] do	660	[r]598	629	[r e]600	[e]625
Other including clay shale do	20,280	22,385	17,817	18,909	[e]18,500
Diatomite[e]	1,000	300	200	200	300
Feldspar (china stone)	5,000	5,300	5,900	5,900	7,300
Fluorspar, all grades[7] thousand tons	201	131	137	167	[e]160
Gypsum and anhydrite do	2,741	2,967	3,138	3,189	[e]3,300
Lime: Quicklime and hydrated lime[e] do	2,500	2,500	2,500	2,500	2,500
Nitrogen: N content of ammonia do	1,716	1,720	1,836	1,767	1,883
Potash, K_2O equivalent do	245	308	324	343	400
Salt:					
Rock do	2,209	1,316	1,569	2,030	[e]2,000
From brine do	1,554	1,394	1,423	1,552	[e]1,600
In brine, sold or used as such do	3,874	3,601	4,134	3,563	[e]3,500
Sand and gravel:					
Common sand and gravel do	97,753	107,096	105,990	107,727	[e]110,000
Industrial sand do	4,123	4,025	4,329	4,178	[e]4,000
Sodium compounds: Sodium carbonate[e] do	1,300	1,300	1,000	1,000	1,000
Stone:					
Calcite do	18	10	7	6	[e]6
Chalk do	11,616	12,430	12,022	12,023	[e]12,100
Chert and flint do	[e]10	174	17	22	[e]20
Dolomite do	13,727	14,983	14,228	14,953	[e]15,000
Igneous rock do	36,138	36,873	36,825	38,437	[e]40,000
Limestone do	71,723	79,002	79,239	80,621	[e]83,000
Sandstone including ganister do	13,336	14,736	15,116	13,177	[e]13,500
Slate, including fill do	[r]753	[r]463	121	124	135
Dimension:					
Igneous do	20	41	55	67	[e]70
Limestone do	160	274	225	[e]250	[e]250
Sandstone do	86	101	117	130	[e]130
Slate	32	31	36	34	[e]35
Strontium minerals	18,000	12,100	16,100	23,000	[e]15,000
Sulfur, byproduct:					
Of metallurgy thousand tons	61	69	71	69	70
Of spent oxides do	3	3	1	(8)	—
Of petroleum refinery do	59	55	75	80	105
Total do	123	127	147	149	175
Talc, soapstone, pyrophyllite do	19	16	19	20	[e]12
Titania[6] do	172	195	206	219	[e]220
MINERAL FUELS AND RELATED MATERIALS					
Coal:					
Anthracite do	2,884	2,016	1,217	2,142	2,162
Bituminous including slurries, fines, etc do	121,827	117,238	49,965	91,905	105,930
Lignite do	—	1	2	5	8
Total do	124,711	[r]119,255	51,184	94,052	108,100
Coke:					
Metallurgical do	[r]7,203	[r]7,192	5,866	7,838	7,995
Breeze, all types do	1,095	1,182	988	1,285	[e]1,300
Fuel briquets, all grades do	1,933	1,784	1,067	1,763	1,003
Gas, natural:					
Marketable[9] billion cubic feet	1,336	1,367	1,361	1,517	[e]1,600
Marketed[10] do	[r]1,264	[r]1,279	1,263	1,403	[e]1,480
Natural gas liquids[11] thousand 42-gallon barrels	33,700	[r]47,300	55,000	55,000	[e]67,000

See footnotes at end of table.

Table 1.—United Kingdom: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985	1986[p]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum:					
Crude[12] million 42-gallon barrels	[r]732	[r]809	885	894	884
Refinery products:					
Naphtha thousand 42-gallon barrels	[r]31,700	[r]32,300	29,100	26,200	24,100
Gasoline do	[r]163,800	[r]179,800	189,900	190,100	199,500
Jet fuel do	[r]34,900	[r]37,000	41,900	41,200	45,500
Kerosene do	[r]14,500	[r]13,900	16,200	18,100	16,800
Distillate fuel oil do	[r]151,000	[r]154,400	158,200	159,300	164,700
Residual fuel oil do	[r]101,200	[r]86,300	83,700	82,500	80,200
Lubricants do	[r]7,000	6,600	7,900	8,400	6,400
Bitumen do	[r]11,500	[r]11,100	11,100	11,000	11,700
Other do	[r]24,000	24,600	26,700	23,800	[e]24,000
Refinery fuel and losses do	[r]57,400	[r]56,600	53,400	49,700	54,400
Total do	[r]597,000	[r]602,600	618,100	610,300	627,300

[e]Estimated. [p]Preliminary. [r]Revised.
[1]Includes data available through July 10, 1987.
[2]Includes a small quantity of primary lead from domestic concentrate.
[3]Produced entirely from imported bullion and includes the lead content of alloys.
[4]Reported figure.
[5]Salable product.
[6]Sales.
[7]Proportions of grades not available; probably about two-thirds acid grade.
[8]Revised to zero.
[9]Methane excluding gas flared or reinjected.
[10]Marketable methane excluding that used for drilling, production, and pumping operations.
[11]Includes ethane, propane, butane, and other condensates.
[12]Excludes gases and condensates.

TRADE

Total exports, about 16% to the United States, increased by 7% to $150 billion while imports, about 10% from the United States, increased by 15% to $174 billion. Net exports to the United States were $4.6 billion; petroleum and petroleum products and automobiles and auto parts were major portions of these exports. The United Kingdom was the United State's fifth largest market, about one-half of which was high-technology electronics.

Barite imports decreased by 25% to about 90,000 tons, mostly from Ireland and Morocco, as the import share of supply fell below 50%. Barite demand decreased by 16%, reflecting decreased well drilling activity in the North Sea.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	427	(2)	(2)	
Alkaline-earth metals	60	1	--	All to Norway.
Aluminum:				
Ore and concentrate	848	1,413	37	Sweden 785; Italy 195; Norway 122.
Oxides and hydroxides	43,975	45,124	1,532	Norway 4,493; Netherlands 4,347; Sweden 3,817.
Ash and residue containing aluminum	3,127	1,702	297	West Germany 731; Spain 293.
Metal including alloys:				
Scrap	88,523	90,805	435	West Germany 40,892; Italy 15,199; France 8,449.
Unwrought	127,560	129,123	2,143	West Germany 54,737; Belgium-Luxembourg 14,677; Italy 11,534.
Semimanufactures	113,022	115,767	10,983	West Germany 20,238; Ireland 15,703.
Antimony: Metal including alloys, all forms	84	27	(2)	Australia 18; Spain 4; Ireland 1.
Arsenic: Oxides and acids	4,088	3,934	1,535	New Zealand 1,450; Finland 192.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Beryllium:				
Oxides and hydroxides	2	10	1	Spain 7; West Germany 2.
Metal including alloys, all forms	2	1	1	
Bismuth: Metal including alloys, all forms	419	72	--	West Germany 30; France 13; Italy 8.
Cadmium: Metal including alloys, all forms	120	94	--	France 40; West Germany 25; Finland 17.
Cesium and rubidium: Metal including alloys, all forms	40	(2)	40	All to Libya.
Chromium:				
Ore and concentrate	--	172	137	Norway 33; France 1.
Oxides and hydroxides	15,689	17,473	2,615	France 2,737; Australia 1,792.
Metal including alloys, all forms	3,888	4,071	1,495	West Germany 746; Japan 425.
Cobalt:				
Oxides and hydroxides	359	429	52	Belgium-Luxembourg 166; Netherlands 80.
Metal including alloys, all forms	918	754	68	Netherlands 127; France 125; West Germany 124.
Columbium and tantalum:				
Ore and concentrate	27	1	--	All to West Germany.
Metal including alloys, all forms:				
Columbium (niobium)	22	9	7	Netherlands 1.
Tantalum	18	20	12	West Germany 6; France 1.
Copper:				
Ore and concentrate	3,069	3,412	--	Sweden 2,330; Belgium-Luxembourg 1,003; France 27.
Matte and speiss including cement copper	8	20	--	All to Italy.
Oxides and hydroxides	583	407	--	Australia 90; Netherlands 90; Singapore 38.
Sulfate	2,120	2,092	--	Nigeria 501; France 248; West Germany 230.
Ash and residue containing copper	5,495	7,106	--	Belgium-Luxembourg 2,195; Japan 1,324; Spain 1,062.
Metal including alloys:				
Scrap	101,194	109,109	11	West Germany 44,289; Italy 27,806; Belgium-Luxembourg 22,416.
Unwrought	38,451	31,551	777	West Germany 10,478; Italy 6,793; France 3,990.
Semimanufactures	109,064	119,784	4,295	Ireland 13,270; Switzerland 12,635; France 8,637.
Germanium: Metal including alloys, all forms	4	4	1	West Germany 2.
Gold:				
Ore and concentrate value, thousands	$6,734	NA		
Waste and sweepings do.	r$6,045	$19,816	$330	France $15,826; West Germany $1,598; Belgium-Luxembourg $957.
Metal including alloys, unwrought and partly wrought thousand troy ounces	202	161	NA	NA.
Hafnium: Metal including alloys, all forms	1	(2)	(2)	Mainly to Sweden.
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite	343	5,710	--	Belgium-Luxembourg 5,000; West Germany 281; Cuba 186.
Pyrite, roasted	--	25	25	
Metal:				
Scrap thousand tons	4,317	4,536	3	Spain 2,728; Sweden 468; West Germany 228.
Pig iron, cast iron, related materials	61,079	82,544	80	Belgium-Luxembourg 18,473; Turkey 15,285; West Germany 10,450.
Ferroalloys:				
Ferrochromium	643	2,421	--	Netherlands 1,962; West Germany 313; Spain 60.
Ferromanganese	687	17,556	19	Belgium-Luxembourg 13,083; Norway 2,001; West Germany 979.
Ferromolybdenum	3,561	4,274	50	West Germany 1,700; Netherlands 1,114; Sweden 283.
Ferronickel	5	28	--	Norway 23; Venezuela 2; France 1.
Ferrosilicochromium	45	--		
Ferrosilicomanganese	1,027	127	--	Israel 78; France 27; Ireland 20.
Ferrosilicon	1,222	2,016	--	Norway 903; West Germany 307; Ireland 157.
Silicon metal	3,259	1,572	62	Belgium-Luxembourg 745; West Germany 177; Ireland 144.
Unspecified	r9,733	12,251	200	West Germany 1,660; Czechoslovakia 1,059; unspecified 4,784.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel —Continued				
Metal —Continued				
Steel, primary forms	680,428	943,725	50,880	West Germany 207,679; Greece 140,262; Italy 96,368.
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	1,404	1,731	290	China 211; West Germany 161.
Universals, plates, sheets do	1,177	1,310	86	West Germany 160; India 123; U.S.S.R. 121.
Hoop and strip do	133	148	10	West Germany 17; France 15; Ireland 13.
Rails and accessories do	107	146	39	France 23; Kenya 11.
Wire do	113	116	22	Canada 11; Ireland 8.
Tubes, pipes, fittings do	578	567	29	Netherlands 61; Sweden 46; Denmark 44.
Castings and forgings, rough do	44	48	8	France 6; West Germany 6.
Lead:				
Ore and concentrate	2,644	3,728	--	Italy 1,823; France 1,616; Portugal 200.
Oxides	6,897	6,611	37	Ireland 2,450; Sweden 1,115; Egypt 500.
Ash and residue containing lead	3,487	4,539	--	West Germany 3,327; Netherlands 510; Belgium-Luxembourg 332.
Metal including alloys:				
Scrap	r34,389	30,800	180	West Germany 17,308; Netherlands 5,040; Ireland 4,362.
Unwrought	143,080	123,173	609	West Germany 34,037; Netherlands 21,739; Belgium-Luxembourg 18,241.
Semimanufactures	4,244	5,776	873	Belgium-Luxembourg 1,423; West Germany 835.
Lithium:				
Oxides and hydroxides	147	--		
Metal including alloys, all forms	163	--		
Magnesium: Metal including alloys:				
Scrap	469	523	69	West Germany 154; Italy 103; Belgium-Luxembourg 95.
Unwrought	965	1,041	542	Canada 132; Australia 96.
Semimanufactures	743	780	131	Switzerland 172; Ireland 101.
Manganese:				
Ore and concentrate, metallurgical-grade	1,934	3,855	12	Belgium-Luxembourg 3,721; Spain 40; Tanzania 40.
Oxides	2,007	1,754	(2)	Nigeria 1,252; Spain 148; Ireland 111.
Metal including alloys, all forms	1,001	487	2	Norway 115; France 81; Italy 67.
Mercury 76-pound flasks	1,247	2,001	551	Ireland 464; West Germany 261.
Molybdenum:				
Ore and concentrate	4,906	4,403	--	Netherlands 2,517; Spain 985; Austria 494.
Oxides and hydroxides	1,614	1,595	112	Austria 595; Netherlands 519.
Metal including alloys:				
Scrap	70	16	4	France 3; Netherlands 3.
Unwrought	47	219	21	West Germany 49; Norway 43; Spain 39.
Semimanufactures	292	166	15	West Germany 54; France 34; Netherlands 21.
Nickel:				
Ore and concentrate	12	40	--	Belgium-Luxembourg 22; Ireland 13; France 5.
Matte and speiss	184	322	--	Belgium-Luxembourg 225; West Germany 45; Italy 40.
Oxides and hydroxides	88	130	25	Netherlands 74; Yugoslavia 10.
Ash and residue containing nickel	7,467	7,597	214	Canada 5,507; Netherlands 448; Norway 388.
Metal including alloys:				
Scrap	5,842	5,409	479	Sweden 2,229; West Germany 699; Canada 514.
Unwrought	12,376	10,585	211	West Germany 2,311; Belgium-Luxembourg 2,300; Sweden 1,980.
Semimanufactures	10,768	10,251	1,145	Japan 1,850; France 1,556; West Germany 1,552.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Platinum-group metals:				
Waste and sweepings				
value, thousands	$2,300	$4,539	$101	West Germany $2,394; Belgium-Luxembourg $1,206; Sweden $646.
Metals including alloys, unwrought and partly wrought				
thousand troy ounces	1,736	1,768	547	Netherlands 193; Switzerland 129.
Rare-earth metals including alloys, all forms	26	57	17	Ireland 20; West Germany 11.
Rhenium: Metal including alloys, all forms	--	(2)	(2)	
Selenium, elemental	174	146	3	West Germany 19; Japan 6; Cyprus 1.
Silicon, high-purity	19	26	--	
Silver:				
Ore and concentrate[3]				
value, thousands	$2	$66	$4	India $57; Israel $4.
Waste and sweepings ----do----	$9,998	$24,840	$121	France $10,495; Belgium-Luxembourg $7,379; West Germany $4,057.
Metal including alloys, unwrought and partly wrought				
thousand troy ounces	54,174	18,101	9,870	France 1,543; Switzerland 1,222.
Tellurium and arsenic, elemental	57	54	8	Finland 20; Netherlands 10.
Tin:				
Ore and concentrate	3,092	2,640	--	Netherlands 2,620; Italy 20.
Oxides	606	549	200	Spain 126; Netherlands 77.
Ash and residue containing tin	547	662	--	West Germany 601; Denmark 38; Netherlands 22.
Metal including alloys:				
Scrap	932	456	6	Netherlands 190; Sweden 61; Italy 46.
Unwrought	13,065	8,894	164	U.S.S.R. 4,974; Netherlands 1,138; West Germany 710.
Semimanufactures	631	711	13	Ireland 128; Italy 79; Iraq 71.
Titanium:				
Ore and concentrate	27	1,125	--	All to Sweden.
Oxides	15,411	17,313	4,849	West Germany 1,312; Italy 1,230.
Metal including alloys:				
Scrap	NA	1,351	474	West Germany 252; Belgium-Luxembourg 203.
Unwrought	NA	196	(2)	West Germany 75; France 44; Netherlands 22.
Semimanufactures	NA	966	111	West Germany 248; France 189.
Tungsten:				
Ore and concentrate	275	184	(2)	France 36; West Germany 25; Netherlands 24.
Oxides and hydroxides	59	109	19	Austria 70; Australia 10.
Ash and residue containing tungsten	54	114	--	West Germany 49; Norway 46; Austria 7.
Metal including alloys:				
Scrap	347	353	19	West Germany 207; Belgium-Luxembourg 84.
Unwrought	85	264	(2)	West Germany 169; Austria 38; France 35.
Semimanufactures	143	218	10	Netherlands 46; France 31; Pakistan 31.
Uranium and/or thorium: Metal including alloys, all forms:				
Uranium	2	--		
Thorium	9	3	--	Italy 2; Netherlands 1.
Vanadium:				
Oxides and hydroxides	483	80	--	Belgium-Luxembourg 66; France 3; Italy 3.
Ash and residue containing vanadium	129	--		
Metal including alloys:				
Scrap	2	8	--	Netherlands 5; Norway 3.
Unwrought	26	1	--	All to West Germany.
Semimanufactures	34	3	--	Belgium-Luxembourg 2.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Ore and concentrate	955	109	--	West Germany 30; France 23; Italy 20.
Oxides	7,901	10,961	388	Sweden 2,776; France 1,688; Belgium-Luxembourg 1,025.
Blue powder	3,371	2,807	1,556	Singapore 238; Saudi Arabia 142.
Matte	577	116	--	Spain 91; France 22; Netherlands 3.
Ash and residue containing zinc	5,504	4,836	--	Sweden 3,190; West Germany 509; Portugal 356.
Metal including alloys:				
Scrap	15,246	17,846	--	West Germany 8,160; Italy 2,252; Belgium-Luxembourg 1,879.
Unwrought	14,660	16,612	2,588	France 5,039; Italy 2,466.
Semimanufactures	2,337	5,093	17	Nigeria 1,720; France 941.
Zirconium:				
Ore and concentrate	434	491	--	West Germany 127; Belgium-Luxembourg 112; France 60.
Metal including alloys:				
Scrap	NA	117	23	West Germany 52; Spain 18.
Unwrought	NA	36	5	France 17; Sweden 9.
Semimanufactures	NA	26	(2)	Uruguay 18; Republic of South Africa 3; Belgium-Luxembourg 1.
Other:				
Ores and concentrates	17	2	--	Ireland 1; Israel 1.
Oxides and hydroxides	462	1,093	322	West Germany 234; Japan 150.
Ashes and residues	16,248	15,014	760	Belgium-Luxembourg 7,506; West Germany 2,315; Sweden 1,863.
Base metals including alloys, all forms	29	7	1	France 3; Belgium-Luxembourg 1; Italy 1.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	2,988	709	--	Barbados 140; Algeria 139; Australia 85.
Artificial:				
Corundum	3,990	6,290	1,502	West Germany 1,645; Australia 1,253.
Silicon carbide	168	531	5	Sweden 169; Norway 161; West Germany 54.
Dust and powder of precious and semi-precious stones including diamond value, thousands	$3,159	$4,491	$1,150	India $671; Japan $441.
Grinding and polishing wheels and stones	3,565	3,901	284	West Germany 571; France 497; Italy 299.
Asbestos, crude	964	307	1	Italy 146; Ireland 38; Yugoslavia 35.
Barite and witherite	14,997	17,106	--	Cameroon 6,002; Norway 3,698; Denmark 2,990.
Boron materials:				
Crude natural borates	330	198	--	France 143; West Germany 24; Sweden 18.
Elemental	19	28	--	Spain 17; Netherlands 5; Switzerland 4.
Oxides and acids	1,151	--	--	
Bromine	2,018	1,971	--	France 840; West Germany 603; Switzerland 193.
Cement	126,953	113,535	296	Ireland 56,211; Nigeria 13,049; Oman 5,005.
Chalk	34,009	35,630	1,291	Finland 3,676; Australia 3,452; West Germany 2,510.
Clays, crude:				
Bentonite thousand tons	22	40	--	Sweden 12; West Germany 5; Pakistan 3.
Chamotte earth do	--	(2)	--	Mainly to France.
Fuller's earth do	17	23	(2)	Sweden 6; West Germany 5; Netherlands 2.
Kaolin do	2,560	2,575	15	Finland 541; West Germany 404; Sweden 368.
Unspecified do	r355	345	NA	NA.
Cryolite and chiolite	47	437	--	West Germany 425; Egypt 3; Republic of Korea 3.
Diamond:				
Gem, not set or strung value, thousands	$1,964,197	$1,602,087	$244,049	Belgium-Luxembourg $801,921; India $249,441.
Industrial stones do	$12,378	$16,338	$5,232	Ireland $2,597; Romania $1,669.
Diatomite and other infusorial earth	611	178	--	Spain 46; Egypt 44; Ireland 38.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Feldspar, fluorspar, related materials:				
Feldspar	456	316	--	Ireland 113; Greece 93; Indonesia 65.
Fluorspar	8,199	7,505	--	West Germany 1,837; Netherlands 1,408; Australia 580.
Unspecified	818	704	--	Ireland 698; Portugal 2; Greece 1.
Fertilizer materials:				
Crude, n.e.s	2,750	2,540	27	Ireland 2,015; Tanzania 104; Saudi Arabia 59.
Manufactured:				
Ammonia	241,369	316,715	33	France 73,855; Spain 52,889; Belgium-Luxembourg 44,919.
Nitrogenous	186,128	155,315	NA	Belgium-Luxembourg 45,948; Netherlands 38,370; Ireland 14,102.
Phosphatic	753	1,240	(2)	West Germany 613; Sudan 405; Ireland 81.
Potassic	98,938	79,678	554	Finland 28,318; Norway 23,015; Netherlands 12,079.
Unspecified and mixed	319,468	349,780	63	Ireland 201,024; Belgium-Luxembourg 32,970; Nigeria 29,049.
Graphite, natural	3,862	2,565	59	West Germany 540; France 411; Austria 341.
Gypsum and plaster	16,647	16,354	530	Ireland 3,951; Hong Kong 1,282; Republic of Korea 1,049.
Iodine	97	224	--	West Germany 114; Israel 34; France 30.
Kyanite and related materials	5,334	5,172	772	West Germany 2,902; France 470.
Lime	19,427	30,379	--	Ivory Coast 7,071; France 6,289; Nigeria 4,533.
Magnesium compounds:				
Magnesite	50	155	NA	NA.
Oxides and hydroxides	79,750	92,601	NA	NA.
Other	1	1	--	All to Belgium-Luxembourg.
Mica:				
Crude including splittings and waste	3,406	3,088	2	West Germany 703; Belgium-Luxembourg 338; Portugal 299.
Worked including agglomerated splittings	90	211	18	Netherlands 66; Spain 21.
Nitrates, crude	219	382	--	France 302; Ireland 49; Denmark 20.
Phosphates, crude	20,253	607	--	West Germany 198; Norway 140; Ireland 122.
Pigments, mineral: Natural, crude	880	1,158	25	Philippines 364; Saudi Arabia 185; Nigeria 123.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$119,962	$75,288	$18,676	Switzerland $39,475; Singapore $3,418.
Synthetic do	$439	$515	$93	Republic of South Africa $127; Ireland $73.
Pyrite, unroasted	29	186	35	Norway 60; France 29.
Salt and brine	484,510	402,946	215	Sweden 132,417; Ireland 58,349; Nigeria 55,102.
Sodium compounds, n.e.s.: Carbonate, manufactured	99,280	--		
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked thousand tons	10	10	(2)	West Germany 5; Belgium-Luxembourg 3; Ireland 1.
Worked do	6	7	2	West Germany 1; United Arab Emirates 1.
Dolomite, chiefly refractory-grade do	33	31	--	Sweden 15; Norway 5; New Zealand 2.
Gravel and crushed rock do	2,041	1,334	2	France 629; Belgium-Luxembourg 339; Ireland 188.
Limestone other than dimension do	618	650	--	Norway 221; Belgium-Luxembourg 179; West Germany 75.
Quartz and quartzite	(2)	1	(2)	Mainly to Japan.
Sand other than metal-bearing do	66	51	1	Sweden 21; Ireland 19; Norway 4.

See footnotes at end of table.

Table 2.—United Kingdom: Exports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Sulfur:				
Elemental:				
Crude including native and by-product	3,025	1,927	--	Netherlands 734; Ireland 165; Tanzania 105.
Colloidal, precipitated, sublimed	247	127	(2)	Republic of South Africa 31; Norway 23; West Germany 17.
Dioxide	127	134	--	Ireland 81; Belgium-Luxembourg 29; U.S.S.R. 16.
Sulfuric acid	44,831	77,431	(2)	Ireland 32,851.
Talc, steatite, soapstone, pyrophyllite	3,583	4,843	97	Nigeria 2,089; Ireland 1,044; West Germany 308.
Vermiculite, perlite, chlorite	1,648	1,411	17	West Germany 501; Israel 168; Sweden 148.
Other:				
Crude	34,257	37,654	144	West Germany 17,501; Ireland 2,071; Canada 2,001.
Slag and dross, not metal-bearing	40,740	30,187	505	West Germany 19,620; Sweden 2,328; Netherlands 1,412.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	5,893	8,111	--	Ireland 4,365; Iran 1,591; Libya 640.
Carbon:				
Carbon black	32,115	51,677	372	Ireland 12,151; Nigeria 5,473; West Germany 4,260.
Gas carbon	--	30	--	France 22; Netherlands 1; Norway 1.
Coal:				
Anthracite thousand tons	203	214	(2)	France 127; Belgium-Luxembourg 33; Sweden 23.
Bituminous do	2,237	2,345	--	Denmark 1,278; Ireland 392; West Germany 191.
Briquets of anthracite and bituminous coal do	73	99	--	Norway 74; Venezuela 15; Sweden 5.
Lignite including briquets do	1	2	--	Mainly to India.
Coke and semicoke do	249	1,163	--	Norway 229; Finland 174; Sweden 134.
Gas, natural: Gaseous million cubic feet	1,593	2,146	--	Belgium-Luxembourg 1,153; Netherlands 462; West Germany 278.
Peat including briquets and litter	10,127	9,778	--	France 4,720; Spain 1,407; Ireland 876.
Petroleum:				
Crude thousand 42-gallon barrels	570,867	579,271	101,491	Netherlands 129,239; France 120,162.
Refinery products:				
Liquefied petroleum gas do	24,700	32,817	2,134	Netherlands 11,846; France 4,831; Sweden 2,688.
Gasoline do	38,543	42,611	9,982	Netherlands 10,323; West Germany 6,524.
Mineral jelly and wax do	364	356	31	Netherlands 69; West Germany 64; Nigeria 42.
Kerosene and jet fuel do	6,745	7,260	110	Ireland 2,033; Iran 1,474; Netherlands 1,203.
Distillate fuel oil do	42,869	38,611	378	France 8,323; West Germany 8,318; Netherlands 7,766.
Lubricants do	5,649	5,729	273	Belgium-Luxembourg 808; West Germany 637; Netherlands 628.
Residual fuel oil do	10,953	23,666	3,631	Ireland 3,490; Italy 3,250.
Bitumen and other residues do	643	433	NA	Ireland 181; Iceland 82; unspecified 126.
Bituminous mixtures do	180	179	1	Iran 47; Ireland 21; Singapore 19.
Petroleum coke do	2,622	2,671	90	Spain 552; France 349; Italy 343.

[r]Revised. NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.
[3]May include other precious metals.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals:				
Alkali metals	3,886	3,320	--	West Germany 2,043; France 1,276.
Alkaline-earth metals	36	57	NA	NA.
Aluminum:				
Ore and concentrate	316,909	257,532	35	Ghana 148,687; Brazil 64,138; Greece 20,040.
Oxides and hydroxides	661,954	572,791	3,246	Ireland 273,943; Jamaica 251,452; West Germany 12,129.
Ash and residue containing aluminum	225	186	--	West Germany 72; Ireland 58; Belgium-Luxembourg 25.
Metal including alloys:				
Scrap	6,746	4,819	106	Ireland 2,617; Nigeria 448; West Germany 329.
Unwrought	172,141	147,113	1,291	Norway 99,841; West Germany 9,354; Iceland 9,139.
Semimanufactures	248,045	239,639	5,235	West Germany 82,319; France 34,576; Belgium-Luxembourg 32,109.
Antimony:				
Oxides	976	1,021	16	France 640; Belgium-Luxembourg 154; China 124.
Metal including alloys, all forms	231	560	--	China 289; France 48; Netherlands 39.
Arsenic: Oxides and acids	5,746	5,804	--	West Germany 21; Sweden 16; unspecified 5,766.
Beryllium:				
Oxides and hydroxides	9	8	7	China 1.
Metal including alloys, all forms	1	9	7	France 1; West Germany 1.
Bismuth: Metal including alloys, all forms	503	402	18	West Germany 74; Japan 55; Republic of Korea 43.
Cadmium: Metal including alloys, all forms	210	878	--	Canada 454; Finland 157; Netherlands 128.
Cesium and rubidium: Metal including alloys, all forms	(2)	(2)	(2)	Mainly from Netherlands.
Chromium:				
Ore and concentrate	129,786	137,675	NA	NA.
Oxides and hydroxides	658	600	22	Italy 169; West Germany 123; Netherlands 100.
Metal including alloys, all forms	185	356	57	Japan 166; West Germany 35; France 26.
Cobalt:				
Ore and concentrate	1	--		
Oxides and hydroxides	502	378	(2)	Canada 282; Belgium-Luxembourg 59; Netherlands 21.
Metal including alloys, all forms	1,824	1,683	179	Zambia 210; Netherlands 195; Zaire 146.
Columbium and tantalum:				
Ore and concentrate	--	1	1	
Metal including alloys, all forms:				
Columbium (niobium)	16	25	7	Switzerland 9; West Germany 5.
Tantalum	52	37	17	West Germany 15; Austria 3.
Copper:				
Ore and concentrate	1,045	1,220	--	Czechoslovakia 1,184; Australia 18; Chile 18.
Matte and speiss including cement copper	1,364	25	--	All from Belgium-Luxembourg.
Oxides and hydroxides	2,743	1,616	65	Australia 677; Norway 647; West Germany 121.
Sulfate	2,020	2,347	288	Italy 461; Israel 458; Netherlands 409.
Ash and residue containing copper	73,217	47,794	2,004	Sweden 26,056; West Germany 13,371; Netherlands 4,790.
Metal including alloys:				
Scrap	8,117	13,329	5,006	Canada 2,106; Republic of South Africa 1,636.
Unwrought	314,330	314,124	5,003	Chile 62,257; Peru 54,450; Canada 53,969.
Semimanufactures	97,396	98,123	1,193	West Germany 34,666; France 14,752; Finland 9,272.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Gallium: Metal including alloys, all forms	25	NA		
Germanium: Metal including alloys, all forms	7	3	1	Belgium-Luxembourg 1; France 1.
Gold:				
Waste and sweepings value, thousands	$112,361	$37,904	$3,086	Sweden $9,241; Australia $4,782; Kuwait $3,527.
Metal including alloys, unwrought and partly wrought thousand troy ounces	1,437	739	32	Switzerland 161; France 32; unspecified 514.
Hafnium: Metal including alloys, all forms	3	5	5	
Iron and steel:				
Iron ore and concentrate:				
Excluding roasted pyrite thousand tons	14,138	15,404	(2)	Canada 5,481; Australia 2,929; Brazil 2,278.
Pyrite, roasted do	296	250	--	Sweden 216; Norway 32; West Germany 1.
Metal:				
Scrap	33,710	50,090	1,753	Ireland 32,412; Canada 6,374; West Germany 3,070.
Pig iron, cast iron, related materials	102,687	117,583	122	Canada 30,736; France 28,360; Brazil 18,447.
Ferroalloys:				
Ferrochromium	65,731	77,467	NA	NA.
Ferromanganese	37,625	44,552	--	Norway 21,251; Republic of South Africa 8,515; France 8,213.
Ferromolybdenum	403	376	--	Austria 148; Belgium-Luxembourg 120; Netherlands 56.
Ferronickel	16,437	17,286	564	Greece 8,946; France 2,749; Dominican Republic 1,506.
Ferrosilicochromium	--	1,064	--	Italy 1,050; West Germany 13; Sweden 1.
Ferrosilicomanganese	27,849	28,972	4	Norway 18,184; Republic of South Africa 4,354; Portugal 3,554.
Ferrosilicon	81,754	82,775	NA	NA.
Silicon metal	27,215	32,914	19	France 15,032; Norway 8,950; Republic of South Africa 6,093.
Unspecified	r15,823	11,789	360	Norway 4,708; France 2,526; Italy 1,159.
Steel, primary forms	869,520	985,599	342	West Germany 453,333; Netherlands 144,998; Belgium-Luxembourg 98,255.
Semimanufactures:				
Bars, rods, angles, shapes, sections thousand tons	808	796	1	West Germany 110; Belgium-Luxembourg 98; France 87.
Universals, plates, sheets do	1,331	1,504	2	West Germany 307; Belgium-Luxembourg 268; Netherlands 227.
Hoop and strip do	157	156	1	West Germany 73; France 23; Belgium-Luxembourg 19.
Rails and accessories do	2	4	(2)	Sweden 2; Belgium-Luxembourg 1; West Germany 1.
Wire do	57	59	(2)	Belgium-Luxembourg 20; France 14; West Germany 8.
Tubes, pipes, fittings do	425	355	3	Netherlands 82; Italy 71; West Germany 65.
Castings and forgings, rough do	29	26	(2)	West Germany 8; France 5; Denmark 2.
Lead:				
Ore and concentrate	24,151	25,931	1	Spain 7,545; Australia 5,493; Honduras 4,696.
Oxides	1,452	1,555	50	Netherlands 699; West Germany 495; Austria 272.
Ash and residue containing lead	7,862	15,092	6,875	Sweden 2,672; Norway 1,000.
Metal including alloys:				
Scrap	1,482	2,045	418	Australia 581; Japan 293.
Unwrought	175,673	185,275	2,320	Australia 150,303; Canada 26,444; Sweden 2,757.
Semimanufactures	9,087	8,892	10	Belgium-Luxembourg 4,059; Ireland 3,513; West Germany 643.
Lithium:				
Oxides and hydroxides	1,109	--		
Metal including alloys, all forms	15	--		

See footnotes at end of table.

Table 3.—United Kingdom: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Magnesium: Metal including alloys:				
Scrap	471	786	57	Belgium-Luxembourg 588; Sweden 63.
Unwrought	5,363	6,159	1	Norway 2,562; Canada 1,496; Netherlands 1,493.
Semimanufactures	1,121	969	106	Belgium-Luxembourg 355; Norway 149; Netherlands 138.
Manganese:				
Ore and concentrate, metallurgical-grade	269,865	386,297	--	Brazil 214,725; Republic of South Africa 155,646; Morocco 6,579.
Oxides	3,582	4,705	163	West Germany 2,615; Belgium-Luxembourg 1,246; Norway 223.
Metal including alloys, all forms	3,043	3,639	246	Republic of South Africa 2,695; France 386; Belgium-Luxembourg 98.
Mercury 76-pound flasks	8,352	11,368	522	Netherlands 4,727; Spain 3,915; China 580.
Molybdenum:				
Ore and concentrate	18,042	19,575	11,430	Peru 1,884; Netherlands 1,872.
Oxides and hydroxides	102	140	--	West Germany 124; China 10; Republic of Korea 6.
Metal including alloys:				
Scrap	271	72	5	Austria 28; West Germany 26; France 6.
Unwrought	29	88	18	Austria 32; France 20.
Semimanufactures	187	182	87	Austria 65; France 20.
Nickel:				
Ore and concentrate	671	--	--	
Matte and speiss	39,892	42,754	23	Canada 42,314; Belgium-Luxembourg 169; Australia 160.
Oxides and hydroxides	552	1,062	5	Australia 624; Netherlands 220; Canada 168.
Ash and residue containing nickel	1,034	1,501	160	Netherlands 596; West Germany 341; Denmark 179.
Metal including alloys:				
Scrap	2,810	4,139	1,225	Netherlands 694; Austria 326.
Unwrought	15,395	16,165	371	Netherlands 4,369; Australia 3,159; Canada 2,205.
Semimanufactures	5,543	5,946	2,841	West Germany 1,998; France 318.
Platinum-group metals:				
Waste and sweepings value, thousands	$71,325	$47,313	$7,348	Canada $6,640; Finland $3,640.
Metals including alloys, all forms troy ounces	546,567	739,473	54,302	France 257,208; Switzerland 96,453; Belgium-Luxembourg 32,151.
Rhenium: Metal including alloys, all forms	--	(2)	(2)	
Selenium, elemental	458	411	42	Canada 110; Japan 78; Belgium-Luxembourg 73.
Silicon, high-purity	25	35	(2)	West Germany 19; Japan 15.
Silver:				
Ore and concentrate[3] value, thousands	$274,424	$217,777	$18	Republic of South Africa $151,850; Canada $54,524; Sierra Leone $2,834.
Waste and sweepings do	$42,697	$58,016	$277	Hong Kong $39,710; Sweden $4,895; Denmark $3,098.
Metal including alloys, unwrought and partly wrought thousand troy ounces	53,435	41,668	547	East Germany 9,324; Australia 4,983; Peru 4,180.
Tellurium and arsenic, elemental	160	156	3	Sweden 112; Belgium-Luxembourg 23; U.S.S.R. 8.
Tin:				
Ore and concentrate	21,055	20,711	129	Chile 8,914; Peru 4,444; Republic of South Africa 2,760.
Oxides	19	19	--	All from Italy.
Ash and residue containing tin	11,081	14,832	3,327	West Germany 2,301; Belgium-Luxembourg 2,053.
Metal including alloys:				
Scrap	1,664	567	87	Netherlands 146; Republic of South Africa 46.
Unwrought	6,998	7,349	661	Netherlands 2,226; Bolivia 1,221; Indonesia 825.
Semimanufactures	591	630	20	Malaysia 389; Belgium-Luxembourg 90; West Germany 55.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Titanium:				
Ore and concentrate	248,110	366,871	--	Australia 190,440; Norway 105,809; India 26,425.
Oxides	9,818	4,286	223	West Germany 2,328; China 379; Norway 308.
Metal including alloys:				
Scrap	NA	6,494	4,163	France 589; U.S.S.R. 575.
Unwrought	NA	405	140	Japan 123; France 52.
Semimanufactures	1,439	1,068	458	Japan 340; West Germany 142.
Tungsten:				
Ore and concentrate	896	627	30	Portugal 213; West Germany 159; Bolivia 59.
Oxides and hydroxides	104	140	--	West Germany 124; China 10; Republic of Korea 6.
Ash and residue containing tungsten	98	301	20	Thailand 200; Republic of South Africa 69.
Metal including alloys:				
Scrap	124	366	38	West Germany 149; Austria 66.
Unwrought	215	180	34	Republic of Korea 63; West Germany 28.
Semimanufactures	79	77	9	Austria 22; France 10; West Germany 10.
Uranium and/or thorium:				
Ore and concentrate	13	--		
Metal including alloys, all forms:				
Uranium	7	--		
Thorium	2	(2)	--	Mainly from France.
Vanadium:				
Oxides and hydroxides	660	260	--	Finland 177; China 75; West Germany 5.
Metal including alloys:				
Scrap	225	(2)	(2)	
Unwrought	96	108	--	All from West Germany.
Semimanufactures	26	21	(2)	West Germany 16; Netherlands 5.
Zinc:				
Ore and concentrate	196,100	185,407	--	Canada 49,046; Australia 34,290; Peru 27,860.
Oxides	3,923	4,413	15	West Germany 1,000; France 960; Mexico 667.
Blue powder	1,902	2,340	38	West Germany 1,149; Belgium-Luxembourg 641; Norway 293.
Matte	54	122	--	Netherlands 46; Belgium-Luxembourg 41; France 35.
Ash and residue containing zinc	29,528	19,309	2,228	West Germany 7,312; Peru 3,626; France 2,335.
Metal including alloys:				
Scrap	2,237	997	57	France 242; Sweden 237; Canada 148.
Unwrought	120,993	135,468	(2)	Canada 40,460; Finland 34,687; Netherlands 33,193.
Semimanufactures	3,756	3,963	13	West Germany 1,361; France 1,081; Belgium-Luxembourg 586.
Zirconium:				
Ore and concentrate	43,077	48,827	1,218	Australia 24,206; Republic of South Africa 23,268.
Metal including alloys:				
Scrap	66	34	4	Sweden 17; France 9; West Germany 4.
Unwrought	2	14	8	France 5; West Germany 1.
Semimanufactures	43	57	37	Canada 18; Japan 1.
Other:				
Ores and concentrates	80	53	--	Bolivia 29; Sweden 20; Republic of South Africa 2.
Oxides and hydroxides	2,754	440	63	France 230; West Germany 118.
Ashes and residues	7,654	7,585	3,249	Netherlands 702; West Germany 650.
Base metals including alloys, all forms	87	26	4	Belgium-Luxembourg 8; France 7.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	191,170	162,903	10	Italy 81,985; Greece 65,677; France 7,967.
Artificial:				
Corundum	9,866	26,170	88	Canada 19,165; West Germany 2,719; Netherlands 1,418.
Silicon carbide	16,960	18,210	31	Norway 11,535; West Germany 2,834; Spain 1,314.
Grinding and polishing wheels and stones	6,001	6,029	160	Netherlands 1,231; Italy 999; West Germany 989.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Asbestos, crude	41,556	37,639	31	Canada 27,819; Republic of South Africa 6,224; Italy 2,300.
Barite and witherite	158,473	120,347	(2)	Ireland 60,802; Netherlands 22,825; Morocco 18,811.
Boron materials:				
Crude natural borates				
value, thousands	$15,584	$11,241	--	Turkey $11,070; Netherlands $136; West Germany $17.
Elemental	9	3	3	
Oxides and acids	5,949	4,198	(2)	France 3,215; Belgium-Luxembourg 868; U.S.S.R. 103.
Bromine	6,169	9,276	2,544	Israel 6,703; Netherlands 28.
Cement	499,621	623,391	366	Ireland 210,508; Netherlands 136,534; East Germany 61,123.
Chalk	4,303	4,594	4	Denmark 3,655; West Germany 266; Turkey 242.
Clays, crude:				
Bentonite	81,051	83,982	16,399	Greece 38,275; Cyprus 20,330.
Chamotte earth	40,911	40,524	--	France 32,082; Republic of South Africa 5,674.
Fuller's earth	5,672	2,013	620	Senegal 1,100; West Germany 212.
Kaolin	4,187	4,201	988	Belgium-Luxembourg 1,203; Netherlands 1,173.
Unspecified	r43,768	51,002	14,323	France 17,814; Spain 7,462.
Cryolite and chiolite	807	3,626	--	Denmark 3,622; Italy 4.
Diamond:				
Gem, not set or strung				
value, thousands	$1,903,190	$1,744,409	NA	NA.
Industrial stones do	$26,386	$29,507	NA	NA.
Diatomite and other infusorial earth	20,880	23,915	2,444	Denmark 16,099; France 2,913.
Feldspar, fluorspar, related materials:				
Feldspar	54,335	55,879	41	Finland 23,623; Norway 16,336; Sweden 9,807.
Fluorspar	1,432	2,422	--	Mexico 2,023; France 378; West Germany 19.
Unspecified	77,230	70,443	--	Finland 23,643; Sweden 9,807.
Fertilizer materials:				
Crude, n.e.s	2,235	2,340	8	Ireland 1,837; Sweden 218; France 130.
Manufactured:				
Nitrogenous thousand tons	1,012	889	(2)	Netherlands 273; Belgium-Luxembourg 210; Ireland 84.
Phosphatic do	189	246	--	Netherlands 82; Belgium-Luxembourg 48; Tunisia 30.
Potassic do	522	582	(2)	East Germany 297; West Germany 152; U.S.S.R. 40.
Unspecified and mixed do	627	514	(2)	Belgium-Luxembourg 100; Netherlands 98; Sweden 79.
Graphite, natural	19,540	23,461	330	China 9,089; Madagascar 6,255; Sri Lanka 2,626.
Gypsum and plaster	87,087	109,255	388	Ireland 62,550; France 32,825; Spain 7,660.
Iodine	2,070	1,323	1	Japan 1,032; Chile 259; France 11.
Kyanite and related materials	52,707	49,453	6,898	Republic of South Africa 26,974; France 9,951.
Lime	3,848	5,576	--	Ireland 4,991; France 410; India 84.
Magnesium compounds:				
Magnesite	12,420	14,860	--	Greece 10,129; Turkey 2,450; Ireland 2,039.
Oxides and hydroxides	122,058	121,284	186	Spain 29,980; Greece 29,195; Netherlands 26,309.
Other	21,753	17,620	--	West Germany 10,172; East Germany 5,562; Netherlands 830.
Mica:				
Crude including splittings and waste	18,894	15,854	29	China 10,430; France 2,024; Brazil 2,000.
Worked including agglomerated splittings	601	602	93	Belgium-Luxembourg 131; France 119.
Nitrates, crude	7,473	7,080	--	Chile 6,294; Belgium-Luxembourg 681; Ireland 105.
Phosphates, crude thousand tons	1,340	1,160	(2)	Morocco 739; Senegal 267; Israel 44.
Pigments, mineral:				
Natural, crude	2,536	2,704	--	India 1,440; Cyprus 993; Netherlands 89.
Iron oxides and hydroxides, processed	34,659	33,625	472	West Germany 27,592; Belgium-Luxembourg 1,549; Spain 1,063.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Potassium salts, crude	36,038	30,425	--	West Germany 17,093; East Germany 13,309; France 18.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$121,441	$68,512	NA	NA.
Synthetic do	$713	$1,545	$289	Switzerland $465; Ireland $385.
Pyrite, unroasted	19,638	15,909	--	NA.
Salt and brine	115,152	333,372	413	Italy 141,131; Spain 49,265; Tunisia 40,150.
Sodium compounds, n.e.s.: Carbonate, manufactured	64,166	166,313	22,045	Belgium-Luxembourg 69,775; Poland 24,211; Sweden 15,934.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	134,717	73,029	136	Sweden 47,841; Italy 6,370; Finland 2,062.
Worked	62,196	74,761	162	Italy 30,300; Portugal 17,300; Spain 13,232.
Dolomite, chiefly refractory-grade	120,823	141,160	--	Spain 103,212; Norway 28,186; Belgium-Luxembourg 3,322.
Gravel and crushed rock	548,376	931,892	45	Ireland 342,410; Netherlands 142,515; France 109,232.
Limestone other than dimension	30,705	705	--	France 576; Ireland 56; Denmark 43.
Quartz and quartzite	6,307	10,906	730	Republic of South Africa 2,882; Netherlands 2,133; West Germany 1,524.
Sand other than metal-bearing	64,019	58,410	2,612	Belgium-Luxembourg 44,575; France 3,634; Ireland 2,779.
Sulfur:				
Elemental:				
Crude including native and by-product	810,963	805,254	--	NA.
Colloidal, precipitated, sublimed	418	524	10	France 329; West Germany 112; Belgium-Luxembourg 70.
Dioxide	2,710	2,871	--	Sweden 2,867; Belgium-Luxembourg 4.
Talc, steatite, soapstone, pyrophyllite	67,615	59,135	NA	France 47; Belgium-Luxembourg 27; unspecified 59,061.
Vermiculite, perlite, chlorite	120,276	134,018	6	Italy 49,320; Republic of South Africa 43,708; Greece 20,360.
Other:				
Crude	631	3,056	--	Austria 1,053; Sweden 924; Switzerland 790.
Slag and dross, not metal-bearing	397,312	612,744	31,569	France 289,212; Belgium-Luxembourg 144,267; Sweden 36,676.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	14,610	13,372	3,901	Trinidad and Tobago 4,215; West Germany 2,991.
Carbon:				
Carbon black	87,038	105,483	--	France 26,508; Norway 8,950; unspecified 44,735.
Gas carbon	3,202	1,338	66	East Germany 644; West Germany 405; France 180.
Coal:				
Anthracite thousand tons	1,269	1,207	57	West Germany 484; Netherlands 229; Belgium-Luxembourg 117.
Bituminous do	7,627	11,525	2,307	Australia 3,380; Netherlands 2,342; Poland 1,533.
Briquets of anthracite and bituminous coal do	171	192	--	West Germany 84; Netherlands 39; Belgium-Luxembourg 30.
Lignite including briquets do	73	42	(2)	East Germany 16; West Germany 15; Netherlands 10.
Coke and semicoke do	1,999	374	6	East Germany 112; West Germany 85; France 33.
Gas, natural: Gaseous million cubic feet	496,257	541,548	(2)	Norway 541,543; West Germany 5.
Peat including briquets and litter	182,011	218,881	1,308	Ireland 191,490; U.S.S.R. 12,267; Netherlands 3,926.
Petroleum:				
Crude thousand 42-gallon barrels	184,852	197,524	--	Norway 84,534; Nigeria 22,766; Turkey 15,589.

See footnotes at end of table.

Table 3.—United Kingdom: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum: —Continued				
Refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	7,552	5,897	110	Algeria 1,531; Saudi Arabia 1,118; Netherlands 631.
Gasoline ——do——	18,164	28,610	600	Netherlands 4,047; U.S.S.R. 3,804; Algeria 3,528.
Mineral jelly and wax ——do——	107	88	10	Netherlands 24; West Germany 20.
Kerosene and jet fuel——do——	2,161	2,353	46	Netherlands 1,004; Venezuela 411; Belgium-Luxembourg 310.
Distillate fuel oil ——do——	16,003	11,558	258	U.S.S.R. 5,372; Netherlands 2,360; France 714.
Lubricants ——do——	11,246	10,205	586	Belgium-Luxembourg 4,550; France 1,138; Netherlands 824.
Residual fuel oil——do——	140,674	114,625	4,143	Netherlands 22,056; Libya 9,622; Spain 7,489.
Bitumen and other residues do——	1,033	1,249	1	Belgium-Luxembourg 631; Spain 326; Netherlands 161.
Bituminous mixtures——do——	39	38	3	France 15; West Germany 8; Netherlands 7.
Petroleum coke ——do——	2,084	2,145	764	Netherlands 712; Belgium-Luxembourg 492.

[r]Revised. NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.
[3]May include other precious metals.

COMMODITY REVIEW

METALS

Aluminum.—In the fall of 1986, The Rio Tinto Zinc Corp. PLC (RTZ) assumed a controlling interest of 51% in Anglesey Aluminium Ltd. in Anglesey, north Wales, by purchase of additional shares from its partner, Kaiser Aluminium & Chemical Corp., for approximately $30 million. Anglesey, the United Kingdom's second largest primary aluminum producer, suffered a loss in 1985 although its smelter, operating at near full capacity, produced 102,000 tons of primary aluminum.

British Alcan Aluminium Ltd. contracted with Kaiser Aluminium Europe Inc. to convert its commercial-size aluminum-lithium billets into sheet down to thicknesses of 0.3 inch and widths up to 50 inches at Kaiser's mill at Koblenz, Federal Republic of Germany. Product sheet specimens were to be used to fabricate prototype components for large commercial aircraft as well as advanced fighter aircraft. British Alcan had previously supplied aluminum-lithium alloys for prototype components in British experimental aircraft and the U.S. McDonnell Douglas F-15 *Eagle* fighter plane. The alloy contained approximately 10% lithium by volume.

Gold.—Ennex International PLC, a subsidiary of Canada's Northgate Exploration Ltd., had discovered and proven sufficient reserves in the Sperrin Mountains in County Tyrone, Northern Ireland, in 1985 for a viable gold mining operation, which was expected to produce about 30,000 troy ounces per year. Nearly 1 million tons of ore averaging about 0.3 troy ounce per ton had been outlined by trenching and drilling. Planning permission was being sought at yearend 1986 to gain access to gold-bearing veins via a 1,400-foot adit. Ennex continued to explore for other gold deposits in Northern Ireland and Scotland.

Three other companies, including the British Petroleum Co. PLC (BP), were searching for gold in the United Kingdom,

and several deposits appeared promising. A privately owned mill was reported to have been installed in 1985 at the old Gwynfynydd gold mine in north Wales that was capable of recovering about 25 troy ounces of gold per day from selected ore fractions. Approximately 100 troy ounces of gold had been recovered at the site in 1984 in a pilot milling operation.

Iron and Steel.—All five of the Government-owned BSC's integrated steelworks, two each in England and Wales and one in Scotland, were scheduled to remain in operation at least until August 1988. These were Scunthorpe in Humberside and Teesside in Cleveland County, Llanwern and Port Talbot in Wales, and Ravenscraig in Scotland. Closure of Scotland's Ravenscraig works in 1985 or 1986 had been a matter of speculation, although its facilities were quite modern and included continuous billet casting. Also, it was the only integrated steelworks with a comprehensive range of secondary steel products. BSC announced a $44 million investment program at Ravenscraig including construction of a $22 million system for coal injection into a blast furnace that was scheduled for commissioning in early 1988.

In August 1986, BSC completed the $75 million relining of its Redcar blast furnace at its Teesside works. This, the largest blast furnace in Europe, had blown out in March after having produced 15.1 million tons of iron in 6.5 years. Its lack of production during the lining period was a cause of the 6% decline in British raw steel production compared with that of 1985. Daily production after its startup in August averaged 8,000 tons.

BSC restarted one of the two blast furnaces at its Scunthorpe works in early 1986 after a 1-year closure for renovation and modernization. The other unit was then closed for similar renovation.

BSC returned to profit for the first time since 1974, and Government aid was reportedly discontinued in 1986 as the privatization of the corporation was being considered. Since 1981, BSC's work force had been reduced by 75% to 54,000 as productivity more than doubled to 0.16 ton of steel per worker-hour. Total BSC crude steel production decreased 14% in 1986 to 11.4 million tons because of the company's major modernization and maintenance activities, particularly at Teesside. British crude steel production by private producers increased from 15% in 1985 to 22% in 1986.

BSC announced construction of a $20 million 26-ton ladle-arc steelmaking unit at its Lackenby works in Teesside to be completed in 1988. Higher quality, continuously cast blooms were to be made for the manufacture of beams, columns, coil plate, and rails at its Workington works. The Lackenby plant capacity was expected to be increased thereby by 25%, to 570,000 tons per year. Also completed was a new 3-strand continuous caster at BSC's Clydesdale works to provide blooms for seamless tubing production at Clydesdale and at the Bromford seamless tube mill.

At midyear, BSC completed a $275 million 2-year renovation of its 80-inch hot-strip mill at its Port Talbot works. Operation of the mill continued during the renovation, which included installation of a second reheat furnace. This enhanced BSC's tinplate production capacity to near 1 million tons per year. Installation of a continuous slab caster at BSC's Llanwern works was also begun in 1986.

United Engineering Steels Ltd., the joint venture created by the April merger of the specialty steel portions of BSC with Guest Keen and Nettlefolds, began conversion of its 1-million-ton-per-year Aldwark works from an ingot producer to a 100% continuous bloom casting operation. The modification, scheduled for completion in the spring of 1988 at a cost of $90 million, was to consist of two twin-strand units placed side by side to produce 16- by 22-inch blooms.

BSC's Gartcosh wide-strip, cold-rolling mill in Scotland was closed in March. Also closed at midyear was BSC's seamless pipeworks at Coatbridge in Scotland. Some operations were transferred to other mills as workers were laid off, some while under strike action.

Pipe demand decreased because of lowered petroleum exploration and development activity in the North Sea. However, the Hartlepool pipeworks received an order in August from BGC for 25 miles of welded pipe for a gas operation in Wales. The pipe required 9,000 tons of steel plate to be supplied by BSC's Teesside and Scunthorpe works.

In May, BSC started a 200,000-ton-per-year $44 million hot-dip galvanizing line at its Shotton works in Deeside, Clwyd County, Wales. The line was to be used to apply a 55 Al-45 Zn coating, tradenamed Zalutite, in addition to the regular zinc galvanizing coating, thereby increasing total works capacity to 750,000 tons per year. Approxi-

mately 70% of the hot-rolled steel sheet was to be supplied from the Ravenscraig works and the balance from Port Talbot. Special Steel Tinsley Park works and the Monks Hall bar and light section mills were closed.

Tin.—By yearend, Wheal Jane and South Crofty were the only tin mines still operating in the United Kingdom, apart from a short-time reclamation program at the Geevor Mine. Both operating mines were owned by Carnon Consolidated Tin Mines Ltd., a subsidiary of RTZ. All concentrate was sent to the Capper Pass smelter-refinery complex for conversion to metal on a toll basis after the initial collapse of world tin prices near yearend 1985. Prices had fallen to near $2 per pound by yearend 1986 compared with about $6 per pound during the first 10 months of 1985.

The Government granted a $22 million interest-free loan to Carnon in September to be allocated over the next few years for modernization to effect lower cost operation of the Wheal Jane and South Crofty Mines. Reportedly, RTZ had planned to close the mines in August if the loan had not been granted. However, RTZ agreed to invest a nearly equal amount in the modernization program with the help of a Government guarantee to back another $14 million in commercial loans. Carnon reduced production costs during the year, without Government aid, by 25% to about $4.30 per pound of contained tin by mining only high-grade ore. This strategy reduced the size of the work force by 38%, curtailed exploration, and temporarily halted operations at the Mount Wellington section of the Wheal Jane Mine. It was anticipated by RTZ that costs could be reduced by at least another 15% over the next few years.

Total production from the two mines in 1986 was 3,234 tons of contained tin, and the average concentrate grade was approximately doubled to 30% tin. It was planned by RTZ to produce tin concentrate at an annual rate of 3,800 tons of contained tin for the following 3 years. Byproduct zinc, copper, and silver concentrates were also to be emphasized. The antiquated beneficiation plant at South Crofty was closed in 1986. Ore was then sent to the modern Wheal Jane froth flotation concentrator for beneficiation.

The Wheal Jane Mine was expected to produce about 75% of Carnon's production during the following few years. However, massive reserves of rich ore were known to exist in South Crofty, and it was planned to invest approximately 75% of the modernization capital at that mine and mill. Continuing future operation of the mines was ultimately contingent upon tin prices approaching $4 per pound.

RTZ closed its Wheal Pendarves and Wheal Maid Mines in October 1985 after the initial collapse of tin prices. These mines had been developmental, each producing only about 200 tons per year of tin in concentrate. Full mine development had been scheduled for around the year 2010.

The Geevor Mine at Penzance, Cornwall, ceased mining in April after having produced nearly 300 tons of tin in concentrate in 1986. Two applications for Government aid by the owner, Geevor Tin Mines PLC, were rejected, the second in October. Hoisting of broken ore in the stopes began in December, with plans to lift 48,000 tons of this material to surface storage by mid-1987. The intention was to hold the ore until the price of tin rose to a reasonable level. An agreement was reached for Geevor to acquire the Marine Mining Cornwall Consortium, which held rights to dredge tin off the coast of Cornwall, but it was contingent upon the Geevor Mine obtaining Government aid. An independent consultant determined in October that the projected mining costs of Geevor were $3.80 to $5.00 per pound of contained tin.

Concord Tin Mines Ltd. announced at yearend that its small 200-ton-per-year underground Wheal Concord Mine at Blackwater near Truro in Cornwall was to be allowed to flood and would remain flooded until the price of tin improved. The company had planned to reopen the tin mine during 1986. The mine had been idle since 1982 when it had closed because of poor ore grades. Concord was reportedly proceeding with its evaluation of the former tin-tungsten Cligga Mine near Perranporth.

Capper Pass Ltd., a subsidiary of RTZ, started up a new 3,000-ton-per-year electrolytic refinery at its smelter complex at North Ferriby despite the tin price collapse. Capacity expansion continued, but it was directed toward the handling of richer concentrates such as those from the East Kemptville Mine in Nova Scotia, Canada, for which a new $11 million arc smelting furnace was being built. Capper Pass had traditionally smelted low-grade concentrates, often containing other metals, as well as many varieties of residue materials. Use of concentrates as source material increased from 50% to 60% during 1986.

Sources of concentrates included South America (principally Bolivia and Peru), Cornwall, and East Kemptville. At yearend, smelting capacity included 15,000 tons of tin per year from low-grade raw materials (20% to 50% tin) via blast furnacing, partial dry refining, and electrolytic refining plus 6,500 tons of tin per year from medium-grade material (50% to 65% tin) via arc furnacing and electrolytic refining.

Rio Algom Ltd.'s mine at East Kemptville, Nova Scotia, Canada, 52.8% owned by RTZ, was operating smoothly by early fall, producing a good-quality concentrate near its rated capacity of 4,500 tons per year of contained tin. All of the product went to the RTZ Capper Pass smelter. The concentrate had earlier contained too-high concentrations of sulfur and other impurities. Although this problem was resolved, Rio Algom transferred ownership of the $100 million mine and mill to the East Kemptville Tin Corp. at yearend, owned by a group of banks headed by Bank of America (Canada) that had originally financed most of the project. Rio Algom's action was precipitated by the tin price collapse. The bank consortium decided to keep the complex active.

INDUSTRIAL MINERALS

Fluorspar.—The Peak National Park Planning Board granted Laporte Industries Ltd. permission to construct a new fluorspar drift mine just outside of the village of Great Hucklow in Derbyshire. The mine, with an eventual annual capacity of 100,000 tons of high-grade ore, was needed by Laporte to replace its existing mines under Longstone Edge, Derbyshire, which were nearing exhaustion. The ore was to be converted to acidspar at Laporte's Cavendish Mill at Stoney Middleton near Sheffield. Site development was to require up to 3 years. Stringent environmental standards included backfilling of exhausted stopes with rock waste and mill tailings.

Nitrogen.—Norsk Hydro began a $120 million expansion of its Immingham fertilizer complex. One of two 1,500-ton-per-day nitric acid plants was being replaced, while two new ammonium nitrate plants were being constructed: a 3,000-ton-per-day liquid unit and an 1,800-ton-per-day granulating unit. The 1.1-million-ton-per-year fertilizer complex was expected to be on-stream by yearend 1987. The only other Norsk Hydro fertilizer plant in the United Kingdom was to be the 100,000-ton-per-year granulation plant at Goole in Humberside. All plants were expected to operate at near full capacity. The company closed both its 50-year-old fertilizer plant at Avonmouth in southwest England as well as its phosphoric acid plant at Immingham in Humberside near Hull.

Potash.—Production of potash at the Boulby Mine increased for the fourth successive year. A U.S.-built Jeffrey 1036 continuous miner, the first in Europe, was commissioned and operated successfully. A 3.6-inch-diameter horizontal hole was drilled a record length of 5,880 feet beginning in the mine at 3,500 feet below the surface to aid in assessing potash seam location, width, and quality. Potash fertilizer imports in 1986 increased more than production, and Boulby's share of domestic supply remained below 50%.

Stone.—Yeoman (Morvern) Ltd., a subsidiary of Foster Yeoman Ltd., began operation of its newly developed Glensanda granite quarry and crushing plant in a remote area on the west coast of Scotland across Loch Linnhe from Oban. The granite produced was medium grained, rich in silica, and ranged in color from pale pink to light grayish white. The first shipment, about 50,000 tons, was made to Houston, Texas, in August, and the first 2 years of production was reportedly to be delivered to Texas and Louisiana ports. Capacity was expected to be eventually expanded to 7.5 million tons per year of crushed stone at a cost of $90 million, with ocean shipments made to England, Western Europe, and the Middle East as well as to North America. A transportation system was being built whereby the rock mined from the hill was to be dropped down a glory hole and transported horizontally through a tunnel to the crushing plant. The 6,000-acre property contains several billion tons of reserves.

Tarmac Roadstone PLC awarded a $21 million contract to design and construct its new granite quarry and crushing and screening plant at Stud Farm in Leicestershire. ARC Ltd., formerly Amey Roadstone Corp., began a $15 million expansion of its Watley limestone aggregate quarry complex in Somerset, which was scheduled to be completed in 1987.

Purchase of U.S. aggregate operations by British firms continued. Tarmac acquired 60% of Lone Star Industries Inc.'s southeastern U.S. operations in Virginia, North Carolina, and South Carolina for $225 million. Redland PLC purchased Genstar Stone Products Co., the sixth largest U.S. crushed stone producer, for $318 million.

A 6-month strike occurred at three roof-

ing slate quarries at Blaenau Ffestiniog in north Wales. Meanwhile, slate imports from Spain continued to increase, reaching about 20,000 tons in 1985. Penhryn Quarry in north Wales produced at a rate of 15,000 tons per year, about 20% greater than previously, while undergoing a modernization program. Carnon acquired the Delabole State Quarry in Cornwall and began stripping the overburden.

Talc.—Shetland Talc Ltd. outlined, by geological mapping and drilling, reserves of several million tons of talc-magnesite rock at Cunningsburgh in the Shetland Islands. The ore body, about 230 feet thick with a talc content of 55% to 60%, was on a main road near a harbor. Construction of a 35,000-ton-per-year mine-plant unit was contingent on the results of evaluations by pilot plant beneficiation, mine-plant engineering, and a product market study of talc powder as a filler material in paint, plastics, and ceramics. Preliminary beneficiation of a drill core sample by the British Geological Survey produced a concentrate containing 94% talc. Approximately 75% of British talc requirements was imported as talc production decreased significantly.

MINERAL FUELS

Inland energy consumption based on coal equivalents was coal, 34%; oil, 34%; gas, 25%; nuclear, 6%; hydropower, 0.7%; and imported electricity, 0.5%. Coal, and to a lesser extent, gas production, increased significantly. Approximately 24% of gas supply was imported from Norway. The Government privatized its gas industry by selling its BGC. About two-thirds of crude oil production continued to be exported.

Energy sources for electricity production, based on coal equivalents, were coal, 72%; nuclear, 17%; oil, 9%; and hydropower, 2%. Oil was replaced by coal in a return to the pattern that had prevailed prior to the long coal strike that ended in March 1985.

All five of the new AGR's for electrical power generation were operating in 1986 although three were not fully operational because of technical problems. Full operation was expected to increase the nuclear share of electricity generation to about 25% in 1990 with the balance being supplied almost completely by coal. Decommissioning of the 11 old Magnox reactors was projected to begin in the early 1990's and was expected to be completed within the following 10 years. A Government inspector's report on the safety aspects of the United Kingdom's proposed first pressurized water reactor (PWR) for electrical power generation was completed in the fall of 1986 after a 4-year study period, which included a 27-month public inquiry. The report recommended construction of this so-called Sizewell B reactor to be built in Suffolk. The Tory government, which supported nuclear power and emphasized its safety aspects, announced that a decision would be made in March 1987 whether to build the 1,100-megawatt PWR as the first stage of the replacement of the Magnox reactors. Research and development of fast breeder reactors was significant, accounting for 40% of the 1986 Government budget on energy research.

A contract was signed for the continued importation of 1,500 megawatts of electrical energy from France to be conducted under the channel through a new 2,000-megawatt conduit.

Coal.—The coal industry continued to remove uneconomical mining capacity, and productivity in existing mines was further improved. The goal of overall profitability was not attained primarily because of lowered coal prices caused by the large drop in the price of oil. New investments in more efficient high-technology mining sites proceeded, and more flexibility in mine working hours was sought from worker unions.

The number of working mines had been reduced by closures and mergers to 111 by yearend, compared with about 170 when the long coal strike ended in March 1985. Meanwhile, the work force under British Coal Corp., formerly the National Coal Board, was reduced by about 40% to approximately 125,000 by yearend. Productivity improved by 23% during 1986 to 3.68 tons per worker shift at yearend, mostly through improved mining practices, especially the use of heavy-duty machinery at the coal faces.

After almost realizing a profit in 1985, British Coal returned to a definite losing operation in 1986 despite having lowered operating costs by 20% during the year. Costs remained especially high in Scotland and South Wales. Prices and sales both decreased, and stocks increased to above 30 million tons by yearend. Some strikes occurred, mostly in Yorkshire. Efforts continued to put the State-owned firm on a profitable basis without Government subsidies. British Coal was the largest producer of hard coal in Europe and had reduced production cost to 25% below those in Belgium, France, and the Federal Republic of Ger-

many.

The Central Electricity Generating Board agreed to purchase 95% of its coal from British Coal during the following 5 years provided prices could be controlled by the price of international coal and fuel oil.

Scotland's first new coal mine in over 20 years began operation in the fall. This new, modern Castlebridge Mine represented an $80 million investment by British Coal. Approximately 45 million tons of reserves had been identified.

British Coal's major investment continued to be development of the 5-mine Selby complex in Yorkshire. The company also began a $45 million development of new anthracite reserves at the Cynheidre Mine in the western portion of the South Wales Field. Drift tunneling to intersect the Carway Fawr seam was partially completed, and subsequent development was projected to allow a production rate of 500,000 tons per year by 1990 from a new 7-million-ton high-grade reserve. Subsequent decreases in anthracite imports were predicted.

Alfred McAlpine Energy Ltd. was awarded a contract by British Coal to mine 280,000 tons over a 3-year period from an opencast site at St. Johns near Wakefield. Fairclough-Parkinson Mining Ltd. obtained a 12-year contract to produce 3.2 million tons of anthracite from the Nant Helen surface mine at Coebren in South Wales. Derek Crouch Ltd. gained a 9-year $44 million contract to surface mine 1.7 million tons of coal from Libry Moor in southwestern Scotland for shipment to power stations in Northern Ireland.

Planning permission was given to British Coal to develop Western Europe's largest open pit coal operation at Coalburn in Lanarkshire, Scotland. A total of 10 million tons was to be supplied to power stations in Northern Ireland over a 20-year period. Estimated reserves were 40 million tons.

British Coal indicated that development of its proposed $130 million prime coking coal mine at Margam near Port Talbot was contingent upon a 6-day 18-shift work week.

British Coal closed its Tilmanstone Mine near Dover in the Kent Field in November because working conditions on the last operative face had deteriorated. British Coal had invested in the other two Kent Mines, Betteshanger and Snowdon, which suffered from high costs and low productivity. Total annual production from the Kent Field was less than 1 million tons.

Construction of British Coal's 2,200-ton-per-hour Southside coal preparation plant at the Grimethorpe Mine near Barnsley, Yorkshire, was completed in early 1986. The plant, one of the world's largest and most technically advanced, was built to accommodate two seams in the North Yorkshire area mined in four collieries. These collieries included Barrow, Hought on Main, and Darfield Main, in addition to Grimethorpe. The upper seam contains a free-burning industrial coal, and the lower seam contains a coking coal.

The Government initiated a $900 million program in August aimed at reducing sulfur dioxide emissions by 14% by 1997. Flue gas desulfurization equipment was to be installed in 3 of 12 coal-fired power stations by British-based companies with licensing rights to Japanese or U.S. technology. A total of 6,000 megawatts of plant was to be retrofitted. The first installation was to be in the recently completed extension of the plant at Drax, North Yorkshire.

British Coal initiated spending $50 million over an 8-year period for engineering development of a practical method of coal liquefaction to produce gasoline, diesel oil, and jet fuel. Construction of a $15 million, 2.5-ton-per-day pilot plant was begun next to the Point of Ayr Mine in north Wales. The plant was based on a liquid solvent extraction process developed by British Coal.

Exploration and evaluation of lignite deposits under and around Lough Neagh in Northern Ireland continued. A license was granted in late 1985 to Meekatharra Minerals Ltd., an Australian firm, to prospect in an area about 20 miles north of the lake at Ballymoney in County Antrim. In 1986, the company delineated about 150 million tons of lignite with cumulative seam thicknesses of up to 350 feet. Projected total production cost was $10 per ton, about one-third of the cost of imported coal or oil. BP Coal Ltd. acquired from Burnett and Hallamshire Group for $12 million a 420-million-ton deposit at Crumlin on the eastern side of Lough Neagh. BP Coal also planned a $1.8 million investigation of its Coagh deposit on the west side of the lake in County Tyrone. Two private consortia and the Northern Ireland Electricity Authority forwarded proposals to the Government for construction of a 450-megawatt lignite power station.

Natural Gas.—British demand for natural gas had increased consistently during the past 10 years. Although domestic pro-

duction increased by 5%, competition with oil became significant in 1986 for the first time because of the significant oil price drop. About 75% of domestic gas supply in recent years had been from domestic sources, mostly from the southern basin of the North Sea, and the remainder had been imported by pipeline to St. Fergus from Norway's 60% share of the North Sea Frigg Field. British imports from this source had become significant during the early 1980's. The field was expected to be depleted by about 1993. A workers' strike at Frigg in April apparently caused a temporary loss of 40% of the United Kingdom's gas supply. The new North Sea Rough Field gas storage system, which was inaugurated in April, was designed to partially relieve such supply shortages as well as to respond to increased demand during the winter months. The storage system could receive gas at a rate of 200 million cubic feet per day up to an estimated storage capacity of 170 billion cubic feet and could release it at a rate of 300 million cubic feet per day.

Government-owned BGC was privatized in December at a price of about $8 billion, yet it remained the monopoly supplier of the country's gas. Measures were being taken by the Government to increase competition. A controversy existed in that BGC prepared to relieve a potential supply shortage in the mid-1990's with less costly imports, whereas the Government preferred to develop new North Sea sources in order to create jobs and other opportunities. Supplies from southern basin fields were beginning to decrease, and this and near-future shortages were being replaced with higher cost, newly developed smaller fields including those central North Sea oil-associated fields where appraisals were more advanced.

Decreased capital expenditures caused by the oil price drop slowed gasfield development in the North Sea and caused postponement of a number of projects not yet started. Three new gasfields began production, two in the southern basin and one small oil-associated field in the central North Sea. Both the Sean Field, north and south reservoirs, operated by Shell (UK) Exploration and Production (Shell Expro), and the Thomas Field, consisting of Bure, Yare, and Thames, and operated by ARCO British Ltd., came on-stream in October in the southern basin. Total reserves from these two complexes were estimated to be about 900 billion cubic feet, and total production was expected to be several hundred million cubic feet per day. Production was to be piped to Bacton on the Norfolk coast. The Sean Field, developed at a cost of $515 million, was unusual in that production, all to be purchased by BGC, could be varied to meet demand. The only other peak shaving field was BGC's Morecomb Bay Field. North Sea Sun Oil Co. Ltd.'s new oil-and-gas field in the central North Sea began production in November and was expected to peak in early 1987 at 10 million cubic feet of gas per day. Shell (UK) Ltd.'s $525 million gas production system in the previously established Fulmer Oilfield in the central North Sea came on-stream in May with a gas reserve of 150 billion cubic feet. The gas was piped to St. Fergus.

Permission was given to develop two small gasfields in the North Sea southern basin. BP Petroleum Development Ltd.'s $1.1 billion development of the Villages complex consisting of the Cleeton Field and the larger Ravenspurn South Field was expected to begin piping gas to a terminal being constructed at Dimlington near Easington on Humberside in late 1988. Estimated reserves were 1,200 billion cubic feet, and production was projected to peak at 240 million cubic feet per day in the late 1990's. Work began in March on the other gasfield, the $950 million V-fields project of Conoco (UK) Ltd., and production was expected to begin in 1988. Reserves in the three fields—Vanguard, Valiant South, and Vulcan—were estimated to be 1,400 billion cubic feet. BGC began the second-phase $440 million development of its Morecambe Bay Gasfield in the Irish Sea. Total output from this peak shaving field was expected to double thereby to 1,200 million cubic feet per day by 1990. Estimated reserves were 5.5 trillion cubic feet. Development of BP's Miller oil-and-gas field in the North Sea was postponed for 1 year. It was estimated to contain reserves of 350 billion cubic feet of sour gas and 360 million barrels of natural gas liquids (NGL). Shell Expro's development of its Gannet cluster of five oil-and-gas fields was canceled early in 1986. Marathon Oil (UK) Ltd. continued its $2.1 billion development of its North Brae recycling gas-condensate field. Gas was to be continually recycled to produce the NGL product, and the system was to be the first of its kind in the North Sea. Estimated reserves were 600 billion cubic feet of gas and 200 million barrels of condensate. Production was expected to begin in late 1988 and to

reach 90,000 barrels of condensate per day by 1990.

Although petroleum exploration and appraisal activity was down, more gas than oil was found as six significant gasfields were discovered. Total British proven reserves at yearend were 22.4 trillion cubic feet. Although 1.6 trillion cubic feet was removed from the British North Sea, estimated reserves decreased only by 0.5 trillion cubic feet as new reserves were discovered and field estimates were increased.

Petroleum.—Although most producing oilfields were profitable at the prevailing prices—$9 to $16 spot prices per barrel for crude during February through November and a yearly average of about one-half of that for 1985—many fields under development or considered for development were marginal or worse. The resultant reduction in exploration activity and field development caused significant personnel layoffs, particularly in Scotland because most of the North Sea activity occurred off its coast. Supply companies were hurt more than oil firms.

Although production of crude petroleum decreased for the first time, output was not significantly below the 1985 level. Of a total of 25 oil-producing wells, 5 old ones accounted for almost one-half of crude output. These and certain other large fields could profit even at a crude price of $5 per barrel.

The major firms associated with British oil production, led by BP, indicated that a tax decrease was required in order to stimulate North Sea development in view of the drop in crude prices but could not agree on its exact nature. However, the Government indicated that its tax regime remained adequately stimulative, and no tax cuts should be provided that did not lead directly to increased North Sea activity. At yearend, legislation was enacted to allow the Government to refund prepaid taxes to companies in early 1987 instead of 1988 to be offset against future tax liabilities. This was expected to free about $500 million for immediate reinvestment by the companies in North Sea activities.

Depressed crude oil prices caused oilfield development to be limited mostly to those projects nearing completion. A few planned developments were postponed. Three new fields began production late in the year in the central North Sea. Balmoral Field operated by North Sea Sun Oil was the largest, with a reserve of about 65 million barrels. Production was expected to peak at 35,000 barrels per day by mid-1987. The Scopa Field, with an estimated reserve of 42 million barrels and developed by Occidental Petroleum (Caledonia) Ltd. at a cost of about $175 million, began production at yearend 1986 and was expected to peak at 15,000 barrels per day. The Petronella Field, with an estimated reserve of 10 million barrels and developed as a satellite of the Tartan Field at a cost of about $65 million, also began production at yearend and was expected to peak at 15,000 barrels per day.

Four new fields were scheduled to begin production in 1987. The largest, North Alwyn, in the northern part of the North Sea with a reserve of 200 million barrels, was being developed by Total Oil Marine Ltd. at a cost of about $2.2 billion. The product, about 100,000 barrels per day, was to be transported through a pipeline, to be completed in 1987, to the Vivian Field, and from there to the Sutton Voe terminal in the Shetland Islands. The $675 million Southeast Forties Field developed by BP was expected to begin production 6 months ahead of schedule in March 1987 from one well. Subsequent development of 13 additional wells was to boost production to 60,000 barrels per day. Britoil PLC's $1 billion Clyde Field, with a reserve of 150 million barrels, was expected to go on-stream in early 1987 and reach a production rate of 50,000 barrels per day. Mobil North Sea Ltd.'s small Ness Field was expected to go on-stream in 1987 and reach production of at least 20,000 barrels per day.

Development of the Tern Field and the Eider Field had begun in late 1985 by Shell Expro and Esso Petroleum Co. Ltd. at an estimated total cost of about $1.7 billion. Development continued throughout the year, and the fields were expected to go on-stream in 1989 and 1988, respectively. The Tern Field, with an estimated reserve of 175 million barrels, was expected to reach peak production of 55,000 barrels per day in 1991. The Eider Field, with an 85-million-barrel reserve, was expected to reach a maximum production of 45,000 barrels per day in 1989. BP's small Cyprus Field was scheduled to begin production in 1988 and was expected to peak later at 9,000 barrels per day. Construction approval of a pipeline spur from the already producing Buchan Field to the Forties Field landing system was approved early in the year.

Three North Sea development projects were postponed for 1 year. Of these, BP's $1.5 billion Miller Field development was the most significant. Construction of a pipe-

line was required for this 300-million-barrel reserve. The other two postponed projects were the twin reservoir Ivanhoe-Rob Roy Field to be developed by Amerada Hess Ltd., which was expected to eventually peak at 50,000 barrels per day, and Shell Expro's Kittiwake Field in the Gannett oil-and-gas field cluster. Kittiwake was the first British field that had not proceeded directly into development after having received governmental approval. Approval had been given in January.

Exploration and appraisal activity decreased by about 30% from the record-high 1985 level to near 1982 and 1983 levels. Of a total of 113 wells drilled, about two-thirds were for exploration, and the balance was for appraisal purposes. Individual discoveries continued to be smaller on the average. British proven oil reserves decreased during 1986 by only 300 million barrels to about 5.2 billion barrels despite extraction of over 900 million barrels. This was caused primarily by an 82% upward revision of proven oil remaining in the Forties Field to 707 million barrels.

The Government offered 127 blocks for exploration at midyear in the 10th Offshore Oil and Gas Licensing Round. Most of the blocks were in or near mature areas of the North Sea with only a few in high-risk frontier areas.

BP gained permission to increase oil production at its Wytch Farm Field, the United Kingdom's largest onshore producer, by 1,000% to 60,000 barrels per day by late 1989. The $390 million development, which included drilling another 46 wells, was expected to begin during the second half of 1987. Estimated reserves at Wytch Field were about 300 million barrels. BP's small Welton Field in Nottinghamshire went on-stream in May at a production rate of about 1,000 barrels per day, and this nearly tripled by yearend 1986. Carless Exploration Ltd.'s new four-well field at Humbly Grove in Hampshire reached a production rate of 2,500 barrels per day. A 20-million-barrel reserve had been found at a depth of 4,500 feet. BP's much smaller Nettleham Field also went on-stream. Overall onshore oil production increased by 50% during the year to 12,000 barrels per day, about 0.5% of North Sea production. Onshore exploration activity increased by 50% as 67 wells were drilled. A total of 74 exploration licenses were awarded in March in the United Kingdom's first round of onshore licensing. The most important of these appeared to be acreage in the Cheshire Basin near the large offshore Morecambe Bay Gasfield off England's northwest coast. Although onshore fields were much smaller than North Sea fields, production costs per unit of oil recovered were significantly lower.

[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from pounds sterling (£) to U.S. dollars at the rate of £1.00 = US$1.47, the average rate during 1986.

The Mineral Industry of Venezuela

By Harold R. Newman[1]

The economic growth of Venezuela improved in 1986 compared with that of previous years. The Central Bank of Venezuela estimated a 5% rise over that of 1985 in the gross domestic product with a 12% inflation rate at yearend 1986. This was the first significant growth in the economy in over 5 years. The devaluation of the bolivar in December 1986 was expected to have an inflationary impact. Persistent weak prices and slack demand on international oil markets continued to impact the economy. Venezuela increased total oil exports, including refined products, from 1.4 million barrels per day (bbl/d) (revised) in 1985 to 1.5 million bbl/d in 1986. However, this was not enough to stop the decline of the country's international currency reserves from $13.7 billion[2] to $9.8 billion. In 1986, Venezuela earned an average of $12.89 per barrel of oil exported, down from the average of $25.70 per barrel in 1985. The aluminum industry, buoyed by exports, was operating at full capacity and undertaking major expansion projects. The chemical industry had marginal improvement and the iron and steel industry continued to suffer from weak demand. Construction was up significantly, primarily because of public sector spending on infrastructure.

The Government significantly liberalized foreign investment rules in September. The requirement that foreign companies divest to minority ownership within a certain number of years was eliminated. Allowable profit remittances were increased to 20% of capital. The new revision also exempts investments in electronics and biotechnology. Also, the new rules eased the regulations on the domestic reinvestment of earnings and eliminated restriction on profit remittances by export enterprises and enterprises that are over 50% Venezuelan owned. In December, Fondo de Inversiones de Venezuela (FIV) announced 33 projects to be offered to the Venezuelan private sector and to foreign companies. They included mining projects for the exploitation of coal and phosphatic rock reserves and for the subsequent processing of these minerals. Also included were exploration of copper, lead, and zinc in Mérida State, crystallized graphite in Táchira State, gold in Bolívar State, and titanium in Yaracuy State. Other mineral projects included bentonite, feldspar, and columbium (niobium). The Government was also trying to steer foreign investment into new petroleum-related areas like coal and petrochemicals. A special commission was to determine if Venezuela should relax its mining tax laws as a way of attracting investment in the mining sector. The Government of Venezuela was considering the revision of its Mining Act, which was drawn up in 1945, and the creation of a national monitoring council with more control of the mining sector. New laws revising regulations on mining concessions, strategic minerals, flow of funds to mining entities, and pollution were topics to be addressed by this council.

On September 29, the Government of Venezuela and representatives of 58 former oil concessionaires signed settlement agreements (Actas de Avenimiento) on the petroleum nationalization claims. The Actas de Avenimiento consisted of 27 settlement agreements covering 58 oil companies and are the final step in the nationalization process that began in 1975. This will end litigation and terminate the legal cases involved. The largest of the 27 settlement agreements was with Exxon Corp. for about $240 million followed by the Royal Dutch/

Shell Group for about $186 million.

The decline in export revenues led the Government to call for new negotiations on public sector debt shortly after the rescheduling agreement was signed in February 1986. The agreement rescheduled $21.2 billion of the $25.9 billion in external public debt then outstanding, with a 12.5-year term (to 1997) at 1-1/8% above the London Inter-Bank Offered Rate. The remaining debt was not rescheduled. Through yearend 1986, the Government repaid $5 billion of the public sector debt that was outstanding in early 1983, making Venezuela the only major debtor country to reduce its debt.

PRODUCTION

Petroleum production averaged 1.8 million bbl/d in 1986. Natural gas liquids (NGL) brought total oil output up to 1.9 million bbl/d. This was based on crude and condensate production capacity of 2.6 million bbl/d. The petroleum industry continues to maintain excess capacity to deal with any market developments that might call for additional production of various crude types to supply the mix of crudes and refined products that maximizes petroleum export revenues under varying market conditions. Venezuela continued to maintain crude oil production in accordance with the limits imposed by the Organization of Petroleum Exporting Countries (OPEC). Production of condensates and NGL was not counted by OPEC. Venezuela's refineries processed 903,000 bbl/d of crude in 1986, of which 24% was gasolines-naphthas, 33% was middle distillates, and 27% was residual oil. Refinery capacity totaled 1.224 million bbl/d, up slightly from that of 1985.

Natural gas production was 3.5 billion cubic feet per day, about one-third of which was reinjected. Gas consumption has been increasing over the past 3 years because the Government is replacing oil in the electrical power generation industry with natural gas. This policy is both to conserve oil and to have more oil available for export. Significant investments have been made to enable gas to substitute for oil, including new pipelines and connections to serve electrical plants and consuming areas. At yearend 1986, proven natural gas reserves totaled 92.6 trillion cubic feet. The Oriente Cryogenic Complex, completed in mid-1985, increased 1986 NGL production 53% to 97,000 bbl/d. NGL from this plant was being exported or used for gasoline blending.

Aluminum is Venezuela's second largest source of foreign currency after petroleum, and the country is the world's fifth largest exporter. In 1986, total aluminum production rose moderately over that of 1985. Current industry installed capacity is 400,000 tons per year. This capacity was exceeded in 1986 by two producers—Industria Venezolana de Aluminio C.A. (VENALUM), producing 295,000 tons, and Aluminio de Caroní S.A. (ALCASA), producing 129,000 tons.

Iron ore production of C.V.G. Ferrominera del Orinoco C.A. (FERROMINERA) increased 15% over that of 1985. This increase was because of the increased output from the new Cerro San Isidro Mine, the growth in exports destined for European markets, and the volume of sales to the United States. Venezuela has proven reserves of nearly 2 billion tons of high-grade iron ore assaying over 55% iron and a further 10 billion tons of iron ore assaying less than 55% iron.

Table 1.—Venezuela: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum:					
Alumina	--	560,000	1,139,000	1,085,000	1,300,000
Metal, unalloyed ingot	273,633	335,200	386,150	395,894	424,000
Gold, mine output, Au content troy ounces	27,993	33,200	50,885	74,180	82,800

See footnotes at end of table.

Table 1.—Venezuela: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS —Continued					
Iron and steel:					
Iron ore and concentrate thousand tons	11,701	9,449	13,371	16,228	19,125
Metal:					
Pig iron do	202	348	326	441	491
Sponge iron do	2,155	2,418	2,486	2,635	2,918
Ferroalloys:					
Ferromanganese do	2	2	2	2	2
Ferrosilicomanganese do	9	9	9	7	9
Ferrosilicon[2] do	42	46	44	42	46
Total do	53	57	55	51	57
Steel, crude do	2,296	2,558	2,770	3,055	3,467
Semimanufactures, hot-rolled do	1,738	1,919	2,460	2,600	2,796
Lead, secondary, smelter[e]	15,000	15,000	17,000	18,000	16,000
INDUSTRIAL MINERALS					
Cement, hydraulic	5,431,860	4,444,104	4,783,000	4,680,000	4,480,000
Clays:					
Kaolin	15,000	15,000	21,938	23,501	22,000
Other thousand tons	2,385	1,839	1,868	1,928	1,648
Diamond:					
Gem carats	83,000	45,367	40,739	47,400	45,000
Industrial do	357,000	233,553	232,183	167,900	188,500
Total do	440,000	278,920	272,922	215,300	233,500
Feldspar	37,000	37,400	38,800	31,167	34,900
Gypsum	237,000	204,600	142,386	133,585	250,230
Lime, hydrated[e]	1,900	2,000	--	--	--
Nitrogen: N content of ammonia	440,433	379,652	463,000	490,300	654,600
Phosphate rock	6,000	8,000	3,000	5,000	194,200
Salt, all types	455,000	310,650	325,000	350,000	420,000
Stone, sand and gravel:					
Stone:					
Dolomite thousand tons	251	239	87	274	271
Granite	1,431,000	770,970	549,239	655,587	568,300
Limestone thousand tons	5,760	27,302	10,847	13,872	14,900
Marble cubic meters	[r]508	[r]455	169	272	549
Sand and gravel thousand tons	13,311	9,040	8,189	6,879	7,030
Sand, glass do	280	107	331	449	335
Sulfur, byproduct of petroleum and natural gas[e]	84,000	85,000	86,000	[r]35,100	99,380
MINERAL FUELS AND RELATED MATERIALS					
Carbon black[e] thousand tons	18	18	51	55	41
Coal, bituminous	46,700	39,100	50,870	40,379	56,290
Gas, natural:					
Gross million cubic feet	1,163,973	1,222,100	1,150,364	1,165,088	1,280,870
Marketable do	527,000	508,460	517,664	498,159	576,390
Natural gas liquids:[3]					
Natural gasoline thousand 42-gallon barrels	5,642	4,483	4,708	6,885	6,687
Liquefied petroleum gas do	15,720	13,949	13,945	15,849	15,007
Total do	21,362	18,432	18,653	22,734	21,694
Petroleum:					
Crude[4] do	691,689	657,365	658,279	613,583	653,900
Refinery products:					
Gasoline:					
Aviation do	328	430	539	373	277
Motor do	62,694	67,500	46,100	59,994	88,470
Jet fuel do	14,362	14,500	14,486	18,263	20,770
Kerosene do	3,675	4,440	4,277	21,648	32,060
Distillate fuel oil do	62,745	67,510	69,744	92,870	87,470
Residual fuel oil do	140,052	108,740	117,466	107,987	96,620
Lubricants do	2,481	[e]2,400	2,340	2,343	2,453
Liquefied petroleum gas do	1,955	[e]2,000	1,868	15,848	2,824

See footnotes at end of table.

Table 1.—Venezuela: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum —Continued					
Refinery products —Continued					
Asphalt and bitumen thousand 42-gallon barrels	9,313	8,660	8,930	10,215	11,980
Naphtha do	10,140	[e]10,000	19,800	21,249	15,750
Refinery gas[5] do	8,578	9,200	12,020	7,844	9,862
Unspecified do	1,479	27,260	27,813	20,754	22,330
Total do	317,802	322,640	325,383	379,388	390,866

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

[1]Table includes data available through June 30, 1987.

[2]Figure represents combined 45% silicon content and 75% silicon content production.

[3]From nonassociated natural gas only.

[4]Includes associated natural gas lease condensate and natural gasoline. Lease condensate is included as follows, in thousand 42-gallon barrels: 1982—1,771; 1983—3,127; 1984—3,156; 1985—not available; and 1986—5,380. Natural gasoline is included as follows, in thousand 42-gallon barrels: 1982—293; 1983—229; 1984—249; 1985—not available; and 1986—247.

[5]Liquid equivalent.

TRADE

Venezuela's trade balance continued to be reflected in lower foreign exchange earnings. The decline of about $5.6 billion in petroleum export revenues produced an equivalent reduction in the nation's trade surplus. Nonoil exports rose 15% over those of 1985, enough to compensate for the modest increase in imports.

Venezuela exported 1.5 million bbl/d of crude and products. However, the drop in average realized prices from over $26 per barrel in 1985 to about $12.85 per barrel in 1986 markedly outweighed the modest increase in export volume. To ensure access to markets, Venezuela greatly expanded its participation in refining and distribution operations in consuming countries. It now has 50-50 joint ventures with AB Nynas-Petroleum (Sweden), Veba Oel AG (Federal Republic of Germany), and Citgo Petroleum Corp. (United States), and a letter of intent for a deal with Champlin Petroleum Co. (United States). These deals ensure placement of about 0.5 million bbl/d of crude oil. In addition, Venezuela refines another 140,000 bbl/d at a leased refinery in Curaçao. These overseas ventures serve the dual purpose of ensuring placement of Venezuelan crude oil exports and giving Petróleos de Venezuela S.A. (PDVSA) profits from downstream marketing and distribution.

FERROMINERA was aiming to increase its foreign sales by countertrade agreements. In late 1986, the company agreed to supply Caterpillar World Trade Corp. with 350,000 tons of iron ore in exchange for Caterpillar heavy equipment and parts.

Also, FERROMINERA exchanged 300,000 tons of iron ore with Poland for 18 crop spraying airplanes. The company also sold 120,000 tons of iron ore to Kawasaki Steel Corp. It was the first time the company exported iron ore to Japan although that country is Venezuela's biggest buyer of aluminum.

The Government of Venezuela and the European Economic Community (EEC) signed a trade agreement giving Venezuela access to the Western European market for 72,000 tons of steel products in 1987 in exchange for a price concession. Without the EEC agreement, Venezuela's steel exports could have been subject to protectionist measures, such as antidumping charges and other tariffs.

Venezuela and Mexico renewed the San José Agreements in late 1986. The countries decided to continue the energy cooperative program with seven Caribbean and Central American countries. Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras, Jamaica, and Panama all receive their oil from Mexico and Venezuela under

conditions that are more favorable than those offered on the international market. About 30,000 bbl/d of oil will be supplied to the above countries annually. The countries will repay 80% of the bill, with the remaining 20% to be repaid in 5 years at an annual interest rate of 8%. Twenty percent of the oil bill will be assigned to finance economic projects. Short-term projects will be repaid over 5 years at 8% annual interest. Long-term projects will be repaid over a 12-year period with an annual interest rate of 6%.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	349,113	359,095	25,916	Norway 196,261; Canada 59,913; Sweden 51,611.
Metal including alloys:				
Scrap	175	--		
Unwrought	224,800	301,769	18,916	Japan 182,636; Netherlands 50,116; Taiwan 34,769.
Semimanufactures	62,359	83,020	46,943	Netherlands 24,125; Japan 6,997.
Copper: Metal including alloys:				
Scrap	1	--		
Unwrought	41	--		
Semimanufactures	412	108	49	Colombia 58; France 1.
Iron and steel: Metal:				
Scrap	1	365	314	Japan 51.
Pig iron, cast iron, related materials	373,931	249,329	176,961	Spain 36,266; Taiwan 19,763.
Ferroalloys:				
Ferrosilicomanganese	42	--		
Ferrosilicon	32,264	41,201	15,441	Japan 22,560; Netherlands 3,200.
Steel, primary forms	150,968	240,874	45,583	Greece 33,394; Thailand 23,779.
Semimanufactures:				
Bars, rods, angles, shapes, sections	295,370	620,933	86,016	Taiwan 430,036; Algeria 50,758.
Universals, plates, sheets	230,431	257,578	19,108	Thailand 60,344; Republic of Korea 48,743; Japan 38,688.
Rails and accessories	(2)	--		
Wire	4,659	6,833	3,947	Trinidad and Tobago 979; Colombia 865.
Tubes, pipes, fittings	181,824	86,576	85,465	Canada 504; Guatemala 233.
Castings and forgings, rough	27	(2)	--	All to Netherlands Antilles.
Unspecified	135	18	18	
Nickel: Ore and concentrate	--	50	--	All to West Germany.
Silver: Metal including alloys, unwrought and partly wrought, troy ounces	778,658	3,503,590	3,501,758	Panama 1,832.
Zinc:				
Oxides	145	1	--	All to Costa Rica.
Metal including alloys, semimanufactures, kilograms	24,805	3,013	--	Nicaragua 2,763; Netherlands Antilles 250.
Other:				
Ores and concentrates	--	147	--	Japan 117; West Germany 30.
Ashes and residues	r585	2,017	1,551	Japan 394; Spain 38.
Base metals including alloys, all forms	53	(2)	--	All to Netherlands Antilles.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc, kilograms	r615	90	--	Do.
Grinding and polishing wheels and stones	133	18	(2)	Trinidad and Tobago 9; Nicaragua 7; Chile 2.
Asbestos, crude, kilograms	3,127	450	--	All to Netherlands Antilles.
Cement	1,317,142	1,630,102	1,304,230	Guadeloupe 107,281; Netherlands Antilles 47,575.
Clays, crude:				
Bentonite	11	--		
Unspecified	5	--		
Diamond: Gem, not set or strung, thousand carats	365	255	70	Belgium-Luxembourg 185.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Fertilizer materials:				
Crude, n.e.s	48	11	--	All to Netherlands Antilles.
Manufactured:				
Ammonia	195,149	175,595	40,092	Spain 55,812; Cuba 24,399.
Nitrogenous	298,062	137,471	--	Colombia 52,470; India 28,196; Chile 22,870.
Unspecified and mixed	17	(2)	--	All to Netherlands Antilles.
Gypsum and plaster	17,918	8,750	--	Trinidad and Tobago 6,000; Barbados 2,750.
Lime	18	--		
Salt and brine kilograms	--	310	--	All to Netherlands Antilles.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,266	173	--	Do.
Worked	6	2	--	Do.
Dolomite, chiefly refractory-grade	3	--		
Gravel and crushed rock	3,536	--		
Quartz and quartzite	1	--		
Sand other than metal-bearing	3,185	13,594	--	All to Costa Rica.
Sulfur:				
Elemental, crude including native and byproduct	15,191	--		
Sulfuric acid kilograms	270	210	--	All to Netherlands Antilles.
Other:				
Crude	207	(2)	--	Do.
Slag and dross, not metal-bearing	r179	114	50	Brazil 34; West Germany 30.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	5,437	7,024	--	Chile 3,835; Guatemala 1,617; Trinidad and Tobago 852.
Petroleum:				
Crude thousand 42-gallon barrels	365,604	301,462	116,144	Netherlands Antilles 23,721; West Germany 22,684.
Refinery products:				
Liquefied petroleum gas do	1,178	1,830	NA	NA.
Gasoline do	33,907	35,153	NA	NA.
Kerosene and jet fuel do	16,721	18,695	NA	NA.
Distillate fuel oil do	42,856	60,709	NA	NA.
Lubricants do	494	843	NA	NA.
Residual fuel oil do	86,096	69,719	NA	NA.
Asphalt do	6,286	6,778	NA	NA.
Unspecified do	r1,895	12,644	NA	NA.

rRevised. NA Not available.
[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate thousand tons	2,522	2,370	92	Brazil 961; Suriname 828; Sierra Leone 330.
Oxides and hydroxides	7,606	7,098	1,697	Netherlands 1,946; West Germany 1,575.
Metal including alloys:				
Unwrought	149	132	33	United Kingdom 76; Netherlands 18.
Semimanufactures	24,401	21,104	6,147	Belgium-Luxembourg 3,437; West Germany 3,118.
Antimony:				
Oxides	39	9	8	Italy 1.
Metal including alloys, all forms	118	102	1	Taiwan 81; Japan 10; Netherlands 10.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Bismuth:				
Oxides and hydroxides _ kilograms	1,580	461	--	Italy 405; West Germany 56.
Metal including alloys, all forms do	269	1,031	396	West Germany 600; Canada 35.
Cadmium:				
Oxides and hydroxides	15	6	--	Netherlands 3; Peru 2; West Germany 1.
Metal including alloys, all forms	1	17	(2)	Mainly from Peru.
Chromium:				
Ore and concentrate	11,914	11,307	4	Cuba 9,000; unspecified 2,297.
Oxides and hydroxides	364	5,109	166	Austria 757; Netherlands 87; unspecified 3,998.
Metal including alloys, all forms	4	8	2	Netherlands 5; West Germany 1.
Cobalt: Oxides and hydroxides	34	24	10	West Germany 11; Belgium-Luxembourg 2.
Columbium and tantalum: Metal including alloys, tantalum _ kilograms	1	173	25	Taiwan 145; United Kingdom 3.
Copper:				
Ore and concentrate	--	3	--	All from Taiwan.
Oxides and hydroxides	142	37	13	Norway 16; West Germany 3.
Metal including alloys:				
Scrap	198	725	393	Italy 332.
Unwrought	r5,083	6,622	86	Peru 5,447; Chile 799.
Semimanufactures	15,193	13,840	1,737	Belgium-Luxembourg 4,496; United Kingdom 2,048; Canada 2,034.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	1,223	868	96	West Germany 772.
Indium: Metal including alloys, all forms kilograms	9	105	--	All from Peru.
Iron and steel:				
Iron ore and concentrate including roasted pyrite	31	216	92	Italy 101; United Kingdom 22.
Metal:				
Scrap	362,944	495,938	450,534	Canada 24,548; Cuba 20,852.
Pig iron, cast iron, related materials	25,280	39,347	3,893	Trinidad and Tobago 32,919; Brazil 1,344.
Ferroalloys:				
Ferroboron	(2)	5,519	(2)	Brazil 5,500; West Germany 19.
Ferrochromium	86	178	78	Sweden 42; West Germany 38.
Ferromanganese	38,818	32,453	10	France 22,000; Brazil 8,800; West Germany 575.
Ferromolybdenum	10	19	5	West Germany 6; Italy 5.
Ferrosilicomanganese	3	2,667	--	Brazil 2,000; West Germany 1; unspecified 666.
Ferrosilicon	68	--	--	
Ferrovanadium	86	277	187	West Germany 90.
Unspecified	748	851	473	United Kingdom 187; Mexico 108.
Steel, primary forms	3,058	1,709	2	Japan 646; Italy 306; France 298.
Semimanufactures:				
Bars, rods, angles, shapes, sections	17,971	13,124	441	Japan 5,924; West Germany 2,110; Belgium-Luxembourg 1,770.
Universals, plates, sheets	130,669	73,556	1,623	Japan 27,008; Italy 11,979; Sweden 9,258.
Hoop and strip	3,235	1,650	643	West Germany 423; Brazil 289.
Rails and accessories	8,819	3,552	328	France 3,137; West Germany 53.
Wire	678	1,490	17	Brazil 1,376; Switzerland 61; Belgium-Luxembourg 24.
Tubes, pipes, fittings	12,204	22,628	4,843	Belgium-Luxembourg 5,598; Netherlands 1,800.
Castings and forgings, rough	23	100	18	Italy 34; United Kingdom 31.
Unspecified	38,417	35,502	3,219	Japan 12,248; Brazil 5,085; West Germany 4,467.
Lead:				
Ore and concentrate kilograms	57	--	--	
Oxides	2,308	1,797	617	Mexico 637; Peru 367.
Metal including alloys:				
Scrap	1,243	3,740	3,403	Canada 337.
Unwrought	7,394	7,886	(2)	Peru 7,880; United Kingdom 6.
Semimanufactures	670	124	75	Belgium-Luxembourg 26; West Germany 20.
Lithium: Oxides and hydroxides	37	42	42	

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Magnesium: Metal including alloys:				
Unwrought	564	880	180	Norway 625; Mexico 75.
Semimanufactures	113	31	31	
Manganese:				
Ore and concentrate, metallurgical-grade	28,956	49,121	744	Brazil 24,377; Mexico 24,000.
Oxides	2,509	1,196	549	Mexico 324; Brazil 98.
Mercury 76-pound flasks	3,537	177	134	West Germany 27; United Kingdom 14.
Molybdenum:				
Oxides and hydroxides	144	34	4	Netherlands 17; Chile 12.
Metal including alloys, all forms kilograms	1,191	6,119	5,685	Japan 343; Panama 36.
Nickel:				
Ore and concentrate	2	--	--	
Matte and speiss	--	6	(2)	Mainly from United Kingdom.
Oxides and hydroxides	42	10	--	Mainly from France.
Metal including alloys:				
Scrap kilograms	540	343	343	
Unwrought	171	201	138	Canada 35; Finland 15.
Semimanufactures	196	371	189	West Germany 99; United Kingdom 60.
Platinum-group metals: Metals including alloys, wrought and partly wrought troy ounces	4,758	2,701	2,283	West Germany 289; United Kingdom 96.
Silver: Metal including alloys, unwrought and partly wrought do	1,403,860	1,054,414	340,830	Peru 692,494; Spain 12,217.
Tin:				
Ore and concentrate kilograms	3	--	--	
Oxides	--	64	12	West Germany 47; Italy 5.
Metal including alloys:				
Unwrought	612	966	773	Brazil 193.
Semimanufactures	213	46	22	Taiwan 9; Netherlands 8.
Titanium: Oxides	14,131	6,683	2,080	West Germany 1,868; Spain 786.
Tungsten:				
Ore and concentrate	--	21	--	All from Italy.
Oxides and hydroxides	16	2	2	
Metal including alloys, all forms	13	19	4	Taiwan 15.
Vanadium: Oxides and hydroxides	7	2	1	Italy 1.
Zinc:				
Ore and concentrate kilograms	35	--	--	
Oxides	77	75	52	Belgium-Luxembourg 7; West Germany 6.
Metal including alloys:				
Scrap	2	3	--	All from Belgium-Luxembourg.
Unwrought	23,376	17,438	823	Peru 12,621; Canada 2,597; Colombia 995.
Semimanufactures	1,273	1,755	256	Peru 801; West Germany 305.
Other:				
Ores and concentrates	2,425	398	69	Italy 59; unspecified 270.
Ashes and residues	9	2	2	
Base metals including alloys, all forms	463	148	124	Brazil 13; United Kingdom 10.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	304	969	48	Ecuador 645; West Germany 148; Brazil 59.
Artificial:				
Corundum	1,794	1,226	68	Brazil 640; West Germany 270; Italy 184.
Silicon carbide	784	396	12	Switzerland 172; Italy 94; Brazil 56.
Grinding and polishing wheels and stones	55	107	17	Italy 44; Brazil 21.
Asbestos, crude	8,013	4,456	968	Canada 3,188; Bahamas 253.
Barite and witherite	69,362	86,459	525	Peru 36,959; Taiwan 15,600; Norway 15,000.
Boron materials:				
Crude natural borates	952	580	361	Netherlands 120; Japan 51.
Oxides and acids	1,119	829	261	West Germany 237; Italy 220.
Cement	4,547	14,413	907	Colombia 10,000; Netherlands 1,567; France 1,149.
Chalk	29	--		

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Clays, crude:				
Bentonite	16,332	13,329	11,024	Colombia 2,246; Canada 37.
Kaolin	21,938	21,017	18,809	United Kingdom 1,504; Colombia 240.
Unspecified	1,880	1,983	1,844	France 103; United Kingdom 36.
Cryolite and chiolite	2,482	1,865	(2)	Greenland 1,854; Denmark 6; West Germany 4.
Diamond:				
Gem, not set or strung thousand carats	5	65	65	
Industrial stones do	2,240	1,190	1,160	West Germany 25; Spain 5.
Dust and powder do	110	2,175	2,050	Spain 125.
Diatomite and other infusorial earth	4,837	9,739	8,218	Mexico 1,410; West Germany 51.
Feldspar, fluorspar, related materials:				
Feldspar	1,267	837	456	Italy 211; Finland 107.
Fluorspar	329	649	173	Netherlands 226; France 122.
Unspecified	32	42	--	Netherlands 23; Canada 18; Italy 1.
Fertilizer materials: Manufactured:				
Ammonia	9	7	3	West Germany 4.
Nitrogenous	4,891	5,638	1	Spain 2,460; France 2,400; Canada 510.
Phosphatic	5,264	10,172	--	Denmark 5,148; Morocco 5,024.
Potassic	146,136	296,279	85,941	Finland 50,722; Jordan 41,475.
Unspecified and mixed	19,718	241,385	72	Denmark 94,690; Romania 62,925; Belgium-Luxembourg 21,000.
Graphite, natural	701	886	173	Japan 393; China 254.
Gypsum and plaster	25,565	73,963	20,079	Spain 28,727; Denmark 24,450.
Lime	33	56	56	
Magnesium compounds:				
Magnesite, crude	64	12	2	West Germany 5; France 4.
Oxides and hydroxides	20,849	88,790	7,732	Austria 24,080; West Germany 10,232; Brazil 10,083.
Mica:				
Crude including splittings and waste	1,061	1,033	871	West Germany 110; France 29.
Worked including agglomerated splittings	7	18	6	Spain 8; France 3.
Phosphates, crude	54,909	72,545	602	Morocco 71,943.
Pigments, mineral:				
Natural, crude	58	88	15	United Kingdom 59; Austria 10.
Iron oxides and hydroxides, processed	3,912	1,988	234	Spain 629; West Germany 588; Netherlands 241.
Precious and semiprecious stones other than diamond:				
Natural kilograms	929	4,884	590	Czechoslovakia 2,717; Brazil 859; Uruguay 628.
Synthetic do	452	6,064	2,170	West Germany 2,291; Taiwan 916.
Pyrite, unroasted	37	13	13	
Salt and brine	64	148	52	West Germany 96.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	r142,675	123,214	92,135	Turkey 12,503; Panama 12,000.
Sulfate:				
Natural	500	627	(2)	Belgium-Luxembourg 615; West Germany 12.
Manufactured	73,295	43,369	33,080	Mexico 7,003; Chile 3,035.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	6,678	2,227	3	Italy 1,997; Portugal 227.
Worked	2	25	25	
Dolomite, chiefly refractory-grade	73,509	32,099	32,099	
Gravel and crushed rock	324	684	--	Brazil 360; West Germany 204; France 120.
Limestone other than dimension	11	--	--	
Quartz and quartzite	185	48	7	Belgium-Luxembourg 40.
Sand other than metal-bearing	1,071	214	128	West Germany 79; Netherlands 5.
Sulfur:				
Elemental:				
Crude including native and by-product	247	14,048	14,048	
Colloidal, precipitated, sublimed	32	21	10	West Germany 11.
Sulfuric acid	6,044	44,105	44,042	West Germany 47; Belgium-Luxembourg 15.
Talc, steatite, soapstone, pyrophyllite	12,594	8,526	3,568	Brazil 1,960; China 1,209.
Vermiculite, perlite, chlorite	57	234	119	Mexico 115.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Other:				
Crude	r1,508	2,299	1,147	Australia 687; United Kingdom 200.
Slag and dross, not metal-bearing	4	21	3	Mexico 18.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	122	287	285	Netherlands 2.
Carbon black	791	305	222	West Germany 53; Panama 22.
Coal:				
Anthracite	10,370	13,845	13,530	Colombia 177; Belgium-Luxembourg 138.
Bituminous	23,231	32,760	93	Colombia 32,667.
Lignite including briquets	706	1,172	1,071	Netherlands 101.
Coke and semicoke	184,277	35,133	3,745	Colombia 24,742; France 6,431.
Peat including briquets and litter	--	10	--	All from Austria.
Petroleum:				
Crude thousand 42-gallon barrels	4,246	3,316	(2)	Netherlands Antilles 3,116; Netherlands 200.
Refinery products:				
Liquefied petroleum gas do	1,354	267	170	United Kingdom 97.
Gasoline 42-gallon barrels	29	182	182	
Mineral jelly and wax do	r36,917	28,981	13,046	West Germany 7,962; Spain 2,635.
Kerosene and jet fuel do	4,565	78,197	17,421	Netherlands 30,777; West Germany 29,818.
Distillate fuel oil do	1	77	1	West Germany 76.
Lubricants do	9,849	17,665	15,640	United Kingdom 567; Netherlands Antilles 480.
Nonlubricating oils do	28,556	17,204	12,584	Netherlands 3,816; West Germany 649.
Residual fuel oil do	898	737	423	Netherlands Antilles 219; Spain 86.
Bitumen and other residues do	3,138	4,780	4,677	Canada 47; Netherlands 30.
Petroleum coke do	239,034	861,808	525,067	Argentina 211,576; Japan 90,750.

rRevised.
[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—Aluminum continued as Venezuela's second largest source of foreign exchange after petroleum. The country was continuing with its expansion plans, of which the first stage would raise smelting capacity to 1,000,000 tons per year by 1995-96. In 1986, Venezuela was Latin America's second largest aluminum producer, after Brazil, and the Government feels that the aluminum industry offers the greatest potential to compensate for loss of export revenues by the petroleum industry and reduce the country's dependence on that commodity. The expansion plan calls for Venezuela to produce 15% of the world's primary aluminum before the year 2000.

ALCASA was planning to boost its output of semimanufactures in addition to its expansion in primary aluminum capacity. The company was building a new hard aluminum sheet-rolling mill with a capacity of 60,000 tons per year to satisfy the domestic industrial products market. ALCASA also signed an agreement with Reynolds Aluminium Europe, which produces aluminum extensions and foil products at Ghlin, Belgium, that gave it a 50% stake in the company. ALCASA will supply 12,000 tons of aluminum foil per year and 16,000 tons of billets per year to the Ghlin plant.

VENALUM was negotiating with three U.S. aluminum fabricating companies for joint venture arrangements. This would give the company access to foreign markets in exchange for long-term metal contracts.

Construction of a 120,000-ton-per-year

aluminum refinery by a new joint venture company, Aluminio de Sur S.A. (Alusur), was expected to begin in early 1987. The venture is between privately owned Suramericana de Aleaciones Laminados (Sural), state-owned Corporación Venezolana de Guyana (CVG), and state-owned Austria Metall MG. Alusur is 40% owned by Sural and its shareholders, 40% by Austria Metall, and 20% by CVG. The new plant will be in Ciudad Guyana near the Interamericana de Alúmina C.A. refinery, which will supply the alumina for the refinery's operation.

The Los Pijiguaos Mine of C.V.G. Bauxita de Venezolana C.A. (BAUXIVEN) continued under development. BAUXIVEN was expecting to begin production in mid-1987 with initial production at 30,000 tons per month. The 200 million tons of proven reserves at Los Pijiguaos is enough to supply the country's aluminum industry for 60 years at current production rates and save an estimated $140 million annually in bauxite imports.

In early 1986, Venezuela signed a barter agreement with Guyana agreeing to exchange oil and oil products for bauxite in 1986 and 1987. The quantity or value of the bauxite shipments were not disclosed; however, in 1986, the quantity was estimated at about 250,000 tons.

Iron Ore.—In 1986, FERROMINERA increased its production target for the new Cerro San Isidro Mine to 9 million tons. Initially, output was scheduled for 4 million tons, but increased competition in the world market resulted in the decision to increase the production of higher grade ore. At the same time, production from the two other lower graded mines, Cerro Bolívar and El Pao, was reduced. The shift in emphasis enabled FERROMINERA to remain competitive on world markets.

Iron and Steel.—Midrex Corp. and Voest-Alpine AG signed a letter of intent with Siderúrgica Venezolana S.A. (Sivensa) to construct a direct-reduction iron (DRI) plant adjacent to Sivensa's Matanzas steelworks at Ciudad Guyana. The plant, which is expected to be operational in 1989, will produce 400,000 tons per year of briquetted iron. Also, Midrex, a subsidiary of Kobe Steel Ltd., will convert CVG's Minerales Ordaz C.A. (MINORCA) plant at Puerto Ordaz to a DRI plant. Midrex will convert the MINORCA plant to its own process by installing a new shaft furnace and three hot briquetting machines. The plant, inactive since 1982, was scheduled to restart production in early 1989 with a capacity of 720,000 tons per year. Kobe Steel will operate the plant and market the product, which is destined for export.

Sivensa was expected to reopen its Ciudad Guyana steelworks, inactive since 1977, following the company's majority acquisition of DRI producer Fior de Venezuela S.A. The operation would take DRI from Fior and replace Sivensa's scrap-based steelworks at Caracas, which must be closed down to comply with industrial zoning laws designed to reduce pollution in the Venezuelan capital.

Other Metals.—Intallmet, the 50-50 partnership of Pechiney World Trade and Pechiney Électrométallurgie, was appointed sales agent for Venezuelan ferrosilicon sales to Asian Pacific markets. Intallmet will also represent C.V.G. Ferroaleacion de Venezuela C.A. (FESILVEN), the state-owned ferrosilicon producer, in other areas. FESILVEN produced a record high 53,000 tons of ferroalloys in 1986. Reportedly, FESILVEN was planning to exploit manganese reserves in the southeastern Guyana region. Studies suggested the existence of over 1 million tons of reserves. The company had plans for increasing its ferroalloy capacity from the existing 50,000 tons per year to 80,000 tons per year.

Results of a Government study that began in 1985 showed that about 32,000 troy ounces of gold per month and several hundred thousand carats of diamonds per year are smuggled out of the southeastern Guyana region. Because of the size and inaccessibility of this jungle region, the Government has been unable to exercise strict control over prospecting and mining activities, particularly in areas close to the border. CVG, the state mining company, was attempting to take control of the situation and legalize activities. There was a proposal for the creation of a Gold and Precious Metals Ministry, which would supervise mining operations and provide technical assistance and support.

In July, further steps were taken to stop illegal exportation of gold. The Central Bank of Venezuela started minting gold coins and opened a registration and certification procedure for all gold that passes through the institution. The bank, which minted 50,000 coins weighing 31.1 grams each, wants to use the revenue earned from the coins to buy more gold from miners. The

bank reportedly bought over 7 tons of gold in 1 year, a much higher figure than was reported to have been produced.

The Government of Venezuela sought bids for the evaluation, exploitation, and processing of gold ores at deposits in the El Callao region currently being worked by the state-owned company, Compañia General de Mineria de Venezuela C.A. (MINERVEN). Known reserves are dwindling at the El Callao Mine. Mining has primarily been in the Colombia vein, with production about 20,000 troy ounces per year. This level of output is insufficient to recover investment and fund exploration. The mill has been operating at 45% of capacity. The aim is to find new reserves to boost production from 20,000 to 32,000 troy ounces of gold per year.

Greenwich Resources Venezuela S.A., a subsidiary of Greenwich Resources PLC, signed two agreements to explore, develop, and exploit mining concessions within the Pastora complex, about 100 kilometers west-northwest of El Callao. The Geology Directorate of the Venezuelan Ministry of Mines and Energy (MEM) was carrying out studies of vein gold deposits in the State of Bolívar. FIV was seeking cooperation between private sector and foreign companies for the development of a number of mining projects including copper, lead, and zinc deposits in Mérida State, and titanium in Yaracuy State.

INDUSTRIAL MINERALS

Phosphate Rock.—The Government of Venezuela was continuing its efforts to develop the country's significant deposits of phosphate rock. In 1986, production was limited to the Riecito Mine in Falcón State, which supplies phosphate rock to the Morón petrochemical complex to make phosphoric acid, and the La Molina Mine in Táchira State. The Government was to invest about $240 million to develop phosphate rock resources in Táchira State. Estimated reserves were over 100 million tons. Mining would be by open pit, and the ore would be transported on the Apure and Orinoco Rivers system, which is navigable for 8 months during the year.

Other Industrial Minerals.—MEM discovered and was exploring large barite deposits in Guárico State; feldspar, gypsum, and talc deposits in Yaracuy State; and graphite deposits in Táchira State.

MINERAL FUELS

Coal.—Venezuela had three major coal projects under way in 1986. Vencemos Cavosa S.A.'s open pit mine in the State of Anzoátegui began production in late 1986 at the rate of 150,000 tons per year. Output will be expanded to 300,000 tons per year as soon as possible. The entire output was scheduled for export to Western Europe. PDVSA continued with the planning and exploration of one of the largest remaining undeveloped coal deposits in the Western Hemisphere. The Paso del Diablo Mine in the Guasare Valley in the State of Zulia has reserves of 350 million tons of coal, while the valley has estimated coal reserves of 1.5 billion tons. The company will select a foreign partner in early 1987 for its $800 million open pit operation, and production was expected to commence in late 1987 starting at 100,000 tons per year and increasing to 1 million tons per year by 1990, depending on marketability. The coal is a low-ash, no-sulfur, high-thermal-value steam coal.

The Government was planning to invest $70 million to develop coking coal reserves in Táchira State. Compañia Carbones del Táchira C.A., a state mining company, will manage the project. Reserves have been estimated at about 600 million tons. The coal will be barged via the Apure and Orinoco Rivers system to the industrial complex at Ciudad Guyana.

Petroleum and Natural Gas.—In mid-1986, PDVSA announced it was reorganizing. Two operating companies, Corpoven S.A. and Meneven S.A., merged under the Corpoven name. PDVSA also created a new company, Interven S.A., to manage joint ventures in the Federal Republic of Germany, Sweden, and the United States. Investments that Interven will control include joint venture agreements with Champlin, Citgo, and Steuart Petroleum Co. in the United States; Veba Oel's Karlaruhe and Newstedt refineries in the Federal Republic of Germany; and Sweden's Nynas-Petroleum.

PDVSA now has nine subsidiaries, including Maraven; Corpoven; Lagoven S.A.; the new company Interven; the petrochemical company Pequiven S.A.; Intevep S.A., a research and development unit; Bariven S.A., which handles overseas purchases;

Isla, which was set up to handle the former Shell Curaçao NV refinery in Curaçao; and Carbozulia, which handles coal operations.

In 1986, Venezuela's proven crude oil reserves increased to over 55 billion barrels, up by more than 26 billion barrels from that of 1985. This was due to significant discoveries of light and medium crudes and an upgrading of estimates of existing reserves, particularly heavy and extra-heavy crudes from the Orinoco Heavy Oil Belt (Faja). With proven and probable reserves of over 186 billion barrels, Venezuela is likely to continue to be among the six top oil producers for several decades.

At yearend 1986, proven natural gas reserves totaled 92.6 trillion cubic feet, up 51% over that of 1985, owing to the same redefinition of proven reserves that affected oil reserves. Most of Venezuela's proven gas reserves are associated gas. In 1986, construction was begun on a major gas trunkline, the Nurgas project, to transport 950 million cubic feet of treated gas per day from the eastern gasfields to the center and west of the country to replace more oil and to fill the developing shortage of gas for reinjection in western Venezuela. The pipeline will run 802 kilometers from Anaco, in Anzoátegui State, to the electricity plant at Morón in central Venezuela, onward to Rio Seco in Falcón State where it will connect with existing western gaslines. Gas pipelines in eastern and western Venezuela will be connected for the first time.

Other Mineral Fuels.—In 1986, PDVSA's petrochemical subsidiary Pequiven produced 2.1 million tons of petrochemicals, up 31% from that of 1985. Principal products were ammonia, ethylene, fertilizer, sulfuric acid, and urea. Pequiven began construction in 1986 of new facilities to produce chlorine and caustic sodas, olefins, ethylene, propylene, and plastics at the El Tablazo petrochemical complex situated on the Gulf of Venezuela in Zulia State.

A report published by the International Uranium Resources Evaluation Project (IUREP) recommended expenditure of $18 million on uranium exploration in Venezuela over the next 5 years. The IUREP report suggested that the Precambrian rocks of the Guyana Shield might contain reserves of up to 42,000 tons of uranium.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, unless otherwise specified, values have been converted from Venezuelan bolivars (Bs) to U.S. dollars at the rate of Bs7.5=US$1.00.

The Mineral Industry of Yugoslavia

By Vuko M. Lepetic[1]

The role of Yugoslavia in the world production of minerals was a modest one. On a world scale, it accounted for about 4% of bauxite, 3% of magnesite, 2% of alumina, and 2% of antimony production. However, the industry was very important for the economy of the country as it provided employment and reduced or eliminated imports of much needed raw materials.

Highlights of the year included the beginning of the modernization of the Tvornica Glinice in Aluminija (TGA) Boris Kidric aluminum smelter, a decision to build a new copper smelter at Bor, reaching the full production capacity at the Omarska iron ore complex, completion of the second blast furnace at Smederevo, modernization of the lead smelter at Trepca, and the development of a large underground natural gas storage capacity by Industrija Nafte (INA) of Zagreb.

Government Policies and Programs.—In the face of continuing economic difficulties, the Government introduced a number of measures aimed at increasing production and exports. In an attempt to restrain inflation, other measures were aimed at linking future wage increases to gains in productivity and restraining the rate of public sector spending. Major reform measures changing bankruptcy, accounting, and income distribution rules were adopted late in the year; the country had a law regulating investment of foreign capital and joint ventures.

PRODUCTION

Yugoslavia's gross domestic product increased by 3.6% in 1986, with industrial production output up 3.9%. Of the more important industrial sectors, large increases were recorded in the production of iron ore, 21%, and petroleum products, 16%. Other segments of the mining and related industries performed at or about 1985 levels. High inflation, shortage of hard currency needed for imports of equipment and raw materials as well as workers' strikes did not permit the industry to achieve a higher degree of growth.

As in previous years, the mineral industry was controlled by the Government. The largest enterprises were Rudarsko Topionicarski Bazen (RTB) Bor (copper), Rudarsko Metalurski Kombinat (RMK) Zajaca (antimony), Energoinvest (aluminum and related products), Dalmacija Cement (cement), Jugohrom (ferroalloys), RMK Zenica (iron and steel), Rudarsko-Metalursko-Hemijski Kombinat Olovo i Cink (RMHK) Trepca (lead and zinc), and INA Zagreb (oil, gas, and refinery products).

Table 1.—Yugoslavia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS					
Aluminum:					
Bauxite thousand tons	3,668	3,500	3,347	3,538	[3]3,459
Alumina do	1,017	1,010	[e]1,000	[e]1,000	1,150
Metal ingot:					
Primary	220,100	258,174	[e]270,000	[e]280,000	282,000
Remelted[4]	26,263	25,385	31,567	36,092	37,670
Total	246,363	283,559	301,567	316,092	[3]319,670
Antimony:					
Mine and concentrator output:					
Ore, gross weight	62,996	50,961	51,000	71,000	[3]61,000
Metal content of ore	1,517	950	[e]950	1,300	1,250
Concentrate, gross weight	3,690	2,072	[e]2,100	3,000	2,800
Metal (regulus)	1,872	895	1,263	1,502	[3]1,830
Bismuth, smelter output	49	45	30	68	[3]21
Cadmium, smelter output	174	48	270	[e]250	250
Chromium: Chromite concentrate (produced largely from imported ores)	81,648	76,935	[e]80,000	[e]75,000	75,000
Copper:					
Mine and concentrator output:					
Ore, gross weight thousand tons	19,733	23,443	25,279	26,166	[3]27,864
Cu content of ores	119,299	129,824	137,600	[e]150,000	150,000
Concentrate, gross weight thousand tons	514	543	[e]580	[e]600	600
Metal:					
Blister and anodes:					
Primary	94,013	86,833	[e]90,000	[e]100,000	100,000
Remelted[4]	86,865	80,903	[e]80,000	[e]90,000	90,000
Refined:					
Primary	82,456	82,925	[e]94,000	[e]100,000	102,000
Remelted[4]	44,414	40,783	33,611	35,442	38,393
Total	126,870	123,708	127,611	135,442	[3]140,393
Gold, refined troy ounces	[r]135,450	[r]136,250	[r e]109,000	[r e]110,000	115,000
Iron and steel:					
Iron ore:					
Gross weight thousand tons	5,106	5,018	5,321	5,478	[3]6,618
Fe content do	1,680	1,529	[e]1,700	[e]1,800	2,200
Iron concentrate, gross weight do	2,669	2,224	[e]2,700	[e]2,800	3,400
Metal:					
Pig iron do	2,703	2,845	2,855	3,120	[3]3,063
Ferroalloys:					
Ferrochromium	50,591	63,807	[e]67,000	[e]47,000	45,000
Ferromanganese	38,895	39,677	[e]50,000	[e]38,000	40,000
Ferrosilicon	70,888	78,014	[e]95,000	[e]93,000	90,000
Silicon metal	29,818	26,256	[e]37,000	[e]37,000	40,000
Ferrosilicomanganese	20,286	26,254	[e]38,000	[e]67,000	65,000
Ferrosilicochromium	6,129	5,998	[e]6,000	[e]6,000	5,000
Other	3,997	10,889	[e]11,000	[e]11,000	15,000
Total	220,604	250,895	304,000	299,000	[3]300,000
Steel, crude:					
From oxygen converters thousand tons	1,349	1,598	1,644	1,801	[3]1,769
From Siemens-Martin furnaces do	1,464	1,432	1,440	1,524	[3]1,509
From electric furnaces do	1,037	1,105	1,152	1,155	[3]1,241
Total do	3,850	4,135	4,236	4,480	[3]4,519
Semimanufactures do	4,513	4,649	5,667	5,694	[3]5,411
Lead:					
Mine and concentrator output:					
Ore, gross weight (lead-zinc ore) do	4,252	4,063	4,634	4,590	[3]4,588
Pb content of ores	113,119	114,000	113,600	[e]110,000	110,000
Concentrate, gross weight	148,210	144,010	[e]150,000	[e]145,000	145,000

See footnotes at end of table.

Table 1.—Yugoslavia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
METALS —Continued					
Lead —Continued					
Metal:					
Smelter:					
Primary	74,008	93,112	[e]95,000	[e]110,000	120,000
Secondary[5]	35,000	34,000	35,000	40,000	45,000
Total	109,008	127,112	[e]130,000	[e]150,000	165,000
Refined:					
Primary[6]	72,000	54,831	45,415	[e]61,954	70,000
Secondary	10,248	42,700	37,400	[e]38,000	43,154
Total	82,248	97,531	82,815	99,954	[3]113,154
Magnesium metal	4,216	4,763	[e]4,300	[e]4,500	4,400
Manganese ore:					
Gross weight	27,494	31,643	[e]27,000	[e]25,000	25,000
Mn content	9,819	11,074	[e]10,000	[e]9,500	9,500
Mercury[e] 76-pound flasks	--	1,500	1,700	1,800	1,800
Nickel:[e]					
Mine output:					
Ore, gross weight thousand tons	[3]452	500	600	800	700
Ni content of ore	4,000	3,000	4,000	5,000	4,400
Ni content of ferronickel	1,500	1,500	2,000	3,000	2,600
Platinum-group metals:					
Palladium troy ounces	2,893	2,926	[e]3,100	[e]3,300	3,100
Platinum do.	418	193	[e]200	[e]250	250
Selenium metal, refined kilograms	42,323	43,782	[e]45,000	[e]46,000	47,400
Silver, metal refined including secondary thousand troy ounces	3,343	3,987	4,051	5,015	[3]5,690
Zinc:					
Zn content of lead and zinc ore	83,813	86,767	[e]87,000	[e]84,000	86,000
Concentrator output, gross weight	149,411	143,809	[e]150,000	[e]130,000	133,000
Smelter including secondary	86,767	88,049	92,649	83,398	[3]89,286
INDUSTRIAL MINERALS					
Asbestos, all kinds	11,657	10,502	8,556	6,916	[3]8,596
Barite	32,114	35,025	[e]35,000	[e]35,000	35,000
Cement, hydraulic thousand tons	9,718	9,592	9,315	9,028	[3]9,127
Clays:					
Ceramic clay, crude	121,709	98,903	[e]125,000	[e]130,000	130,000
Fire clay:					
Crude	337,073	303,965	[e]310,000	[e]320,000	320,000
Calcined	60,009	54,551	[e]60,000	[e]65,000	65,000
Kaolin	236,485	208,254	[e]210,000	[e]220,000	224,000
Feldspar, crude	42,265	41,372	[e]42,000	[e]45,000	47,000
Gypsum:					
Crude thousand tons	640	623	[e]650	[e]680	700
Calcined	108,498	93,997	[e]95,000	[e]100,000	102,000
Lime:					
Quicklime thousand tons	1,550	1,696	[e]1,700	1,650	1,700
Hydrated do.	860	853	[e]900	[e]850	900
Magnesite:					
Crude	328,456	303,965	326,000	[e]417,000	[3]423,000
Sintered	152,676	137,680	[e]140,000	[e]150,000	152,000
Caustic calcined	11,712	11,527	[e]12,000	[e]15,000	16,000
Mica, all grades	1,403	946	[e]950	[e]1,000	1,000
Nitrogen: N content of ammonia thousand tons	422	410	[e]400	[e]420	400
Pumice and related volcanic materials: Volcanic tuff	516,514	504,814	[e]500,000	[e]510,000	500,000
Quartz, quartzite, glass sand:					
Quartz and quartzite thousand tons	205	201	[e]210	[e]220	225
Glass sand do.	2,418	2,391	[e]2,500	[e]2,600	2,700
Total do.	2,623	2,592	[e]2,710	[e]2,820	2,925
Salt:					
Marine	37,980	28,874	NA	NA	NA
From brines	191,746	194,709	NA	NA	NA
Rock	198,500	191,885	NA	NA	NA
Total	428,226	415,468	380,000	410,000	[3]504,000

See footnotes at end of table.

Table 1.—Yugoslavia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
INDUSTRIAL MINERALS —Continued					
Sand and gravel excluding glass sand thousand cubic meters	24,912	24,205	21,464	22,136	[3]21,841
Sodium compounds: Sodium carbonate	181,880	183,374	188,291	199,629	[3]207,968
Stone excluding quartz and quartzite:					
Dimension:					
Crude:					
Ornamental thousand cubic meters	72	74	NA	NA	NA
Other do	12	13	NA	NA	NA
Partly worked facing thousand square meters	2,134	2,139	2,273	2,544	[3]2,844
Cobblestones, curbstones, other thousand cubic meters	29	63	NA	NA	NA
Dolomite thousand tons	930	954	NA	NA	NA
Limestone do	4,872	NA	NA	NA	NA
Shale do	8,324	7,936	NA	NA	NA
Crushed and broken, n.e.s. thousand cubic meters	4,872	3,156	NA	NA	NA
Milled marble and other do	NA	8,800	NA	NA	NA
Sulfur, pyrite, pyrrhotite:					
Pyrite, gross weight thousand tons	810	694	[e]700	[e]750	800
Pyrrhotite, gross weight do	32	17	[e]18	[e]20	20
Sulfur:					
Sulfur content of pyrite[7] do	340	291	[e]294	[e]315	336
Sulfur content of pyrrhotite[7] do	13	7	[e]7	[e]8	8
Byproduct:					
Of metallurgy[e] do	200	180	160	170	175
Of petroleum[e] do	4	3	3	3	3
Total[e] do	557	481	464	496	522
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	24,670	24,690	[e]24,000	[e]25,000	25,000
Coal:					
Bituminous thousand tons	389	392	389	400	[3]407
Brown do	10,744	11,303	11,391	12,465	[3]13,389
Lignite do	43,545	46,889	53,651	56,635	[3]56,626
Total do	54,678	58,584	65,431	69,500	[3]70,422
Coke:					
Metallurgical do	2,427	3,028	NA	NA	NA
Breeze do	183	249	NA	NA	NA
Foundry do	170	163	NA	NA	NA
Total do	2,780	3,440	3,516	3,545	[3]3,495
Gas:					
Manufactured (excluding petroleum refinery gas):					
From coke plants million cubic feet	30,904	39,658	NA	NA	NA
From lignite gasification plants do	3,621	3,672	NA	NA	NA
Natural, gross production do	80,728	73,816	70,523	84,755	[3]86,460
Natural gas plant liquids: Propane and butane thousand 42-gallon barrels	1,012	1,079	NA	NA	NA
Petroleum:					
Crude:					
As reported thousand tons	4,340	4,125	4,044	4,149	[3]4,140
Converted thousand 42-gallon barrels	32,146	30,554	29,954	30,731	30,665
Refinery products:					
Gasoline do	23,042	22,283	33,175	31,221	[3]34,603
Liquefied petroleum gas do	2,939	2,660	NA	NA	NA
Jet fuel do	2,433	2,430	NA	NA	NA
Kerosene do	110	182	NA	NA	NA
Middle distillate fuel oil do	9,041	9,373	NA	NA	NA
Distillate fuel oil: Diesel do	24,546	25,856	27,273	25,341	[3]27,766

See footnotes at end of table.

Table 1.—Yugoslavia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity[2]	1982	1983	1984	1985[p]	1986[e]
MINERAL FUELS AND RELATED MATERIALS —Continued					
Petroleum —Continued					
Refinery products —Continued					
Residual fuel oil thousand 42-gallon barrels	35,990	36,203	32,560	30,156	[3]37,409
Lubricants ---do---	3,045	3,227	3,171	4,228	[3]4,494
Paraffin ---do---	235	181	NA	NA	NA
White spirit ---do---	254	289	NA	NA	NA
Asphalt and bitumen ---do---	3,254	4,123	NA	NA	NA
Petroleum coke ---do---	326	240	NA	NA	NA
Other ---do---	2,278	249	NA	NA	NA
Total ---do---	107,493	107,296	NA	NA	NA

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

[1]Table includes data available through July 1987.

[2]In addition to the commodities listed, bentonite, common clay, and diatomite are also produced, and tellurium may be recovered as a copper refinery byproduct, but available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Includes undetermined quantity of secondary raw material.

[5]Calculated as the difference between reported total and reported primary figure.

[6]Calculated as the difference between reported total and reported secondary figure.

[7]Calculated from pyrite and pyrrhotite concentrate using 42% as average sulfur content.

TRADE

The total value of worldwide exports was $11.2 billion while the import value stood at $13.3 billion, thus creating a trade deficit of over $2 billion, a 25% increase compared with that of 1985. Approximately 30% of total imports was represented by mineral commodities (crude oil, coke, steel semimanufactured products, fertilizers, fuel oil, etc.). About 12% of exports (aluminum and steel semimanufactures, alumina, and fertilizers) fell in this same category.

Yugoslavia enjoyed a trade surplus with the United States, its fourth largest trading partner, of $185 million. The principal U.S. exports to Yugoslavia were, in order of decreasing value, wheat, oil cakes, cotton, artificial fibers, coking coal, and petroleum coke worth about $528 million. The principal Yugoslav goods exported to the United States were automobiles, wood products, apparel, and agricultural and chemical products valued at a total of $713 million.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	651,893	803,675	--	U.S.S.R. 359,891; Romania 274,564; West Germany 67,976.
Oxides and hydroxides	419,636	432,440	--	U.S.S.R. 380,432; Romania 26,004; Italy 12,909.
Metal including alloys:				
Scrap	295	265	--	Italy 250; West Germany 15.
Unwrought	142,040	142,699	--	East Germany 31,291; France 30,219; Italy 21,182.
Semimanufactures	61,866	66,736	7,473	Czechoslovakia 16,917; West Germany 8,749.
Cadmium: Metal including alloys, all forms	38	55	--	Czechoslovakia 28; Switzerland 27.
Chromium:				
Ore and concentrate	25,848	13,150	--	All to Czechoslovakia.
Oxides and hydroxides	25	1	--	All to Switzerland.
Copper:				
Ore and concentrate	8	85,391	1	West Germany 55,633; Japan 20,097; Finland 9,655.
Matte and speiss including cement copper	672	933	--	All to Bulgaria.
Sulfate	4,972	5,433	24	Greece 2,620; Italy 1,906; Turkey 390.
Metal including alloys:				
Scrap	3,473	2,436	--	Austria 854; Italy 633; West Germany 549.
Unwrought	2,394	3,392	--	East Germany 1,781; Belgium-Luxembourg 883; Italy 627.
Semimanufactures	33,701	30,995	3,124	West Germany 5,055; Italy 4,476; Czechoslovakia 4,293.
Iron and steel:				
Iron ore and concentrate, pyrite, roasted	45,740	59,727	--	Hungary 43,669; Austria 16,033; Guiana 25.
Metal:				
Scrap	141,732	173,419	--	Italy 138,163; Austria 25,094; Hungary 5,051.
Pig iron, cast iron, related materials	5,297	19,741	--	Hungary 10,003; West Germany 6,767; Turkey 553.
Ferroalloys:				
Ferrochromium	58,029	52,752	20,316	Austria 8,619; Italy 8,393.
Ferromanganese	12,110	7,650	2,636	Italy 2,500; Hungary 1,653.
Ferrosilicomanganese	28,645	35,860	24,495	Turkey 6,475; Austria 2,665.
Ferrosilicon	59,095	52,706	--	Japan 17,582; Italy 11,594; Austria 8,415.
Silicon metal	22,266	27,063	4,295	U.S.S.R. 9,608; Poland 4,629.
Unspecified	3,818	7,266	19	East Germany 4,153; West Germany 1,557; Austria 1,293.
Steel, primary forms	92,864	90,537	--	West Germany 27,540; Italy 27,158; Poland 13,937.
Semimanufactures:				
Bars, rods, angles, shapes, sections	493,767	635,591	12	Egypt 172,899; West Germany 63,026; Kenya 61,472.
Universals, plates, sheets	106,846	182,833	4,241	West Germany 52,573; China 49,814; Italy 32,215.
Hoop and strip	9,409	8,437	28	Poland 5,507; Italy 2,347; Czechoslovakia 274.
Rails and accessories	11,380	14,031	--	Romania 9,933; Turkey 3,750; Bulgaria 285.
Wire	28,404	59,680	--	Italy 29,062; U.S.S.R. 11,671; France 6,435.
Tubes, pipes, fittings	163,278	158,197	8,587	Turkey 26,100; West Germany 16,500; East Germany 15,796.
Castings and forgings, rough	5,988	7,221	151	Italy 2,962; West Germany 2,007; Austria 987.
Lead:				
Ore and concentrate	5,925	5,764	--	All to Romania.
Oxides	13	5	--	Iraq 2; U.S.S.R. 2.
Metal including alloys:				
Unwrought	16,296	17,097	--	Czechoslovakia 9,908; West Germany 1,791; Greece 1,633.
Semimanufactures	2,218	48	--	Iraq 16; U.S.S.R. 15; Libya 12.
Magnesium: Metal including alloys:				
Scrap	13	63	--	All to West Germany.
Unwrought	3,162	3,044	260	West Germany 1,491; Belgium-Luxembourg 476; Austria 286.
Semimanufactures	20	--		

See footnote at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Manganese:				
Ore and concentrate, metallurgical-grade	7,157	13,281	--	Italy 10,027; Switzerland 2,820; France 434.
Oxides	--	(2)	--	All to Italy.
Mercury 76-pound flasks	638	1,189	--	United Kingdom 957; Switzerland 174; Venezuela 58.
Nickel:				
Ore and concentrate	(2)	47	--	All to Czechoslovakia.
Matte and speiss	47	--		
Metal including alloys:				
Scrap	153	398	--	West Germany 195; Italy 171; Austria 32.
Unwrought	466	347	--	Austria 238; Italy 60; West Germany 29.
Semimanufactures	266	167	--	Austria 114; United Kingdom 29; Italy 24.
Platinum-group metals:				
Waste and sweepings value, thousands	$237	$19	--	All to West Germany.
Metals including alloys, unwrought and partly wrought do.	$164	$137	--	Do.
Silver:				
Waste and sweepings do.	$17	$52	--	All to Austria.
Metal including alloys, unwrought and partly wrought thousand troy ounces	1,993	2,990	NA	United Kingdom 1,640; West Germany 707; Czechoslovakia 322.
Tin: Metal including alloys:				
Unwrought	(2)	(2)	--	Mainly to U.S.S.R.
Semimanufactures	(2)	1	--	Mainly to Iraq.
Titanium: Oxides	15,979	12,302	413	East Germany 10,466; Romania 724; Italy 420.
Tungsten: Metal including alloys, unwrought	--	9	--	All to Sweden.
Zinc:				
Ore and concentrate	5,484	--		
Oxides	1,988	2,085	--	Romania 1,401; Hungary 550; Egypt 100.
Metal including alloys:				
Scrap	612	465	--	All to Austria.
Unwrought	24,038	14,882	--	Czechoslovakia 9,291; East Germany 4,042; West Germany 902.
Semimanufactures	8,137	11,537	--	Czechoslovakia 5,653; West Germany 3,259; U.S.S.R. 963.
Other: Ashes and residues	2,507	761	--	Italy 620; West Germany 83; Switzerland 36.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	--	3	--	All to Iraq.
Artificial: Corundum	17,145	15,611	--	Italy 5,944; Romania 3,702; West Germany 3,618.
Grinding and polishing wheels and stones	3,520	3,743	135	Bulgaria 713; West Germany 602; Poland 374.
Asbestos, crude	2,220	2,018	--	Albania 1,483; Egypt 400; France 81.
Barite and witherite	20,256	19,790	--	Hungary 11,862; U.S.S.R. 4,000; Romania 3,750.
Boron materials: Oxides and acids	1,219	--		
Cement thousand tons	1,091	1,263	2	Egypt 755; Italy 236; Algeria 91.
Chalk	--	(2)	--	All to U.S.S.R.
Clays, crude:				
Bentonite	189	292	--	Iraq 168; West Germany 100; Albania 24.
Chamotte earth	6	2	--	All to Central African Republic.
Fire clay	27	66	--	Italy 22; Bulgaria 21; Greece 20.
Kaolin	9	4	--	Turkey 2; Libya 1; U.S.S.R. 1.
Unspecified	22	4	--	Italy 3; Greece 1.
Cryolite and chiolite	9	14	--	All to Malta.
Diatomite and other infusorial earth	394	1,504	--	All to Austria.
Feldspar	3,793	6,722	--	Italy 4,822; East Germany 886; Hungary 581.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Fertilizer materials:				
Crude, n.e.s	--	2	--	All to Austria.
Manufactured:				
Ammonia	1	64,706	--	Italy 34,680; Austria 21,863; Greece 4,257.
Nitrogenous	156,423	181,647	--	West Germany 61,808; Denmark 33,643; China 16,500.
Phosphatic	111,937	95,809	--	Hungary 45,519; Czechoslovakia 31,312; Bulgaria 13,775.
Potassic	--	2	--	All to Iraq.
Unspecified and mixed	316,643	526,553	--	Nigeria 128,562; West Germany 95,253; Hungary 91,871.
Graphite, natural	(2)	24	--	All to West Germany.
Gypsum and plaster	2,270	8,826	--	Hungary 8,589; Iraq 76; Italy 48.
Lime	25,996	25,796	--	Hungary 21,415; Italy 2,464; Austria 1,826.
Magnesium compounds:				
Magnesite	(2)	76	--	U.S.S.R. 75; Austria 1.
Oxides and hydroxides	144	326	--	Poland 217; Bulgaria 109.
Other	6,715	7,869	--	Italy 4,436; Albania 2,393; Poland 1,040.
Mica:				
Crude including splittings and waste	--	(2)	--	All to Italy.
Worked including agglomerated splittings	4	2	--	All to Albania.
Nitrates, crude	--	2,000	--	All to Italy.
Pyrite, unroasted	359,202	156,132	--	West Germany 76,385; Romania 70,285.
Salt and brine	450	90	--	Hungary 40; Iraq 30; Italy 19.
Sodium compounds, n.e.s.: Carbonate, manufactured	10,718	15,228	--	Italy 11,072; Albania 2,500; Greece 1,284.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	46,398	44,073	--	Italy 23,378; Czechoslovakia 14,350; Japan 1,651.
Worked	19,322	12,789	84	Austria 3,035; Italy 2,274; West Germany 1,864.
Dolomite, chiefly refractory-grade	106	192	--	Austria 190; Malta 2.
Gravel and crushed rock	75,273	22,502	--	Italy 12,271; Czechoslovakia 3,861; U.S.S.R. 2,412.
Quartz and quartzite	13,130	14,432	--	West Germany 10,069; Spain 3,961; Italy 188.
Sand other than metal-bearing	18,031	22,859	--	Italy 11,102; Greece 8,239; Albania 2,647.
Sulfur: Elemental, sulfuric acid	18,634	22,536	--	Italy 12,971; Austria 7,948; Bulgaria 1,602.
Talc, steatite, soapstone, pyrophyllite	2	54	--	Greece 48; Austria 6.
Other:				
Crude	1,481	4,108	--	Austria 2,061; West Germany 765; Romania 490.
Slag and dross, not metal-bearing	19,148	2,614	--	Greece 1,104; Italy 1,024; Austria 427.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	591	1,658	--	Italy 1,434; Libya 209; U.S.S.R. 15.
Carbon: Carbon black	122	170	--	Austria 103; West Germany 66.
Coal:				
Anthracite	--	22	--	All to Italy.
Bituminous	3	4	--	All to Iraq.
Lignite including briquets	219,122	504,450	--	Austria 239,615; Hungary 198,967; East Germany 2,631.
Coke and semicoke	101,042	152,132	--	Hungary 93,174; Austria 27,021; Romania 14,783.
Peat including briquets and litter	5,281	3,209	--	All to Italy.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	442	86	--	Italy 75; West Germany 6; Austria 5.
Gasoline do	5,652	4,661	--	Hungary 973; Poland 808; West Germany 627.
Mineral jelly and wax do	43	31	--	West Germany 20; Italy 6; Albania 2.
Kerosene and jet fuel do	151	164	11	United Kingdom 25; France 24; U.S.S.R. 21.
Distillate fuel oil do	1,182	359	--	Austria 120; Greece 113; Netherlands 93.
Lubricants do	1,062	858	--	Austria 561; Italy 114; Czechoslovakia 67.
Residual fuel oil do	--	59	--	Switzerland 54; U.S.S.R. 4; China 1.
Bitumen and other residues do	1,557	1,319	--	Austria 466; Italy 385; Greece 341.
Bituminous mixtures do	4	2	--	Mainly to Iraq.
Petroleum coke do	17	97	--	Austria 41; Italy 38; West Germany 17.

NA Not available.
[1]Table prepared by Jozef Plachy.
[2]Less than 1/2 unit.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	185,800	162,968	--	Guinea 123,911; Greece 16,090; Australia 14,234.
Oxides and hydroxides	113,241	118,366	4	Greece 24,892; Guinea 40,940; Italy 7,558.
Metal including alloys:				
Scrap	--	315	--	Mongolia 185; Greece 122; U.S.S.R. 7.
Unwrought	34,057	39,319	--	U.S.S.R. 38,026; Romania 600; Netherlands 454.
Semimanufactures	14,805	14,063	10	U.S.S.R. 9,289; West Germany 1,747; Austria 1,093.
Antimony:				
Ore and concentrate	1,345	2,401	--	Morocco 1,269; Thailand 611; Turkey 431.
Metal including alloys, all forms	56	234	--	United Kingdom 60; China 50; Austria 44.
Arsenic:				
Oxides and acids	115	120	--	France 60; West Germany 45; Belgium-Luxembourg 13.
Metal including alloys, all forms	42	60	--	Sweden 40; West Germany 11; Austria 9.
Beryllium: Metal including alloys, all forms	--	(2)	(2)	Mainly from West Germany.
Bismuth: Metal including alloys, all forms	5	18	(2)	Belgium-Luxembourg 17.
Cadmium: Metal including alloys, all forms	2	(2)	--	Mainly from West Germany.
Chromium:				
Ore and concentrate	273,679	281,066	--	Albania 136,870; Turkey 83,495; U.S.S.R. 60,249.
Oxides and hydroxides	824	667	--	West Germany 277; Poland 164; West Germany 135.
Cobalt: Oxides and hydroxides	34	43	12	Canada 12; Netherlands 9.
Columbium and tantalum: Metal including alloys, all forms, tantalum	(2)	2	(2)	West Germany 1.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Copper:				
Matte and speiss including cement copper	(2)	--		
Sulfate	1,468	2,826	(2)	U.S.S.R. 1,425; Poland 1,400; West Germany 1.
Metal including alloys:				
Scrap	441	947	83	Italy 560; Bulgaria 131; Greece 87.
Unwrought	31,824	39,255	--	Chile 10,313; Zambia 5,797; Zaire 5,528.
Semimanufactures	18,870	28,165	21	Poland 20,501; West Germany 3,797; Bulgaria 1,000.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite -- thousand tons	1,566	2,180	--	Peru 691; Canada 560; U.S.S.R. 528.
Pyrite, roasted	--	1	--	All from West Germany.
Metal:				
Scrap	781,452	728,581	--	U.S.S.R. 645,082; Bulgaria 43,327; Poland 28,236.
Pig iron, cast iron, related materials	66,295	55,296	8	Bulgaria 25,803; U.S.S.R. 16,271; Algeria 6,490.
Ferroalloys:				
Ferrochromium	763	1,840	--	Sweden 421; West Germany 411; Bulgaria 386.
Ferromanganese	1,754	1,563	--	West Germany 1,097; France 380; Austria 60.
Ferromolybdenum	1,022	697	15	Austria 500; West Germany 103; United Kingdom 44.
Ferrosilicomanganese	1,867	43	--	All from West Germany.
Ferrosilicon	1,657	1,074	--	West Germany 918; U.S.S.R. 120; Italy 25.
Silicon metal	1,208	294	--	West Germany 154; Sweden 125; Austria 12.
Unspecified	2,666	2,875	20	France 892; West Germany 720; Austria 595.
Steel, primary forms	689,127	762,279	--	Czechoslovakia 220,215; U.S.S.R. 217,202; Poland 81,409.
Semimanufactures:				
Bars, rods, angles, shapes, sections	173,552	186,903	34	Romania 36,786; Czechoslovakia 32,728; U.S.S.R. 19,567.
Universals, plates, sheets	438,952	431,323	52	Czechoslovakia 136,669; Austria 68,402; Italy 59,149.
Hoop and strip	130,064	110,397	7	Poland 37,659; West Germany 30,622; Italy 11,240.
Rails and accessories	10,705	37,672	--	Austria 13,731; West Germany 9,039; U.S.S.R. 4,265.
Wire	32,303	45,021	7	Czechoslovakia 12,766; West Germany 5,847; Italy 5,238.
Tubes, pipes, fittings	58,249	100,604	634	West Germany 19,386; Italy 16,741; East Germany 16,144.
Castings and forgings, rough	11,998	2,726	1	Czechoslovakia 859; West Germany 719; Italy 375.
Lead:				
Ore and concentrate	574	416	--	All from Austria.
Oxides	4,310	5,820	14	Austria 3,777; Bulgaria 1,053; Netherlands 548.
Metal including alloys:				
Scrap	--	960	--	Greece 764; Italy 196.
Unwrought	11,614	9,520	--	Peru 2,781; Spain 2,375; Italy 1,500.
Semimanufactures	68	76	(2)	Italy 44; U.S.S.R. 20; West Germany 7.
Magnesium: Metal including alloys:				
Unwrought	12	(2)	--	All from Austria.
Semimanufactures	(2)	25	(2)	Switzerland 23; Austria 1; France 1.
Manganese:				
Ore and concentrate, metallurgical-grade	148,032	140,249	--	Republic of South Africa 73,228; Gabon 33,597; U.S.S.R. 33,124.
Oxides	977	692	--	France 300; Belgium-Luxembourg 185; West Germany 142.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Mercury ——— 76-pound flasks	812	232	--	Austria 116; West Germany 87; Japan 29.
Molybdenum: Metal including alloys, all forms	32	15	(2)	Austria 9; Hungary 2; Netherlands 2.
Nickel:				
Matte and speiss	7	501	--	Cuba 370; Brazil 73; West Germany 37.
Metal including alloys:				
Scrap	1	--		
Unwrought	2,659	2,839	--	U.S.S.R. 1,970; Bulgaria 339; France 150.
Semimanufactures	844	667	11	U.S.S.R. 223; West Germany 198; United Kingdom 102.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$1,916	$2,782	--	Czechoslovakia $926; West Germany $805; U.S.S.R. $462.
Silver: Metal including alloys, unwrought and partly wrought thousand troy ounces	836	1,061	NA	Austria 514; West Germany 161; Canada 96.
Tin:				
Oxides	(2)	8	--	West Germany 7; Japan 1.
Metal including alloys:				
Unwrought	1,122	1,387	--	Malaysia 955; West Germany 128; Bolivia 108.
Semimanufactures	70	42	(2)	West Germany 37; Italy 4.
Titanium:				
Ore and concentrate	47,209	27,275	--	Australia 27,155; West Germany 111; Mongolia 9.
Oxides	763	1,080	1	West Germany 529; Poland 293; Czechoslovakia 100.
Tungsten:				
Ore and concentrate	--	2	--	All from Canada.
Metal including alloys, all forms	36	18	(2)	Hungary 4; Austria 3; West Germany 3.
Zinc:				
Ore and concentrate	26,913	58,669	--	Czechoslovakia 15,651; Ireland 12,424; Mexico 5,670.
Oxides	3,163	3,226	--	Austria 1,394; Czechoslovakia 776; West Germany 723.
Metal including alloys:				
Unwrought	24,683	39,281	--	Algeria 10,368; Italy 9,850; Bulgaria 9,499.
Semimanufactures	3,031	721	--	Bulgaria 341; Czechoslovakia 163; Poland 92.
Other:				
Ores and concentrates	r1,963	1,741	6	West Germany 1,580; Italy 136; Austria 19.
Ashes and residues	1,268	1,400	--	All from Switzerland.
Base metals including alloys, all forms	r572	588	7	Netherlands 270; Republic of South Africa 75; United Kingdom 74.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	373	294	--	Poland 135; Austria 65; Italy 60.
Artificial: Corundum	2,125	1,988	1	Austria 751; Poland 709; Italy 335.
Dust and powder of precious and semi-precious stones including diamond value, thousands	$1,215	$1,502	--	U.S.S.R. $460; Belgium-Luxembourg $447; Switzerland $408.
Grinding and polishing wheels and stones	1,101	1,067	13	Austria 418; Italy 187; Poland 117.
Asbestos, crude	45,490	54,372	--	U.S.S.R. 40,863; Republic of South Africa 6,498; Canada 5,922.
Barite and witherite	380	270	--	Spain 130; West Germany 80; Italy 60.
Boron materials:				
Crude natural borates	40,487	33,687	9,219	Turkey 22,971; West Germany 788.
Oxides and acids	115	2,634	--	U.S.S.R. 1,610; Italy 597; France 153.
Bromine	9	2	--	West Germany 1; Israel 1.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Cement	261,800	134,603	3,300	Hungary 57,574; U.S.S.R. 42,929; Albania 7,749.
Chalk	4,028	3,967	--	Austria 2,001; Italy 1,166; France 570.
Clays, crude:				
Bentonite	4	15	--	West Germany 9; Austria 5; Italy 1.
Chamotte earth	10,159	7,716	--	Czechoslovakia 6,989; France 382; United Kingdom 323.
Fire clay	29,885	36,643	--	Czechoslovakia 29,940; Poland 3,078; Spain 2,008.
Kaolin	83,307	83,136	973	Czechoslovakia 34,493; East Germany 14,558; U.S.S.R. 14,033.
Unspecified	12,474	6,573	247	Poland 4,986; Czechoslovakia 1,257.
Cryolite and chiolite	1,253	675	--	Denmark 674; United Kingdom 1.
Diamond:				
Gem, not set or strung value, thousands	$389	$449	--	Switzerland $217; Czechoslovakia $150; Austria $38.
Industrial stones do.	$1,265	$1,426	--	Belgium-Luxembourg $638; United Kingdom $248; West Germany $169.
Diatomite and other infusorial earth	551	1,144	47	Italy 473; Austria 394; France 137.
Feldspar, fluorspar, related materials:				
Feldspar	769	910	--	All from France.
Fluorspar	6,750	9,298	--	China 4,740; France 2,214; East Germany 1,202.
Fertilizer materials:				
Crude, n.e.s	516	680	--	U.S.S.R. 600; France 80.
Manufactured:				
Ammonia	127,840	67,179	--	Hungary 36,955; U.S.S.R. 14,324; Austria 11,076.
Nitrogenous	460,355	462,003	--	U.S.S.R. 136,501; Hungary 125,193; Czechoslovakia 115,275.
Phosphatic	29,086	60,539	--	Romania 26,270; Tunisia 24,311; Morocco 9,027.
Potassic	525,792	621,868	--	U.S.S.R. 327,747; East Germany 275,873; Austria 12,345.
Unspecified and mixed	113,348	131,529	101,133	Romania 26,014; Tunisia 4,263.
Graphite, natural	2,220	2,267	2	Czechoslovakia 1,328; Austria 394; West Germany 392.
Gypsum and plaster	18	24	2	West Germany 11; Italy 11.
Iodine	53	85	--	Japan 72; West Germany 12; Austria 1.
Lime	5	732	--	Bulgaria 731; West Germany 1.
Magnesium compounds:				
Magnesite	31,543	27,533	(2)	Greece 18,247; Turkey 9,286.
Oxides and hydroxides	3,170	2,039	--	Norway 1,844; West Germany 174; Austria 21.
Other	16,543	13,766	--	Greece 8,900; Italy 1,987; Turkey 1,977.
Mica:				
Crude including splittings and waste	140	253	--	West Germany 190; Italy 22; France 20.
Worked including agglomerated splittings	99	132	(2)	Czechoslovakia 46; Austria 37; Belgium-Luxembourg 19.
Phosphates, crude thousand tons	1,438	1,317	--	Morocco 412; Togo 327; Jordan 256.
Pigments, mineral: Iron oxides and hydroxides, processed	2,618	2,134	15	Belgium-Luxembourg 538; U.S.S.R. 449; West Germany 393.
Potassium salts, crude	121	2	--	All from West Germany.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$29	$58	--	West Germany $40; Switzerland $15; Austria $3.
Synthetic do.	$266	$190	--	Austria $90; Switzerland $51; Czechoslovakia $41.
Pyrite, unroasted	157	61,081	--	Spain 61,061; West Germany 20.
Salt and brine	284,038	320,812	1	Romania 222,016; East Germany 32,137; U.S.S.R. 30,643.
Sodium compounds, n.e.s.: Carbonate, manufactured	82,342	65,820	--	Romania 42,471; Poland 8,156; Bulgaria 7,259.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,001	312	--	Austria 163; France 149.
Worked	49	224	--	Italy 215; West Germany 6; Sweden 2.
Dolomite, chiefly refractory-grade	1,309	514	--	Italy 341; West Germany 150; Norway 23.
Gravel and crushed rock	6,819	312	--	Italy 150; France 95; Belgium-Luxembourg 62.
Limestone other than dimension	189	775	--	All from Italy.
Quartz and quartzite	928	17,740	43	Spain 16,576; West Germany 1,029; Italy 58.
Sand other than metal-bearing	55,598	56,786	277	Hungary 19,292; West Germany 16,091; Czechoslovakia 13,032.
Sulfur:				
Elemental:				
Crude including native and byproduct	115,905	162,726	6,858	Poland 105,036; Saudi Arabia 31,539; West Germany 5,422.
Colloidal, precipitated, sublimed	407	584	--	West Germany 237; Poland 186; Italy 138.
Dioxide	(2)	200	--	All from Italy.
Sulfuric acid	37,368	58,672	--	Hungary 52,773; Greece 3,796; Austria 1,667.
Talc, steatite, soapstone, pyrophyllite	6,129	4,378	--	Austria 1,356; Italy 1,051; West Germany 772.
Other:				
Crude	12,924	13,317	--	Hungary 6,879; U.S.S.R. 2,911; Austria 1,035.
Slag and dross, not metal-bearing	31,080	11,808	--	Canada 9,842; Italy 1,961; West Germany 5.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	678	536	105	Albania 412; Netherlands 14.
Carbon: Carbon black	23,246	27,751	69	Italy 22,398; West Germany 2,097; U.S.S.R. 1,803.
Coal:				
Anthracite thousand tons	201	247	(2)	U.S.S.R. 246.
Bituminous do	3,412	4,033	574	U.S.S.R. 2,887; Poland 185.
Briquets of anthracite and bituminous coal do	(2)	--		
Lignite including briquets do	147	162	--	U.S.S.R. 146; East Germany 16.
Coke and semicoke do	37	35	5	Italy 26; West Germany 3.
Gas, natural: Gaseous million cubic feet	119,373	129,933	--	All from U.S.S.R.
Peat including briquets and litter	9,432	7,445	--	U.S.S.R. 5,250; Hungary 2,138; Sweden 57.
Petroleum:				
Crude thousand 42-gallon barrels	72,553	64,696	--	Iraq 28,144; Libya 16,959; Algeria 11,858.
Refinery products:				
Liquefied petroleum gas do	1,091	862	--	Bulgaria 460; West Germany 166; Hungary 141.
Gasoline do	422	150	(2)	West Germany 90; Romania 23; Italy 22.
Mineral jelly and wax do	17	22	--	Italy 11; West Germany 7; Netherlands 2.
Kerosene and jet fuel do	1,161	835	--	Italy 601; Austria 98; Czechoslovakia 88.
Distillate fuel oil do	234	88	(2)	U.S.S.R. 63; Italy 13; Hungary 11.
Lubricants do	481	589	2	Italy 228; Hungary 152; West Germany 38.
Residual fuel oil do	6,989	9,096	--	U.S.S.R. 4,462; Italy 1,497; Netherlands 421.
Bitumen and other residues do	(2)	1	--	Mainly from Netherlands.
Bituminous mixtures do	(2)	1	(2)	Mainly from West Germany.
Petroleum coke do	629	562	334	Norway 85; Malta 51; West Germany 46.

[r] Revised. NA Not available.
[1] Table prepared by Jozef Plachy.
[2] Less than 1/2 unit.

COMMODITY REVIEW

METALS

Aluminum.—The eight Yugoslav bauxite mines (Vlasenica, Niksic, Mostar, Bosanska Krupa, Obrovac, Rovinj, Jajce, and Kosova) produced 3.46 million tons of ore in 1986. Energoinvest's mine at Vlasenica, with an annual output of 1.5 million tons, was the largest in the country. Of these eight mines, seven yielded red bauxite, used for the production of alumina. Only Niksic produced white bauxite used mainly in the manufacture of refractories and abrasives. About 85% of total bauxite production came from open pit operations while the remainder was obtained by underground mining. The latter should become increasingly important, particularly at Vlasenica, as the rich surface ore bodies are being exhausted.

With an annual output of 1.2 million tons, Yugoslavia was the second largest producer of alumina in Europe (after the Federal Republic of Germany) and the sixth in the world. There were four alumina plants in the country. The three in Kidricevo, Mostar, and Titograd used Pechiney (France) technology and equipment. The fourth alumina plant at Zvornik was one of the two largest in Europe, with an annual capacity of 600,000 tons, and was designed by the VAMI Aluminum Institute of Leningrad. Apart from metallurgical alumina, the plants yielded hydrate as well as various alumina-related products (ceramic fiber, water glass, and zeolites).

Aluminum and its alloys (rolling slabs, extrusion billets, "Properzi" wire, cast strip, and ingots) were produced at Kidricevo, Mostar, Sibenik, and Titograd. Kidricevo was being modernized at a cost of $116 million. The International Finance Corp., a private sector arm of the International Bank for Reconstruction and Development, provided UNIAL-TGA Boris Kidric with a $32.4 million loan to help finance this project. The remainder was to come from TGA, aluminum fabricators throughout Yugoslavia, and a consortium of 13 banks. The project, to be completed by December 1988, should increase TGA's smelting capacity to 70,000 tons per year from the present 45,000 tons. It was to include the upgrading of casting, quality control, and auxiliary facilities. Pechiney would provide technology and assistance.

The search for more bauxite sources continued in 1986. An estimated $500,000 was to be spent by the Slobodan Penezic Krcun copper works and Vlasenica bauxite mine on prospecting for new deposits. One find on Mount Jablanik near Valjevo in Serbia was estimated at about 20 million tons of ore containing up to 50% alumina.

Copper.—Among the significant developments in the copper industry were the continuing effort at rationalization of the open pit transportation system of Majdanpek, in cooperation with the Continental Conveyor and Equipment Co. Inc. of Winfield, Alabama, as well as reconstruction and modernization of its mill. The latter was expected to bring about increased recoveries of copper, gold, and silver. Also, consideration was given to a new Bor copper smelter. Reconstruction of the existing plant was not thought practical as neither its capacity nor recovery (91%) could be significantly improved. Therefore, construction of a new smelter, which would have a recovery rate of almost 98%, was considered. Construction of a 350,000-ton-per-year sulfuric acid plant and consequent improvement of the environmental conditions at Bor was also the subject of the same studies. An agreement of cooperation relating to the above was signed between Bor on the one hand and Outokumpu Oy and Tampela Oy of Finland on the other.

Bor, Majdanpek, and Veliki Krivelj, all in Eastern Serbia, along with Bucim in Macedonia, were the four producing copper mines; their annual output of ore increased by 6.5% in 1986. More than 95% of almost 28 million tons of ore was mined in open pits. Only at Bor was a minor portion of the production mined underground. In all these ores, copper accounted for about 75% of the ore value, the remainder being contained gold, platinum-group metals, silver, etc. The ultimate products of the copper mines were copper, pyrite, and magnetite concentrates. Copper concentrates from the four mines were further treated in the copper smelter and refinery at Bor. The smelter could turn out 170,000 tons of anode copper annually while the electrolytic refinery had an annual capacity between 160,000 and 165,000 tons of cathode copper. Copper and copper alloys were further processed by casting and hot and cold rolling into numerous semifinished and finished products. The anode slime from the refinery was the ma-

jor source of the country's production of gold, palladium, platinum, selenium, and silver.

Gold.—Exploration for gold continued. In addition to further examination of the Deli Jovan, Homolje, Miroc, and Stara Planina Mountains, new prospects were discovered on the slopes of the Zeljin and Goc Mountains in Serbia. The Geological Institute of Belgrade (Geozavod) considered the latter two areas promising.

Blagodat, Bor, Bucim, Krivelj, Lece, Majdanpek, Sase, Srebrenica, and Zletovo were the major base metal mines with ores containing gold. Gold was invariably obtained from the ores as a byproduct in the copper smelter at Bor and in Trepca's lead smelter in Zvecan. The richest gold-bearing ore was the lead-zinc ore at Lece where the content ranged from 3 to 4 grams of gold per ton of ore (0.09 to 0.12 troy ounce per short ton). The copper ores contained less gold, ranging from 0.7 to 2 grams per ton of ore (0.02 to 0.06 troy ounce per short ton).

Iron and Steel.—The modernization program for medium-term development of the iron and steel industry adopted by the Yugoslav Iron and Steel Industry Association foresaw that at the end of the present decade Yugoslavia would produce about 6.3 million tons of steel per year, almost 1.8 million tons more than in 1986. The modernization and rationalization of the existing plants were intended to bring up the production and to balance supply and demand on the domestic market as well as to create conditions for exports of finished steel products. Major contributors to this ambitious expansion program were to be the Omarska iron ore complex and Niksic, Sisak, Smederevo, and Zenica iron and steel enterprises.

The Omarska complex, a subsidiary of the Zenica metallurgical combine, consisted of three open pit mines and a concentrator. The mines had the capacity to produce about 2 million tons per year of ore assaying about 40% iron. The ore was beneficiated to yield 52% iron concentrates at the rate of about 1.7 million tons per year. When fully built, the complex was expected to produce 3.2 million tons of iron concentrate per year thus eliminating iron ore imports of about 2 million tons annually.

Construction of the second blast furnace was completed at the Smederevo iron and steel enterprise. It was designed to produce 850,000 tons of pig iron annually thus increasing Smederevo's ironmaking capacity from the present 650,000 tons to 1,500,000 tons per year. The Zenica combine produced 1.5 million tons of steel (a record-high level). The Sisak enterprise marketed about 360,000 tons of steel, 136,000 tons of pig iron, and 350,000 tons of welded and seamless tube during the year while the Niksic enterprise made about 288,000 tons of pig iron and 265,000 tons of finished and semifinished products.

Lead and Zinc.—RMHK Trepca (eight mines), Zorka-Sabac (three mines), Energoinvest (two mines), Mezica, and Zletovo were the lead and zinc producers in 1986. Trepca, the largest and oldest in the country, was undergoing substantial modernization of the existing facility and construction of new facilities. The first stage of the lead smelter modernization was finished and resulted in the production of 100,000 tons of lead metal for the year. The second phase was in progress along with construction of new lead and zinc refineries.

Difficulties in ore production were experienced at Trepca as exploration and development lagged. In general, exploration for lead and zinc continued in various areas of the country but without major success.

INDUSTRIAL MINERALS

Production of industrial minerals increased by 4%. Leading this group were asbestos, 24%, and salt, 23%. New developments related to feldspar and magnesite are also noted.

Asbestos.—The situation with this commodity remained unstable, and attempts to lessen the country's dependence on imports were not successful despite higher production from the Azbest Mine in Bosnia and Herzegovina and from the Korlace Mine in Serbia. The Stragari Mine in Serbia, which was to come on-stream in 1982, became operational in 1986 and was below its rated capacity of 500,000 tons of ore annually.

Feldspar.—Feldspat was the name of a new feldspar producing operation in Bujanovac, Serbia. The mine and mill, expected to yield annually 25,000 tons of feldspar, 15,000 tons of silica sand, and 2,000 tons of mica, came on-stream in midyear. The ore reserves were about 16 million tons and doubling of production was foreseen by 1990.

Magnesite.—The Goles Mine of Lipljani (Kosovo) was to undergo modernization in order to increase its production capability from the present 80,000 to 170,000 tons per year and thus provide Magnohrom in

Kraljevo (Serbia) with raw material. The Magnohrom complex was a major producer and exporter of refractory bricks and related materials.

Salt.—A new marine salt production unit, rated at 50,000 tons per year, was brought into operation at Ulcinj, Montenegro. It was built by Ulcinj's Bajo Sekulic and Lurgi GmbH of the Federal Republic of Germany. Sodaso of Tuzla (Bosnia and Herzegovina) began construction of a new mine on nearby Mount Majevica. The new operation was to replace the depleted deposits of Tuzla. Sodaso was the country's leading producer responsible for supplying about 90% of domestic demand.

MINERAL FUELS

Coal.—A significant newcomer to the line of producing entities was the Grivica open pit coal mine belonging to the Banovici Basin. Its designed capacity was 1 million tons per year. By 1990, its annual output was expected to be 3.2 million tons, making it the largest brown coal open pit in the country. About $12.5 million was invested in the project. The reserves were estimated at about 110 million tons.

Most of the country's reserves and production (over 90%) came from 10 major basins. They were as follows: Rasa (in Croatia, bituminous coal), Banovici (in Bosnia and Herzegovina, brown coal), Srednje Bosanski Rudnici (in Bosnia and Herzegovina, brown), Zasavski Premogovniki (Slovenia, brown), SenjskoResavski Basin (Serbia, brown), Kolubara (Serbia, lignite), Kreka (Bosnia and Herzegovina, lignite), Velenje (Slovenia, lignite), and Kostolac (Serbia, lignite). Yugoslavia used the calorific value to classify types of coal. Bituminous had a value of more than 5,000 kilocalories; brown ranged from 3,200 to 5,000 kilocalories; and lignite had a calorific value below 3,200 kilocalories. Most of the coal, particularly the lignite, was used to generate electric power at or near the minesite, thus minimizing coal transportation costs. Coal mining ranked very high on the priority list of Yugoslav planners. Exploration and investments in new mines and facilities as well as in the rehabilitation and rationalization of the existing ones continued.

The U.S. Government trade and development program contributed $475,000 toward a feasibility study for the construction of a battery of coke ovens at the Bakar coke works. The Sisak Iron and Steel Enterprises also participated in the financing of the study. The new coke battery would increase the Bakar annual output by 850,000 tons of coke, thus doubling total output to 1,700,000 tons. In addition, 35,000 tons of tar, 150,000,000 cubic meters of gas, and large quantities of sulfuric acid and ammonium sulfate were to be produced. The investment needed to realize this project was put at $120 million.

Petroleum and Natural Gas.—Only about 20% of the crude oil and 40% of gas consumed in 1986 came from domestic sources. Exploration for both oil and gas continued. Naftagas and Yugopetrol stepped up their efforts in the Morava River Valley (Serbia) following a discovery of a field capable of producing 600,000 barrels per year. It was considered that possible output from the area might reach 3.7 million barrels annually. The same companies along with INA-Naftaplin began a 5-year exploration program on a 4,300-square-kilometer area in the Adriatic Sea off the coast of Montenegro. INA-Naftaplin had four oil strikes and two gas finds during recent exploration near the exhausted Lendava Field in northwest Yugoslavia. Naftagas started up the Velika Greda Oilfield and Banatski Dvor Gasfield, both in Vojvodina, near Vrsac and Zrenjanin, respectively. The Zebanec oil and gas field near Cakovec in Croatia came on-stream during the year. INA-Naftaplin contracted Wimpey Laboratories of the United Kingdom to conduct geotechnical site investigations in the area of the Ivana and Ika Gasfields near Pula, Croatia. INA was also working on the $92 million development of an underground gas storage system at the exhausted Okoli Gasfield near Zagreb. The system would store gas needed to supplement the regular production during the high domestic demand in the winter months.

The country's principal producers-refiners were INA of Zagreb, Naftagas of Novi Sad, and Energoinvest of Sarajevo. The largest of the three was INA with facilities in Croatia and Slovenia. It operated crude oil refineries in Rijeka and Sisak. Its exploration and productions division was Naftaplin. INA also operated a fertilizer and carbon black plant near Kutina, Croatia, and a small refinery and petrochemical plant at Lendava, Slovenia. Naftagas operated in Vojvodina, the northern part of Serbia, and was involved in exploration and production of crude oil and natural gas, refining (Novi Sad, Pancevo), and in the petrochemical industry (Pancevo). Ener-

goinest operated a refinery at Bosanski Brod and a lubricant plant at Modric, but had no exploration or production facilities.

There were three principal areas of production, Sava River, Drava River, and Banat-Backa. INA-Naftaplin was active in the first two while Naftagas operated in the last.

Uranium.—Zirovski Vrh was the only operating mine in the country. This underground operation was rated at 210,000 tons of ore per year. The nearby mill was built to produce 272 tons of yellow cake annually.

Development of a new process for the separation of uranium from phosphoric acid was reported by the Yugoslav engineers and scientists. First uranium concentrates were produced in the pilot plant facilities of the Industrija Hemijskih Proizvoda, Prahovo. If shown that the production of uranium is both technically and economically feasible, construction of a commercial production plant would be considered within the framework of future nuclear and other energy-related investments.

Late in 1985, the Government of Yugoslavia announced plans to spend about $15 billion on the construction of four nuclear powerplants with a capacity of 1,000 megawatts each. However, this project was suspended after the Chernobyl accident and the fate of the nuclear energy program became a topic of lively controversy among both the Government and the public.

[1]Physical scientist, Division of International Minerals.

The Mineral Industry of Zaire

By George A. Morgan[1]

Zaire remained the major world producer of cobalt in 1987 and was second in world production of diamonds. Commodities that were important to the economy and ranked according to export value were copper, crude petroleum, cobalt, diamonds, and coffee.

The gross domestic product (GDP) was estimated at $5 billion,[2] of which mining accounted for about 20%. The real growth rate in the GDP was 1.5%. An economic stabilization program, which was instituted in September 1983, led to greatly reduced inflation, limits on Government spending, and decontrol of most prices. Total medium- and long-term debt was $5.5 billion, of which about 75% was owed to bilateral Government creditors, 14% to multilateral institutions, and 6% to commercial banks. The Government eliminated or privatized a number of agricultural parastatals and instituted a new tax regime for La Générale des Carriéres et des Mines du Zaire (Gécamines). The latter company had improved operations, regained control of sales receipts, and consequently increased its tax payments.

Gécamines, one of the largest mining companies in Africa, was the main vehicle for the generation of wealth in Zaire. Gécamines accounted for about 15% of the GDP, and it supplied on average 20% of budget receipts and about 60% of total payments in hard currency made to the Bank of Zaire. Total annual corporate sales amounted to about $1 billion. Of total net sales of $863 million by Gécamines in 1985, the latest year available, 40% or $349.4 million was retained by the company and the remainder was paid to the Bank of Zaire. In return, the Bank of Zaire provided on Gécamine's account 24.8 million zaires, as well as remitting directly to the company about 55% of the receipts as local currency.

Government support was provided to local entrepreneurs who sought foreign partners for a number of development projects. A new investment code was promulgated in April 1986. Under the code, for investments of a minimum of $100,000, exemptions were possible from certain dividend taxes, import taxes and duties on selected items, indirect duties and taxes, and taxes on capital goods produced in Zaire. For investments exceeding $5 million, more favorable exemptions were available on an ad hoc basis. Investments that occurred in the Inga Industrial Free Zone represented a separate category. Various advantages could be obtained depending on the location of the enterprise, labor requirements and local labor composition, training available, and export potential. Repatriation of profits and earnings was guaranteed to foreign investors, and exemptions from taxes were possible for 5 years, but could range from 1 to 10 years. Those involving mining ventures could be negotiated for longer periods. Zaire became a member of the International Bank for Reconstruction and Development's (World Bank) Multilateral Investment Guarantee Agency, which insured new foreign investment in Zaire from the risks of currency manipulation, expropriation, and civil unrest.

Output from four main hydroelectric plants in Shaba Region, the site of most mining in Zaire, again declined as utilization of electricity from the Inga hydroelectric complex southwest of Kinshasa increased. Gécamines plants increased their dependence on the Inga-Shaba power-line, which extended about 1,800 kilometers from the Inga complex. Of a total consumption of 3,191 megawatt hours in Shaba Region in 1985, the latest year available, 40% was from Inga. Of a total national consumption of 4,753 megawatt hours of electricity, the mining sector accounted for 58%.

Table 1.—Zaire: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[e]
METALS					
Cadmium, smelter	280	308	318	296	300
Cobalt:					
Mine output, Co content[e]	11,300	11,300	18,000	20,000	20,000
Refined	5,475	5,360	9,075	10,791	11,000
Columbium-tantalum concentrate:					
Gross weight kilograms	60,000	51,000	100,000	184,970	120,000
Cb content[e] do	16,200	13,800	27,000	49,500	32,000
Ta content[e] do	16,800	14,300	28,000	51,800	33,600
Copper:					
Mine output, Co content[2]	519,000	536,500	562,000	562,700	563,000
Blister and leach cathodes	473,500	479,100	480,600	480,000	480,000
Refined	175,000	227,231	224,774	226,800	227,000
Gold troy ounces	60,733	192,930	117,115	63,022	60,000
Manganese ore and concentrate	--	--	(3)	--	--
Monazite concentrate, gross weight	32	15	2	--	--
Silver thousand troy ounces	1,751	1,288	1,225	1,516	1,500
Tin:					
Mine output, Sn content	2,320	2,163	2,708	3,100	2,800
Smelter, primary	353	201	170	85	--
Tungsten, mine output, W content	38	44	30	18	15
Zinc:					
Mine output, Zn content	82,100	76,215	74,836	e74,000	74,000
Metal, primary, electrolytic	64,400	62,500	66,100	67,925	60,000
INDUSTRIAL MINERALS					
Cement, hydraulic thousand tons	541	513	529	e480	480
Diamond:					
Gem[e] thousand carats	308	3,355	5,169	4,032	4,661
Industrial stones[e] do	5,856	8,627	13,290	16,127	18,643
Total do	6,164	11,982	18,459	20,159	23,304
Lime	103,825	106,993	109,856	e110,000	110,000
Stone, crushed thousand tons	317	387	348	e350	350
Sulfur:					
Byproduct of metallurgy, S content of sulfuric acid from sphalerite[e]	25,000	36,000	37,000	36,000	36,000
Sulfuric acid, gross weight	146,400	159,864	152,800	169,000	170,000
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous thousand tons	123	111	121	121	e120
Petroleum:					
Crude thousand 42-gallon barrels	8,385	9,234	11,698	12,225	e12,226
Refinery products:					
Gasoline do	173	62	258	18	--
Kerosene and jet fuel do	132	42	240	--	--
Distillate fuel oil do	82	105	422	--	--
Residual fuel oil do	316	101	364	--	--
Refinery fuel and losses do	47	34	67	19	--
Total do	750	344	1,351	37	--

[e]Estimated. [p]Preliminary.
[1]Table includes data available through Aug. 4, 1987.
[2]Content of concentrate produced.
[3]Revised to zero.

Table 2.—Zaire: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984[r]	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	35	--		
Metal including alloys, scrap	--	16	--	All to Belgium-Luxembourg.
Antimony: Ore and concentrate	--	449	--	Do.
Cadmium: Metal including alloys, all forms[2]	308	224	NA	NA.
Chromium: Ore and concentrate	2	--		
Cobalt:				
Oxides and hydroxides	21	--		
Metal including alloys, all forms	[2]13,351	[2]9,298	2,178	United Kingdom 146; unspecified 6,974.
Columbium and tantalum:				
Ore and concentrate	44	26	26	
Ash and residue containing tantalum	87	--		
Copper:				
Ore and concentrate	69,640	[2]59,060	--	Japan 7,908; France 205; unspecified 50,947.
Matte and speiss including cement copper	--	50	--	All to Switzerland.
Ash and residue containing copper	107	--		
Metal including alloys, all forms	[2]449,913	[2]463,913	28,155	Belgium-Luxembourg 212,553; Italy 33,905.
Gold:				
Ore and concentrate value, thousands	$138	--		
Metal including alloys, unwrought and partly wrought troy ounces	1,046	965	--	All to Belgium-Luxembourg.
Hafnium: Metal including alloys, all forms value, thousands	$40	--		
Iron and steel: Metal:				
Ferroalloys	--	25	--	All to France.
Semimanufactures:				
Universals, plates, sheets	1	276	--	All to Ivory Coast.
Tubes, pipes, fittings	13	--		
Castings and forgings, rough	--	24	--	All to Italy.
Manganese: Ore and concentrate, metallurgical-grade	19,704	25,498	--	All to Belgium-Luxembourg.
Nickel: Metal including alloys, unwrought	10	22	--	Japan 12; Sweden 10.
Platinum-group metals: Metal including alloys, unwrought and partly wrought, platinum value, thousands	$1,900	--		
Silver:				
Ore and concentrate[3] do.	--	$1,597	--	All to United Kingdom.
Waste and sweepings do.	$76	--		
Metal including alloys, unwrought and partly wrought do.	$166	--		
Tin:				
Ore and concentrate	[2]3,633	[2]5,095	--	Netherlands 1,761; Spain 426; unspecified 2,908.
Oxides value, thousands	$306	--		
Ash and residue containing tin	124	--		
Metal including alloys, unwrought	320	15	--	Belgium-Luxembourg 5; Italy 5.
Tungsten:				
Ore and concentrate	41	33	21	Japan 10.
Metal including alloys, all forms	[2]33	[2]64	--	Yugoslavia 16; unspecified 48.
Uranium and thorium: Ore and concentrate	22	--		
Zinc:				
Ore and concentrate	--	5,260	--	All to Japan.
Metal including alloys, unwrought	[2]60,400	[2]70,700	12,042	Taiwan 2,295; unspecified 56,363.
Other:				
Ores and concentrates:				
Of base metals	69,999	49	--	Japan 48; Italy 1.
Of precious metals value, thousands	--	$83	--	All to Spain.
Ashes and residues	--	373	--	West Germany 195; Belgium-Luxembourg 169.
Base metals including alloys, all forms	360	1,818	--	West Germany 1,041; France 553.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	--	$3	$3	
Dust and powder of precious and semiprecious stones including diamond value, thousands	$18	$88	--	France $72; West Germany $12.
Grinding and polishing wheels and stones do.	NA	$1,428	--	All to Japan.

See footnotes at end of table.

Table 2.—Zaire: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984[r]	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Cement[2]	168,403	85,208	NA	NA.
Diamond:				
Gem, not set or strung value, thousands	[2]$217,800	[2]$201,500	$180	Belgium-Luxembourg $129,408; unspecified $71,912.
Industrial stones do.	$26,801	$19,164	--	Belgium-Luxembourg $15,568; Japan $1,579.
Dust and powder do.	$1,906	$895	$895	
Diatomite and other infusorial earth	--	15	--	All to Spain.
Meerschaum, amber, jet	--	1	--	All to Taiwan.
Pigments, mineral:				
Natural, crude value, thousands	$174	--		
Iron oxides and hydroxides, processed do.	$190	--		
Precious and semiprecious stones other than diamond:				
Natural do.	--	$452	$318	Hong Kong $76.
Synthetic do.	--	$7	--	Thailand $6; Switzerland $1.
Stone, sand and gravel; Dimension stone, crude and partly worked do.	--	$44	$44	
Other: Crude	--	2	--	Belgium-Luxembourg 1; West Germany 1.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum:				
Crude thousand 42-gallon barrels	11,496	12,561	11,230	Sweden 690.
Refinery products:				
Mineral jelly and wax 42-gallon barrels	--	32	--	All to France.
Distillate fuel oil do.	10,429	NA		
Residual fuel oil do.	37,323	NA		

[r]Revised. NA Not available.

[1]Table prepared by Virgina A. Woodson. Owing to the lack of available official trade data published by Zaire, this table should not be taken as a complete presentation of this country's mineral exports. These data have been compiled from trade statistics of individual trading partners, unless otherwise noted.

[2]Conjoncture Economique (printed in Belgium).

[3]May include waste and sweepings and platinum-group metals.

Table 3.—Zaire: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984[r]	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	71	24	--	United Kingdom 20; Belgium-Luxembourg 4.
Metal including alloys:				
Unwrought	63	1	--	All from Belgium-Luxembourg.
Semimanufactures	1,178	1,137	--	Netherlands 276; Belgium-Luxembourg 261; Hong Kong 238.
Copper: Metal including alloys, semimanufactures	74	99	2	Belgium-Luxembourg 89.
Iron and steel: Metal:				
Scrap	--	10	--	All from Italy.
Pig iron, cast iron, related materials	6	41	--	France 40.
Ferroalloys:				
Ferromanganese	--	10	--	All from Belgium-Luxembourg.
Unspecified	([2])	39	--	Belgium-Luxembourg 22; West Germany 13.
Steel, primary forms	12	3	--	All from Belgium-Luxembourg.
Semimanufactures:				
Bars, rods, angles, shapes, sections	35,282	11,712	--	Belgium-Luxembourg 8,713; Italy 1,030; France 640.
Universals, plates, sheets	26,312	18,285	--	Belgium-Luxembourg 10,569; West Germany 4,575.
Hoop and strip	2,675	1,875	--	Belgium-Luxembourg 1,051; West Germany 761.
Rails and accessories	10,109	1,906	--	Belgium-Luxembourg 714; France 713; West Germany 466.

See footnotes at end of table.

Table 3.—Zaire: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984[r]	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel: Metal —Continued				
Semimanufactures —Continued				
Wire	883	865	6	Belgium-Luxembourg 640; France 112.
Tubes, pipes, fittings	16,601	14,222	842	Italy 5,011; Belgium-Luxembourg 3,301; West Germany 2,799.
Castings and forgings, rough	3,493	3,120	--	Italy 2,407; Belgium-Luxembourg 308.
Unspecified	--	2	2	
Lead:				
Oxides	24	37	--	Belgium-Luxembourg 24; France 11.
Metal including alloys:				
Unwrought	346	1,154	--	All from Belgium-Luxembourg.
Semimanufactures	16	2	--	Do.
Manganese:				
Ore and concentrate, metallurgical-grade	4	4	--	All from France.
Oxides	1	--		
Molybdenum: Metal including alloys, all forms, value, thousands	$15	--		
Nickel: Metal including alloys:				
Unwrought	--	4	--	All from Belgium-Luxembourg.
Semimanufactures	4	1	--	All from Switzerland.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, value, thousands	$6	$29	--	All from Belgium-Luxembourg.
Silver: Metal including alloys, unwrought and partly wrought, do.	$2,589	$1,439	--	Switzerland $1,120; Belgium-Luxembourg $228.
Tin: Metal including alloys:				
Unwrought	--	1	--	All from United Kingdom.
Semimanufactures	2	--		
Titanium:				
Ore and concentrate	--	5	--	All from Belgium-Luxembourg.
Oxides	349	86	--	Belgium-Luxembourg 85.
Zinc:				
Oxides	7	7	--	France 4; Italy 3.
Metal including alloys, semimanufactures	13	6	--	Belgium-Luxembourg 4; France 2.
Other:				
Ores and concentrates	--	20	--	All from Netherlands.
Oxides and hydroxides	8	--		
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1	--		
Artificial:				
Corundum	--	4	--	All from Hong Kong.
Silicon carbide, value, thousands	--	$3	--	All from Canada.
Grinding and polishing wheels and stones	35	90	--	Italy 39; Belgium-Luxembourg 36.
Asbestos, crude	531	210	--	All from Canada.
Barite and witherite	1,859	1,305	--	Italy 1,100; Netherlands 200.
Boron materials: Oxides and acids	1	--		
Cement	3,161	3,614	--	Belgium-Luxembourg 3,606.
Chalk	114	164	--	Belgium-Luxembourg 105; France 59.
Clays, crude:				
Bentonite	--	210	--	Netherlands 170; Italy 40.
Kaolin	--	7	--	All from Italy.
Unspecified	31	59	--	United Kingdom 40; Belgium-Luxembourg 19.
Diamond:				
Gem, not set or strung, value, thousands	$32	$433	--	All from Switzerland.
Industrial stones, do.	--	$52	--	Do.
Diatomite and other infusorial earth	277	911	--	Belgium-Luxembourg 609; France 302.
Feldspar, fluorspar, related materials	30	15	--	Netherlands 10; West Germany 5.
Fertilizer materials:				
Crude	300	301	--	All from Belgium-Luxembourg.
Manufactured:				
Ammonia	80	52	--	Belgium-Luxembourg 26; Netherlands 15; France 11.
Nitrogenous	21,838	11,308	--	France 7,131; Netherlands 1,553.
Phosphatic	413	857	--	All from Belgium-Luxembourg.
Potassic	919	101	--	Belgium-Luxembourg 100.
Unspecified and mixed	12,326	7,030	--	Belgium-Luxembourg 3,786; France 1,979; West Germany 1,265.

See footnotes at end of table.

Table 3.—Zaire: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984[r]	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Graphite, natural	1	--		
Gypsum and plaster	14,072	178	--	France 155; Belgium-Luxembourg 23.
Lime	3,142	1,508	--	Belgium-Luxembourg 1,398; West Germany 100.
Magnesium compounds:				
Magnesite, crude				
value, thousands	--	$50	--	Canada $46; Belgium-Luxembourg $4.
Other	--	441	--	All from Belgium-Luxembourg.
Mica:				
Crude including splittings and waste	--	4	--	All from France.
Worked including agglomerated splittings	--	--		
value, thousands	$12			
Phosphates, crude	40	50	--	All from Belgium-Luxembourg.
Pigments, mineral: Iron oxides and hydroxides, processed	82	18	--	Belgium-Luxembourg 12; France 5.
Precious and semiprecious stones other than diamond, natural				
value, thousands	--	$48	--	All from Switzerland.
Salt and brine	135	145	--	Belgium-Luxembourg 128; France 12.
Sodium compounds, n.e.s.: Carbonate, manufactured	2,428	1,889	--	France 1,869; Belgium-Luxembourg 20.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	64	91	--	All from Italy.
Worked	261	714	--	Portugal 317; Greece 194; Italy 96.
Dolomite, chiefly refractory-grade	1	--		
Gravel and crushed rock	283	381	363	France 10.
Quartz and quarzite	18	--		
Sand other than metal-bearing	2,915	485	469	Belgium-Luxembourg 16.
Sulfur:				
Elemental:				
Crude including native and by-product	150	283	--	All from Belgium-Luxembourg.
Colloidal, precipitated, sublimed	1	3	--	All from Italy.
Sulfuric acid	576	180	--	Belgium-Luxembourg 119; Netherlands 41; United Kingdom 20.
Talc, steatite, soapstone, pyrophyllite	216	406	--	France 309; Belgium-Luxembourg 85.
Other:				
Crude	470	65	--	All from Belgium-Luxembourg.
Slag and dross, not metal-bearing	--	65	--	Do.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	6	4	--	All from United Kingdom.
Carbon black	202	680	608	West Germany 34; Belgium-Luxembourg 24.
Coal:				
Anthracite and bituminous	--	12	--	All from Belgium-Luxembourg.
Briquets of anthracite and bituminous coal	--	126	--	Do.
Lignite including briquets	--	10	--	All from West Germany.
Coke and semicoke	1,018	1,002	--	All from Belgium-Luxembourg.
Peat including briquets and litter	--	9	--	Do.
Petroleum:				
Crude				
thousand 42-gallon barrels	1,460	730	--	All from Angola.
Refinery products:				
Gasoline, motor ---do---	754	170	--	Portugal 164; Belgium-Luxembourg 3.
Mineral jelly and wax ---do---	6	2	[3]	Belgium-Luxembourg 1.
Kerosene and jet fuel ---do---	2,009	24	--	All from Portugal.
Distillate fuel oil ---do---	5,026	26	--	France 25.
Lubricants ---do---	163	32	1	Belgium-Luxembourg 18; France 6; Spain 6.
Residual fuel oil ---do---	[4]80	[4]437	NA	NA.
Asphalt	--	[3]	[3]	
Bitumen and other residues ---do---	11	16	--	Spain 15.
Bituminous mixtures ---do---	8	23	--	Spain 21; Belgium-Luxembourg 2.
Petroleum coke ---do---	44	[3]	--	All from Belgium-Luxembourg.

[r]Revised. NA Not available.

[1]Table prepared by Virginia A. Woodson. Owing to the lack of available official trade data published by Zaire, this table should not be taken as a complete presentation of mineral imports of this country. These data have been compiled from the trade statistics of individual trading partners unless otherwise noted.

[2]Value only reported at $104,000.

[3]Less than 1/2 unit.

[4]Conjoncture Economique (printed in Belgium).

PRODUCTION AND TRADE

The total value of exports was $1.87 billion and the total value of imports was $1.5 billion. The value of U.S. exports to Zaire was $104.2 million and consisted mainly of mining and transport equipment and wheat. The value of U.S. imports from Zaire was $239 million, consisting of crude petroleum, zinc, copper, and cobalt.

Zaire sought commitment from multilateral lenders and the U.S.S.R. for $500 million of a $700 million project to renovate the National Route. The National Route, a 1,600-mile-long transport route between Shaba Region and the Atlantic port of Matadi, was the only export route entirely within Zaire. Other export routes required transshipment across international boundaries to ocean ports. The National Route itself consisted of a combination of road, railroad, and river barge transport. Renovation would involve construction of a railroad to parallel and replace the current barge transport section between the river ports of Ilebo and Kinshasa on the Kasai River.

Agence Maritime Internationale du Zaire was the Government's official transit agent and controlled most imported goods. It also represented AMI Zimbabwe (Pvt.) Ltd. of Zimbabwe, which handled road and container traffic. Transit times for railroad shipments from Zimbabwe through Zambia have been up to 60 days.

COMMODITY REVIEW

METALS

Cobalt.—Gécamines, through its sales agent, Afrimet-Indussa Inc., set a producer price of $7.00 per pound for cobalt following a pricing agreement with Zambia in December. Gécamines allowed for discounts from the producer price for customers with large orders under long-term agreement.

Columbium and Tantalum.—The Société Minière du Kivu completed 10 separate tests in its mining and processing of the Lueshe carbonatite at its pilot plant. While results were satisfactory, further metallurgical work remained, and pilot plant research was extended to the Bingo carbonatite. Capacity of the pilot plant was increased from 1.5 tons per hour to 2.5 tons per hour. About 300 tons of concentrate was shipped to the Federal Republic of Germany for further concentration and metallurgical testing.

Copper.—Gécamines proceeded with fulfillment of its third 5-year plan, which was designed to maintain production capacity at 470,000 tons per year. The plan included purchase of a mobile, in-pit crusher with conveyor for the Kov Mine; the installation of a new sulfuric acid reactor at Shituru; and improvements in the transport and maintenance systems. A drying unit, 13 water cooling units, 6 electrofilters, and an acid storage tank remained to be installed at the Shituru acid plant. Capacity of the plant was about 500 tons of acid per day. Following a series of equipment shipping delays, attempts to install a baghouse dust collector at the Lubumbashi smelter for the recovery of 3,000 tons of copper per year, as well as other metals, resulted in damage to two motors. Replacement motors were on order to complete the installation. Planning for the fourth 5-year plan, 1991-95, included an increase in capacity to 570,000 tons of copper per year by yearend 1995, a $100 million pyrometallurgical plant at Kolwezi, and development of the Tenke-Fungurume copper-cobalt deposit. The installation of electric haulage in the open pit mines remained a priority objective.

Overburden removal at the western group mines lagged for the fifth consecutive year, and a Canadian firm was contracted to coordinate production and staffing of the mines. Reserves at the Musonoi, Mupine, Mutoshi, and Kakanda Mines were steadily being exhausted, and the Kov and Kamfundwa Mines were prepared as replacements. A total of 31.6 million cubic meters of material was mined from open pits in 1985, the latest year available, and 6.3 million tons was mined from underground mines. The Kov Mine, a major open pit mine in the western group, produced 736,000 tons of ore in 1985, and output for 1986 was estimated at 1,140,000 tons. The underground Kambove Mine in the central group of mines was scheduled for closure at yearend 1987 owing to depletion of reserves. The concentrator at Kambove would be used to treat ore from the new Kamfundwa Mine. Insufficient production from the central group of mines necessitated the shipment of about 800,000 tons of copper concen-

trate from the western group of concentrators to the metallurgical plants near Shituru. Refined copper production capacity for Gécamines was 250,000 tons per year at the Shituru refinery. The plant also had production capacity of about 40,000 tons of soluble anodes per year.

The Société de Développement Industriel et Minière du Zaire, 100% Government-owned, shipped its output of copper concentrates to Zambia where they were received by RST Resources Corp. of the United States. RST Resources handled smelting and refining of the copper concentrates in Zambia at Luanshya prior to selling the metal to Japan. Payment for the concentrates was in the form of vehicles by General Motors Corp. of the United States. Philips Barrett Kaiser of Canada was contracted to operate the mines until November 1986. The Executive Council created a commission to determine the extension of the contract for an additional 3 years. To sustain a continuing supply of ore from the Kinsenda Mine, a new shaft costing about $8 million was planned for construction beginning in early 1987.

Table 4.—Zaire: Copper production in 1985, by mine or plant

(Thousand metric tons)

Mine or plant	Ore	Concentrate	Copper content
	Gross weight		
MINE			
Western group:			
Open pits	8,751	--	384.1
Kamoto underground	3,138	--	132.5
Central group:			
Kambove underground	1,637	--	49.1
Open pits	848	--	24.2
Kipushi underground[1]	1,539	--	53.4
Sodimiza underground	1,000	--	36.5
Total	16,913	--	679.8
CONCENTRATOR			
Western group:			
Kamoto	6,672	532	213.6
Kolwezi	4,142	696	162.1
Mutoshi	2,052	65	18.2
Dima	945	131	27.6
Central group:			
Kambove	1,501	88	38.5
Kakanda	739	82	17.3
Kipushi[1]	1,542	164	47.9
Sodimiza	1,007	63	32.7
Total	18,600	1,821	[2]557.9

[1]The Kipushi ore also contained 105,600 tons of zinc, and the Kipushi concentrator produced 137,000 tons of zinc concentrate containing 74,500 tons of zinc.
[2]Total copper recovered by la Générale des Carriéres et des Mines du Zaire (Gécamines) in 1985 was 486,800 tons.

Sources: Gécamines Annual Report 1985; Sodimiza Annual Report 1985.

Gold.—The Government-owned Offices des Mines d'Or Kilo-Moto (Okimo) and Andrade-Guteriez S.A. of Brazil completed plans for development of the D7-Kanga gold deposit in northeastern Zaire. Output would be about 180,000 troy ounces (revised) per year. Mine development was to be completed in 3 years, and Andrade-Guteriez would operate it for Okimo for 7 years with an option to continue operations for an additional 14 years. About $65 million of the $100 million capital investment required would be provided by the African Development Bank, with repayment over a 15- to 20-year period and an 8- to 10-year grace period. The Bank of Brazil would provide the remainder as a credit for the purchase of Brazilian equipment at 8% interest per year. The loans were to be amortized by 15% of the proceeds from the sales of gold produced on an annual basis. Refining of gold produced by Okimo took place in Switzerland since June 1985. According to a convention made with the Bank of Zaire, 50% of refined gold production was sent to the bank; the remainder was sold by Okimo on the world market.

Byproduct gold from blister copper shipped to Hoboken, Belgium, for refining was recovered for Gécamine's account. Re-

covery was about 160,000 troy ounces per year.

Manganese.—Efforts were being made by the Government-owned Entreprise Minière de Kisenge Manganese (EMK) to negotiate a favorable price with transportation parastatals for the transport of manganese ore from the minesite at Kisenge to the port of Matadi. Export would be to Europe. EMK continued its efforts to restart a battery plant and to build a plant to process rhodochrosite to manganese dioxide. Shipments of several thousand tons per year of stockpiled ore have been made to Gécamines, and to a battery plant in Kinshasa.

Tin.—Production of tin ore by Zairetain ceased at Manono in 1985 owing to poor market conditions and the cost of mining and processing hard pegmatite deposits. Metal production also ceased at Zairetain, which had the only tin smelter in Zaire, with a capacity of 12,000 tons per year. The Government was seeking a partner to restart the Manono plant. About 90% of output by the Société Minière et Industrielle du Kivu (Sominki), previously transported to Kinshasa via C-130 cargo planes, was shipped by river to Ubundu, then by rail to Kisangani. From Kisangani it was again shipped by barge on the Zaire River to Kinshasa, and thence by railroad to the port of Matadi. The remaining 10% was shipped by a combination of road, railroad, and river to Kinshasa via the Kasai River. Sominki, which normally employed about 12,000 workers, placed about 6,000 workers on unemployment with Government approval owing to Sominki's inability to sell tin from May 1986 in an oversupplied market.

Zinc.—About 175,000 tons of mixed zinc-copper concentrate was shipped annually from the Kipushi Mine in the southern group to the sulfuric acid plant in the central group. The concentrates graded between 54% and 58% zinc and were roasted to produce a concentrate grading about 62% zinc. The roasted concentrates were then shipped to the Uzine de Zinc de Kolwezi for electrowinning. Capacity was 72,000 tons of electrolytic zinc per year.

INDUSTRIAL MINERALS

Output and earnings by the Société Minière de Bakwanga (MIBA) were up in 1986, and the average price was $8.26 per carat compared with an agreed floor price of $7.90 per carat. The minimum floor price was made with DeBeers Central Selling Organization, which had the right to purchase all of MIBA's output. Output by artisanal miners, as indicated by purchases recorded by 20 registered buyers-counters, was 14.2 million carats compared with 12.4 million carats in 1985.

MIBA was restructured in October 1986, according to the terms of an agreement reached between the Government and Société d'Entreprises et d'Investissements S.A. (Sibeka), which owned 20% of MIBA, wherein the Government regained administrative control of MIBA. The president of the administrative council, which consisted of eight members, three chosen by Sibeka and five by the Government, was responsible for the day-to-day operations of MIBA. MIBA worked eight separate deposits with overburden-to-ore ratios varying from zero to nine. Three washeries were operational, as well as a dredge at Dibindi. Output from the Massif III deposit was treated at the Massif V and Disele washeries, and concentrates were sent to the main concentrating plant. Output from all other deposits, including production by dredge, was first sent to the central washing and classification plant prior to processing at the main concentrating plant. The central sorting plant completed the diamond recovery process by MIBA.

Construction of the new hydroelectric plant, Lubilanji II, in east Kasai Region was nearly completed. Total generating capacity of the plant was to be 8,400 kilowatts. MIBA was primarily responsible for financing the plant, and its output was considered indispensable to MIBA's future diamond production plans.

MINERAL FUELS

Hydro-Quebec International of Canada completed a study of Zaire's electrical system. Total installed hydroelectric generating capacity as of July 1986 was 2,486 megawatts and was about three times the country's requirements. Some electricity was exported to Burundi, Congo, and Zambia. The Inga I plant, which has been operated at only 15% of capacity because of limited demand, had damage to its turbines and required repair.

The International Development Association approved $37 million for rehabilitation of the Ruzizi I hydroelectric plant and of the distribution networks of Bukavu, Goma, Kiliba, and Uvira, in eastern Zaire. Rehabilitation of the distribution network in Shaba Region and maintenance work on the

Inga plants were included in the loan.

The Government announced its decision to build a 6-megawatt hydroelectric plant at Kakobola on the Lukufu River, thus supplying electricity to Kikwit and the region of Kwilu.

Coal.—Coal imports were primarily for the metal processing plants of Gécamines in Shaba Region. Imports of coal from Zimbabwe to plants at Likasi were 5,000 tons per month, and 7,000 tons of coke per month was also imported from Zimbabwe for the copper smelter at Lubumbashi. Total cost was about $10 million. Total consumption for Zaire was about 250,000 tons of coal per year.

Petroleum.—Crude petroleum imports were virtually nil as the country's sole refinery at Kinlao required major redesigning. Locally produced crude oil was all exported. Output from offshore oilfields was as follows in thousand barrels: GCO, 289; Lukami, 2,321; Mibale, 6,184; Motoba, 19; and Mwambe, 75.

Consumption of petroleum products increased, but utilization of fuel oil continued to decline as reliance on electricity went up. Diesel fuel made up 55% of total refined product consumption. Imports of refined products were mainly through the port of Ango-Ango, near Matadi. Small quantities were shipped through Sakania on the border with Zambia in southern Shaba Region, and through Uganda and Tanzania into eastern Zaire.

Amoco Zaire Petroleum Co., a subsidiary of Amoco Production Co. of the United States, signed a concession agreement with the Government and Petrozaire, the state-owned petroleum company. The agreement provided for exploration over three 5-year periods of blocks 3 and 4. Block 3 and block 4, consisting of 1.85 million acres and 6.11 million acres, respectively, covered the western portion of Lake Tanganyika.

Negotiations were under way between the Executive Council, which reviews capital projects for the Government, and an unidentified consortium to explore for petroleum in blocks 1 and 2, which are Lake Mobutu and Lake Edward, respectively.

Compagnie Française d'Études et de Construction Technip of France was contracted to conduct a feasibility study on transport needs for the crude petroleum and refined products sector. Under study were an offshore terminal, a pipeline to storage facilities at the Muanda refinery, and a multiproduct pipeline between Muanda and the port of Matadi. Financing for the project was by the World Bank.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from zaires (Z) to U.S. dollars at the rate of Z55.793=US$1.00 for 1985, and Z71.100=US$1.00 for 1986.

The Mineral Industry of Zambia

By Thomas O. Glover[1]

Copper and byproduct cobalt production continued to dominate the Zambian mining industry in 1986. Their combined value amounted to $406.8 million,[2] which represented 91.4% of the total value of all minerals produced during the year. Other minerals produced that were of importance to the Zambian economy were zinc, $10.2 million; coal, $7.4 million; cement, $5.7 million; and lime, $5.4 million. The combined value of these four commodities was $28.7 million or 6.5% of the total mineral production value.

Zambia was the world's sixth largest producer of copper and the third largest producer of cobalt. Zambia's economy was faced with growing difficulties that grew progressively worse by yearend. As part of an International Monetary Fund (IMF) financial restructuring program, the Government of Zambia was obliged to introduce a number of severe economic measures. These included the decontrol of bank interest rates, removal of subsidies on basic food, liberalization of the import licensing system, and a foreign exchange auction system. Owing to the small amount of available foreign exchange and the continuous high and escalating demand for foreign exchange, the Zambian kwacha dropped from $0.455 per kwacha on October 8, 1985, before start of auction, to $0.066 per kwacha on November 29, 1986.

Before the auction was introduced, foreign exchange constraints led to a sharp fall in gross investments and a reduction of imports needed for maintaining higher levels of production in the economy. The problem of foreign debt complicated Zambia's economic problems. The country's external liabilities totaled $5.8 billion, including more than $600 million in arrears on medium- and long-term debts. With copper and cobalt exports accounting for 90% of export earnings and 50% of the gross domestic product, the 75% fall in the real price of copper since 1973, coinciding with high real interest rates on foreign payments, created a crisis that entailed a backlog of arrears on payments abroad and substantial foreign borrowing.

Food riots started December 8, 1986, on Zambia's copper belt over the 120% rise in the food staple mealie-meal. The riots were only the tip of public resentment toward the country's fiscal policy. Strikes against public institutions also occurred during 1986.

To improve the Chinese-built Tanzania-Zambia Railway line (TAZARA), several Western European and other Governments and international organizations pledged $34.4 million in assistance. A considerable portion of TAZARA must be refurbished to handle all the scheduled shipments to the Dar es Salaam Port.

PRODUCTION AND TRADE

Zambia's production of refined copper metal decreased 4% in 1986, while the production of refined cobalt metal decreased only slightly. Copper ore milled in fiscal year 1986 (April 1, 1985, to March 31, 1986) decreased about 13% from that of fiscal year 1985 (April 1, 1984, to March 31, 1985), although the grade of ore remained about the same. In 1986, Zambia Consolidated Copper Mines Ltd. (ZCCM) production came from 10 underground mines and 4 open pit mines at the company's 5 operating divisions.

By the end of January, ZCCM had announced a new 5-year plan to rehabilitate and restructure its mining operations. The plan involved the closure of three copper mines and a lead-zinc mine as well as three operating plants. The plan also included streamlining management and the decentralizing of decision-making processes throughout the company. ZCCM also announced a major reorganization and streamlining of its top management as part of the plan. The company's operational center was moved to Kalulushi, Zambia, from Lusaka where immediate action could be expected on operational activities. The new Nchanga tailings leach plant was officially commissioned on September 25, 1986, in the copper belt town of Chingola. Several technical problems were encountered subsequent to the startup operation. Planned production from the leach plant had not been met.

Zambia was investigating the possibilities of exporting mineral products through other than South African ports. Zambia, already shipping via rail through the Port of Dar es Salaam, Tanzania, took into consideration the Port of Beira in Mozambique and the Port of Lobito in Angola. Both ports, however, were serviced by railroads under attack by resistance groups. The Beira railway and port were partly operational, but the Benguela railway and the Lobito Port were not operational in 1986.

Table 1.—Zambia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[p]
METALS					
Cobalt:					
Mine output, Co content of ore concentrate	[e]3,251	3,199	4,620	[e]5,800	[e]5,770
Metal	2,446	2,407	3,472	4,359	4,344
Copper:					
Mine output:					
Total content of ore	720,290	868,251	668,688	608,092	614,230
Recoverable content of concentrate[2]	[r]574,507	[r]540,961	532,679	458,573	[e]457,000
Leaching (electrowon including that in recoverable content)[2]	[r]118,975	[r]134,377	125,909	103,910	[e]110,000
Metal:					
Blister and anodes, Cu content[e 3]	[4]584,680	581,200	525,000	482,300	463,178
Refined	584,613	575,423	521,871	479,446	460,437
Gold[5] troy ounces	13,439	10,160	12,185	7,909	1,865
Iron ore: Magnetite	797	715	595	984	637
Lead:					
Mine output, Pb content of ore	21,240	25,865	18,124	15,021	14,851
Metal, smelter and refined[6]	14,645	14,572	8,825	8,873	6,648
Selenium, recoverable content of:					
Refinery muds kilograms	[7]42,668	[7]42,752	[e]33,650	[e]37,790	[e]29,870
Elemental, refined locally do.	22,453	22,051	[2]17,355	[2]19,490	15,405
Silver[8] thousand troy ounces	887	933	795	607	861
Tin concentrate, gross weight	10	22	4	22	3
Zinc:					
Mine output, Zn content of ore	51,967	55,163	41,128	31,956	33,017
Metal, smelter plus electrolytic	39,186	37,882	29,177	22,766	22,493
INDUSTRIAL MINERALS					
Cement, hydraulic thousand tons	154	155	(9)	316	334
Clays, building, not further specified do.	27	9	209	2	4
Feldspar	362	226	184	185	214
Gem stones:					
Amethyst kilograms	23,476	38,799	24,827	19,612	6,991
Emerald do.	--	17	23	115	413
Lime, hydraulic and quicklime thousand tons	185	193	232	256	243
Nitrogen: N content of ammonia	27,200	[r]27,800	27,900	17,600	[4]24,700
Sand, construction	365,437	182,752	52,513	38,978	83,593
Stone:					
Limestone thousand tons	427	511	916	702	705
Phyllite do.	9	10	17	13	19
Miscellaneous (building)	4,338,653	193,625	72,741	108,251	133,804
Sulfur, elemental basis (produced as sulfuric acid):					
From pyrite	1,239	25,513	18,172	28,288	19,187
From copper ores[e]	[4]83,870	79,525	79,000	79,008	74,000
Total[e]	[4]85,109	105,038	97,172	107,296	93,187
Talc	271	1,313	367	9,529	266

See footnotes at end of table.

Table 1.—Zambia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[p]
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous thousand tons	604	453	510	471	557
Petroleum refinery products:[e 2]					
Gasoline thousand 42-gallon barrels	NA	NA	1,016	870	NA
Jet fuel do	NA	NA	350	294	NA
Kerosene do	NA	NA	217	198	NA
Distillate fuel oil do	NA	NA	1,706	1,603	NA
Residual fuel oil do	NA	NA	768	677	NA
Other do	NA	NA	60	51	NA
Refinery fuel and losses do	NA	NA	240	258	NA
Total do	NA	NA	4,357	3,951	NA

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Table includes data available through May 21, 1987.
[2]Data are for fiscal year beginning Apr. 1 of that stated.
[3]Includes leach cathodes.
[4]Reported figure.
[5]Primarily contained in blister copper and refinery muds.
[6]For all practical purposes, Zambian output of crude lead and refined lead are regarded as equal; the latter is reported, and inasmuch as no impure lead is marketable, no attempt had been made to estimate the trivial difference between the two stages of processing.
[7]Selenium output for fiscal year ending Mar. 31, includes elemental selenium recovered from exported refinery muds by overseas refiners amounting to 20,215 kilograms in 1982 and 20,701 kilograms in 1983.
[8]Refined silver and silver contained in blister copper and refinery muds.
[9]Less than 1/2 unit.

Table 2.—Zambia: Copper production and ore reserves of Zambia Consolidated Copper Mines Ltd., by mine[1]

Mine	Ore milled and treated			Ore reserves		
	Gross weight (thousand metric tons)	Copper grade (percent)	Copper recoverable in copper concentrate (percent)	Gross weight (thousand metric tons)	Copper grade (percent)	Cobalt (percent)
Baluba[2]	2,168	1.71	95.31	49,283	2.54	0.17
Chambishi[2]	1,358	1.53	94.80	22,241	2.81	--
Chibuluma[2]	600	2.16	95.71	8,133	3.34	.22
Kansanshi	--	--	--	4,278	2.97	--
Konkola[2]	1,527	2.87	86.40	49,260	3.84	.07
Luanshya[2]	2,314	1.36	95.69	38,679	2.46	--
Mufulira[2]	3,548	2.07	93.26	82,183	3.07	--
Nchanga[2 3]	9,373	2.89	63.33	121,398	3.67	.52
Nkana[2]	3,525	1.40	92.15	79,274	2.40	.15
Total or average	24,413	2.21	81.74	454,729	3.08	.29

[1]Data shown are for fiscal year Apr. 1, 1985, through Mar. 31, 1986.
[2]Underground.
[3]Open pit.

Source: Zambia Consolidated Copper Mines Ltd. 1986 Annual Report.

COMMODITY REVIEW

METALS

Copper, Cobalt, Byproduct Gold, Selenium, and Silver.—ZCCM treated approximately 24.2 million tons of ore in 1986 yielding about 458,570 tons of copper metal. Ore reserves, as published in the ZCCM Annual Report for the year ending March 31, were estimated at 14 million tons of contained copper and about 0.89 million tons of contained cobalt. Production of cobalt in 1986 decreased slightly from that of 1985.

ZCCM's largest copper producer continued to be the Nchanga Div. The Nchanga open pit copper mine was the largest open pit mine in Zambia and one of the largest open pit mines in Africa. In addition to the Nchanga open pit mine, the division operated underground mines at Nchanga and Chambishi, an open pit at Kansanshi, and three other small open pits. On April 1, 1985, the Nchanga Div. took over management of the Chambishi Mine, which had commenced production 20 years previously. The Chambishi Mine was first started as an open pit and in later years was converted to an underground mine. Only the Nchanga open pit and underground mines produced cobalt. Production from the remote Kansanshi open pit was discontinued on February 1, 1986, as part of ZCCM's economy programs. The Nchanga Div.'s metallurgical plants consisted of a conventional sulfide concentrator at Chambishi and a sulfide-oxide concentrator at Nchanga. A leach plant and a tailings leach plant were also at Nchanga. The third stage of the construction at the tailings leach plant had several technical operating problems during the year. In the eastern extension of the Nchanga pit, drilling was continued to evaluate the extent of cobalt mineralization. Results confirmed the existence of greater copper and cobalt ore reserves at Nchanga. A total of 9.373 million tons of 2.89% copper were delivered to the Nchanga concentrators from the Nchanga open pits, the Kansanshi open pit, and the Nchanga underground mine. In addition, a total of 388,000 tons of cobalt ore from the Nchanga open pit, at average grades of 0.75% cobalt and 1.52% copper, were treated in the Nchanga, Nkana oxide, and Konkola concentrators. An additional 1.358 million tons of copper ore from the Chambishi Mine, at a grade of 1.53% copper, were delivered to the Chambishi concentrator. At the Nchanga open pits, procurement was completed for the second stage of the trolley assist system, and 2,000 feet of trolley lines were installed. The trolley assist system was scheduled for completion in 1987. The trolley assist system, when completed, will power all of the haulage trucks out of the pits electrically; the trucks will then switch to diesel power to complete their trip. The Nchanga Div. employed 12,607 people at its operations on March 31, 1986.

The Mufulira Div. included the Mufulira Mine, one of the world's largest underground copper mines, plus concentrating, smelting, and refining operations. A total of 3.596 million tons of ore was hoisted that graded 2.07% copper. Ore production was below the scheduled rate owing to inadequate developed reserves, a shortage of labor owing to strikes, greater support requirement caused by rock stresses, and low plant and equipment availabilities resulting from a shortage of foreign exchange. The Mufulira Div. employed 7,773 people at its operations on March 31, 1986.

The Nkana Div. had the deepest underground copper mining operation in Zambia. The Nkana Div. commenced production in 1932 and produced copper and cobalt from four ore sources: Mindola, Central Shaft, the South Ore body, and Chibuluma. The process plants included three concentrators, two cobalt plants, a smelter, and a refinery. The Nkana Div. also had major sulfuric acid producing facilities. Combined ore deliveries from three underground sources at the Nkana Mine in 1986 were 3.526 million tons at a grade of 1.40% copper and 0.097% cobalt. Ore delivered from the Chibuluma Mine amounted to 0.599 million tons at a grade of 2.16% copper and 0.18% cobalt. The Nkana Div. employed 14,412 people at its operations on March 31, 1986.

The Luanshya Div. operated the Luanshya and Baluba underground copper mines. In addition to copper, Baluba also produced cobalt. Although the ore tonnage produced from each mine was similar in 1986, the Baluba Mine expanded production while the Luanshya Mine contracted production as its reserves were worked out. The Luanshya Mine commenced operation in 1927; the Baluba Mine commenced production in 1973. Ore produced from the Luan-

shya Mine in 1986 totaled 2.314 million tons containing 1.36% copper. Ore produced from the Baluba Mine amounted to 2.168 million tons containing 1.71% copper and 0.14% cobalt. Ore production at both mines, as well as development advance achievements were restricted by shortages of spare equipment parts and consumable items. The Luanshya Div. employed 8,943 people at its operations on March 31, 1986.

The Konkola Div. operated the Konkola underground copper mine and a concentrator. The concentrator produced copper concentrates from Konkola ore and cobalt concentrates from Nchanga cobalt ore. On April 1, 1986, the Konkola Div. merged with the Nchanga Div. The Konkola Mine, in production since 1957, was one of the wettest mines in the world. Ore produced by the Konkola Mine was 1.544 million tons at a grade of 2.87% copper. The Konkola concentrator produced 38,276 tons of copper concentrates from the Konkola ore and 1,066 tons of copper concentrates and 467 tons of cobalt concentrates from the Nchanga cobalt ore.

During 1986, corporate restructuring continued from the preceeding year. The number of operating divisions was decreased from seven to five and the number of strip mines from five to four. The number of underground mines remained at 10. Kalulushi, Zambia, on the Zambian copper belt became the operational headquarters for ZCCM replacing Lusaka. Head office functions in Lusaka were limited to corporate policy formulation, strategies and plans, and financial control.

During fiscal year 1986 (April 1, 1985, to March 31, 1986), the Ndola precious metals plant produced 21.7 tons of silver, 0.28 ton of gold, and 15.4 tons of selenium from the anode slimes. Minor quantities of platinum-palladium salts were also produced. In addition, 30 tons of decopperized slimes were exported.

Lead, Zinc, and Byproduct Silver.—The Kabwe Div., operators of the Kabwe lead-zinc operation and the Nampundwe copper-pyrite operation, was operated by ZCCM. The Kabwe Mine had been operational since 1906, making it ZCCM's oldest operating mine. In addition to lead and zinc, silver was also produced as a byproduct. The Kabwe metallurgical plant consisted of a concentrator, a leach and electrowinning zinc plant, a Waelz kiln complex, a sinter plant, an Imperial smelting furnace, and a lead refinery. The Nampundwe operation had a concentrator near Lusaka where copper and pyrite concentrates were produced. The Kabwe Mine produced 150,728 tons of ore in 1986 grading 10.8% lead and 21.8% zinc. The Nampundwe Mine produced 285,418 tons of ore grading 11.7% sulfur and 0.4% copper. The Kabwe Mine had about 2 more years to operate prior to closure. A team of managers was appointed to plan its orderly closure.

INDUSTRIAL MINERALS

Fertilizer Materials.—Nitrogen Chemicals of Zambia (NCZ) was approved by a group of international financiers to embark on an $83.75 million rehabilitation program at its Kafue fertilizer plant. The work involved the upgrading of the plant's ammonia unit to a capacity of 300 tons per day, with the ammonium nitrate and fertilizer units also revamped. After completion of the rehabilitation program, to be carried out by Klöckner AG of the Federal Republic of Germany and Kobe Steel Ltd. of Japan, production was expected to improve.

Gemstones (Amethyst, Aquamarine, Emerald, Garnet, and Tourmaline).—An agreement for the mining and marketing of amethyst was signed by the United Kingdom-based multinational, the Lonrho Group, and the Government of Zambia. The agreement involved the formation of two companies on a joint basis, Kariba Minerals and Kariba Amethyst Marketing. Controlled mining of precious and semiprecious stones had not been effective in prior times. The agreement called for equal partnership between Lonrho and the Zambian Government. The mining of additional deposits of aquamarine, garnet, and tourmaline commenced midyear in the Lundazi District of Zambia.

Zambia sold Israel 100 kilograms of rough emeralds that were valued at $1 million at an auction in Switzerland in September 1986. Zambia issued 30 new emerald mining and exploration licenses during the year.

MINERAL FUELS

Coal.—Production of coal at the Maamba Collieries increased approximately 18% from that of 1985 to 557,099 tons valued at $7.4 million, a 7.3% increase in value. Maamba Collieries made steady progress in its three-stage $22 million rehabilitation program begun in 1985. The program was scheduled for completion by the end of 1989. The targeted production was 600,000 tons per year. A loan from the African Development Bank financed the development pro-

gram. A pilot scheme testing the acceptability of smokeless fuel briquets produced from Zambian coal as a substitute for wood or charcoal was undertaken in the United Kingdom with the purpose of countering the depredation of Africa's forests.

Petroleum.—In March 1986, Placid Oil Co. of the United States signed exploration and production agreements with Zambia. Under the agreements, covering a time frame of 25 years, the company will explore 14,350 square miles in the Luangwa Valley east of Lusaka and 17,000 square miles in western Zambia. The exploration agreement was for 4 years, and it may be extended by two 2-year periods. If commercial discoveries are made, production under a 25-year agreement will be shared with the Government of Zambia, which will have an option to acquire participating interests.

Mobil Oil Exploration Zambia, a subsidiary of Mobil Oil Corp. of the United States, joined Placid Oil in the search for oil in Zambia. Mobil pledged $26 million over 4 years for exploration of the 14,350-square-mile tract leased by Placid Oil in the Luangwa Valley.

Repair of the 1,054-mile Tanzama crude oil pipeline, from Dar es Salaam, Tanzania, to the Ndola refinery in Zambia, was under way in 1986 and scheduled for completion in 1987. Approximately $4.1 million will be expended on the repair of the pipeline. After the repair is completed, the line may then be extended 150 miles northward to Lubumbashi in Zaire.

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[1]Physical scientist, Div. of International Minerals.

[2]Where necessary, Zambian kwachas (K) have been converted to U.S. dollars at the rate of K1=US$0.07796.

The Mineral Industry of Zimbabwe

By Thomas O. Glover[1]

In terms of basic production volume, Zimbabwe's mineral industry showed improvement in 1986. Total value of mineral production increased by approximately 7% over that of 1985 to $417.7 million.[2]

The economic growth rate in 1986 was 1.3% compared with 6.5% in 1985. Real growth rate was projected to drop even further in 1987. An average inflation rate of 15% prevailed in 1986 compared with under 10% in 1985. The country's overall balance of payments improved during 1985-86 but was expected to deteriorate during 1987-88. The debt-to-service ratio continued to rise in 1986 to 25% and was expected to peak at approximately 35% in 1987. Other negative aspects of the economic picture were the shortage of domestic railway capacity to move bulk products and a worsening of the unemployment situation.

The Government of Zimbabwe was expected to have a total cumulative investment of about $577 million in fixed capital in the country's mining industry over the ensuing 5 years. This was disclosed in the Government's 5-year national development plan. The plan would activate idle capacity in existing mine plants and develop new mines. Public investment for the plan would be approximately $154 million. This reflected the Government's declared intention to increase its involvement in the mining industry, which was estimated to be 80% foreign owned. The Government also signified its intention to impose an export tax on iron ore as well on any or all minerals produced in and exported from Zimbabwe.

PRODUCTION AND TRADE

Production of most major mineral commodities increased in 1986. Gold production increased slightly in 1986 from that of 1985, and it remained the mineral with the highest output value at $176 million. Immediately following gold in value were coal, $54 million; asbestos, $52 million; nickel, $36 million; copper, $26 million; chromite, $24 million; and iron ore, $13 million.

Of 34 minerals reported produced, 21 showed increased production and 13 showed decreases. Seven minerals accounted for about 91% of the total value of all minerals produced in 1986. The minerals, ranked in terms of percent of total value of all minerals produced, were gold, 42.1%; coal, 12.8%; asbestos, 12.3%; nickel, 8.7%; copper, 6.2%; chromite, 5.7%; and iron ore, 3.0%. Of the seven minerals, only asbestos and chromite showed slight decreases in production in 1986 compared with that of 1985. The principal reason for the overall increase in value of mineral production was the increase in output of key minerals with a rise in unit prices for asbestos, chromite, gold, iron ore, and coal.

Zimbabwe's trade surplus in 1986 was approximately $190 million. Despite the intention to reduce dependency on the Republic of South Africa and to introduce a trade sanctions package, the Republic of South Africa remained Zimbabwe's main trading partner. The United Kingdom was second with 12.6% of imports and 9.2% of exports. In 1986, Zimbabwe was even more dependent on the Republic of South Africa,

with up to 80% of its imports and up to 90% of its exports transported via the Republic of South Africa's transport network and ports. As of August, 77% of all iron and steel and 78% of all asbestos shipments were handled by the Republic of South Africa's ports. In order to break the dependency, Zimbabwe was backing a plan to rebuild the railway in the Beira corridor across Mozambique to the Port of Beira.

Table 1.—Zimbabwe: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[p]
METALS					
Aluminum: Bauxite, gross weight	7,533	23,145	22,726	20,877	24,284
Antimony, mine output, metal content[2]	206	143	256	194	175
Beryllium: Beryl concentrate, gross weight	52	47	19	38	103
Cesium minerals: Pollucite	e80	--	--	--	--
Chromium: Chromite, gross weight - thousand tons	432	431	477	536	533
Cobalt:					
Mine output, recoverable metal content[e]	100	73	78	100	76
Metal (including content of refinery sludges)	98	73	78	92	76
Columbium and tantalum: Tantalite concentrate:					
Gross weight - kilograms	36,000	2,480	59,000	40,000	33,000
Cb content[e] - do.	5,400	370	8,850	6,000	4,950
Ta content[e] - do.	12,600	870	20,650	14,000	11,550
Copper:					
Mine output, Cu content	24,693	21,600	24,000	21,570	21,390
Metal:[3]					
Smelter, primary[e]	23,200	21,600	23,000	20,670	20,500
Refinery, primary	e23,000	21,560	22,687	20,389	20,423
Gold, mine output, Au content - thousand troy ounces	426	453	478	472	478
Iron and steel:					
Iron ore:					
Gross weight - thousand tons	837	926	927	1,100	1,110
Fe content[e] - do.	500	555	555	660	670
Metal:					
Pig iron[e] - do.	250	r584	r400	r674	644
Ferroalloys:					
Ferromanganese	2,123	2,085	1,845	2,044	2,000
Ferrochromium	179,838	157,914	177,800	156,000	155,000
Ferrosilicochromium	12,815	27,542	42,482	53,527	50,000
Total	194,776	187,541	222,127	211,571	207,000
Steel, crude - thousand tons	528	672	391	e465	490
Nickel:					
Mine output, Ni content	13,309	r e12,020	r e12,150	11,116	e10,370
Metal, smelter[4]	12,200	r10,146	10,251	9,381	9,730
Platinum-group metals:					
Platinum - troy ounces	1,704	1,693	772	611	836
Palladium - do.	2,765	2,395	1,222	965	1,125
Total - do.	4,469	4,088	1,994	1,576	1,961
Silver, mine output, Ag content - thousand troy ounces	918	935	893	799	841
Tin:					
Mine output, Sn content[e]	1,660	1,700	1,670	1,670	1,470
Metal, smelter	1,197	1,234	1,210	1,207	1,079
Tungsten, concentrate output:					
Gross weight	67	22	55	14	2
W content[e]	52	15	29	10	2
INDUSTRIAL MINERALS					
Abrasives: Natural, corundum	8,714	5,120	--	--	--

See footnotes at end of table.

Table 1.—Zimbabwe: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	1984	1985[p]	1986[p]
INDUSTRIAL MINERALS —Continued					
Asbestos thousand tons	198	153	165	173	164
Barite	800	980	700	400	298
Cement, hydraulic thousand tons	576	580	NA	NA	NA
Clays:					
Bentonite (montmorillonite)	85,490	63,097	NA	NA	71,987
Fire clay	11,746	9,255	8,900	9,747	12,591
Kaolin	2,442	470	1,350	1,104	901
Feldspar	666	1,645	1,399	2,300	2,026
Gem stones, precious and semiprecious:[5] Emerald kilograms	NA	NA	8	13	59
Graphite	8,225	8,000	12,334	10,450	15,000
Kyanite	2,207	--	--	--	1,851
Lithium minerals, gross weight	9,787	19,193	22,548	27,910	32,760
Magnesite	60,660	24,071	21,642	19,385	22,649
Mica	861	544	911	582	1,340
Nitrogen: N content of ammonia thousand tons	84	r71	69	69	69
Phosphate rock, marketable concentrates do	122	r133	134	135	136
Pigments, iron oxide[e]	1,000	1,000	1,000	--	207
Pyrite, gross weight thousand tons	58	57	57	57	63
Quartz[6] do	669	47	32	103	145
Stone: Limestone do	1,270	1,222	1,152	1,323	1,407
Sulfur:[e]					
S content of pyrite do	25	24	25	25	25
Byproduct of coal and metallurgy do	5	5	5	5	5
Total do	30	29	30	30	30
Talc	270	551	285	437	797
MINERAL FUELS AND RELATED MATERIALS					
Coal, bituminous thousand tons	2,769	3,437	3,110	3,120	4,047
Coke, metallurgical[7] do	166	203	e200	e200	e200

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Table includes data available through July 2, 1987.
[2]Content of concentrates.
[3]Smelter copper includes impure cathodes produced by electrowinning in nickel processing.
[4]Includes Ni content of nickel oxide and nickel fonte.
[5]In 1982, 1,080 kilograms of beryl and 36 kilograms of aquamarine were produced.
[6]Includes rough and ground quartz as well as silica sand.
[7]Data represent output by the Wankie Colliery Co. Ltd. for years ending Aug. 31 of that stated; additional output by the Redcliff plant of Zisco Ltd. may total 250,000 metric tons per year of metallurgical coke and coke breeze.

Table 2.—Zimbabwe: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, semimanufactures	1	--		
Beryllium: Ore and concentrate	78	18	18	
Chromium: Ore and concentrate	--	11,552	--	All to Philippines.
Cobalt: Metal including alloys, all forms	195	1,045	(2)	West Germany 1,041.
Columbium and tantalum: Metal including alloys, all forms, tantalum[3] value, thousands	$97	$178	--	NA.
Copper:				
Matte and speiss including cement copper	579	203	--	All to West Germany.
Ash and residue containing copper	--	102	--	All to Spain.
Metal including alloys:				
Scrap	--	10	--	All to West Germany.
Unwrought	[3]21,539	[3]17,580	--	Italy 12,943; West Germany 2,300.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	--	643	--	All to Netherlands.

See footnotes at end of table.

Table 2.—Zimbabwe: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel: Metal:				
Scrap	3,264	--	--	NA.
Pig iron, cast iron, related materials[3]	250	28	--	
Ferroalloys:				
Ferrochromium	144,993	98,855	55,014	West Germany 33,976; Belgium-Luxembourg 5,432.
Ferrosilicochromium	20,089	20,189	3,488	West Germany 14,491; Spain 1,601.
Unspecified	44,487	71,264	--	Japan 28,966; Italy 18,254; United Kingdom 9,041.
Steel, primary forms	[3]184,134	[3]243,495	--	Taiwan 12,242; Italy 950; unspecified 230,303.
Semimanufactures:				
Bars, rods, angles, shapes, sections	[3]77,526	[3]95,484	3,801	Ivory Coast 9,138; Hong Kong 3,523; unspecified 79,022.
Universals, plates, sheets	--	14,563	--	Ivory Coast 13,485; Portugal 1,078.
Hoop and strip	--	205	--	Ivory Coast 190; Morocco 15.
Rails and accessories[3]	3,842	4,241	--	NA.
Wire[3]	16,070	10,337	--	NA.
Tubes, pipes, fittings	--	33	--	Ivory Coast 28; France 3.
Lead: Metal including alloys, unwrought	--	35	--	All to Greece.
Lithium: Ore and concentrate[3]	23,805	28,117	--	NA.
Molybdenum: Metal including alloys, all forms	2	--		
Nickel:				
Ore and concentrate	10	--		
Matte and speiss	147	12	--	All to Austria.
Metal including alloys:				
Scrap	202	--		
Unwrought	7,743	7,599	1,917	Japan 2,382; West Germany 1,405.
Semimanufactures	12	73	69	Morocco 2; Thailand 2.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	--	$3	--	All to United Kingdom.
Silver: Waste and sweepings do	r$25	$93	--	All to Italy.
Tin: Metal including alloys, unwrought	628	1,015	140	West Germany 373; Japan 222.
Titanium: Metal including alloys, all forms[3]	167	73	--	NA.
Tungsten: Ore and concentrate	[3]72	[3]36	--	West Germany 14; unspecified 22.
Zinc: Metal including alloys:				
Unwrought	r20	--		
Semimanufactures	100	--		
Other:				
Ores and concentrates	238	449	--	All to Belgium-Luxembourg.
Ashes and residues	39	1,126	--	West Germany 1,054; Italy 36.
Precious metals including alloys, waste and scrap[3] value, thousands	$2,820	$2,282	--	NA.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	4	--		
Asbestos, crude	[3]155,385	[3]158,633	137	Japan 29,253; Italy 6,708; Thailand 6,487.
Cement[3]	164,415	73,789	--	NA.
Clays, crude	--	36	--	West Germany 18; Japan 18.
Diamond: Gem, not set or strung value, thousands	[3]$3,750	[3]$2,035	$100	NA.
Diatomite and other infusorial earth	7	--		
Fertilizer materials: Manufactured, unspecified and mixed	2	--		
Graphite, natural	r72,919	[3]15,440	159	Japan 105; United Kingdom 54; unspecified 15,122.
Magnesite, crude[3] value, thousands	$431	$417	--	NA.
Precious and semiprecious stones other than diamond: Natural do	$3,021	$741	$47	Switzerland $483; West Germany $207.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	--	1,399	--	All to Italy.
Worked	255	45	(4)	Switzerland 42.
Gravel and crushed rock	28,829	48,970	--	All to United Kingdom.
Quartz and quartzite	177	95	--	Belgium-Luxembourg 77; United Kingdom 18.
Other: Crude	1,655	2	--	Belgium-Luxembourg 1; West Germany 1.

See footnotes at end of table.

Table 2.—Zimbabwe: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	--	477	477	
Coal: All grades including briquets[3]	174,776	118,844	--	NA.
Coke and semicoke[3]	102,286	89,612	--	NA.

[r]Revised. NA Not available.

[1]Table prepared by Virginia A. Woodson. Owing to a lack of official trade data published by Zimbabwe, this table should not be taken as a complete representation of this country's mineral exports. These data have been compiled from various sources, which include United Nations information, data published by trading partner countries, and partial official trade data of Zimbabwe. Unless otherwise specified, data are compiled from trade statistics of individual trading partners.

[2]Less than 1/2 unit.

[3]Central Statistical Office, Harare, Zimbabwe. Quarterly Digest of Statistics. Dec. 1986.

[4]Unreported quantity valued at $16,000.

Table 3.—Zimbabwe: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	20	10	1	Japan 8; Ireland 1.
Metal including alloys:				
Unwrought	98	423	--	France 189; United Kingdom 138.
Semimanufactures				
value, thousands	[2]$5,349	[2]$7,074	$24	NA.
Chromium: Oxides and hydroxides	--	3	--	All from United Kingdom.
Cobalt: Oxides and hydroxides	3	--		
Copper: Metal including alloys:				
Scrap	--	8	--	All from Italy.
Unwrought	3	3	--	All from United Kingdom.
Semimanufactures	65	38	2	United Kingdom 26; West Germany 5.
Iron and steel: Metal:				
Pig iron, cast iron, related materials	35	33	--	All from Canada.
Ferroalloys:				
Silicon metal	--	2	--	All from United Kingdom.
Unspecified	(3)	5	--	All from West Germany.
Semimanufactures:				
Bars, rods, angles, shapes, sections[2] value, thousands	$4,741	$6,048	--	NA.
Universals, plates, sheets[2] do	$25,488	$29,515	--	NA.
Hoop and strip	71	89	--	Italy 34; Belgium-Luxembourg 33.
Rails and accessories	--	1	--	All from United Kingdom.
Wire	743	333	(4)	United Kingdom 264; Belgium-Luxembourg 69.
Tubes, pipes, fittings[2] value, thousands	$10,702	$4,663	--	NA.
Lead: Metal including alloys, semimanufactures	--	2	--	All from United Kingdom.
Manganese: Oxides	85	--		
Nickel: Metal including alloys, semimanufactures	4	--		
Silver: Metal including alloys, unwrought and partly wrought value, thousands	--	$3	--	All from United Kingdom.
Titanium:				
Oxides	3	20	--	United Kingdom 18; Denmark 2.
Metal including alloys, semimanufactures	--	1	1	
Zinc:				
Oxides	92	110	--	All from United Kingdom.
Metal including alloys, all forms[2] value, thousands	$3,911	$4,106	--	NA.

See footnotes at end of table.

Table 3.—Zimbabwe: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Other: Oxides and hydroxides	4	--		
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	3	40	--	All from Greece.
Artificial: Corundum	23	--		
Grinding and polishing wheels and stones	19	22	--	West Germany 13; Italy 6.
Boron materials: Crude natural borates	398	434	--	All from Belgium-Luxembourg.
Cement	55	--		
Chalk	17	77	--	All from France.
Diamond:				
Gem, not set or strung thousand carats	65	--		
Industrial stones value, thousands	--	$23	--	All from United Kingdom.
Diatomite and other infusorial earth	--	70	--	All from France.
Fertilizer materials: Manufactured:				
Ammonia[2] value, thousands	$6,666	$6,089	--	NA.
Nitrogenous	5,770	--		
Potassic	5,575	10,182	--	All from West Germany.
Graphite, natural	5	1	(5)	Mainly from United Kingdom.
Gypsum and plaster	--	18	--	All from United Kingdom.
Magnesite, crude value, thousands	--	$8	--	All from Canada.
Mica: Worked including agglomerated splittings	--	1	--	All from United Kingdom.
Pigments, mineral: Iron oxides and hydroxides, processed	25	--		
Precious and semiprecious stones other than diamond:				
Natural value, thousands	--	$24	--	Switzerland $23; Hong Kong $1.
Synthetic do	--	$1	--	All from Switzerland.
Salt and brine	6,071	9,230	--	West Germany 8,942; United Kingdom 288.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	--	18	--	All from France.
Sulfate, manufactured	198	--		
Sulfur:				
Elemental: Crude including native and byproduct value, thousands	$3,742	--		
Sulfuric acid	12	1	--	All from United Kingdom.
Talc, steatite, soapstone, pyrophyllite	18	20	--	Italy 18; Denmark 2.
Other: Crude	--	5	--	All from West Germany.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	54	53	--	All from Trinidad and Tobago.
Carbon black	257	909	--	United Kingdom 899; Belgium-Luxembourg 10.
Coal: All grades including briquets[2] value, thousands	$4,684	$7,092	--	NA.
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	(6)	12	--	All from France.
Gasoline do	r650,479	16,268	7	Italy 15,836; Netherlands 425.
Mineral jelly and wax do	11,459	7,107	1,244	Hong Kong 3,935; United Kingdom 1,873.
Kerosene and jet fuel do	365,289	70	--	All from United Kingdom.
Distillate fuel oil do	2,087,106	1,641	1,634	West Germany 7.
Lubricants do	r6,607	5,123	886	West Germany 3,059; Italy 364.
Residual fuel oil do	289	--		
Bitumen and other residues do	412	103	--	All from Italy.
Bituminous mixtures do	6	8,968	--	All from Netherlands.
Petroleum coke do	--	176	--	All from United Kingdom.

rRevised. NA Not available.

[1]Table prepared by Virginia A. Woodson. Owing to a lack of official trade data published by Zimbabwe, this table should not be taken as a complete presentation of this country's mineral imports. These data have been compiled from various sources, which include United Nations information and data published by trading partner countries, unless otherwise specified data are compiled from trade statistics of individual trading partners.

[2]Central Statistical Office, Harare, Zimbabwe. Quarterly Digest of Statistics. Dec. 1986.

[3]Unreported quantity valued at $1,338,000.

[4]Less than 1/2 unit.

[5]Unreported quantity valued at $2,000.

[6]Unreported quantity valued at $1,000.

COMMODITY REVIEW

METALS

Chromite.—Zimbabwe's production of chromite came mainly from two major producers, Zimbabwe Alloys Ltd. (Zimalloys) and Zimbabwe Mining and Smelting Co. (ZIMASCO). Zimalloys, a subsidiary of Anglo American Corp. (Zimbabwe) Ltd. (AAC), and ZIMASCO, a subsidiary of Union Carbide Corp. of the United States, produced the bulk of the chromite ore from mines along the Great Dyke.

Zimalloys, which approached bankruptcy in 1983, instituted new mining practices and products that gave additional life to its operations. A combination of poor prices for ferrochromium, an overvalued Zimbabwean dollar, and rising production costs created the near-bankruptcy condition. Zimalloys curtailed costly deep-level mining operations on the North Dyke and closed a high-carbon ferrochromium furnace as well. Emphasis on production switched from the North Dyke mines—the Sutton, Vanad, and Caesar Mines—where output was reduced, to the Netherburn and Inyala Mines bought in 1982 and 1984, respectively. Although Netherburn was a North Dyke mine, the seams were thicker than normal for the area. The Inyala mining operation was in a podiform deposit where mining costs were lower. Although Zimalloys reduced its mining operations on the North Dyke, in 1986 it helped establish cooperatives in the area to secure supplies of high-grade chromite. Cooperatives were considered the most suitable means of exploiting the narrow chromite seams that were found close to the surface on the North Dyke.

Seventy percent of the ore requirements of ZIMASCO's smelter at Kwekwe came from the Shurugwi and Lalapanzi Divisions that had surface mining operations at the Valley Mine and underground operations at Shurugwi and Lalapanzi.

Operations at Shurugwi were chiefly confined to the North Section, previously Railway Block Mine, and the South Section, previously Peak Mine. Both mines were exploiting scattered lenticular deposits of chromite in the Shurugwi ultrabasics. At the Lalapanzi Mine, output was to be increased to 50,000 tons per year by 1989 as part of a $5 million project that commenced in 1984. The Lalapanzi Mine, formerly the Cambrae Mine, was bought by ZIMASCO in 1980. Production rose from 22,000 tons per year in 1980 to 35,000 tons per year in 1986. With completion of expansion in 1989, Lalapanzi will be ZIMASCO's single largest mining operation on the North Dyke.

Cobalt.—Bindura Nickel Corp. Ltd. (BNC), the only producer of byproduct cobalt in Zimbabwe, produced 76 tons of cobalt in 1986. Bindura's selling price decreased by 30 cents per pound from 1985 to 1986. Bindura also processed nickel-copper-cobalt matte pellets imported from the Selebi-Phikwe operation in Botswana at their smelting and refining plant at Bindura. The pellets contained approximately 0.16% cobalt. The plant in Botswana was approximately 373 miles from the Bindura smelter in Zimbabwe.

Copper.—Mhangura Copper Mines Ltd. accounted for the majority of Zimbabwe's cathode production. The company was owned 54% by Zimbabwe Mining Development Corp. (ZMDC) and had two mines, Miriam and Norah, and a smelter and refinery. The estimated minable ore reserves at the Miriam Mine were 11.36 million tons at 1.27% copper, and the reserves at the Norah Mine were 2.0 million tons at 1.18% copper. There were no significant new ore discoveries during the year, and the decrease of ore reserves from that of 1985 was mainly owing to depletion by mining. Both the Miriam and Norah Mines were equipped with concentrators.

The standard cathode produced at the refinery underwent a brand name change to Mhangura Standard Cathodes. The former brand name, Mangula, was not accepted by the London Metal Exchange warranty after March 18, 1986. The refinery also produced a precious metals slime that contained gold, palladium, platinum, and silver. The slimes accounted for about 75% of all of Zimbabwe's silver production. Cathode copper and the precious metals slime were all sold through the Mineral Marketing Corp. (MMC) of Zimbabwe.

The refurbished Eiffel Flats refinery, which recommenced operations in the latter part of 1985, produced copper cathodes in 1986 at about the same level of monthly output as in 1985. The cathodes were produced from nickel-copper-cobalt matte pellets that were shipped to the refinery from the Selebi-Phikwe mining complex in Botswana. Approximately 10,500 tons was received from Botswana in 1986. Copper prices dropped 3 cents per pound compared

with those of 1985. Production at the Eiffel Flats refinery was planned at 4,800 tons of copper per year.

ZMDC's other operating facility, Lomangundi Smelting and Mining Co. Ltd., operated two additional copper mines, the Angwa and Avondale. The operation proved to be unprofitable. Owing to the need to provide employment and concentrates, the mines continued to operate with Government subsidy. Angwa's ore grade was 1.0% copper, and Avondale's was 0.85% copper. Small quantities of gold and silver were also recoverable from the ore. The Angwa and Avondale ores were processed at the Shackleton Mine concentrator. The Shackleton Mine had closed during 1985.

In 1986, Angwa and Avondale employed a total of 3,546 people—2,867 in mining activities, 360 in smelting and refining, and 319 in administration, apprentices, and trainees. In addition to Zimbabwean copper, an additional 600 tons of copper concentrates averaging 19% copper was purchased from Mozambique's Muconguera Mine near Mutate.

Gold.—Zimbabwe's three largest gold producers were Falcon Mines PLC, Falconbridge Investments (Zimbabwe) (Pvt.) Ltd., and Coronation Syndicate Ltd. (Corsyn), which operated a total of eight gold mines. Corsyn's three operations consisted of the Arcturus, Mazowe, and Muriel Mines. Falconbridge Investments' two operations were the Blanket and the Golden Kopje Mines. Falcon's three operations were the Dalney Group of mines, the Venice Group of mines, and Olympus Consolidated Mines Ltd.

Corsyn showed an overall increase in ore throughput and gold production. At the Arcturus Mine, both ore throughput and gold output increased significantly, the latter by 2,669 troy ounces. At the Mazowe Mine, ore throughput dropped by 12,000 tons, but gold output increased by 1,125 troy ounces. Ore reserves at Mazowe also increased significantly. While production of gold at the Muriel Mine dropped slightly. Mining policy at Muriel, a high-grade ore property, was to maximize ore recovery by several methods with acceptable ore dilution.

The Zimbabwe Branch of Willoughby's Consolidated PLC announced an agreement in late 1986 to acquire Corsyn Consolidated Mines Ltd. by acquiring from Coronation all the issued share capital of Corsyn. Willoughby's and Coronation's were both controlled by Lonrho PLC, and the transactions envisioned would only involve a corporate reorganization.

Falcon Mines purchased the What Cheer Mine in April 1986 for $1.6 million. The What Cheer claim holdings were contiguous with the claim holdings of the company's Venice Mine. Services to What Cheer were supplied by the Venice Mine, and the two mines were to be linked underground, with ore trammed underground from the What Cheer to the Venice.

The Dalney Mine was sinking a new 2,477-foot egress and ventilation shaft that will cost $5 million by completion in November 1988. The new shaft was calculated to save $710,000 annually.

Other companies operating gold properties in Zimbabwe were Lonrho Zimbabwe Ltd., Rio Tinto (Zimbabwe) Ltd. (RTZ), and Gladstone Mines Holdings (Pvt.) Ltd. Lonrho operated the Athens, How, and Shamva Mines. The Athens Mine was undergoing a $10 million upgrading project that was expected to boost gold output by 15,432 troy ounces per year. The Shamva Mine was planning a $5 million expansion that would increase its production capacity to 30,865 troy ounces per year. Shamva was Lonrho's third largest gold mine in Zimbabwe. Lonrho's How Mine was set to expand production at yearend. The extension of a previously undeveloped ore body at the How Mine could result in a significant production increase. In addition to the operating mines of Lonrho, the company commenced operations at the Bernheim Mine, which had been inoperative since 1978. RTZ's Brompton Mine was operated briefly in early 1986 but suspended production by yearend. Gladstone, in the Lomangundi region, has been working its Redwing gold mine since 1984. The mine is situated at Mhangura, Zimbabwe.

Exploration for gold was undertaken in Zimbabwe during 1986 by ZMDC and Cluff Mineral Exploration (Zimbabwe) Ltd. (CMEZ). ZMDC commenced prospecting at Gadzema, 120 kilometers west of Harare, where a gold deposit grading 0.22 troy ounce of gold per ton was found. ZMDC also explored for gold in the Chinedzi, Mudzi, and Save Regions. CMEZ made two gold discoveries at its Bindura concession; the Rebecca and Freda Prospects were estimated to contain 248,098 troy ounces and 51,023 troy ounces of gold, respectively. A third concession owned by CMEZ had reserves estimated at 52,972 troy ounces of gold.

Zimbabwe's numerous small-scale mines

produced about 482,000 troy ounces of gold per year. Prior to September 1986, the gold was refined at the Republic of South Africa's Rand Refineries. Zimbabwe commenced sending its gold to Australia for refining in September as a temporary arrangement until a new gold refinery was constructed in Zimbabwe. The cost of the new refinery was estimated at $22 million and was to be built in Harare's Msasa suburb next to the high-security mint. The plant was expected to be operational in 2 years and was to handle gold from the entire central and east African preferential trade areas. The Government of Zimbabwe was expanding capacity at the Kwekwe roasting plant with construction of a third roaster. Once operational, the existing two roasters would then be refurbished.

Iron and Steel.—In 1986, Zimbabwe produced 1.1 million tons of iron ore from two mines, Buchwa and Ripple Creek, owned by the Buchwa Iron Mining Co. (Pvt.) Ltd., a subsidiary of Zimbabwe Iron and Steel Co. Ltd. (ZISCO) at Redcliff. Buchwa and Ripple Creek were situated 238 kilometers and 17 kilometers from the ZISCO steel mill, respectively. Buchwa Mine produced 78.4% of the total production and Ripple Creek produced 21.6%. ZISCO's steel mill complex had an annual production capacity of 1 million tons of liquid steel. Upgrading operations were under way in 1986 to construct a new sintering plant at the mill and to expand the production at the Ripple Creek Mine. The Buchwa Mine increased its production by introducing new, larger capacity drills and trucks.

The Government of Zimbabwe announced its intention of imposing an export tax on iron ore as well as an export tax on any or all minerals exported from and produced in Zimbabwe.

Despite management and labor union difficulties, ZISCO pressed ahead with plans for its rehabilitation and investment program. Bids from a number of companies interested in undertaking project management consultancy for the rehabilitation were under consideration. ZISCO's program was to guarantee the company continued operation, increased production, and improved efficiency and marketing. A fundamental part of the program was to increase minable ore reserves at Ripple Creek to 50 years of production rather than the current projected 8 years.

MMC of Zimbabwe exported steel valued at $2 million to Ethiopia via the Beira route to Beira Port in Mozambique.

Zimbabwe set up an iron and steel institute in 1986 that was to encourage greater cooperation between ZISCO and domestic steel users. In 1985, only 15% to 20% of ZISCO's output was consumed by the domestic market.

Nickel.—Refined nickel production in 1986 was 9,730 tons valued at $36.4 million. The prices of refined nickel decreased by 50 cents per pound compared with 1985 prices. BNC intended to seek financial help from the Government and major stockholders after suffering financial losses of $10.3 million in 1986. BNC borrowing rose 38% to $62.8 million and was necessary to finance losses and to provide increased working capital and capital expenditures. Revenues fell 16%, while the average unit cost of sales increased 21%. In addition to production and grade problems, the nickel group was hit by weak international prices.

Nickel was produced from four mines in Zimbabwe—the Epoc, Madziwa, Shangani, and Trojan. All four were operated by BNC, a subsidiary of AAC. The two refineries at Trojan and Eiffel Flats treated both domestically produced matte and that from Botswana. The final product was a high-grade electrolytic cathode containing 99.98% nickel. Exports were to Europe, Japan, the Republic of South Africa, and the United States.

Tin.—ZMDC's takeover of the Kamativi Tin Mines Ltd. was finalized on November 24, 1986, after protracted discussions between ZMDC and the Industrial Development Corp. ZMDC held 91.3% of the shares in Kamativi with the balance being held by private overseas investors. Output of metal from the smelter dropped by 10.6% to 1,079 tons compared with that of 1985. The price of tin fell from $5.27 per pound in 1985 to $2.69 per pound in 1986 after the collapse of the International Tin Council's price support system in October 1985. Kamativi had 1,600 employees.

A contract was awarded to KHD Humboldt Wedag AG to supply new preparation plant equipment for the Kamativi Mine. The new plant would yield salable products of tin concentrate grading 65% tin and a concentrate containing 36% tantalum pentoxide and 52% columbium pentoxide.

INDUSTRIAL MINERALS

Asbestos.—Asbestos sold for $302.17 per ton in 1985 and $314.20 per ton in 1986. Approximately 96% of Zimbabwe's asbestos was exported to the Middle East and Asia. Barter sales accounted for 10% of all asbestos exports.

Production was from two mines—the King Mine in the Mashava Area and the Shabanie Mine in the vicinity of Zvishavane. Both mines were equipped with their own milling facilities with designed capacities of 200,000 tons of ore per year at Shabanie and 120,000 tons of ore per year at King.

MMC of Zimbabwe concluded a sales contract for asbestos to India amounting to $4.2 million. This was the third asbestos sale to India during the past 3 years and was for 10,000 tons of asbestos to be delivered between October 1986 and August 1987.

Kyanite.—ZMDC's kyanite mine in the Mutoko area, although it operated only on a test mine basis of 300 tons per month, enabled the sale of kyanite to the Federal Republic of Germany, Japan, and the Republic of South Africa. By yearend, it was upgraded to a full commercial operation. A new kyanite manufacturing study was also concluded that involved the calcining of kyanite to produce mullite for making refactory bricks.

Lithium.—Bikita Minerals (Pvt.) Ltd. was Zimbabwe's sole producer of lithium, primarily used as feedstock in the glass and ceramics industries. Production was scheduled to be increased considerably in 1987 after a new $3.5 million heavy media separation plant becomes operational. Bikita's exports were shipped through the Republic of South Africa in 1986. Bikita's open pit mine commenced operations in 1952. Sales were by MMC through agents in the Far East, Europe, and the United States.

MINERAL FUELS

Coal.—Wankie Colliery Co. Ltd., a subsidiary of AAC, produced 4.0 million tons of bituminous coal in 1986; however, sales amounted to only 3.4 million tons. Mine price for coal was $15.94 per ton compared with $13.70 per ton in 1985.

Wankie operated the No. 3 underground coal mine and two opencast coal mining pits that were responsible for 22% and 78% of the total production, respectively. During the early part of 1986, the demand for coal for the Hwange Power Station (HPS) remained significantly below original forecasts. Mining operations continued to be centered in an area of the pit where coking coal was most easily mined. In July, the third operating unit of the HPS became operational, and demand increased to the extent that some coal had to be taken from coal storage piles. Since August, most of the coal production has been from the main dragline pit. The underground mine continued to maximize production of high-quality coal averaging 12.54% ash and 24.09% volatiles.

RTZ planned to set up a multimillion dollar operation for production of low-sulfur, low-phosphate coal in the Zambezi River Valley. Zimbabwe had been importing this type of coal from the Republic of South Africa at a cost of approximately $11 million annually. Infrastructure, such as roads, was required before mining could commence.

Coke.—The rebuilding of the coke ovens and the refurbishing of the byproducts plant at Wankie were started September 29, 1986. The existing ovens were dismantled by December 31. The new brickwork was to begin in early January 1987. The entire rehabilitation of the coke ovens should be completed and in operation by October 1, 1987. The project was necessary to ensure that Zimbabwe remained self-sufficient in coke and also to supply coke to Wankie's traditional customers in Zambia and Zaire. Consumers of coke in Zimbabwe had stockpiled the fuel prior to shutdown of the ovens. Some coke was also purchased from the Republic of South Africa for reexport to Zambia and Zaire. Total cost of rehabilitating the coke ovens was $19.2 million.

Petroleum.—Zimbabwe had no indigenous production of crude petroleum or natural gas. The country did not have an operating refinery; however, plans exist to rebuild the Feruka refinery with expectations of selling refinery products in southern Africa. The Government of Iran had offered to finance 10% of the total cost of rebuilding the oil refinery at Mutare on Zimbabwe's eastern border. Much of the country's fuel was being supplied via the Beira corridor pipeline by Saudi Arabian refinieries.

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[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Zimbabwean dollars (Z$) to U.S. dollars at the rate of Z$1.665=US$1.00.

The Mineral Industry of Other Central African Countries

By Thomas O. Glover[1]

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CAMEROON

Cameroon continued to enjoy sustained economic growth that began with its independence in 1960. Growth in the gross domestic product (GDP) averaged 2.8% per year during the 1960's and the first half of the 1970's. Starting in 1976 and for the succeeding 10 years, the GDP accelerated rapidly owing to the coming on-stream of Cameroon's small but domestically significant offshore oil industry. In 1985, the GDP grew by 7.8%, but in 1986, it was only up 5.5%. The country's sustained economic growth in dollar terms of gross national product (GNP) per capita reached $1,075 in 1986. The ranking in GNP per capita by the International Monetary Fund put Cameroon in the middle-income category for developing countries. The sustained economic growth rate up to 1986 was due to the injection of income from oil into the economy, but crude oil price reductions in 1986 brought a slowdown.

In 1986, crude oil production grew to 200,000 barrels per day, an increase of 8.2% from that of 1985. Most of the oil came from the Société Nationale Elf Aquitaine (SNEA) wells in the multifield Rio del Rey complex. Additional output came from the Moudi Field operated by Compagnie Française des Pétroles S.A. Proven oil reserves in Cameroon were 540 million barrels. At 1986 production rates, and in the absence of further discoveries, Cameroon will have exhausted its recoverable oil reserves by the year 1995. Owing to worldwide crude price reductions, the country's oil income fell 60% between 1985 and 1986, from $1.82 billion[2] to $0.72 billion. Cameroon's refinery operator commenced operating the Sonara refinery in 1981 at Point Limboh. Sonara's capacity of 43,000 barrels per day was small by most standards. In 1986, natural gas reserves, estimated at 100 billion cubic meters, were not produced commercially because there were no domestic users. Proposals for a multibillion-dollar liquefied natural gas plant at Kribi had been submitted; however, work on the plant had not commenced.

Cameroon had much future work to do on the iron ore and bauxite deposits. Only limestone and tin were mined during 1986. Limestone was used by the country's two existing cement plants at Bonaberi and Figiul. Alluvial tin was produced at Mayo Darle in small quantities. Two French ex-

ploration groups, Bureau de Recherches Géologiques et Minières (BRGM) and the La Source Group were both attempting to evaluate the mineral potential of the Wum Banyo region. BRGM was evaluating tin deposits near Mayo Darle to determine the potential for expanding the existing activities to produce about 100 tons of cassiterite concentrate per year, while La Source was studying the Wum Banyo region for gold, titanium, and tungsten.

Société d'Études des Bauxites du Cameroun had future plans to develop bauxite reserves in Cameroon at Kribi and Minim-Martap. Overall reserves were estimated at 1 billion tons grading 43% aluminum. The Alucan smelter at Edea was supplied with bauxite from Guinea. The smelter capacity was to be doubled in the 1990's, according to official planning, to 160,000 tons per year. The smelter was jointly owned by the Pechiney Group, 58%; and the Cameroonian Government, 42%.

Table 1.—Other countries of Central Africa: Production of mineral commodities[1]

Country[2] and commodity[3]	1982	1983	1984	1985[p]	1986[p]
CAMEROON					
Aluminum metal, primary metric tons	78,900	77,400	73,100	90,296	83,810
Cement, hydraulic[4] do.	530,000	610,000	NA	748,858	783,368
Gold, mine output, Au content troy ounces	136	261	e250	249	246
Petroleum, crude[e] thousand 42-gallon barrels	35,000	542,000	56,000	49,000	53,000
Pozzolana metric tons	81,028	NA	NA	105,634	168,425
Stone:					
Limestone do.	83,379	50,675	NA	96,961	78,260
Marble do.	NA	NA	251,600	1,432	331
Tin ore and concentrate:					
Gross weight do.	e15	NA	14	13	NA
Sn content[e] do.	10	NA	10	10	NA
CENTRAL AFRICAN REPUBLIC					
Diamond:					
Gem carats	185,573	229,681	235,589	189,545	258,701
Industrial stones do.	91,000	65,677	101,562	87,452	98,677
Total do.	276,573	295,358	337,151	276,997	357,378
Gold troy ounces	1,000	2,492	6,953	6,033	7,041
CHAD					
Sodium carbonate, natural (natron), slabs (plaques), broken metric tons	e5,000	NA	NA	NA	NA
CONGO					
Cement, hydraulic do.	39,242	15,034	NA	58	NA
Copper, mine output, Cu content do.	149	35	NA	253	e250
Gas, natural:					
Gross[e] million cubic feet	13,000	13,000	NA	NA	13,000
Marketed do.	350	350	NA	NA	e350
Gold, mine output, Au content[e] troy ounces	83	267	101	r515	500
Lead, mine output, Pb content metric tons	4,095	4,000	1,740	1,460	e1,400
Lime do.	--	--	7,061	NA	e7,000
Petroleum, crude thousand 42-gallon barrels	r8,000	40,271	44,911	43,564	e39,000
Zinc, mine output, Zn content[e] metric tons	3,000	3,000	2,780	2,336	2,300

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

[1]Includes data available through July 31, 1987.

[2]In addition to the countries listed, Equatorial Guinea and São Tomé e Principe, covered textually in this chapter, presumably produce modest quantities of a variety of crude construction materials (clays, sand and gravel, and stone) and may produce minor amounts of other mineral commodities (most notably gypsum, lime, and salt), but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, sand and gravel, and stone) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[4]Includes imported clinker.

[5]Reported figure.

CENTRAL AFRICAN REPUBLIC

Reported production of diamonds and gold in 1986 was valued at $36.2 million. Production of diamonds and gold increased by 29.0% and 16.7%, respectively.

A program of economic and financial reform was initiated in July to revive a sluggish economy by the end of 1987. The Government planned to liberalize the economy, with intervention by the public sector confined to public and social services, and the basic infrastructure. Loans of $46 million were made to the Government to support the new program.

The production of diamonds, the principal source of export revenues, was based on the diamond deposits near Bria in the eastern section of the country and near Carnot in the western section. Up to 20,000 local miners, mining small areas and deposits, produced approximately 90% of the annual production. The majority of diamonds were sold and exported as uncut stones. During 1986, exports of rough uncut diamonds increased, while the exports of cut diamonds decreased drastically. In 1984, the Government set up the National Diamond Agency to upgrade treatment of rough uncut diamonds. The company was controlled by the Government, 51%; and privately owned, 49%. The Government took the initiative to stimulate diamond production by drastically reducing the export tax on diamonds, and modifications to the Mining Code were planned.

Société de l'Uranium Centrafricain, Compagnie Générale des Matières Nucléaires of France, and Aluminium Suisse S.A. of Switzerland planned to exploit a uranium deposit of 17,000 tons of reserves in the Central African Republic. The project had not started as yet owing to a lack of needed infrastructure and the depressed price of uranium.

The Central African Republic imported all of its petroleum needs in 1986 because the country had not found commercially exploitable crude oil. A petroleum consortium, headed by Esso Exploration and Production Central Africa, completed its first exploratory well in April and then abruptly abandoned it. No information on Aouakale No. 1 well was released.

CHAD

The Government of Chad and its population had been involved in a debilitating war for more than two decades. The production of minerals, always very small, ceased to exist after 1980. Only natron was produced in 1980 as a form of salt. Prior to 1980, natron, a hydrous sodium carbonate, was mined at approximately 20 basins northwest of Bol near Lake Chad. Natron was not exported but was used locally.

In 1986, Chad was one of the world's poorest and least industrialized nations. Almost all (90%) of Chad's energy needs were still met by utilizing wood and charcoal. Chad's entire annual consumption of petroleum products was estimated to be only 23.8 million gallons. All of this was imported from Cameroon and Nigeria. Diesel fuel sold for $1.81 per gallon with gasoline selling for $3.00 per gallon.

Chad was not a petroleum producer in 1986, although there were proven petroleum reserves in the Lake Chad region sufficient to meet domestic needs. A consortium with Esso Exploration and Production Central Africa were exploring southern Chad in hopes of finding and developing oil deposits significant for export.

CONGO

In 1985, Congo's petroleum sector accounted for about 95% of all exports, 66% of all public revenues, and 47% of the total GDP. As market conditions deteriorated in 1986, this dependence had an extremely depressing impact on the Congolese economy. With the crude oil selling price falling from $26 per barrel to a low of $11 per barrel and the CFAF-dollar exchange rate dropping from a 1985 average of CFAF449.26 to CFAF346.30 in 1986, petroleum export revenues fell by more than one-third.

There was a gradual decrease in crude production for the previous 3 years as existing reserves were depleted. Development of the Tchibouela Oilfield by SNEA and the Hydro-Congolaise de Raffinage (Hydro-

Congo) was expected to lift production levels in 1987. Responding to the drastic reduction of revenues, SNEA has reduced its budget for 1987 by about $20 million. The resulting slowdown in development activities may cause the Congolese production to decrease further. SNEA's output of crude represented 63% of all Congolese crude oil production in 1986.

Other oilfields awaiting improvement in market conditions before development were SNEA's Loussima Oilfield and Azienda Generali Italiana Petroli S.p.A.'s Zatchi-Marine Reservoir.

The only operating oil refinery in the Congo, owned by SNEA and Hydro-Congo, operated at a profit in 1986 despite an estimated reduction in output from 4 million barrels in 1985 to about 3.5 million barrels in 1986.

The refinery also instituted several operational changes that would cut the need for some refined oil imports and dependence on heavy fuel oil exports, which faced increasingly adverse market conditions. In June, a $1.5 million conversion project was completed that permitted an increase in the output of gasoline, kerosene, and other more highly refined products. The refinery also replaced the heavy Congolese crude with lighter Angolan crudes as its principal feedstock. The change to lighter crudes made it possible to produce aviation fuel for internal consumption by 1987.

While offering considerable potential, the nonfuel minerals sector remained largely unexploited. Recent metals production had been limited to a Government lead-zinc-copper mine near M'Fouati, and scattered small artisanal gold mines run by individual miners with the gold being disposed of through the Government. After a major modernization effort by the only cement producer in the Congo, production was short-lived, and the plant again halted production shortly after startup. No reason was given for the plant shutdown.

EQUATORIAL GUINEA

The Republic of Equatorial Guinea was a unitary republic that gained independence from Spain on October 12, 1968. The Republic was headed by a President whose term expires in 1989. Its legislative branch was made up of a 60-member Peoples Representative Chamber. The judicial system was headed by the Supreme Court, but in practicability, was under the absolute rule of the President.

Equatorial Guinea was a member of the United Nations, the Organization of African Unity, the Central African Bank, the Customs and Economic Union of Central Africa, the International Monetary Fund, and the International Bank for Reconstruction and Development.

Population in 1986 was approximately 330,000 with an annual average growth rate of 1.83%. The country was made up of two land areas, Rio Muni on the continent of Africa and the island of Bioko. Malabo, the country's capital, was on Bioko. The Government of Nigeria granted Equatorial Guinea $3.7 million in aid, so that the country could host a conference of the Union Douaniere et Economique de l'Afrique Centrale.

Onshore oil exploration showed little potential and offshore operations were minimal. Alluvial gold, iron ore, manganese, silica, titanium, and uranium had been found in promising occurrences in previous years.

SAO TOME E PRINCIPE

Both islands are in the Gulf of Guinea and were about one-third the size of the State of Rhode Island. The capital of both islands was São Tomé on the island of the same name. The only minerals mined in the islands were clay and stone that were used for local construction projects. The terrain was volcanic and mountainous with a hot and humid climate and an 8-month-long rainy season. The Government was a republic with a President heading the Government. The President was assisted by a cabinet of ministers and a single legislative chamber. The islands gained their freedom from Portugal on July 12, 1975.

The financial picture had never been very promising since independence. The Organization of Petroleum Exporting Countries (OPEC) granted the country its sixth loan from the OPEC Fund for International Development. The 1986 loan was $1 million and was to be used as a balance of payments

support loan. Five of the country's six loans were for balance of payments support loans. The remaining loan was for a petroleum products storage and distribution project. São Tomé's economy was based on tropical agricultural products.

[1]Physical scientist, Division of International Minerals.
[2]Where necessary, values have been converted from Communauté Financiere Africaine francs (CFAF) to U.S. dollars at the rate of CFAF346.3 = US$1.00.

The Mineral Industry of Other East African Countries

By Kevin Connor[1]

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BURUNDI

During 1986, the Government continued with efforts to ease the country's almost total reliance on coffee exports for trade revenues by allocating 45% of the Government's budget to commerce and industrial projects. The collapse in coffee prices in 1985 continued to exacerbate the country's growing trade deficit, weakened currency, and dwindling reserves of foreign exchange in 1986.

Amoco Burundi Petroleum Corp., a subsidiary of Amoco International Oil Co., continued with plans to drill at least two exploration wells in Lake Tanganyika in 1987. Both offshore and onshore drilling exploration was planned by Amoco Burundi. Any oil or gas finds were expected to have substantial impact on the Burundian economy, as a major portion of the country's trade deficit was directly attributable to petroleum and gas imports.

Investigations of the country's nickel laterites near Musongati continued in 1986 with completion of analysis and reporting on 2,500 meters of exploration drilling. The feasibility project consultant, Exploration und Bergbau GmbH of the German Democratic Republic, released further details on the extent and content of the higher grade nickel deposits. More than 200 million tons of nickel ore had been estimated in Burundi by yearend, with a high-grade nickel zone identified at Buhinda, northeast of Musongati.[2]

Within the explored high-grade Buhinda area, reserves at a cutoff grade of 0.8% nickel were placed at 29 million tons, averaging 1.62% nickel, 0.12% cobalt, and 0.31% copper. The ore also contains palladium and platinum. Approximately 46% of the ore was of ferrolitic type, and 54% was of the higher valued saprolite type. Drilling evidence seemed to suggest a coherent 1,200-meter-long by 200-meter-wide mineralized zone, characterized by thick, saprolitic, high-grade nickel ore. The shallow ore body was described to have overburden ranging from 5 to 55 meters, with an average of approximately 21 meters.

According to Exploration und Bergbau's analysis, exploitation of the deposit would be by surface mining. Overburden was of

soft, mostly unconsolidated materials and could be removed with dozers, rippers, and scrappers. Except for some canga crusts, blasting would not be required. Because of different ore types, selective mining in at least two sites was recommended, and a blending bed was considered necessary to guarantee a homogenous feed to the ore processing plant. Winning of the nickel metal was preliminarily assessed and could be accomplished by either hydrometallurgical or pyrometallurgical processes. Several standard metallurgical processes were identified as recovery methods to be thoroughly tested for specific applicability on the Buhinda ores.

Research into utilization of Burundi's peat deposits as an alternative energy source continued throughout 1986. The 6-year study, funded by $9 million[3] from the International Development Association (IDA) and the United Nations Development Program (UNDP), was expected to be completed by December 1987. All of the research through 1986 has been conducted by Ireland's Bord na Mona and Ekono Oy of Finland, world leaders in the development of peat bog harvesting techniques and utilization of the peat as a fuel. Burundi's peat could be used for either direct stove heating in a briquet form or as boiler fuel for generating electricity.

Table 1.—Other countries of East Africa: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Country and commodity	1982	1983	1984	1985[p]	1986[e]
BURUNDI[2]					
Clays: Kaolin	[e]2,000	4,053	1,990	4,360	[3]5,113
Gold, troy ounces	[e]100	272	1,115	829	[3]980
Lime	302	[e]300	42	1,100	[3]160
Peat	[e]14,000	13,293	14,000	10,313	[3]12,455
ETHIOPIA[2]					
Cement, hydraulic[e]	145,000	170,000	240,000	250,000	250,000
Clays: Kaolin	[e]9,000	[e]9,000	NA	NA	NA
Gold, mine output, Au content[e], troy ounces	12,000	14,000	15,000	15,000	15,000
Gypsum and anhydrite, crude[e], cubic meters	4,000	4,000	4,000	4,000	4,000
Petroleum refinery products:					
Gasoline, thousand 42-gallon barrels	801	855	[e]900	849	850
Kerosene and jet fuel, do.	466	465	[e]500	478	500
Distillate fuel oil, do.	1,493	1,514	[e]1,500	2,149	2,100
Residual fuel oil, do.	2,173	2,033	[e]2,000	1,377	1,400
Other, do.	129	146	[e]150	122	125
Refinery fuel and losses, do.	548	475	[e]500	544	550
Total, do.	5,610	5,488	[e]5,550	5,519	5,525
Platinum, mine output, Pt content[e], troy ounces	125	125	125	150	150
Pumice[e], cubic meters	30,000	[3]5,625	6,000	6,000	6,000
Salt:[e]					
Rock	15,000	15,000	15,000	15,000	15,000
Marine	110,000	110,000	120,000	120,000	120,000
Stone, sand and gravel:[e]					
Limestone	5,000	5,000	5,000	5,000	5,000
Sand, cubic meters	650,000	650,000	650,000	650,000	650,000
Other	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
KENYA[2]					
Barite	--	300	210	255	[3]420
Carbon dioxide, natural	2,700	NA	3,161	3,151	[3]4,093
Cement, hydraulic, thousand tons	[e]1,300	1,280	1,164	847	[3]1,312
Clays:					
Bentonite	--	200	NA	NA	NA
Kaolin	1,077	650	295	320	[3]2,000
Corundum	([4])	NA	NA	NA	NA
Diatomite	1,783	1,570	1,512	3,082	[3]1,450
Dolomite	--	1,920	2,865	[e]3,000	3,000
Feldspar	--	700	685	692	--
Fluorspar	88,726	59,084	46,578	58,174	[3]50,851

See footnotes at end of table.

Table 1.—Other countries of East Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country and commodity	1982	1983	1984	1985[p]	1986[e]
KENYA[2] —Continued					
Gem stones, precious and semiprecious:					
Amethyst ____ kilograms	3	5	17	10	[3 4]
Aquamarine ____ do	[4]	4	7	7	[3 4]
Garnet ____ do	63	68	107	90	[3]44
Ruby ____ do	--	98	187	92	[3]66
Sapphire ____ grams	33	--	NA	100	NA
Tourmaline ____ kilograms	11	37	13	31	[3]5
Gold, mine output, Au content ____ troy ounces	21	100	600	442	[3]2,339
Gypsum and anhydrite ____	300	1,350	[e]1,500	[e]1,500	[3]11,060
Iolite ____ grams	--	5,504	23,000	24,000	NA
Iron and steel:					
Iron ore: Gross weight ____	4,310	--	--	--	--
Steel, crude[e] ____	10,000	10,000	10,000	10,000	10,000
Kyanite ____ kilograms	--	5,447	1,000	1,000	1,000
Lime ____	21,941	34,869	20,855	27,860	[3]12,300
Magnesite ____	--	NA	311,254	300,000	300,000
Petroleum refinery products:[e]					
Gasoline, motor thousand 42-gallon barrels	2,555	2,555	2,600	2,600	2,600
Jet fuel ____ do	3,285	2,555	2,600	2,600	2,600
Distillate fuel oil ____ do	3,285	3,285	3,300	3,300	3,300
Residual fuel oil ____ do	4,745	4,015	4,000	4,000	4,000
Unspecified ____ do	730	365	400	400	400
Refinery fuel and losses ____ do	150	365	400	400	400
Total ____ do	14,750	13,140	13,300	13,300	13,300
Phosphatic materials: Guano ____	[4]	--	6	6	--
Salt:					
Rock ____	[e]45,000	[e]60,000	72,885	66,330	65,000
Other ____	24,411	[e]23,427	28,000	25,800	[3]35,379
Total ____	[e]69,411	83,427	100,885	92,130	100,379
Sodium compounds, n.e.s.:					
Soda, crushed, raw ____	2,412	4,260	5,288	5,441	[3]5,882
Soda ash ____	160,440	193,690	226,050	227,760	[3]237,650
Stone, sand and gravel:					
Calcareous:					
Coral (for cement manufacture) ____	1,442,928	NA	NA	NA	[3]175,030
Kunkur (for cement manufacture) ____	NA	NA	NA	230,000	NA
Limestone (for cement manufacture) ____	--	1,579,960	1,444,234	1,333,000	[3]2,069,020
Sand, glass ____	NA	74	95	100	[3]255
Shale ____	259,426	231,069	789,484	750,000	750,000
Vermiculite ____	1,556	[e]1,200	872	1,515	[3]2,544
Wollastonite ____	--	--	--	--	[3]298
LESOTHO[2]					
Diamond:					
Gem[e] ____ carats	33,119	--	--	--	--
Industrial[e] ____ do	9,000	--	--	--	--
Total ____ do	42,119	--	--	--	--
Stone[e] ____ cubic meters	25,000	25,000	25,000	25,000	NA
MALAWI[2]					
Cement, hydraulic ____	53,453	70,318	70,058	[r e]61,500	[3]69,363
Coal ____	--	--	2,000	[r e]4,000	[3]10,419
Lime ____	2,041	2,190	2,005	[e]2,000	[3]2,775
Stone: Limestone ____	79,758	109,186	[e]100,000	[e]100,000	120,000
MAURITIUS[2]					
Lime[e] ____	[3]7,000	7,000	7,000	7,000	7,000
Salt[e] ____	[3]6,000	6,000	6,000	6,000	6,000
Stone: Basalt, not further described[e] ____	[3]942,000	1,100,000	1,100,000	1,100,000	1,100,000
MOZAMBIQUE[2]					
Asbestos ____	852	[r e]600	[r e]400	55	--
Bauxite ____	--	--	--	5,037	10,000
Beryllium: Beryl concentrate, gross weight ____	8	6	7	[e]6	6

See footnotes at end of table.

Table 1.—Other countries of East Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country and commodity	1982	1983	1984	1985[p]	1986[e]
MOZAMBIQUE[2] —Continued					
Bismuth	4	1	NA	NA	NA
Cement, hydraulic thousand tons	350	420	[e]450	[e]450	450
Clays:					
Bentonite	1,455	250	405	361	400
Kaolin	310	292	[e]300	152	200
Coal, bituminous thousand tons	67	59	107	20	30
Copper, mine output, salable ore and concentrate:					
Gross weight	1,455	1,189	1,573	590	500
Cu content	310	250	291	118	100
Feldspar	696	817	[e]800	67	70
Gem and ornamental stones:					
Aquamarine grams	1,881	2,246	2,400	3,600	3,600
Beryl, morganite do	198	28	96	50	50
Emerald do	3,819	3,531	4,200	5,000	5,000
Garnet kilograms	1,639	1,268	1,625	1,500	1,500
Rose quartz do	8,200	4,911	3,600	2,500	2,500
Tourmaline grams	19,593	1,597	6,000	1,500	1,500
Lime, hydraulic[e]	10,000	10,000	10,000	10,000	10,000
Marble cubic meters	561	406	575	715	700
Mica, waste	148	309	[e]300	[e]300	300
Monazite concentrate kilograms	3,065	4,141	[e]4,000	[e]4,000	4,000
Petroleum refinery products:[e]					
Gasoline thousand 42-gallon barrels	608	637	140	175	175
Kerosene and jet fuel do	201	162	23	50	50
Distillate fuel oil do	989	454	160	250	250
Residual fuel oil do	1,288	652	487	500	500
Asphalt do	7	11	25	25	25
Total do	3,093	1,916	835	1,000	1,000
Salt, marine[e]	28,000	28,000	28,000	28,000	28,000
Tantalum ores and concentrates, gross weight:					
Microlite kilograms	29,600	23,000	9,900	6,283	6,000
Tantalite	21,600	13,900	6,700	4,275	4,000
RWANDA[2]					
Beryllium: Beryl concentrate, gross weight	69	32	44	27	--
Columbite-tantalite, ores and concentrates, gross weight	62	50	52	28	--
Gold, mine output, Au content troy ounces	286	623	240	238	[3]208
Tin:					
Mine output, Sn content	1,159	1,068	1,093	813	[3]29
Smelter output, Sn content	908	1,110	[e]1,000	800	--
Tungsten, mine output, W content	324	231	260	167	[3]13
SEYCHELLES[2]					
Guano[e]	4,500	4,500	4,500	4,500	4,500
SOMALIA[2]					
Salt, marine[e]	30,000	30,000	30,000	30,000	30,000
Sepiolite, meerschaum[e]	[3]9	10	10	10	10
SUDAN[2]					
Cement, hydraulic thousand tons	183	[e]200	176	193	200
Chromium: Chromite concentrate, gross weight[e]	19,000	20,000	20,000	8,799	8,500
Gold, mine output, Au content[e] troy ounces	400	500	1,500	1,500	1,600
Gypsum and anhydrite, crude[e]	8,000	8,000	8,000	6,400	7,000
Manganese ore[e]	400	400	400	400	400
Mica, all grades	165	10	10	[e]10	10
Petroleum refinery products:[e]					
Gasoline thousand 42-gallon barrels	1,000	1,000	[3]772	1,000	1,000
Jet fuel do	300	300	[3]334	300	300
Distillate fuel oil do	2,000	2,000	[3]1,438	1,500	1,500
Residual fuel oil do	2,000	2,000	[3]1,690	1,500	1,500
Other do	--	--	[3]216	--	--
Refinery fuel and losses do	300	300	[3]44	300	300
Total do	5,600	5,600	[3]4,494	4,600	4,600
Salt	27,927	[e]75,000	[e]75,000	38,467	40,000

See footnotes at end of table.

Table 1.—Other countries of East Africa: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country and commodity	1982	1983	1984	1985[p]	1986[e]
SWAZILAND[2]					
Asbestos: Chrysotile	30,145	26,287	25,832	25,130	[3]20,908
Coal, anthracite	115,043	101,652	124,569	166,079	[3]172,000
Diamond carats	--	--	16,837	21,128	40,000
Stone: Quarry product cubic meters	82,041	151,468	97,657	83,903	85,000
Tin, mine output, Sn content	7	5	1	--	--
TANZANIA[2]					
Cement, hydraulic thousand tons	[e]400	[e]420	370	301	300
Clays:					
Bentonite	[e]50	75	75	[e]75	75
Kaolin	[e]750	1,276	1,885	1,636	1,600
Coal, bituminous	[e]1,000	9,996	9,722	20,000	20,000
Diamond[5] carats	[r e]220,000	260,574	277,352	[r e]295,500	300,000
Gem stones, precious and semiprecious excluding diamond:[e 6]	650	[3]646	650	[3]646	650
Gold, refined[e] troy ounces	600	800	[3]2,680	[3]1,776	2,000
Gypsum and anhydrite, crude[e]	12,000	12,000	12,000	[3]14,411	12,000
Lime, hydrated and quicklime[e]	6,800	[3]3,006	3,000	[3]2,472	3,000
Mica, sheet	5	([4])	([4])	([4])	([4])
Nitrogen: N content of ammonia[e]	6,000	6,000	6,000	6,000	6,000
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	[e]800	718	892	[e]800	800
Kerosene do.	[e]300	174	213	[e]300	300
Jet fuel do.	[e]220	200	259	[e]220	220
Distillate fuel oil do.	[e]1,050	914	1,062	[e]1,050	1,050
Residual fuel oil do.	[e]1,750	1,317	1,904	[e]1,750	1,750
Liquefied petroleum gas do.	[e]80	54	63	[e]80	80
Refinery fuel and losses do.	[e]300	290	330	[e]300	300
Total do.	[e]4,500	3,667	4,723	[e]4,500	4,500
Phosphate minerals: Apatite	--	[e]20,000	14,536	15,000	20,000
Salt, all types	[e]37,000	28,297	21,659	21,108	25,000
Soda ash	--	--	298	300	300
Tin, mine output, Sn content	9	6	[e]6	2	2
UGANDA[2]					
Cement, hydraulic[e]	[3]17,015	20,000	20,000	20,000	20,000
Lime, hydrated and quicklime	74	413	[e]500	[e]500	500
Phosphate minerals: Apatite[e]	--	100	100	100	100
Salt, evaporated[e]	5,000	5,000	5,000	5,000	5,000
Tin, mine output, Sn content	4	25	[e]25	[e]25	25
Tungsten, mine output, W content	4	4	[e]4	[e]4	4

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

[1]Includes data available through Sept. 10, 1987.

[2]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (clays, sand and gravel, and stone) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

[4]Less than 1/2 unit.

[5]Diamond figures are estimated to represent 70% gem-quality or semigem-quality and 30% industrial-quality stones.

[6]Exports.

COMOROS

The Comoro Islands continued to rank among the world's poorest nations in 1986. There were no known commercially exploitable mineral deposits on the islands, and only small sand and gravel excavations for local construction were operated during the year. The country's principal foreign exchange earners were the agricultural exports, vanilla and cloves, which were used in perfume manufacture. Both production declines and depressed market conditions adversely affected revenues from these historical trade earners.

DJIBOUTI

Mineral production in Djibouti during the year was limited to locally used construction materials, evaporated salt, and a small amount of lime. The Hanle-Gaggade phase I geothermal project was under way, with Pool-Intairdril of the United States selected as the drilling contractor for four exploration geothermal wells. Drilling work began in December at Hanle, 50 kilometers southeast of the Ethiopian border. The wells were to be drilled over a 1-year period and expected to range in depth from 2,270 meters to 2,424 meters. The value of the drilling contract was estimated at $6 million.[4] The Italian company Aquater, a subsidiary of the state agency Ente Nazionale Idrocarburi (ENI), was consultant on the geothermal project and was expected to conduct a detailed analysis on well data to determine the area's geothermal reserves. Potentially, all of Djibouti's electrical demands could be met with geothermal energy. The total phase I cost was estimated at $16.6 million and was being funded by the IDA, the Government of Italy, the African Development Bank, the Organization of Petroleum Exporting Countries Fund for International Development, and the UNDP.

ETHIOPIA

Mineral production in Ethiopia continued to be a small part of the economy with only minor amounts of gold, kaolin clay, and platinum produced for export, while gypsum, limestone, and salt were produced for domestic consumption. All petroleum-related requirements were imported, with crude being refined at the country's sole refinery at Assab.

The Government was putting considerable emphasis on increasing the production of gold, with the only production in 1986 coming from the Adola alluvial deposits in southern Ethiopia. Assistance from the U.S.S.R. was under way during the year to increase output from the Adola area. The Government hoped to quadruple the annual production, which was estimated at 15,000 troy ounces for 1986. The Bureau de Recherches Géologiques et Minières (BRGM) of France was under contract to conduct a final feasibility study on development of the Lega Denbi gold deposits, also in southern Ethiopia. Part of the study was for construction of a proposed 3,000-ton-per-day conventional cyanide leaching and associated processing plant. The estimated $500,000[5] study was being financed by the European Investment Bank. The study was expected to be completed by yearend, and followup contract work for final design and engineering studies were expected in 1987. Seltrust Engineering of the United Kingdom submitted a preliminary feasibility study of the Lega Denbi gold deposits and existing mine in November 1985.

Work continued on development of an open pit potash mining operation in the Danakil Depression in northern Ethiopia in 1986. The Ethiopian-Libyan Mining Co. contracted with Entreprise Minière et Chimique S.A. of France to design and supervise the construction of a 1.5-million-ton-per-year open pit mine and beneficiation plant based on approximately 70 million tons of proven potassium chloride reserves in the western Danakil area. Mining operations were not expected to get under way until 1990.

A seminar promoting oil and gas exploration in Ethiopia was held in Addis Ababa in April 1986, at which nine international petroleum companies attended. Fifteen predefined exploration concession blocks in the Ogaden area of southeastern Ethiopia and nine offshore concession blocks were promoted at the seminar and made available for contract concessions by the Ethiopia Ministry of Mines and Energy. Seven of the international firms requested further information on the blocks being offered. By yearend, only Conoco Petroleum Ltd. of the United States had bid on any of the blocks.

Unrelated to the April petroleum exploration conference, Chevron Oil Co. acquired prospecting rights to 26,500 square kilometers in the Gambela Basin of southwestern Ethiopia. The U.S.S.R. continued exploration activities in the Ogaden area and announced a substantial gas discovery during 1986.

KENYA

Kenya's economy grew at an impressive 5.7% rate in 1986, while inflation was below 10%. The stability of the economy was due in part to the slump in import prices for petroleum, a welcomed relief as Kenya continued to import all of its fossil fuel needs. Kenya has spent as much as 35% of its annual export earnings on energy imports. The mineral industry, a minor contributor to the economy, experienced setbacks in 1986. The major reason for the downturn in the minerals sector was the loss of important Middle Eastern markets, particularly for cement exports. Industrial construction programs within those market economy countries resulted in the completion of a number of cement plants during the early to mid-1980's. In 1986, fluorspar exports were also down owing to marketing problems. The Kenya Fluorspar Co. Ltd. (KFC), the country's sole fluorspar mine operator, was moving as quickly as possible to expand marketing into Europe, Australia, the United States, and Japan. The international soda ash market was oversupplied during the year and prices remained stagnant.

In March, the IDA approved a $6 million[6] credit to Kenya for technical assistance in developing the country's petroleum industry. The technical assistance project was to help the Government with petroleum and natural gas in-house exploration research efforts, and to assist in the promotion of Kenyan exploration concessions to international petroleum companies.

KFC successfully produced low-phosphorus, high-quality fluorspar during the last half of 1986 for the first time since startup of the operation in 1975. Results of laboratory work in 1985 by Robertson Research International Ltd. of the United Kingdom, a chemical analysis research contractor, resulted in the development of an economically feasible process for reducing phosphorus impurities in KFC's concentrates. The level of impurities had plagued the company's marketing situation since startup. The impurity level had been as high as 0.5% phosphorus pentoxide, which was making the concentrates hard to market. By the use of various reagents to depress apatite in the flotation circuit, Robertson Research showed that the phosphorus pentoxide content could be lowered to less than 0.10%. In addition to the use of the reagents in the new process at the company's plant, extra cleaning of the concentrates was also required; therefore, the cleaning circuit at the processing plant was expanded in 1986 from six to nine cleaning stages. The required additional washing was also having the beneficial effect of lowering the level of other impurities of the plant's fluorspar product.

Soda ash production by the country's sole producer, Magadi Soda Co., reached a record-high level, almost 4% greater than that of 1985. Despite the international oversupply of soda ash, the price remained firm at approximately $120 per ton delivered. However, internal railroad transportation problems were cause for concern for Magadi, which was hoping to expand its operation substantially under an estimated $95 million planned program to manufacture pure soda ash. Other minerals produced in Kenya were small scale and strictly for domestic markets.

The fledgling gold sector continued to evolve with the development of an underground mine near Bondo on the shores of Lake Victoria. Shaft sinking operations started at the minesite in 1986. Also in the Lake Victoria area, the gossan deposits at the old Macalder Mines were under investigation by a local Kenyan company, Migori Gold. Development of small open pits up to 30 meters in depth by Migori was being proposed to recover the gold ore, reported to have an average grade of 0.16 troy ounce of gold per ton. The Government's attempts to control illegal gold panning and trading through licensing of miners and traders in 1986 proved frustrating and were considered ineffective by Government officials.

LESOTHO

During 1986, there were no commercial mining operations in Lesotho. Since the closure of the Letseng-la-Terai diamond mine in 1982, the country's annual mineral production has been reduced to exploitation of sand and gravel for local construction. Lesotho continued, however, to export mine labor to the Republic of South Africa.

MALAWI

Cement manufacture by the Portland Cement Co. Malawi Ltd. increased approximately 13% in 1986. As in previous years, problems surrounding imports of required coal and gypsum hampered the production cycle; however, the increase was considered satisfactory by Portland Cement and the Government. To obtain a higher degree of self-sufficiency in cement manufacture, gypsum exploration intensified in Malawi with investigations centering on the known Katete and Linthembwe deposits in central Malawi and a number of locations in the Dedza and Dowa Districts.

The Kaziwiziwi coal mine near Livingstonia produced over 10,400 tons in its second year of operation. The mine, which had closed early in the year, was reopened in August and was steadily increasing production. The mine operator was the Mineral Investment & Development Corp. (MIDCOR). The rate of extraction by yearend increased to 750 tons per week. The sales of coal slightly exceeded the production, and the locally supplied coal was having a significant impact on imports. The Kaziwiziwi Mine was Malawi's first commercial coal mine. With assistance from the Government of France, a coal analysis laboratory was commissioned in Lilongwe. Previously, coal samples had to be sent abroad for analysis. The coal at Kaziwiziwi had good calorific value and an ash content averaging less than 15%.

During the year, coal mined from Kaziwiziwi's four underground labor intensive longwall faces was loaded directly from the mine into trucks for transportation to customers. There were no facilities to clean or size the coal in 1986; however, screening and sizing facilities were to be installed in 1987. Malawi reserves of coal were estimated at 860 million tons at yearend, and further reserves were expected to be identified. Based on the success or failure of the Kaziwiziwi Mine, MIDCOR was planning to open up two other larger coal mines in north Rumphi and at Ngana. Other coal prospects were also being evaluated in the south around the Lower Shire area. MIDCOR eventually hoped to develop a coal export industry. Proximate tests on Malawi coals from Kaziwiziwi and other sites all showed good calorific values, low sulfur, and medium ash contents.

Lime production increased within Malawi's small-scale artisan industry, owing mainly to an increase in the number of artisan operators. Both the Malawi Geological Survey Department and Department of Mines were promoting projects to upgrade the quality of lime produced as well as increase production. The Government hoped that local suppliers could compete with or replace costly lime imports, which supplied all of Malawi's high-quality requirements in 1986.

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

(Metric tons unless otherwise specified)

Commodity	1982	1983	Destinations, 1983	
			United States	Other (principal)
Aluminum: Metal including alloys, scrap	13	--	--	
Cement	--	3	--	All to Mozambique.
Copper: Metal including alloys, scrap	7	--		
Iron and steel: Metal:				
Scrap	3	26	--	Republic of South Africa 17; Zimbabwe 9.
Semimanufactures: Universals, plates, sheets	49	--		
Lead: Metal including alloys, scrap	100	83	--	All to Zimbabwe.
Other metals: Ores and concentrates	--	166	--	All to United Kingdom.

[1]Table prepared by Virginia A. Woodson.

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

(Metric tons unless otherwise specified)

Commodity	1982	1983	Sources, 1983	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	180	170	--	West Germany 43; Switzerland 30; Hong Kong 27.
Copper: Metal including alloys, all forms	46	52	NA	Republic of South Africa 26; United Kingdom 21.
Iron and steel: Metal:				
Pig iron, cast iron, related materials	10	23	--	Zimbabwe 20; Canada 3.
Steel, primary forms ------ value	$15,413	$4,999	--	Zimbabwe $4,559; Republic of South Africa $209.
Semimanufactures:				
Bars, rods, angles, shapes, sections	5,199	4,436	--	Zimbabwe 2,047; Republic of South Africa 1,439.
Universals, plates, sheets	10,746	9,338	--	Republic of South Africa 5,829; Japan 2,736.
Hoop and strip	99	132	--	Republic of South Africa 112; Japan 20.
Rails and accessories	678	4	--	All from Republic of South Africa.
Wire	1,756	1,175	NA	Zimbabwe 715; Republic of South Africa 448.
Tubes, pipes, fittings	1,893	2,188	--	Republic of South Africa 1,743; Zimbabwe 162.
Castings and forginigs, rough	35	1	--	Mainly from Republic of South Africa.
Lead: Metal including alloys, all forms	79	73	--	Zimbabwe 66.
Tin: Metal including alloys, all forms kilograms	1,575	848	--	Republic of South Africa 840.
Tungsten: Metal including alloys, all forms	(2)	34	--	Mainly from Republic of South Africa.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones kilograms	--	21,219	190	Republic of South Africa 14,895; United Kingdom 2,770.
Cement	233,678	12,260	--	Zambia 8,811; Mozambique 3,047.
Fertilizer materials: Manufactured:				
Nitrogenous	64,626	84,025	--	Republic of South Africa 44,587; West Germany 15,000; Belgium-Luxembourg 13,975.
Phosphatic	15,192	21,339	--	Republic of South Africa 21,213.
Potassic	7,524	9,694	175	West Germany 2,973; Republic of South Africa 2,500; Israel 2,496.
Unspecified and mixed	32,998	48	--	Zambia 40; Republic of South Africa 8.
Lime	2,585	2,941	--	Zambia 1,481; Republic of South Africa 1,446.
Mica: Worked including agglomerated splittings kilograms	1,182	--		
Phosphates, crude	373	62	--	United Kingdom 36; Zimbabwe 22.
Precious and semiprecious stones other than diamond: Natural kilograms	1	--		
Pyrite, unroasted	NA	6	--	All from Republic of South Africa.
Salt and brine	13,415	9,850	--	Republic of South Africa 4,342; Namibia 3,600.
Sodium compounds, n.e.s.: Sulfate, manufactured	1,395	1,214	--	United Kingdom 714; Netherlands 464.
Stone, sand and gravel	31	2	--	All from Republic of South Africa.
Sulfur:				
Elemental: Colloidal, precipitated, sublimed	9	55	--	Zimbabwe 50.
Sulfuric acid	318	491	(2)	United Kingdom 328; Republic of South Africa 103.
MINERAL FUELS AND RELATED MATERIALS				
Carbon black	4	11	(2)	Republic of South Africa 10.
Coal, all grades	60,986	43,728	--	Mozambique 19,425; Zambia 12,144.
Coke and semicoke	399	130	--	All from Zimbabwe.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1982	1983	Sources, 1983	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum:				
Crude ---------42-gallon barrels--	--	958	--	Republic of South Africa 533; Zambia 252.
Refinery products:				
Liquefied petroleum gas --do----	3,631	3,758	--	Zambia 3,248; Republic of South Africa 371.
Gasoline ----------do----	314,833	305,103	--	Zambia 165,441; Republic of South Africa 103,531.
Mineral jelly and wax ---do----	39,556	37,608	3,439	Republic of South Africa 25,279; Singapore 5,587.
Kerosene and jet fuel ---do----	72,264	78,754	--	Republic of South Africa 74,809.
Distillate fuel oil ------do----	433,489	488,472	--	Republic of South Africa 445,394.
Lubricants----------do----	21,838	26,554	(2)	Republic of South Africa 26,516.
Nonlubricating oils ----do----	580	317	--	Republic of South Africa 314.
Residual fuel oil ------do----	9,005	1,474	--	Mozambique 814; Zambia 176.
Bitumen and other residues do----	30,342	19,241	--	Zambia 13,490; Republic of South Africa 5,751.
Petroleum coke-------do----	330	242	--	Republic of South Africa 209.

NA Not available.
[1]Table prepared by Virginia A. Woodson.
[2]Less than 1/2 unit.

MAURITIUS

The mineral industry of Mauritius remained insignificant in 1986, with only small amounts of salt and lime produced, along with some sand, gravel, and stone for building construction. For the first time since 1974, Mauritius recorded a trade balance surplus for the year, owing mainly to lower import prices and increasing exports. Fuel imports decreased by 36%, while manufacturing exports increased by 16%, and total exports increased 34%. Although sugar production remained the single most important export item, the manufacturing sector accounted for 55% of export revenues for the year.

MOZAMBIQUE

Despite the known occurrences of extensive deposits of many minerals, Mozambique's mineral industry remained limited to small-scale mining operations. Mineral commodities produced included bauxite, beryl, cement, clays, coal, copper, gem and ornamental stones, salt, and tantalum ores. Caught between falling mineral production owing to civil strife and increasing foreign exchange needs, the Government of Mozambique changed its mineral policy code and was encouraging joint ventures with foreign investors in 1986.

At independence in 1975, the mining industry had been in private hands. In 1978 and 1979, the entire industry was nationalized and then operated by two state agencies, Empresa Nacional de Minería and Carbonífera de Mozambique S.A., which exclusively handled the coal industry. In 1983, the Ministry of Mineral Resources was formed with responsibility for all mineral exploration and exploitation. Under the Ministry was the National Institute for Geology, the National Directorate for Hydrocarbons, the Coal Cabinet, and the National Directorate of Mines, agencies still intact in 1986. The new code was a major departure from the previous Government policy of state ownership and control of all mining operations through the Government's mineral agencies.

The new mining law was enacted in July 1986 and delineated a much improved code for licensing and regulating mineral enterprises within Mozambique, as well as complementing the country's new investment code, which created and protected rights for private and foreign investment in the country. Other key provisions of the law included financial benefits such as duty-free imports on mining machinery and equipment, and exemption from custom fees on mineral exports. Passage of the law was considered a

major step in attracting foreign investment to Mozambique. However, owing to continued civil strife throughout most of the country, improvements in the general economy from mining were expected to be slow in evolving.

The civil strife continued to severely cripple the country's major mineral export earner, the coal industry. The Government, however, hoped to substantially expand the industry during the late 1980's and early 1990's with an agreement for coal mining and exports between the Government of Mozambique and Brazilian interests. Large reserves of both steam and metallurgical coal had been identified at Moatize in Tete Province by Brazil's Cia. de Pesquisa de Recursos Minerais (CPRM), and further exploration studies by CPRM were under way in 1986. Mozambique's coal reserves were estimated at over 10 billion tons. Resolution of civil strife, development of power, and improved transportation in the area were considered necessary before any large-scale mining could take place.

In October, the Government awarded Edlow Resources of the United States a 27-year concession for exploration and development of titanium-bearing beach sands along a 200-kilometer stretch of coastline in the Zambezia and Nampula Provinces centered around the port town of Pebane. The company was expected to start a $20 million[7] project early in 1987 to explore for and develop ilmenite and rutile deposits within the concession.

In other developments, the United Nations Industrial Development Organization was funding a small feasibility study to investigate construction of a direct-reduction iron and steel plant complex for Mozambique. Technical assistance was being provided by the Indian firm Sponge Iron India Ltd. (SIIL). The study was to investigate construction of a rotary-kiln direct-reduction plant using local coal and iron ore. SIIL was to conduct laboratory tests on Mozambique ores for suitability, as well as preliminary design work for the proposed plant. Petroleum exploration work by the partnership, Esso Petroleum Co. and Shell Exploration Co., continued in the northern Province of Cabo Delgado. Esso had been active since 1983 exploring onshore for petroleum in the Rovuma River Basin of Cabo Degado. Seismic testing was completed in the last half of 1985, and exploratory drilling operations began in the first half of 1986 at a site 15 kilometers from the small port town of Mocimboa da Praia. Results of the drilling were unknown at yearend.

REUNION

Mineral activities on the island were limited to small sand and gravel operations for local construction and the operation of a 200,000-ton-per-year cement clinker grinding plant at Saint Denis, which manufactured cement mix from imported materials. Reunion, an island of approximately 2,500 square kilometers, had a population of slightly less than 550,000 people in 1986 and remained an overseas Department of France.

Table 4.—Reunion: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
Abrasives, n.e.s.: Grinding and polishing wheels and stone _ value, thousands	$2	--		
Aluminum: Metal including alloys:				
Scrap	51	43	--	All to France.
Semimanufactures	1	--		
Cement	827	4	--	All to Comoros.
Copper: Metal including alloys:				
Scrap	132	138	--	France 136.
Semimanufactures value, thousands	--	$1	--	All to Mauritius.
Fertilizer materials: Manufactured:				
Nitrogenous	--	3	--	All to Madagascar.
Unspecified and mixed	--	6	--	All to Comoros.

See footnote at end of table.

Table 4.—Reunion: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
Iron and steel: Metal:				
Scrap	2,287	2,716	--	Italy 2,596; France 120.
Semimanufactures:				
Bars, rods, angles, shapes, sections	269	86	--	Comoros 53; Madagascar 33.
Universals, plates, sheets	554	700	--	Comoros 516; France 123.
Hoop and strip	--	1	--	All to Comoros.
Wire	2	3	--	Comoros 2; Madagascar 1.
Tubes, pipes, fittings	32	75	--	Comoros 65; Madagascar 9.
Castings and forgings, rough	3	1	--	All to Comoros.
Lead: Metal including alloys:				
Scrap	161	--		
Unwrought	116	--		
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	499	731	--	Comoros 719.
Kerosene and jet fuel do	3,751	--		
Distillate fuel oil do	--	112	--	All to France.
Lubricants do	931	511	--	Comoros 490.
Residual fuel oil do	--	40	--	All to Comoros.
Silver: Waste and sweepings value, thousands	$1	--		
Sulfur:				
Elemental: Crude including native and byproduct do	--	$1	--	All to Comoros.
Sulfuric acid	--	4	--	Madagascar 3; Mauritius 1.

[1]Table prepared by Virginia A. Woodson.

Table 5.—Reunion: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals value, thousands	$2	$2	--	All from France.
Aluminum:				
Oxides and hydroxides	--	2	--	Do.
Metal including alloys, semimanufactures	240	225	--	France 188; Belgium-Luxembourg 22.
Chromium: Oxides and hydroxides	4	4	--	France 2; West Germany 2.
Copper: Metal including alloys:				
Scrap	2	--		
Unwrought	3	2	--	All from France.
Semimanufactures	219	257	--	France 226; Republic of South Africa 17.
Iron and steel: Metal:				
Pig iron, cast iron, related materials	54	5	--	All from France.
Ferroalloys	--	1	--	Do.
Steel, primary forms	--	42	--	Do.
Semimanufactures:				
Bars, rods, angles, shapes, sections	18,264	18,422	--	Republic of South Africa 9,680; France 6,433; Belgium-Luxembourg 1,453.
Universals, plates, sheets	14,228	18,708	--	France 11,900; Belgium-Luxembourg 4,771.
Hoop and strip	75	39	--	All from France.
Rails and accessories	13	652	--	West Germany 606; France 44.
Wire	517	624	--	France 316; Republic of South Africa 302.
Tubes, pipes, fittings	7,246	8,223	1	France 6,657; Republic of South Africa 1,469.
Castings and forgings, rough	410	398	--	France 388.

See footnote at end of table.

Table 5.—Reunion: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Lead:				
Oxides	17	9	--	All from France.
Metal including alloys, semimanufactures	10	11	--	Do.
Mercury value, thousands	--	$2	--	Do.
Nickel: Metal including alloys, semimanufactures	10	14	--	France 13.
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$13	$7	--	All from France.
Tin: Metal including alloys:				
Scrap do	--	$1	--	Do.
Unwrought do	$6	--		
Semimanufactures	3	1	--	Do.
Titanium: Oxides	267	379	--	France 360; United Kingdom 19.
Zinc:				
Oxides	2	8	--	All from France.
Metal including alloys:				
Unwrought	--	1	--	Do.
Semimanufactures	--	8	--	Do.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	3	1	--	Do.
Artificial: Corundum	3	--		
Grinding and polishing wheels and stones	61	39	--	Mainly from France.
Asbestos, crude	3	4	--	All from France.
Barite and witherite	62	220	--	Do.
Cement	139,451	248,661	--	Kenya 129,254; Republic of South Africa 60,222; France 30,545.
Chalk	1,349	2,072	--	France 1,562; Mauritius 510.
Clays, crude	72	553	--	All from France.
Diamond: Gem, not set or strung value, thousands	$18	$13	--	Do.
Diatomite and other infusorial earth	37	25	--	Do.
Feldspar, fluorspar, related materials	9	--		
Fertilizer materials: Manufactured:				
Ammonia	14	11	--	France 9; Belgium-Luxembourg 2.
Nitrogenous	2,744	2,495	--	Italy 1,504; France 648; Belgium-Luxembourg 273.
Phosphatic	167	279	--	France 199; Belgium-Luxembourg 60.
Potassic	50	249	--	All from Belgium-Luxembourg.
Unspecified and mixed	27,004	29,765	50	France 17,189; Italy 12,002; Mauritius 509.
Gypsum and plaster	6,876	7,730	--	All from France.
Lime	2,119	1,784	--	Kenya 1,446; Mauritius 334.
Magnesite, all forms	206	154	--	Belgium-Luxembourg 83; Greece 71.
Mica: Crude including splittings and waste	5	13	--	All from France.
Pigments, mineral: Iron oxides and hydroxides, processed	27	62	--	West Germany 35; France 27.
Precious and semiprecious stones other than diamond: Natural value, thousands	$20	$29	--	France $13; Hong Kong $9.
Salt and brine	3,299	2,224	--	West Germany 1,486; Madagascar 415.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	5	18	--	Mainly from West Germany.
Sulfate, manufactured	209	478	--	France 388; Italy 60.
Stone, sand and gravel:				
Dimension stone, worked	560	399	--	France 317; Italy 58.
Gravel and crushed rock	85	2	--	All from France.
Quartz and quartzite	--	4	--	Do.
Sand other than metal-bearing	80	29	--	Do.
Sulfur: Sulfuric acid	92	129	--	France 66; Netherlands 48.
Talc, steatite, soapstone, pyrophyllite	43	60	--	All from France.
Other: Crude	91	66	--	Do.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	18	22	--	Do.
Carbon black	3	3	--	Do.
Coal, all grades	96	2	--	Do.
Peat including briquets and litter	2	1	--	Do.

See footnote at end of table.

Table 5.—Reunion: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	196	183	--	Bahrain 67; Singapore 55; Republic of South Africa 52.
Gasoline, motor do.	775	807	--	United Arab Emirates 419; Bahrain 385.
Mineral jelly and wax do.	--	[2]	--	All from France.
Kerosene and jet fuel do.	353	380	--	Bahrain 103; United Arab Emirates 103.
Distillate fuel oil do.	493	516	--	Bahrain 311; United Arab Emirates 186.
Lubricants do.	30	23	--	France 15; Netherlands 4; Republic of South Africa 4.
Residual fuel oil do.	171	65	--	Bahrain 40; Madagascar 17; Republic of South Africa 8.
Bitumen and other residues do.	44	47	--	All from Republic of South Africa.
Bituminous mixtures do.	1	1	--	All from France.

[1]Table prepared by Virginia A. Woodson.
[2]Less than 1/2 unit.

RWANDA

Rwanda's sole mineral agency, Société Minière du Rwanda (SOMIRWA), remained financially insolvent in 1986. The agency declared bankruptcy and went into receivership in September 1985. Little changed during 1986 to resolve SOMIRWA's financial problems, although the Government was making strenuous efforts to reorganize the industry, and international agencies including the International Monetary Fund (IMF) were investigating possible solutions. However, the country's small tungsten and columbite-tantalite industries did operate, as well as some other small industrial mineral operations.

Internationally funded projects were under way during the year in the mineral areas of gold exploration, natural gas development, and cement manufacture. The UNDP was funding further gold exploration studies in the Niugwe and Miyove areas of Rwanda. Niugwe was in the southwestern part of the country near the border with Burundi, while Miyove was situated approximately 65 kilometers northwest of Kigali. The project entailed additional geological mapping, sampling and geochemical testing, trenching, and some diamond drilling. Other projects included Chinese assistance to the Government of Rwanda in the development of a small cement industry based on local resources and a European Economic Community-funded project to further study the possibilities of utilizing the large natural gas reserves of Lake Kivu.

SEYCHELLES

The only mineral-related operations on the islands of Seychelles were small sand and gravel pits for local construction, and collection and processing of guano for fertilizer. The Government of Seychelles was actively seeking partners to continue with petroleum exploration in its territorial waters. Pertinent exploration through 1986 centered around three exploration wells drilled in the western Continental Shelf by Amoco International during 1980 and 1981. The wells proved to be dry. After careful evaluation of the well data obtained, Amoco International closed down its Seychelles operation in March 1985. In an attempt to attract further international participation, the Government enacted a new petroleum code in July 1986. In August, an agreement was reached between the Seychelles National Oil Co. and the Oil & Natural Gas Co. of

India for a seismic survey project that would cover 3,000 square kilometers of the Continental Shelf. Funding was secured at yearend for a project to evaluate the petroleum exploration work done to date in Seychelles, which included approximately 28,000 kilometers of aeromagnetic survey work, 14,000 kilometers of seismic survey work, and the three Amoco International exploration wells. The cost of the project was estimated at $630,000.[8]

Table 6.—Seychelles: Exports and reexports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1983	1984	Destinations, 1984	
			United States	Other (principal)
Aluminum: Metal including alloys:				
Scrap	8	--		
Semimanufactures value, thousands	$1	$1	--	All to United Kingdom.
Copper: Metal including alloys, scrap	30	25	--	West Germany 13; Pakistan 10.
Fertilizer materials: Manufactured, nitrogenous	100	400	--	All to Mauritius.
Lead: Metal including alloys, scrap	4	8	--	All to West Germany.
Petroleum refinery products:				
Gasoline, motor 42-gallon barrels	--	128	--	Bahrain 119.
Kerosene and jet fuel do.	290,974	91,450	--	Bahrain 91,442.
Distillate fuel oil do.	183,300	341,705	--	Bahrain 227,269; Singapore 45,334; Djibouti 33,182.
Lubricants do.	280	--		
Residual fuel oil do.	6,414	45,561	--	Kenya 19,021; Bahrain 9,917.
Zinc: Metal including alloys, scrap	--	8	--	All to United Kingdom.
Other base metals: Metals including alloys, all forms value, thousands	$3	--		

[1]Table prepared by Virginia A. Woodson.

Table 7.—Seychelles: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1983	1984	Sources, 1984	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals value, thousands	--	$1	--	All from United Kingdom.
Aluminum: Metal including alloys, semimanufactures	68	34	1	Republic of South Africa 18; Belgium-Luxembourg 5.
Copper: Metal including alloys, semimanufactures	15	6	--	United Kingdom 5; Republic of South Africa 1.
Iron and steel: Metal, semimanufactures:				
Bars, rods, angles, shapes, sections	407	1,039	NA	Zimbabwe 477; Republic of South Africa 243.
Universals, plates, sheets	880	437	1	Japan 321; Republic of South Africa 64; Singapore 48.
Hoop and strip	2	1	--	All from Singapore.
Wire	6	5	--	Mauritius 4.
Tubes, pipes, fittings	184	479	2	West Germany 157; Japan 155; United Kingdom 126.
Castings and forgings, rough	10	2	--	Australia 1; United Kingdom 1.
Lead: Metal including alloys, semimanufactures	--	1	--	All from Australia.
Mercury value, thousands	--	$2	--	All from Republic of South Africa.
Nickel: Metal including alloys, semimanufactures do.	$1	$1	--	Do.
Tungsten: Metal including alloys, all forms do.	--	$2	--	All from United Kingdom.
Zinc: Metal including alloys:				
Unwrought	--	1	--	All from Republic of South Africa.
Semimanufactures value, thousands	--	$2	--	Japan $1; United Kingdom $1.
Other: Base metals including alloys, all forms	36	1	--	All from United Kingdom.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	3	4	--	United Kingdom 3; China 1.
Asbestos, crude value, thousands	--	$1	NA	NA.
Cement	19,408	10,667	--	U.S.S.R. 6,048; Kenya 4,101.

See footnotes at end of table.

Table 7.—Seychelles: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1983	1984	Sources, 1984	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Fertilizer materials: Manufactured:				
Ammonia	3	2	--	West Germany 1; Republic of South Africa 1.
Nitrogenous	1,005	20	--	All from West Germany.
Phosphatic	10	26	--	All from Belgium-Luxembourg.
Potassic	24	56	--	Mauritius 36; Belgium-Luxembourg 20.
Unspecified and mixed	155	122	--	West Germany 51; Mauritius 36.
Precious and semiprecious stones other than diamond: Natural value, thousands	--	$2	--	NA.
Salt and brine	317	409	--	Republic of South Africa 364; Singapore 20.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	--	19	--	Denmark 18.
Sulfate, manufactured	69	34	--	West Germany 30.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	97	6	--	Republic of South Africa 3; United Kingdom 2.
Worked	3	1	--	All from United Kingdom.
Dolomite, chiefly refractory-grade	--	14	--	All from Belgium-Luxembourg.
Sand other than metal-bearing	--	5	--	India 3.
Sulfur:				
Elemental: Crude including native and byproduct value, thousands	$1	--		
Sulfuric acid	9	10	--	Netherlands 5; Japan 2.
Talc, steatite, soapstone, pyrophyllite	30	--		
MINERAL FUELS AND RELATED MATERIALS				
Carbon black value, thousands	--	$2	--	All from Netherlands.
Coal: Anthracite	2	2	NA	NA.
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	1,833	2,262	--	Republic of South Africa 2,250.
Gasoline, motor do	3,978	67,677	--	Bahrain 33,932; U.S.S.R. 21,259.
Mineral jelly and wax do	32	39	--	United Kingdom 24; Republic of South Africa 15.
Kerosene and jet fuel do	162,130	109,632	--	Bahrain 72,742; Djibouti 28,884.
Distillate fuel oil do	292,335	438,275	--	Bahrain 290,373; Djibouti 94,377.
Lubricants do	1,169	1,190	NA	Singapore 966; United Kingdom 112.
Residual fuel oil do	95,631	96,870	--	Kenya 67,686; Djibouti 29,184.
Bitumen and other residues do	--	1,212	--	Republic of South Africa 1,133.
Bituminous mixtures do	--	1,539	--	Singapore 1,339; Republic of South Africa 170.

NA Not available.

[1]Table prepared by Virginia A. Woodson.

SOMALIA

As in previous years, the only mineral produced in Somalia for commercial export was sepiolite. Other industrial minerals were produced for local consumption, including salt from coastal evaporation pans, and limestone quarried for Somalia's fledgling cement industry at Berbera.

Sepiolite production in Somalia occurred at the country's sole mining location near the village of Bur, 370 kilometers northeast of Mogadiscio in central Somalia. Proven reserves exceed 2 million tons, and total reserves in the Bur area were estimated to be substantial, between 50 and 100 million tons of sepiolite ore.

The most important mineral-related activity during the year was the continuation and expansion of petroleum exploration activities in Somalia by several international companies. Because of the substantial petroleum discovery at Alif by the Yemen Hunt Oil Co. in mid-1984, in North Yemen's Ma'rib Jawaf Basin, speculation was widespread that the same structure extended into the Gulf of Aden and possibly down into Somalia. A number of international petroleum companies became interested in pursuing exploration programs in northern Somalia and finalized exploration agreements with the Government in 1986.

Occidental International Oil Co. of the United States began seismic studies in August just north of the Hafun Peninsula on the northeast coast of Somalia. Chevron of the United States signed a 3-year exploration agreement with the Government at the

beginning of the year, for a concession covering three blocks in the northern Guban area. The blocks covered about 50,000 square kilometers along Somalia's northwestern coast, both onshore and offshore in the Gulf of Aden. Geophysical survey work was expected to take 2 years. Conoco of the United States signed an exploration agreement with the Government in June for a concession covering approximately 100,000 square kilometers in the northern areas of Nugal, Sol, and Togder. Consolidated International Petroleum Corp. (CIPC) of Canada signed an exploration agreement in February for two blocks on Somalia's northern coastline. CIPC was to spend $8.5 million[e] over 3 years to acquire approximately 700 line-kilometers of seismic data on the two blocks, which covered 30,000 square kilometers along the Gulf of Aden coastline.

SUDAN

The economy of Sudan continued to suffer from a variety of financial ills and needed a major infusion of international aid in 1986. The only bright spots in Sudan's mineral sector were two separate gold developments. Petroleum activities, outside of emergency imports, were at a complete standstill or closing down.

One of the two gold developments involved the completion of the first full year of leaching operations at the Gebeit gold mine in the Red Sea Hills. Minex Developments Inc. operated the mine on behalf of its parent company, Greenwich Resources Ltd. of Vancouver, Canada, which owned 49% of the operation, and the Government of Sudan, which owned the remaining 51%. Ore derived from a low-grade lode and stockpiled tailings were feedstock for the vat-leaching operation. Throughout the year, work continued on development of an underground mine at Gebeit, which was expected to begin production operations in mid-1987.

Two levels were nearing completion at yearend 1986 at depths of 80 meters and 120 meters. Approximately 100 meters of horizontal development had occurred on the upper of the two levels, with drivage on the lower level expected to begin in early 1987. Mining of ore was to occur between these two levels within the Wadi gold lode. A third development level, at 160 meters depth, was in the planning stages. Rehabilitation and deepening of a 45-degree incline shaft was completed in 1986, along with installation of a new headframe and winder. Also, a water supply system was operational, which was piping water 11 kilometers from Wadi Hadayu to Gebeit.

Capacity of the mine's vat-leaching operation, which had an original capacity of 100 tons per day, was being increased to 300 tons per day. The processing plant was being constructed during the year by GEC Mechanical Handling of the United Kingdom. The completed plant was to comprise crushing, grinding, gravity separation, flotation, leaching, and smelting.

A new intersection of gold mineralization was discovered in the Wadi Lode, a depth of 165 meters. The grade was reported to average 0.52 troy ounce of gold per ton across a 5.5-meter-width, and was the thickest gold intersection discovered to date within the Wadi Lode. The discovery increased recoverable reserves, grading 0.96 troy ounce of gold per ton, from 175,000 tons to 600,000 tons. The Gebeit operation was 200 kilometers northwest of Port Sudan. Additional exploration work was planned through 1989.

The other major gold activity was the development of the Hassai Mine by BRGM and Total Compagnie Minière, both of France. They continued with construction of a gold heap-leaching operation at Hassai in the Red Sea Hills throughout most of 1986. Startup of the open pit and leaching operation was expected to begin early in 1987, with BRGM as the operator. Proven reserves were estimated at 1.8 million tons of ore containing approximately 420,000 troy ounces of gold. Further exploration efforts were in progress throughout most of the year.

Other areas of the mineral industry remained stagnant at best. The chromite industry still suffered from inadequate and antiquated mining equipment and facilities. The Government-owned Ingessana Hills Mining Corp. continued to exploit the chromite deposits at Jebel Gam near the Ethiopian border at well below the area's potential. Mining and Government officials felt conditions and production levels would not improve until a major infusion of technical and financial assistance could be made. The gypsum, mica, and cement industries were also stagnant. Development of the Heglig and Unity petroleum fields in the south remained unchanged. No real progress on exploiting the known 400 million barrels of crude oil reserves had been made since early 1984, and no progress was expected to be made until the political and civil strife problems between Sudan's southern and northern factions were resolved.

SWAZILAND

Swaziland's economy remained agriculturally based in 1986 with sugar the main export crop, with cotton, maize, and citrus fruits also making healthy contributions to the country's export earnings. Forestry was the second largest foreign exchange earner, and tourism remained important. With the rapid growth in the country's manufacturing sectors, the percentage contribution to the economy by the minerals sector continued to slowly decline, representing approximately 5% of the country's export earnings and 3% of salaried employee earnings in 1986. Asbestos, coal, and diamonds dominated Swaziland's mineral economy. Coal and diamonds continued to increase in importance, while asbestos production at the country's only mine, Havelock, continued to decrease. Market problems and depletion of higher grades were given as the reasons for the decline. The overall value of minerals exported had risen in the previous few years owing to coal export increases and the startup of a diamond mine at Dvokolwayo. Diamond production was still increasing steadily at the Dvokolwayo operation, which was in its third year. Approximately 2,500 people were employed in Swaziland's minerals sector in 1986. Almost one-half of the work force was underground mining personnel.

Mineral export revenues increased almost 20% to $84 million.[10] The increase was attributed to market price increases for diamonds and asbestos, and most notably a substantial increase in coal exports, approximately 40%, to 177,000 tons. Export of coal to the Republic of Korea for briquetting more than trebled, to almost 90,000 tons. The other major coal export market was the Kenya's Bamburi cement plant, which received approximately 65,000 tons.

Production of asbestos ore from the Havelock underground mine decreased slightly, while tonnage of chrysotile fiber product from the mill decreased substantially. Poor ore quality was given as the main cause for the decrease of fiber produced, as evidenced in the mill's recovery rate, which dropped 7% from 1985 to 1986.

A treatment plant at the Dvokolwayo open pit diamond mine was commissioned during the first half of the year, and a scrubber and rod mill to treat the clay portion of the ore was commissioned in the last half of 1986. Estimates by mine officials were that the mine could operate as an open pit operation for another 7 years, after which mining of the kimberlite pipe was to continue underground.

TANZANIA

General economic conditions within Tanzania improved for the first time in several years. The drop in import prices for crude petroleum and petroleum products, for which Tanzania imports all its requirements, along with a good agricultural year and devaluation of the country's shilling were all responsible for the improvement. Tanzania's major mineral production remained the Williamson Diamonds Ltd. open pit operations at Mwadui and Almasi. Exports for 1986 were valued at approximately $12.3 million.[11] In September, the Government granted income tax concessions to expatriates working in the minerals sector of the economy. Taking effect retroactively to June 3, expatriates engaged in both mining and petroleum activities would pay a maximum of 50% income tax instead of the previous 75% ceiling.

In March, Geosurvey International of the United Kingdom made available a final report of countrywide geophysical airborne surveys conducted by the company in Tanzania during the 1976-81 period. The airborne survey data resulted in the development of both regional maps at a scale of 1:2,000,000 and detailed survey maps on particular sites, such as the processed results of aeromagnetic data on the Mwadui diamond field. According to the report summary, the airborne geophysical results show a number of promising exploration targets for diamonds, ferrous and base metals, gold, nickel, and uranium, as well as potential hydrocarbon-bearing formations.

Chinese assistance with construction of an underground coal mine at Kiwira continued throughout the year. Commissioning of the planned 150,000-ton-per-year mine was expected in the last half of 1988. The first phase of drilling at the Kabulo Ridge coal project, funded by the International Bank for Reconstruction and Development (World Bank), was completed during the year along with a feasibility study report.

The study proposes open pit mining of a 10-meter-thick seam of interbedded coal and shale at Kabulo Ridge. A second-phase study was also proposed; however, funding for the second phase was still pending a World Bank decision at yearend. Production at the country's sole operating coal mine near Llima remained well below capacity. The mining operation continued to suffer from a lack of spare parts, equipment, and fuel.

Progress in the area of legalized gold exploration and development was hampered throughout the year by a number of factors. The incumbent artisan program initiated in 1983 was being scrapped. Basically, the program was evaluated as generating limited interest and was unsuccessful in preventing clandestine operations. The Government was preparing a new artisan program for small-scale gold operators, which was expected to improve licensing procedures for operators and deter gold smuggling. The new program was to cover artisan gem operations and miners, as well the gold sector.

Tanzania's State Mining Corp. (STAMICO) continued into the second year of a 3-year agreement with the Geneva-based Dar Tadine Tanzania (DTT), for gold exploration over five concessions covering 7,000 square kilometers near Lake Victoria, and operation of a small gold-tailing-leaching plant at Buhemba. DTT suspended the Buhemba static leach operation in mid-1986 because of poor recoveries. Operation of the Buck Reef gold mine by STAMICO was hindered throughout the year owing to continued flooding of lower mine levels coupled with a shortage of fuel for pumping equipment, as well as shortages of other supplies and equipment spares. Poor recoveries of gold from ore resulted in an estimated production of only 2,000 troy ounces for the year.

The country's only phosphate mine at Minjingu continued to produce well below capacity. As in the past, the shortfall in production was not a mining problem, but mainly a transportation problem. The Minjingu Mine, built with Finnish assistance in the early 1980's, continued to be unable to reliably move ore concentrate to the fertilizer manufacturing facilities at Tanga, owing to railroad problems, particularly a shortage of railway wagons to carry the ore.

Work continued on planning for a natural gas gathering and treatment plant complex on the island of Songo-Songo, just off the country's southeast coast. Early in the year, Snamprogetti S.p.A. of Italy was awarded a contract to conduct further engineering studies on construction of the proposed plant. General plans called for the building of three offshore platforms, two onshore wellheads, a gas-gathering system, the gas treatment plant on Songo-Songo, a bitumen plant on Songo-Songo, and a 56-kilometer pipeline to transport the treated gas to the Kilwa Masoko terminal on the coast.

Amoco Tanzania Oil Co. signed an exploration and production-sharing agreement with the Government in October for an approximate 20,000-square-kilometer concession. The concession covered areas of Lake Tanganyika in western Tanzania. The first phase of the agreement called for Amoco Tanzania to conduct field studies and to study and interpret existing seismic data on the area by yearend 1987. Amoco Tanzania had the option to conduct additional seismic surveys on Lake Tanganyika, and the drilling of at least two exploratory wells would extend its exploration license to a term of 11 years. Amoco Tanzania also had a 50% interest in an exploration and production concession in the Lake Rukwa Valley area. Results of seismic survey work on the Rukwa area at yearend showed the existence of oil-and-gas-bearing rock; however, according to Amoco Tanzania officials, no conclusions were to be drawn until further survey work was completed and analyzed.

UGANDA

Uganda's economy continued to struggle throughout 1986, although the country's civil security situation improved during the year, along with the promise of further improvements in all sectors from the new Government, which came to power in January. In an attempt to save scarce foreign exchange, severe restrictions on imports of consumer goods were imposed in emergency measures announced by the Government in August. Also, a barter trade policy for essential import items was initiated. The policy was particularly aimed at trade with Uganda's neighboring states. By yearend, several barter protocols with a number of countries were concluded. Agriculture remained the mainstay of Uganda's economy, and coffee continued to be the major foreign

exchange earner, estimated at 90% of all export revenues. To improve and encourage agricultural productivity, producer prices for major export crops were significantly increased by the Government early in the year.

Mineral exploration permits and mining licenses were suspended in July to give the new Government time to develop a policy and regulatory structure to manage and control mineral activities within Uganda, and to help curtail illegal gold mining and trading operations. Late in the year, Lonrho Ltd. of the United Kingdom signed an agreement with the Government to plan and build a 180-kilometer oil pipeline from Kampala to its border with Kenya. Construction of the pipeline was to be contingent upon a similar agreement being reached with the Government of Kenya to complete the pipeline to the port city of Mombasa. The Government of Kenya was still considering the project at yearend.

The Government of Uganda introduced a two-tier foreign exchange rate in May, which for essential import items like fuel, was fixed at the exchange rate of 1,500 Ugandan shillings (U Sh) to U.S. dollars (US$), and for nonessential items a normal market exchange rate of U Sh5,000 per US$1.00. However, the Government changed strategies in midyear, and the two-tier system was abolished and the exchange rate was fixed at U Sh1,500 to US$1.00. At the same time, fuel prices were almost doubled and Government salaries were increased 50%. As a result, inflation increased and was rampant by yearend at almost 300%. The IMF and World Bank reacted by suspending some lines of credit.

The Ugandan Development Corp. (UDC), the state agency responsible for revitalizing industry within the country, was allocated $6 million[12] in 1986 to support its activities. Almost one-half of this allocation was spent on renovation plans for the Lake Katwe salt plant, an operation which, owing to a variety of problems including the country's constant civil strife, had not been functional since its construction in 1982.

The Kilembe copper mine remained on a care-and-maintenance basis for another year. In October, Uganda's Ministry of Minerals and Water Development announced a long-range, three-phase restoration program for the country's copper industry. The first phase, estimated at $20 million, would rehabilitate the mine and mill, with an eventual full-scale mine production of approximately 40,000 tons per month. Proven and probable copper ore reserves at Kilembe were approximately 4 million tons, grading 1.75% copper.

The second phase would be the construction of a cobalt recovery, sulfuric acid plant complex, to be built at Kasese where an estimated 1.1 million tons of cobalt pyrite concentrates from the mine was stockpiled during the 1970's. The Ministry of Minerals and Water Development estimated that 2,400 tons of cobalt carbonate per year could be produced from the stockpile, while slightly over 100,000 tons of 98% sulfuric acid per year could be produced. The acid production was expected to be shipped to Tororo, where a proposed fertilizer industry would utilize the sulfuric acid production in the manufacture of phosphate fertilizers from local reserves of apatite and pyrochlore ore. The third phase would involve the construction of an integrated wirebar copper complex to produce semifinished and finished products instead of just blister copper. No timetable was given by the Ministry on the start or completion dates of the program phases.

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[1]Physical scientist, Division of International Minerals.

[2]Mining Magazine (London). Mining Annual Review. Aug. 1987, p. 409.

[3]Where necessary, values have been converted from Burundi francs (FBu) to U.S. dollars at the rate of FBu115.00 = US$1.00.

[4]Where necessary, values have been converted from Djibouti francs (DF) to U.S. dollars at the rate of DF178.00 = US$1.00.

[5]Where necessary, values have been converted from Ethiopian birr (EB) to U.S. dollars at the rate of EB2.07 = US$1.00.

[6]Where necessary, values have been converted from Kenyan shillings (K Sh) to U.S. dollars at the rate of K Sh16.25 = US$1.00.

[7]Where necessary, values have been converted from Mozambique meticais (M) to U.S. dollars at the rate of M43.00 = US$1.00.

[8]Where necessary, values have been converted from Seychelles rupees (SR) to U.S. dollars at the rate of SR6.80 = US$1.00.

[9]Where necessary, values have been converted from Somalia shillings (So. Sh.) to U.S. dollars at the rate of So. Sh.70.00 = US$1.00.

[10]Where necessary, values have been converted from Swazi emalangeni (E) to U.S. dollars at the rate of E0.44 = US$1.00.

[11]Where necessary, values have been converted from Tanzanian shillings (T Sh) to U.S. dollars at the rate of T Sh32.00 = US$1.00.

[12]Where necessary, values have been converted from Ugandan shillings (U Sh) to U.S. dollars at the rate of U Sh1,400.00 = US$1.00.

The Mineral Industry of Other West African Countries

By George A. Morgan and David J. Ellis[1]

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BENIN

There was little change in the mineral industry of Benin in 1986, as the economy remained in the grip of a regional recession exacerbated by falling oil prices, which nullified much of the income from Benin's oil production.

Benin's industrial sector accounted for less than 10% of the gross domestic product (GDP), with the mineral industry providing about one-half of that total. Several major projects initiated over the last several years continued to perform and/or progress below Government expectations. These included the Savé sugar refinery, the Dassa-Parakou section of the Dassa-Cotonou highway, the Benin-Togo Nangbeto hydroelectric plant, the Onigbolo cement plant, and the Semé Oilfield. Funding for these projects is the major source of the Beninese external debt, which was estimated to be over $800 million.[2]

COMMODITY REVIEW

The state of the oil industry was uncertain during much of the year, during which time the Government managed the production facilities while seeking a new operator for the Semé Oilfield to replace Pan Ocean Oil Co. (Panoco) of Switzerland, whose contract was canceled in May. Panoco had been expected to implement the second phase of the Semé development project, which was an increase in production from 8,000 to 25,000 barrels per day (bbl/d), at a cost of $45 million. Much of the funding for the project, provided by the International Bank for Reconstruction and Development (World Bank) and the European Investment Bank, was withheld earlier in the year while the financing agencies examined the terms of the agreement between the Government and Panoco. The break with Panoco occurred less than a year after the Government canceled a management contract with Saga Petroleum A/S of Norway, which developed the Semé Oilfield.

Oil production for the year averaged 5,500 bbl/d, and all of the crude oil was sold on the spot market and exported because there was no oil refinery in Benin. Spot market prices for oil decreased during most of the year but made a slight recovery toward yearend. Production costs for the crude oil were high, estimated to be almost $8 per barrel. With spot market prices dropping to as low as $8.02 per barrel and averaging as little as $11.00 per barrel, the profit margin was slight.

Benin had identified several deposits of minerals in varying quantities, most notably gold, iron ore, kaolin, and phosphates. However, apart from the case of gold, a lack of infrastructure and depressed world markets made it doubtful that any imminent development would occur. With the bull market for gold, there were stirrings of interest in developing the small gold deposits in the north, but total reserves were estimated to contain only 3 tons of gold.

Table 1.—Other countries of West Africa: Production of mineral commodities[1]

Country[2] and commodity[3]	1982	1983	1984	1985[p]	1986[e]
BENIN					
Cement, hydraulic[4] metric tons	314,542	300,000	300,000	300,000	300,000
Petroleum, crude thousand 42-gallon barrels	--	1,000	2,500	3,000	2,000
Salt, marine[e] metric tons	100	100	100	100	100
BURKINA FASO (formerly Upper Volta)					
Gold[e] troy ounces	--	--	500	50,000	60,000
Phosphate rock[e] thousand tons	3	3	3	3	3
CAPE VERDE ISLANDS					
Pumice and related volcanic materials[e] metric tons	NA	10,000	10,000	10,000	10,000
Salt do	6,500	6,500	6,500	6,500	6,500
IVORY COAST					
Cement[e 4] thousand metric tons	1,100	636	536	679	[5]776
Diamond[e 6]	NA	NA	25,000	20,000	13,000
Petroleum:[7]					
Crude thousand 42-gallon barrels	3,278	8,760	9,960	8,060	6,600
Refinery products:					
Gasoline do	1,896				
Jet fuel and kerosene do	895				
Distillate fuel oil do	3,536	NA	NA	NA	NA
Residual fuel oil do	4,029				
Liquefied petroleum gas do	81				
Refinery fuel and losses do	803				
Total do	11,240	NA	NA	NA	NA
MALI					
Cement, hydraulic metric tons	27,000	[e]20,000	25,365	19,005	20,000
Gold, mine output, Au content[e 8] troy ounces	13,000	13,000	[5]16,075	[5]16,075	16,100
Phosphate rock[e] metric tons	10,000	10,000	3,250	[5]3,000	3,000
Salt[e] do	4,500	4,500	4,500	4,500	4,500
Stone: Marble do	NA	NA	758	769	750
NIGER					
Cement, hydraulic do	38,000	38,000	38,000	38,000	38,000
Coal do	75,000	118,609	123,644	150,635	150,000
Gypsum[e] do	3,000	3,000	3,000	3,000	3,000
Molybdenum concentrate, Mo content[e] do	[5]42	40	33	20	20
Phosphate rock do	1,000	1,000	1,000	1,000	1,000
Salt[e] do	3,000	3,000	3,000	3,000	3,000
Tin, mine output, Sn content do	41	40	76	100	80
Uranium concentrate, U_3O_8 content do	5,014	4,041	3,276	3,236	3,200
SENEGAL					
Cement, hydraulic do	363,470	394,916	384,821	406,890	[5]360,000
Clays: Fuller's earth (attapulgite) do	98,999	100,375	115,498	95,957	[5]81,857
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	738	484	546	[e]540	550
Jet fuel and kerosene do	651	442	401	[e]400	400
Distillate fuel oil do	825	538	675	[e]680	650
Residual fuel oil do	1,200	566	786	[e]790	750
Other do	40	20	23	[e]20	20
Refinery fuel and losses do	147	137	233	[e]230	230
Total do	3,601	2,187	2,664	[e]2,660	2,600

See footnotes at end of table.

Table 1.—Other countries of West Africa: Production of mineral commodities[1] —Continued

Country[2] and commodity[3]	1982	1983	1984	1985[p]	1986[e]
SENEGAL —Continued					
Phosphate rock and related products:					
Crude:					
Aluminum phosphate, thousand metric tons	279	1,187	279	355	[5]131
Calcium phosphate, do	902	1,254	1,932	1,814	[5]1,850
Manufactured:					
Aluminum phosphate, dehydrated, do	136	144	142	200	60
Other[9], do	5	3	[7]7	8	5
Salt[e], metric tons	160,000	170,000	165,000	[5]160,000	[5]145,000
TOGO					
Cement products:					
Clinker, thousand metric tons	868	693	154	--	--
Cement[10], do	279	232	243	284	348
Iron and steel:[e]					
Crude, do	5	2	--	--	--
Semimanufactures, do	10	2	--	[5]7	[5]9
Phosphate rock, beneficiated product, do	2,800	2,010	2,400	2,450	[5]2,208
Salt[e 11], metric tons	100	--	--	--	--
Stone: Marble, dimension, square meters	15,087	5,177	5,317	[12]5,671	5,000

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

[1]Includes data available through Sept. 25, 1987.

[2]In addition to the countries listed, The Gambia and Guinea-Bissau, which are covered in the text of this chapter, presumably produced a variety of crude construction materials (clays, sand and gravel, and stone) and may produce gypsum, lime, and salt, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3]In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone) presumably is produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[4]Output based entirely on imported clinker.

[5]Reported figure.

[6]Does not include smuggled diamonds.

[7]Data are for years ending July 30 of that stated.

[8]Production for Soviet-Malian Mine.

[9]Products marketed under the trade names "Balifos" and "Phospal."

[10]In 1984, production of domesitic clinker ended, and in 1986, all cement was produced from clinker imported from Western Europe.

[11]Togo's national refinery closed in 1981 and its salt company closed in 1982.

[12]The Société Togolaise de Marbrerie et de Matériaux produced 1,205 metric tons of marble block in 1985.

BURKINA FASO

The mineral industry remained a relatively small part of the economy of Burkina Faso, with the industrial sector, of which the extractive industry was only one segment, accounting for only about 17% of the GDP. However, with the continued development of the Poura gold mine, and with a feasibility study under way to evaluate a zinc-silver deposit at Perkoa, the mining industry could become more important in the near future.

COMMODITY REVIEW

The Poura gold mine, situated 160 kilometers southwest of the capital, Ouagadougou, became the focal point for the mining industry. The mine had been operating since October 1985 under the Société de Recherches et d'Exploitation Minière du Burkina (SOREMIB), which was a joint venture composed of the Government (60%), the Islamic Development Bank (20%), and Compagnie Française des Mines S.A. (Coframines), a subsidiary of France's Bureau de Recherches Géologiques et Minières (BRGM) (20%). Original estimates of reserves were 700,000 troy ounces of contained gold (85% recoverable), but new estimates raised the level of reserves to 1,100,000 troy ounces of contained gold. To develop these new reserves, SOREMIB solicited a loan of $6 million[3] from the European Investment Bank, one of the organizations involved in the initial financing of the

mine. Several other smaller gold deposits were under investigation in the arid northern areas of the country, most notably near Sebba and Dori-Yalogo.

The Government continued to search for financing for the construction of a 350-kilometer railway to link the Tamboa manganese deposits, situated near the northern border, with the railhead at Ouagadougou. Construction work had been started in 1985 using local labor, but work was halted in August 1986 owing to a lack of funds. The manganese (Mn) deposit had reserves of over 13 million tons of oxide ore containing 50% to 55% Mn, with an additional 13 million tons of underlying carbonate ore containing an average of 48% Mn. A World Bank study on the project had concluded that the deposit was not economically viable at 1986 prices.

A zinc-silver deposit at Perkoa in western Burkina Faso was identified during a United Nations Development Program exploration project. The International Development Association provided a $7.1 million loan for a feasibility study to determine the project's viability. As a result of the study, full development cost, including construction of a rail link to the main railway, was estimated at about $100 million.

Small-scale exploitation of phosphate and marble deposits continued, with production aimed at local markets.

CAPE VERDE ISLANDS

The mineral industry continued to be confined to small-scale production of salt, pumice, and pozzolana, all for domestic use. The pozzolana was used in the production of cement, using imported clinker.

The 3-year project to build a cement factory on the Island of Maio was initiated in midyear. A managing company called Cimenterie du Cap-Vert was established in 1985, with the Government as a principal stockholder. The factory was planned to have a vertical clinker kiln with an output capacity of 64,000 tons per year. A 2-year project to build a port facility to service the factory was also initiated in 1986.

THE GAMBIA

There was no real increase in mineral-related activities in The Gambia. Development of low-grade heavy mineral sands was not considered economic, and there was no indication that exploitation of these deposits would be feasible in the foreseeable future. The Gambia was involved in a cooperative project with Senegal as part of an effort to locate hydrocarbon deposits. Most of the effort in Gambian territory was centered offshore using seismic studies. The U.S. Agency for International Development sponsored a program of aerial photography along the Gambia River as part of a mapping project to facilitate geologic investigation.

GUINEA-BISSAU

There was little change in the limited mineral industry, which remained the production of undocumented amounts of building materials. Despite changes enacted in the hydrocarbons law in 1985 aimed at attracting bids for offshore oil exploration licenses, there were no reports of any being granted. Offshore oil exploration, consisting mainly of seismic studies had been occurring off the coast since the 1960's, but no oil had been discovered in marketable quantities.

IVORY COAST

The Ivory Coast was involved in two major changes in economic fortune in 1986. The high point came in November when it was announced that a formal agreement on debt rescheduling and new loans had been reached with the Paris and London Clubs, the World Bank, and the International Monetary Fund (IMF).

The low point occurred shortly thereafter, when world commodity prices for coffee and

cocoa, which are major export commodities for the Ivory Coast, plunged. This unfortunately timed event was a disappointing end to a year full of renewed optimism in the ability of the Ivory Coast to emerge successfully from the slight economic downturn encountered in the early 1980's.

The November 1986 agreement with the international financing agencies was one part of a serious commitment to a medium- to long-term program for the restoration of the economy, which also included the creation of more stringent guidelines for the existing austerity program. The rescheduling of over $1 billion[4] in debts and the initiation of a 5-year, $1.5 billion lending program, sponsored by the World Bank and the IMF, was negotiated on the premise that commodity prices for agricultural goods would remain at a certain level. Agriculture directly provided about one-third of the GDP and was a base for much of the manufacturing and processing industries in the Ivory Coast.

Despite the yearend price slump, the per capita GDP rose almost 30% compared with that of 1985. The balance of trade also improved, showing a 15% increase to a $1.75 billion surplus. The value of total U.S. exports to the Ivory Coast fell to about $60 million, while U.S. imports of goods from the Ivory Coast also fell in value to about $450 million. France, the Netherlands, Nigeria, and the United States remained the main trading partners for the Ivory Coast.

COMMODITY REVIEW

Diamonds.—The value of illicit diamond production and export was estimated to be over $25 million. Société pour le Développement Minière de la Côte d'Ivoire (SODEMI) completed studies on two sites in the western Seguela region, where reserves were estimated to be 150,000 carats. Small-scale diamond workings produced less than 20,000 carats, which were legally marketed through a joint venture between Belgium and the Ivory Coast called Belgivodiam.

Gold.—Two gold mining ventures neared the production stage, and exploration work on other gold properties continued. Société de Mines d'Ity (SMI), a joint venture between SODEMI (60%) and Coframines (40%), completed all preliminary studies at its Ity site and prepared for production to begin in late 1986 or in 1987. An 8-year program of heap-leaching lateritic open pit ore, followed by mining of clay ore, was planned to yield a total of over 2 million tons of ore containing over 650,000 troy ounces of gold (20 metric tons). SMI was also involved with two alluvial deposits in the Daloa region; one at Issia and one on the bed of the north-south running Lobo River.

The Ivory Coast Syndicate, a joint venture company composed of three Canadian organizations, Eden Roc Mineral Corp. (40%), Golden Rule Resources Corp. (40%), and Dibi Resources Inc. (20%), was working on a gold property in the southeastern Sanwi region. Two major hard-rock deposits had been identified at Asupiri and Aniuri, as well as an alluvial gravel deposit in the Afema area. Application for a mining permit for 1987 was anticipated by the venture.

Mineral Fuels.—Production of crude oil decreased to about 18,000 bbl/d, but was enough to meet about 80% of the Ivory Coast's oil needs. Phillips Petroleum Co., the principal offshore oil producer, continued to negotiate with the Government on the possible development of offshore natural gas reserves to fuel a powerplant. The Société Ivoirienne de Raffinage (SIR) oil refinery in Abidjan continued to process both domestically produced and imported crude oil, with which it supplied the local market as well as doing contract work for companies such as Chevron Corp. SIR made a profit in 1985 for the first time since its construction in 1983. Previously, it had needed Government subsidies to keep it running.

Table 2.—Ivory Coast: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1985	Destinations, 1985	
		United States	Other (principal)
METALS			
Aluminum: Metal including alloys, semimanufactures	510	--	Burkina Faso 113; Mali 80; Ghana 76.
Copper: Metal including alloys:			
Scrap	1,308	--	France 413; Belgium-Luxembourg 341.
Semimanufactures value, thousands	$235	--	France $228.
Iron and steel: Metal:			
Scrap	25,286	--	Spain 15,385; Italy 7,241.
Pig iron, cast iron, related materials			
value, thousands	$1	NA	NA.
Steel, primary forms	12	--	All to Senegal.
Semimanufactures:			
Bars, rods, angles, shapes, sections	1,120	--	Burkina Faso 351; Guinea 255; Niger 225.
Universals, plates, sheets	3,901	--	Mali 2,535; Niger 516; Burkina Faso 446.
Hoop and strip	3	--	All to France.
Rails and accessories	472	--	Burkina Faso 388; Niger 41; Togo 41.
Wire	538	--	Guinea 161; Burkina Faso 146; Mali 86.
Tubes, pipes, fittings	4,105	104	Burkina Faso 798; Senegal 779; Benin 497.
Castings and forgings, rough	5	--	Burkina Faso 2; Mali 1; Niger 1.
Lead:			
Oxides	32	--	All to Burkina Faso.
Metal including alloys, scrap	702	--	Italy 460; France 87.
Manganese: Ore and concentrate, metallurgical-grade	445	--	All to Nigeria.
Nickel:			
Matte and speiss	6	--	All to Burkina Faso.
Metal including alloys, scrap	51	--	France 45; Belgium-Luxembourg 6.
Silver:			
Waste and sweepings value, thousands	$1	$1	
Metal including alloys, unwrought and partly wrought do	$14	$1	France $12.
Tin: Metal including alloys:			
Scrap	163	--	France 138; Belgium-Luxembourg 25.
Semimanufactures	2	--	All to Ghana.
Titanium: Oxides	9	--	Niger 5; Liberia 4.
Zinc: Metal including alloys:			
Scrap	500	--	France 385; Italy 59.
Unwrought	190	--	Nigeria 140; Ghana 50.
INDUSTRIAL MINERALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc	2	--	All to Mali.
Grinding and polishing wheels and stones	2	--	Do.
Barite and witherite	931	--	Gabon 742; Benin 129.
Boron materials: Crude natural borates	9	--	Mali 7; Benin 2.
Chalk	8	--	Burkina Faso 5; Niger 2.
Clays, crude	289	--	Liberia 100; Ghana 58; Benin 41.
Diamond: Gem, not set or strung value, thousands	$12	--	All to France.
Diatomite and other infusorial earth	1	--	All to Niger.
Fertilizer materials: Manufactured:			
Ammonia	17	--	Burkina Faso 7; Mali 5; Niger 4.
Nitrogenous	968	--	Burkina Faso 533; Mali 286.
Phosphatic	18	--	Burkina Faso 12; Benin 6.
Potassic	987	--	Mali 476; Benin 364.
Unspecified and mixed	46,501	--	Mali 27,463; Burkina Faso 19,037.
Graphite, natural	20	--	All to Mali.
Gypsum and plaster	34	--	Burkina Faso 15; Mali 13.
Mica: Crude including splittings and waste	2	--	All to Ghana.
Pigments, mineral: Iron oxides and hydroxides, processed	2	--	Benin 1; Mali 1.
Salt and brine	1,936	--	Burkina Faso 289; unspecified 1,647.
Sodium compounds, n.e.s.:			
Carbonate, manufactured	51	--	Cameroon 20; Burkina Faso 14.
Sulfate, manufactured	274	--	Burkina Faso 109; Niger 91; Mali 67.
Stone, sand and gravel:			
Dimension stone, crude and partly worked	43	--	All to Mali.
Dolomite, chiefly refractory-grade	15	--	Do.
Gravel and crushed rock	97	--	Burkina Faso 52; unspecified 45.
Quartz and quartzite	2	--	All to Ghana.

See footnotes at end of table.

Table 2.—Ivory Coast: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1985	Destinations, 1985	
		United States	Other (principal)
INDUSTRIAL MINERALS —Continued			
Sulfur:			
Elemental:			
Crude including native and byproduct	1,997	--	Nigeria 1,876.
Colloidal, precipitated, sublimed	1	--	All to Burkina Faso.
Sulfuric acid	106	--	Mali 56; Burkina Faso 49.
Other: Crude	67	1	Mali 30; Burkina Faso 26.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black value, thousands	$1	--	Mainly to Ghana.
Peat including briquets and litter	25	--	All to ship stores.
Petroleum:			
Crude thousand 42-gallon barrels	1,220	--	All to Italy.
Refinery products:			
Liquefied petroleum gas do	12	--	Burkina Faso 7; Mali 3.
Gasoline, motor do	1,018	--	Nigeria 283; Mali 212; Senegal 138.
Mineral jelly and wax do	4	--	Mainly to Burkina Faso.
Distillate fuel oil do	1,939	--	Burkina Faso 284; Senegal 161; bunkers 1,040.
Lubricants do	134	--	Burkina Faso 33; Ghana 32; Mali 26.
Residual fuel oil do	1,017	--	Togo 142; Burkina Faso 118; bunkers 727.
Bitumen and other residues do	441	49	Cameroon 248; Ghana 67; Algeria 59.
Bituminous mixtures do	14	--	Mali 12; Burkina Faso 1.
Petroleum coke do	(2)	--	All to Burkina Faso.

NA Not available.
[1]Table prepared by Virginia A. Woodson. Data for 1984 were not available at the time of publication.
[2]Less than 1/2 unit.

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

(Metric tons unless otherwise specified)

Commodity	1985	Sources, 1985	
		United States	Other (principal)
METALS			
Alkali and alkaline-earth metals	21	--	East Germany 20.
Aluminum:			
Oxides and hydroxides	218	--	France 215.
Metal including alloys:			
Scrap	150	--	France 104; Gabon 26.
Unwrought	21	--	All to France.
Semimanufactures	2,859	(2)	Cameroon 1,573; France 700.
Chromium: Oxides and hydroxides	9	--	Italy 4; West Germany 3; France 2.
Cobalt: Oxides and hydroxides value, thousands	$1	--	All from France.
Copper: Metal including alloys:			
Unwrought	6	--	Do.
Semimanufactures	947	(2)	France 795; Belgium-Luxembourg 106.
Iron and steel: Metal:			
Scrap	28	--	France 24; Senegal 4.
Pig iron, cast iron, related materials	412	--	France 408.
Ferroalloys:			
Ferromanganese	28	--	All from France.
Unspecified	5	--	Do.
Steel, primary forms	14	--	Do.
Semimanufactures:			
Bars, rods, shapes, sections	25,576	--	France 11,387; Zimbabwe 9,138.
Universals, plates, sheets	63,762	--	France 26,023; Zimbabwe 13,485; Belgium-Luxembourg 11,833.
Hoop and strip	3,364	1	United Kingdom 1,517; West Germany 969.
Rails and accessories	134	--	Italy 133.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1985	Sources, 1985	
		United States	Other (principal)
METALS —Continued			
Iron and steel: Metal —Continued			
Semimanufactures —Continued			
Wire	2,463	(3)	France 1,623; West Germany 425.
Tubes, pipes, fittings	4,302	232	France 2,571; Italy 793.
Castings and forgings, rough	272	(2)	France 110; Belgium-Luxembourg 88.
Lead:			
Ore and concentrate	2	--	All from Netherlands.
Oxides	57	--	France 32; Netherlands 25.
Metal including alloys:			
Scrap	315	--	Senegal 170; France 90; Cameroon 54.
Unwrought	60	--	All from France.
Semimanufactures	9	--	France 6; West Germany 3.
Magnesium: Metal including alloys, semimanufactures value, thousands	$1	--	All from France.
Manganese:			
Ore and concentrate, metallurgical-grade	2,067	--	Gabon 2,021.
Oxides	578	--	France 339; Belgium-Luxembourg 229.
Nickel: Metal including alloys:			
Unwrought	10	--	Norway 4; Zimbabwe 4.
Semimanufactures	275	(2)	France 227; Italy 25.
Tin: Metal including alloys:			
Unwrought value, thousands	$5	--	All from France.
Semimanufactures	6	--	France 5.
Titanium: Oxides	415	--	West Germany 161; France 133; Spain 60.
Tungsten: Metal including alloys, all forms	1	--	All from France.
Uranium and thorium: Metal including alloys, all forms value, thousands	$7	--	Do.
Zinc:			
Oxides	36	--	West Germany 16; France 13.
Metal including alloys:			
Unwrought	857	--	France 440; Cameroon 356.
Semimanufactures	3,753	--	France 1,977; Belgium-Luxembourg 1,727.
Other:			
Ores and concentrates	99	--	Republic of South Africa 43; Australia 32.
Oxides and hydroxides	44	--	France 16; Norway 13.
Base metals including alloys, all forms	4	--	Niger 3.
INDUSTRIAL MINERALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc	10	--	France 8; Italy 1.
Artificial: Corundum	40	--	All from France.
Dust and powder of precious and semi-precious stones including diamond value, thousands	$16	--	All from Sweden.
Asbestos, crude	11	--	Austria 6.
Barite and witherite	2,737	2	France 2,342; Spain 320.
Boron materials:			
Crude natural borates	1,312	1,310	France 1.
Oxides and acids	4	NA	France 3.
Chalk	4,305	--	France 4,009.
Clays, crude	990	--	France 434; Netherlands 300; Norway 100.
Diamond: Gem, not set or strung value, thousands	$56	--	All from France.
Diatomite and other infusorial earth	129	--	France 127.
Feldspar, fluorspar, related materials	25	--	All from France.
Fertilizer materials:			
Crude, n.e.s value, thousands	$1	--	Do.
Manufactured:			
Ammonia	3,329	1,063	Netherlands 1,147; Trinidad and Tobago 1,064.
Nitrogenous	33,822	--	France 12,009; Belgium-Luxembourg 10,482; West Germany 5,497.
Phosphatic	8,445	--	Senegal 8,346.
Potassic	53,148	--	Spain 27,279; East Germany 10,307; Belgium-Luxembourg 8,282.
Unspecified and mixed	33,256	21,672	Senegal 11,516.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1985	Sources, 1985	
		United States	Other (principal)
INDUSTRIAL MINERALS —Continued			
Graphite, natural	3	--	West Germany 2.
Gypsum and plaster	30,902	--	Morocco 29,862.
Phosphates, crude	7,793	--	All from Senegal.
Pigments, mineral: Iron oxides and hydroxides, processed	157	--	West Germany 113; United Kingdom 18.
Precious and semiprecious stones other than diamond: Natural value, thousands	$78	--	France $54; Switzerland $18.
Salt and brine	42,951	--	Senegal 39,983; West Germany 2,222.
Sodium compounds, n.e.s.: Carbonate, manufactured	3,203	--	France 1,850; Netherlands 406; East Germany 303.
Sulfate, manufactured	37	--	France 24; Belgium-Luxembourg 12.
Stone, sand and gravel: Dimension stone, crude and partly worked	167	--	Italy 166.
Dolomite, chiefly refractory-grade	4,065	--	France 2,256; Burkina Faso 1,762.
Gravel and crushed rock	58	--	West Germany 49; France 9.
Quartz and quartzite	40	--	China 15; Japan 15; France 10.
Sand other than metal-bearing	177	--	Belgium-Luxembourg 111; France 63.
Sulfur: Elemental: Crude including native and byproduct	58	--	West Germany 49; France 9.
Sulfuric acid	13,368	(2)	Spain 10,646; Italy 2,698.
Other: Slag and dross, not metal-bearing	52,528	--	France 41,112; Belgium-Luxembourg 11,416.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	125	32	West Germany 59; Netherlands 34.
Carbon black	263	--	France 242; West Germany 21.
Coal, all grades	70	--	Liberia 68.
Coke and semicoke	50	--	All from Belgium-Luxembourg.
Petroleum: Crude thousand 42-gallon barrels	10,726	--	Nigeria 6,656; Cameroon 1,517.
Refinery products: Liquefied petroleum gas 42-gallon barrels	54,822	174	Nigeria 32,932; United Kingdom 12,528.
Gasoline, motor do	22,763	1,632	Netherlands 9,707; France 6,715.
Mineral jelly and wax do	15,929	--	West Germany 9,051; Netherlands 4,061.
Kerosene and jet fuel do	4,170	682	France 1,883; West Germany 659.
Distillate fuel oil do	31,757	37	Brazil 17,389; France 9,049.
Lubricants do	261,968	434	France 141,995; Italy 110,719.
Residual fuel oil do	1,945,486	1,369,363	Nigeria 226,254; United Kingdom 141,925.
Bitumen and other residues do	2,018	127	France 1,521; Morocco 182; Netherlands 182.

NA Not available.
[1]Table prepared by Virginia A. Woodson. Data for 1984 were not available at the time of publication.
[2]Less than 1/2 unit.
[3]Unreported quantity valued at $14,000.

MALI

Continued investigation and exploitation of gold resources were the only significant elements of Mali's mineral industry in 1986. Mali's landlocked position, lack of infrastructure, and the continued encroachment of the Sahara Desert upon the already arid and drought-ridden countryside, limited exploration and development of much of the mineral potential. The country remained dependent on aid from international agencies and foreign countries, as well as trade with its principal sources for imports, which were, in descending order, France, the Ivory Coast, and the Federal Republic of Germany. Mali has maintained a large external trade deficit despite austerity programs and two IMF-sponsored standby arrangements since 1983.

The Kalana gold mine completed its second full year of production with no apparent production change from that of 1985, although the value of production more than doubled to $6.6 million,[3] owing to the increase in the price of gold. Kalana was operated by the Société de Gestion et d'Exploitation des Mines d'Or de Kalana (SOGEMORK), which was overseen by the Government-run Société Nationale des Re-

cherches Minières. The U.S.S.R. continued to provide technical and financial assistance to SOGEMORK, focusing on an expansion of the gold treatment facilities in 1986. Further exploration was implemented in the vicinity of the mine in order to locate additional reserves, which could be processed when the treatment capacity expansion has been completed.

Of the many gold deposits identified over the course of the last 20 years during exploration programs sponsored by BRGM and the United Nations Development Plan (UNDP), two appeared to show promise for imminent development. One was the Loulo deposit, controlled by a joint venture between BRGM and the Government of Mali and known as the Syndicat de Recherches d'Or. Loulo was 20 kilometers from the town of Kéniéba in western Mali, near the border with Senegal. In 1985, BRGM conducted a study to determine the environmental impact of a gold mine on the area, and hoped to begin production of between 56,000 and 64,000 troy ounces of gold per year by 1988.

The second promising deposit was discovered during the course of an ongoing geochemical sampling program sponsored by UNDP and the Government of Mali, which started in 1983 and had covered over 15,000 square kilometers of land southwest of Sikasso in southern Mali. Major deposits were found near Syama and Taboukoroni in the Bagoé region, and Utah International Inc. of the United States was negotiating an exploration and mining contract for those areas with the Government of Mali.

Among other minerals mined in Mali, small amounts of phosphate rock were produced at Tilemsi and crushed at Bourem in the eastern-central area, along the Niger River. As a result of limited infrastructure, the phosphate was consumed only within Mali. Salt was also produced for domestic use, as were insignificant quantities of cement and marble. Deposits of iron ore, manganese, and uranium had been identified, but were not considered economically viable. Some exploration for oil continued, but no discoveries were reported.

NIGER

The continued oversupply in the uranium market meant little increase in world market prices and thus decreased revenues obtained from Niger's chief export commodity, which accounted for over 50% of export earnings. Since the decline in demand for uranium began in 1981, the amount of the GDP accounted for by revenue from the sale of uranium fell from about 15% to below 5% in 1986. Nevertheless, the uranium mining industry continued to be the mainstay of the economy, despite attempts to diversify into other commercial products in both agriculture and mining.

Uranium operations continued at the two working mines in the Aïr region of Niger, northeast of the capital, Niamey. At the older mine near Arlit, production amounted to about 1,200 tons, despite capacity for 2,300 tons per year. At Akouta, which lies 20 kilometers south of Arlit, production was almost 2,000 tons from a treatment plant designed for 2,200 tons per year. Ownership of the two uranium-producing companies, Société des Mines de l'Aïr (SOMAÏR) at Arlit and Compagnie Minière d'Akouta (COMINAK) was divided among companies from France, the Federal Republic of Germany, Italy, Japan, Niger, and Spain.

Until the time of the depression in the uranium market, Niger had been able to sell all of its production to the member countries in the mining consortia. The representative mining companies had purchased uranium from Niger in amounts generally consistent with their equity involvement, although France had traditionally taken much the largest portion of production. When the market slumped, the Government of Niger negotiated a long-term contract with France in which France agreed to pay a premium price for uranium while prices remained low. Although that agreement kept the uranium industry in Niger afloat, the other countries represented in SOMAÏR and COMINAK, with the exception of Japan, made efforts to reduce their commitments to buy Niger uranium. Niger looked for new markets, particularly in Western Europe, and tried selling on the spot market but with little success.

Arlit and Akouta were the only operating uranium mines in Niger, although there were several other quality deposits, the majority of which were linked to the extensive Arlit concession area. The most important of these deposits were the Imouraren deposit, which was 100 kilometers south of Arlit, and the Arni deposit, which was

adjacent to the Arlit Mine and had been slated to replace Arlit when reserves are exhausted. Both of these deposits were controlled by Office National des Resources Minière (ONAREM) of Niger and Compagnie Générale des Matières Nucléaires, a subsidiary of BRGM, but under 1986 market conditions for uranium no imminent production was foreseen. Despite this fact, exploration for uranium continued in the Aïr region under a consortium that included ONAREM and the Japanese firm International Resources S.A.

Coal has been produced at Anou-Araren since 1980 in order to fuel the associated power generating station, which provided electricity for the uranium mines and associated needs in the Aïr region. The open pit mine continued to be operated in 1986 by Sté. Nigerienne de Charbon and had reserves estimated at 6 million tons of coal. Another mineral associated with the uranium industry was molybdenum, which was produced as a byproduct at Akouta. The content of metal in the molybdenum concentrate produced at Akouta has declined over the last few years owing to metallurgical problems at the treatment plant.

Niger had deposits of several other exploitable minerals, including bauxite, copper, diamonds, iron ore, phosphate rock, tin, and titanium, but excepting the ongoing small-scale exploitation of tin and phosphate rock, infrastructural problems and market conditions precluded any imminent development.

SENEGAL

Mining and processing of phosphate rock remained the only major factor in the mineral industry participation in the economy of Senegal. Fishing and agriculture continued to provide most of the foreign exchange revenue, but sales of phosphates contributed about $80 million,[6] or 17%, of total export earnings.

Senegal's trade deficit decreased slightly compared with that of 1985, but the country continued to struggle with a debt service burden equal to almost one-third of its export revenues. Some relief was provided by another Paris Club debt rescheduling in November, the fifth rescheduling Senegal has received. Senegal embarked on a long-term structural adjustment program in 1980, and remained focused on that program in 1986. Imports were cut back and emphasis was placed on commercial and subsistence farming.

France remained Senegal's main trading partner both in general and for phosphate rock. Senegal produced almost 2 million tons of crude phosphate, of which over 1.6 million tons was exported. Of total production, 131,000 tons was aluminum phosphate, and 1.8 million tons was calcium phosphate. France received over 300,000 tons, about 20% of the phosphate rock exports. Other top markets for the phosphate were, in descending order, the United Kingdom, India, Spain, and the Philippines. Other exports of mineral commodities included cement, salt, and fuller's earth, of which 52,000, 104,000, and 91,000 tons were exported, respectively.

COMMODITY REVIEW

Gold.—Predevelopment work on the Sabodala gold mine in the southeastern region continued under the direction of Société Minière de Sabodala, a company formed in 1983 as a joint venture between the Government (41.4%) and S.A. Serem a subsidiary of France's BRGM (58.6%). Reserves were estimated as being 12 tons of gold, and initial production was slated for late 1988.

Iron Ore.—Despite much optimism about the development of the Falémé iron ore deposits during 1985, lack of purchase commitments by Western European steel companies, combined with the resulting reluctance of the World Bank to provide financing, kept the project on hold in 1986. Société des Mines de Fer du Senegal Oriental had controlled the three major deposits in the southeastern region since 1975. A feasibility study done in 1984 had outlined an annual production of 6 million tons of enriched ore. In 1985, the Romanian foreign trade organization Geomin agreed to take 1.5 million tons of ore per year in exchange for equipment and services, but no other major markets were enlisted. The cost of constructing the necessary infrastructure, which included a 250-kilometer railroad and a port near Dakar, was estimated at $700 million.[7]

Petroleum.—The dispute over the boundaries of territorial waters between Senegal and neighboring Guinea-Bissau was resolved through arbitration. The Government-run Société Nationale des Petroles contin-

ued its project to make a comprehensive survey of oil potential in sedimentary basins. Petro-Canada was conducting the exploration program with financing from the International Development Association and the Petro-Canada Assistance Program.

Phosphate Rock.—Total annual production at the Compagnie Sénégalaise des Phosphates de Taïba (CSPT) was slightly higher than that of 1985. Exports also increased, but because of a decrease in world prices the value of exports fell by a little over $7 million. Similarly, although sales of phosphate rock to the Société des Industries Chimiques du Senegal (ICS) also increased, the value dropped slightly. CSPT had hoped to be producing at its capacity of 2.1 million tons per year, but lack of sales and a decreasing market price had retarded its investment program.

The Société Sénégalaise des Phosphates de Thies (SSPT) decreased total production by over 50% compared with that of 1985. Much of the decrease was accounted for by a decrease in the production of the aluminum phosphate, of which SSPT was one of the few world producers. Quantity and value of exports also decreased compared with that of 1985.

The operations of the ICS began in 1984 as part of an effort to provide a supporting market for the phosphate mines. A sulfuric acid plant and a phosphoric acid plant were situated at Darou-Khoudoss, adjacent to Taiba, and a plant producing triple superphosphate and diammonium phosphate was constructed outside Dakar. All of the ICS facilities had railway connections to the port at Dakar, which was specially designed to give access to important raw material imports as well as to ship the final products of the processing of the local phosphate rock.

TOGO

Production and export of phosphate rock continued to be the mainstay of the economy of Togo. Cement, marble, and steel rebars were also produced but were mainly used locally. Exports of phosphate rock were valued at $95 million[8] and accounted for almost 50% of total export revenue in 1986, despite output representing less than 70% of production capacity. The main destinations for Togolese phosphates were, in descending order, the United States, France, Yugoslavia, the Netherlands, and the Federal Republic of Germany. European demand for phosphates was sluggish, and Togo pursued new markets in the United States and the Far East. A medium-term supply contract was signed with Arcadian Co. of the United States, which boosted the United States into the position of Togo's principal market, displacing France. In midyear, the Government enlisted the Société Commerciale des Potasses et de l'Azote, an international marketing agency, in an effort to improve marketing and sales for phosphate rock.

The Government continued to pursue a policy of privatization for selected businesses, as part of a medium-term program to revitalize the industrial sector. In 1984, a U.S. business executive took over management of the then Government-owned steel mill and began production of rebar and processed scrap from railroad ties and other metal. The Société Togolaise de Sidérurgie showed a profit in 1985 and 1986, exporting about 1,500 tons in 1986 in addition to what was sold locally. There was further capital investment of almost $1 million, and plans were made for the construction of a new rolling mill. A lease was also granted for the reopening of the fuel depot at the Lomé oil refinery, which closed in 1982. A consortium composed of Royal Dutch/Shell, British Petroleum Co. Ltd., Texaco Inc., and Mobil Oil Corp. formed a company called Société de Stockage de Lomé to operate the fuel storage depot.

COMMODITY REVIEW

Cement.—Ciment du Togo imported 278,000 tons of clinker from Western Europe and produced 22% more cement than that of 1985. Total sales were valued at about $27 million, most of which was locally used. About 30% was exported to neighboring countries.

Petroleum.—The Simmons Group Ltd. of Canada signed a 5-year oil prospecting contract to investigate two sedimentary basins. Unocal Togo Ltd. drilled a well offshore near the Port of Lomé, without success.

Phosphate Rock.—Negotiations with investors continued on the possible development of another phosphate rock mine at Dagbati, in concert with the construction of a phosphoric acid plant and a granulated triple superphosphate plant, both with a 1,000-ton-per-day capacity. The total cost of

the two projects was estimated to be $400 to $500 million, with about 25% of the capital to come from the World Bank and Middle East sources. The Government was anxious to step up development of the project, but World Bank officials advised caution in view of the market situation.

[1]Physical scientists, Division of International Minerals.

[2]Where necessary, values for Benin have been converted from Communauté Financière Africaine francs (CFAF) to U.S. dollars at the rate of CFAF346=US$1.00. The official CFAF exchange rate in French francs (F) was maintained and freely convertible at CFAF50=F1.

[3]Where necessary, values for Burkina Faso have been converted from CFAF to U.S. dollars at the rate of CFAF346=US$1.00.

[4]Where necessary, values for Ivory Coast have been converted from CFAF to U.S. dollars at the rate of CFAF346=US$1.00.

[5]Where necessary, values for Mali have been converted from CFAF to U.S. dollars at the rate of CFAF346=US$1.00.

[6]Where necessary, values for Senegal have been converted from CFAF to U.S. dollars at the rate of CFAF346=US$1.00.

[7]Mining Annual Review. 1987, p. 427.

[8]Where necessary, values for Togo have been converted from CFAF to U.S. dollars at the rate of CFAF346=US$1.00.

The Mineral Industry of the Islands of the Caribbean

By Doris M. Hyde[1]

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BAHAMAS

The 350,000-barrel-per-day Bahamas Oil Refining Co. remained closed throughout 1986. Financially troubled Charter Oil Co., joint owner of the refinery with Chevron Oil Bahamas Ltd., agreed in principle to have Chevron assume full ownership in return for canceling debts owed Chevron. Finalization of the agreement was pending at yearend.

Burmah Oil Ltd. took more than a $30 million loss on the sale of its interest in South Riding Point Grand Bahama Transshipment Terminal to South Riding Point Terminal Holding Ltd.

Table 1.—Islands of the Caribbean: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Country[2] and commodity	1982	1983	1984	1985[p]	1986[e]
BAHAMAS[3]					
Cement, hydraulic thousand tons	[e]64	26	--	--	--
Petroleum refinery products[e] thousand 42-gallon barrels	70,810	62,780	44,000	6,000	--
Salt thousand tons	816	862	[e]870	[e]850	850
Stone: Aragonite do.	3,049	2,337	[e]2,200	[e]2,000	2,000
Sulfur, byproduct of petroleum[e] do.	5	5	3	1	--
BARBADOS[3]					
Cement, hydraulic do.	--	--	[e]150	[r e]215	220
Gas, natural:					
Gross[e] million cubic feet	550	752	893	900	900
Marketed do.	350	360	370	370	370
Petroleum:					
Crude thousand 42-gallon barrels	[e]265	380	635	679	700
Refinery products[e] do.	1,455	1,480	1,500	1,500	1,500
CUBA[3 4]					
Cement, hydraulic thousand tons	3,163	3,231	3,347	3,182	3,000
Chromite do.	27	34	38	[r]38	46

See footnotes at end of table.

Table 1.—Islands of the Caribbean: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country[2] and commodity	1982	1983	1984	1985[p]	1986[e]
CUBA[3 4] —Continued					
Cobalt[5]	[e]1,500	1,621	1,397	1,490	1,500
Copper, mine output, metal content	2,645	2,667	2,701	3,076	3,300
Gas, natural:					
Gross[e] million cubic feet	2,000	2,300	2,300	2,400	2,400
Marketed do	378	293	120	244	260
Gypsum[e] thousand tons	127	130	130	130	130
Iron and steel: Steel, crude do	[r]290	[r]352	325	401	[6]416
Lime do	146	153	151	170	180
Nickel:					
Mine output, Ni-Co content of oxide and sulfide	37,600	39,257	33,227	33,577	34,200
Metallurgical products, Ni content:[5]					
Granular oxide and powder	9,001	9,342	8,447	8,853	8,700
Oxide sinter	11,750	11,542	8,894	7,054	7,000
Sulfide	15,346	16,752	14,489	16,180	17,000
Total	36,097	37,636	31,830	32,087	32,700
Nitrogen: N content of anhydrous ammonia thousand tons	98	86	169	163	160
Petroleum:					
Crude[7] thousand 42-gallon barrels	3,600	4,937	5,125	5,771	6,600
Refinery products do	47,340	48,180	48,340	46,020	46,500
Pyrite, gross weight thousand tons	48	13	--	--	--
Salt do	198	180	185	221	230
Sulfur:[8]					
S content of pyrite do	20	5	--	--	--
Byproduct of petroleum do	8	8	8	8	8
Total do	28	13	8	8	8
DOMINICAN REPUBLIC[3]					
Aluminum: Bauxite, dry equivalent, gross weight do	152	--	--	--	--
Cement, hydraulic do	948	1,104	1,143	[r e]1,100	[6]952
Coal, subbituminous	--	--	--	[e]600	600
Copper, mine output[e] thousand tons	3	3	--	--	--
Gold thousand troy ounces	386	354	338	329	[6]284
Gypsum:[e]					
For cement manufacture thousand tons	180	180	180	[r]280	[6]102
Other do	30	30	30	30	30
Iron and steel: Ferroalloys, ferronickel[8]	14,375	52,278	63,966	68,824	58,640
Lime[e]	40,000	40,000	40,000	[r]34,000	34,000
Mercury 76-pound flasks	49	[e]40	[r e]40	55	120
Nickel:[8]					
Mine output, metal content	5,376	19,552	23,923	25,394	22,000
Metal, smelter, Ni content of ferronickel shipments	5,484	21,200	24,220	25,809	[6]21,878
Petroleum refinery products thousand 42-gallon barrels	10,250	10,910	[e]11,000	12,647	13,000
Salt[e]	60,000	60,000	60,000	[r]47,159	[6]54,000
Silver thousand troy ounces	2,198	1,329	1,207	1,581	[6]1,356
GUADELOUPE[3]					
Abrasives, natural: Pumice[e] thousand tons	240	240	[r]250	[r]215	210
Cement[e] do	160	160	160	160	160
HAITI[3]					
Aluminum: Bauxite, dry equivalent, gross weight do	377	--	--	--	--
Cement, hydraulic do	213	216	[e]220	[e]220	180
JAMAICA[3]					
Aluminum:					
Bauxite, dry equivalent, gross weight do	8,378	7,683	8,937	5,975	[6]6,964
Alumina do	1,758	1,851	1,749	1,513	[6]1,586
Cement, hydraulic do	211	277	261	240	[6]241
Gypsum do	108	108	180	179	[6]240
Lead, refined (secondary)[e]	1,000	1,000	1,000	1,000	1,000
Lime thousand tons	114	121	115	86	[6]92
Petroleum refinery products thousand 42-gallon barrels	[e]6,100	8,366	8,243	9,008	10,000
Salt	--	--	--	[e]200	200
Silica sand thousand tons	10	15	14	16	[6]12
Stone:					
Limestone	--	--	[9]83,000	([10])	NA

See footnotes at end of table.

Table 1.—Islands of the Caribbean: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country[2] and commodity	1982	1983	1984	1985[p]	1986[e]
JAMAICA[3] —Continued					
Stone —Continued					
Marble	30	[r]320	370	50	[6]200
Marl[e] thousand tons	10,260	9,069	8,640	[r]6,210	[6]3,791
Sand and gravel[e] do.	6,500	9,135	8,625	[r]6,250	[6]9,219
MARTINIQUE[3]					
Cement, hydraulic[e] do.	200	[6]207	[6]190	200	200
Petroleum refinery products thousand 42-gallon barrels	4,320	4,300	4,300	4,300	4,300
Pumice, converted from cubic meters[e] thousand tons	156	[6]146	[6]136	150	140
NETHERLANDS ANTILLES[3]					
Petroleum refinery products[e] thousand 42-gallon barrels	158,100	150,700	139,000	20,000	[6]58,400
Phosphate rock thousand tons	--	3	19	[e]20	20
Salt[e] do.	272	[r]283	356	350	350
Sulfur, byproduct of petroleum do.	[e]90	87	63	[e]25	40
ST. VINCENT[3]					
Salt[e] do.	50	50	50	50	50
TRINIDAD AND TOBAGO[3]					
Asphalt, natural do.	[r]32	[r]37	34	28	30
Cement, hydraulic do.	189	[r]392	405	329	320
Gas, natural:					
Gross million cubic feet	[r]207,547	[r]225,999	268,369	318,954	330,000
Marketed do.	97,834	109,627	119,695	124,197	132,300
Iron and steel:					
Iron, sponge thousand tons	218	302	239	205	[6]337
Steel, crude do.	179	210	199	174	[6]327
Semimanufactures (wire rod) do.	116	164	135	103	[6]231
Lead, refined (secondary)[e]	2,000	2,000	2,000	2,000	2,000
Natural gas liquids[e] thousand 42-gallon barrels	35	40	40	40	40
Nitrogen: N content of ammonia thousand tons	701	993	1,074	1,086	1,100
Petroleum:					
Crude thousand 42-gallon barrels	[r]64,617	58,344	62,042	64,259	61,650
Refinery products do.	55,107	27,178	31,077	29,678	30,860
Sulfur, byproduct of petroleum[11] thousand tons	13	10	[e]7	5	5

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

[1]Table includes data available through June 12, 1987.

[2]In addition to the countries listed, Antigua, Bermuda, Dominica, Grenada, Montserrat, and St. Lucia presumably produced crude construction materials (clays, sand and gravel, and stone), but output is not always reported, and information is inadequate to make reliable estimates of output levels. Antigua also has a petroleum refinery that was closed in 1976 but became operational again for a short period in 1982.

[3]In addition to the commodities listed, crude construction materials (lime, salt, sand and gravel, stone, etc.) may also be produced, but data on such production are not always available and information is sometimes inadequate to make reliable estimates of output levels.

[4]In addition to the commodities listed, iron ore and manganese ore presumably were produced during the period covered by this table, but available information is inadequate to make reliable estimates of output levels.

[5]Anuario Estadistico de Cuba provides figures on nickel-cobalt content of granular and powder oxide, oxide sinter, and sulfide production. Using an average cobalt content in these individual products of 0.9% in total granular and powder oxide, 1.1% in total oxide sinter, and 4.5% in total sulfide, the cobalt content of reported Ni-Co production was determined as being 1.16% of granular and powder oxide, 1.21% of oxide sinter, and 7.56% of sulfide. The remainder of reported figures would represent the nickel content.

[6]Reported figure.

[7]Cuba reports crude oil production in metric tons. A conversion to barrels was made using a factor of 6.652. Some published production figures indicate a need to use a conversion factor of 7.3 to balance the units of measurement. However, pending more accurate information, the original factor will continue to be used in this publication.

[8]The Dominican Republic reports gross weight of ferronickel production. When official data are not available, figures for nickel content of mine production are determined from an average of 37.4% Ni contained in ferronickel production. Nickel content of ferronickel shipments is obtained from Falconbridge Dominicana C. por A. annual reports.

[9]Exports.

[10]Revised to zero.

[11]Limited quantities of sulfur as a byproduct of natural gas may also be produced.

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

(Metric tons unless otherwise specified)

Commodity	1983	1984	Destinations, 1984	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, unwrought	1	--		
Iron and steel: Metal:				
Steel, primary forms	--	61	61	
Semimanufactures:				
Bars, rods, angles, shapes, sections	(2)	392	392	
Universals, plates, sheets	(2)	--		
Wire	--	343	343	
Tubes, pipes, fittings	11	52	52	
Nickel: Metal including alloys, all forms	1	--		
Other: Ashes and residues	769	3,683	3,683	
INDUSTRIAL MINERALS				
Cement	5	784	784	
Diamond: Industrial stones value	$1,500	--		
Gypsum and plaster	--	6,788	6,788	
Lime	20	1	1	
Salt and brine	856,337	975,208	945,107	Jamaica 25,845; Canada 4,256.
Stone, sand and gravel: Dimension stone:				
Crude and partly worked	1	--		
Worked value, thousands	--	$25	--	All to Cayman Islands.
Other: Slag and dross, not metal-bearing	--	3	3	
MINERAL FUELS AND RELATED MATERIALS				
Coal: All grades including briquets	22,353	15	15	
Petroleum:				
Crude thousand 42-gallon barrels	66,467	59,008	58,012	Canada 996.
Refinery products:				
Liquefied petroleum gas do	2	3	(2)	Mainly to Turks Island.
Gasoline:				
Aviation do	9	260	248	Turks Island 11; Jamaica 1.
Motor do	8,397	7,587	6,816	Netherlands Antilles 693; Trinidad and Tobago 50.
Kerosene and jet fuel do	7,708	5,449	4,219	Canada 968; Trinidad and Tobago 175.
Distillate fuel oil do	20,533	13,977	11,683	Canada 1,452; France 565.
Lubricants do	1	(2)	(2)	Mainly to Turks Island.
Residual fuel oil do	22,935	18,814	13,593	United Kingdom 3,344; Italy 885.

[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.

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

(Metric tons unless otherwise specified)

Commodity	1983	1984	Sources, 1984	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Unwrought	(2)	1	1	
Semimanufactures	212	202	202	
Copper: Metal including alloys:				
Unwrought	(2)	(2)	(2)	
Semimanufactures	55	66	64	United Kingdom 2.
Iron and steel:				
Iron ore and concentrate	10	--		
Metal:				
Scrap	10	16	--	All from Turkey.
Pig iron, cast iron, related materials	11	3	3	
Steel, primary forms	25	1,052	96	Trinidad and Tobago 956.
Semimanufactures:				
Bars, rods, angles, shapes, sections	2,401	3,107	3,107	
Universals, plates, sheets	719	338	225	United Kingdom 113.
Hoop and strip	21	38	37	Canada 1.
Rails and accessories	4	20	20	
Wire	21	36	31	United Kingdom 5.
Tubes, pipes, fittings	1,682	1,080	982	Canada 83; United Kingdom 14.
Castings and forgings, rough	2	13	13	

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1983	1984	Sources, 1984	
			United States	Other (principal)
METALS —Continued				
Lead: Metal including alloys, all forms	4	12	10	United Kingdom 2.
Tin: Metal including alloys, scrap	2	8	6	China 1.
Zinc: Metal including alloys, all forms	24	60	48	Unspecified 12.
Other:				
Ores and concentrates	112	97	97	
Ashes and residues	41	10	10	
Base metals including alloys, all forms	3	7	7	
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones value	$39,980	$41,068	$39,132	United Kingdom $1,761; Switzerland $100.
Cement	14,622	25,656	17,413	Spain 3,856; Colombia 2,660.
Clays, crude	7	133	130	United Kingdom 3.
Diamond:				
Gem, not set or strung value	$117	--	--	
Industrial stones do	$2,415	$800	$130	United Kingdom $670.
Fertilizer materials:				
Crude, n.e.s	261	339	339	
Manufactured:				
Nitrogenous	3,098	4,503	4,503	
Phosphatic	374	820	820	
Potassic	65	97	97	
Unspecified and mixed	1,259	2,036	2,033	Spain 3.
Gypsum and plaster	1,389	699	699	
Lime	806	821	821	
Mica: Worked including agglomerated splittings value, thousands	$139	$178	$178	
Nitrates, crude	32	84	84	
Phosphates, crude	--	22	22	
Potassium salts, crude	60	49	49	
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$160	$79	$6	Brazil $47; United Kingdom $14; Hong Kong $12.
Synthetic do	$40	$6	$4	Sri Lanka $2.
Salt and brine	5,977	2,898	2,880	Canada 18.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	437	1,363	1,329	Ireland 34.
Worked value, thousands	$176	$283	$267	Canada $15; United Kingdom $1.
Gravel and crushed rock	3,433	4,132	4,131	Canada 1.
Sand other than metal-bearing	3,582	10,527	10,527	
Other: Crude	86	139	139	
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	1,533	392	392	
Coal: All grades including briquets	213	361	350	Haiti 11.
Coke and semicoke	--	5	5	
Peat including briquets and litter	1,367	1,486	1,354	St. Croix 132.
Petroleum:				
Crude thousand 42-gallon barrels	115,661	96,744	--	Nigeria 30,095; Mexico 17,077; Indonesia 12,524.
Refinery products:				
Liquefied petroleum gas do	56	67	59	Netherlands 8.
Gasoline:				
Aviation do	302	49	9	Netherlands Antilles 40.
Motor do	1,458	2,101	1,266	Netherlands Antilles 775; Trinidad and Tobago 42.
Mineral jelly and wax do	(2)	(2)	(2)	
Kerosene and jet fuel do	489	277	7	Netherlands Antilles 270.
Distillate fuel oil do	1,903	1,841	1,184	Netherlands Antilles 656; Venezuela 1.
Lubricants do	22	26	24	Jamaica 2.
Residual fuel oil do	4,125	5,845	684	Indonesia 1,788; Singapore 1,345; Netherlands Antilles 1,043.

[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.

BARBADOS

Real economic growth in 1986 was 5% over that of 1985, helped by gains in the nonmineral sectors. Crude oil production was estimated to have risen only slightly after 2 years of significant growth. Petro-Canada International Assistance Corp. reported that in 1985 crude oil and natural gas were discovered in three of five wells drilled in southeastern Barbados, with a fourth well that could result in another oil discovery still under testing. This drilling program was a cooperative project with state-owned Barbados National Oil Co. (BNOC). In July 1986, BNOC indefinitely suspended its drilling program because low market prices for imported oil made additional drilling uneconomical. BNOC claimed it was spending $10 million per year on drilling. In November, BNOC reported that at the end of March 1985, proven crude oil reserves totaled 3.8 million barrels and natural gas reserves were about 7 billion cubic feet.

The Government encouraged further development of limestone and sandstone deposits for use as construction materials. Construction material demand was to be increased by modifying financing requirements for home ownership.

Arawak Cement Co. Ltd. faced increasing criticism from two Puerto Rican cement manufacturers that charged Arawak's cement was being sold in Puerto Rico for less than its selling price in Barbados. This dispute was not resolved and eventually could be presented to the U.S. Federal Trade Commission for disposition. The Puerto Rican cement producers have lodged a similar complaint against Honduras.

CUBA

Falling world market prices for nickel, petroleum, sugar, and tobacco were responsible for some contractions in Cuba's economy during 1986. Although exports remained somewhat protected by long-term agreements with member countries of the Council for Mutual Economic Assistance (CMEA), Cuba's export earnings in convertible currency fell substantially. During the last several years, the export and reexport of surplus crude oil and petroleum products emerged as important foreign exchange earners, but, as world prices tumbled in 1986, Cuba's procurement contract price with the Soviet Union reportedly remained unchanged, and this once preferentially low price for petroleum was no longer so attractive.

In 1985, reexported petroleum brought Cuba about $470 million[2] in convertible foreign exchange. In 1986, even though exported volumes remained at about the same level, their values were estimated to have fallen to about $270 million because of the decrease in world oil prices. Because much of Cuba's non-CMEA trade is denominated in U.S. dollars, a drop in the value of the U.S. dollar since early 1985 has also been damaging. Cuba's petroleum reexports have been mostly paper transactions whereby the Soviet Union sells the oil on commission in Western Europe and credits Cuba's account.

An estimated 2% economic growth for 1986 and a similar growth rate projected for 1987 prompted the Government to initiate austerity measures to decrease foreign currency import expenditures and expand available export volumes by curbing domestic consumption. Other economic actions included food and electricity price increases and the reduction or elimination of some subsidies benefiting public officials.

In August, a new chrome ore processing plant was brought on-stream at Cayo Guan, Moa, in northeastern Holguín Province. The Merceditas Mine, about 36 kilometers distant, provides the ore. The $12 million Czechoslovak-built facility can process 50,000 tons of ore per year and produce about 37,400 tons of refractory chromite. Output in 1986 was about 10,000 tons. The new plant was reportedly to replace the old processing facility. Cuba was expected to bring the Amores Mine in Baracoa, Holguín Province, on-stream in 1987, with about 10,000 tons of production projected for that year. Chromite ore has also been produced at the Chromita, Potosí, and Cayoguam Mines in Holguín Province.

Although no production figures have been made available, the Delitas underground gold mine on the Isla de Juventud was reported to have an expected life of about 25 years. Silver values in the ore were reported to be higher than the gold values.

Two levels, at 56 and 89 meters, were being developed first, and exploration for new reserves continued. Another active gold mine was the Aguas Claras Mine, an open pit operation in Holguín Province in northeastern Cuba.

Reportedly, the Soviet Union would provide technical and financial assistance for the third stage of expansion at Empresa Metalúrgica José Martí, the 400,000-ton-per-year steel plant at Cotorro near Havana. This expansion project would add a new 200,000-ton-per-year electric furnace, continuous casting machines, a medium section mill, and auxiliary equipment. Cuba has projected the export of a total of 1 million tons of steel products during the 1986-90 period. During the previous 5-year period, a total of 600,000 tons of ingots, bars, sheets, and wire rod was exported to countries in Asia, Latin America, and the Mideast. A small, 10,000-ton-per-year-capacity steel plant went on-stream in Villa Clara in central Cuba. During 1986, it produced 5,000 tons of steel.

Cuba's Comandante Che Guevara 30,000-ton-per-year nickel oxide sinter plant at Punta Gorda began production in January, but it came on-stream with only 10,000 tons of its eventual 30,000-ton-per-year designed capacity. Production for 1986 was first estimated at 5,000 to 7,000 tons, but because of design and technical problems, this amount was progressively reduced to less than 1,200 tons. The plant may not reach full capacity production until 1990.

The problems at Punta Gorda caused a delay in construction work at Cuba's second new nickel plant project, Las Camariocas. In midyear, the 16,000 workers at the nickel processing and mining complex at Moa were reduced by one-third as part of Cuba's effort to improve the economics and efficiency of nickel production.

Reportedly, within 5 years, Cuba would start mining the Castellanos lead, zinc, and barite deposit in Pinar del Río Province. Other projects to be developed during the same time period included bentonite, quartz, and silicon on the Isla de Juventud. The Centro de Investigaciones Minero-Metalúrgicas de Cuba was investigating deposits containing bauxite, copper, phosphorite, quartz, tungsten, and materials for the construction and ceramic industries. Marble has long been an important material for both domestic use and export. Production comes from the Isla de Pinos, Pinar del Río Province, and from quarries in the Santa Rita area of eastern Cuba. The marble industry is under the supervision of Empresa de Marmoles.

Hydropower provides only about 46 megawatts of Cuba's more than 3,100 megawatts of installed electrical capacity. An additional 25 megawatts of hydropower was expected to be operational by 1990. In 1986, it was announced that a third nuclear reactor facility was planned for construction in the northeast, in Holguín Province. The two 440-megawatt reactors presently under construction at Juragua, Cienfuegos, were expected on-stream by 1990. The Government tried to allay fears in neighboring countries that the Soviet-designed Cienfuegos reactors might have the same weaknesses as the ones at Chernobyl in the Soviet Union. The Government stressed that strict safety measures were being employed and that Cienfuegos incorporates an efficient containment system. Reportedly, it took 3 years to lay down the base for the facility's foundation, a block of sufficient size and strength to resist damage by earthquakes measuring up to Force Eight on the Richter Scale. Another reported safety feature to be incorporated was an airtight concrete dome for each reactor that could even withstand being hit by an aircraft.

Cuba's oil production rose to about 18,000 barrels per day. If Cuba is to reach its stated goal of 40,000 barrels per day by 1990, production must increase by about 25% each year for the next 4 years. Cuba's total energy needs in 1986 were met primarily through domestically produced and imported petroleum. Natural gas is used to support an electric power station in Ciego de Avila, near the Satibonico Field in central Cuba, but little gas is otherwise utilized. Possible gas reserves in the Pinar del Río region and associated gas in the northern coastal oilfields may be used in the future. Bagasse provides about 55% of the energy consumed by the industrial sector, primarily by the sugar industry.

Table 4.—Cuba: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985
METALS			
Aluminum:			
Ore and concentrate	432	NA	
Ash and residue containing aluminum	410	NA	
Metal including alloys, scrap	4,085	NA	
Chromium: Ore and concentrate, refractory-grade	[2]41,212	[2]41,650	West Germany 3,451; Austria 2,976; Canada 961.
Copper:			
Ore and concentrate[2]	2,553	3,201	NA.
Ash and residue containing copper	227	NA	
Metal including alloys, scrap	3,090	NA	
Iron and steel: Metal:			
Scrap	144,269	22,457	All to Italy.
Pig iron, cast iron, related materials	36	NA	
Steel, primary forms	22,227	14,018	All to Italy.
Semimanufactures	[2]80,604	[2]95,870	Egypt 34,338.
Lead: Metal including alloys, all forms	409	NA	
Nickel:			
Matte and speiss	3,452	2,043	Italy 1,649; Yugoslavia 370; Austria 24.
Oxides and hydroxides, metal content[2 3]	6,390	9,152	U.S.S.R. 3,050; Czechoslovakia 2,261; East Germany 1,028.
Sinter, metal content[2 3]	13,810	6,630	West Germany 1,827; Czechoslovakia 1,162; East Germany 610.
Sulfide, metal content[2 3]	16,458	17,594	All to U.S.S.R.
Metal including alloys, unwrought	430	1,647	Czechoslovakia 1,592; Japan 55.
Vanadium: Ash and residue containing vanadium	NA	177	All to West Germany.
Zinc:			
Matte	28	NA	
Ash and residue containing zinc	463	NA	
Metal including alloys:			
Scrap	313	NA	
Unwrought	300	NA	
Other:			
Ores and concentrates	10,054	NA	
Oxides and hydroxides	1,710	3	All to West Germany.
INDUSTRIAL MINERALS			
Abrasives, n.e.s.: Artificial, corundum	NA	25	All to Italy.
Cement	[2]224,728	[2]60,358	French Guiana 4,000.
Stone, sand and gravel:			
Dimension stone: Crude and partly worked	270	NA	
Sand other than metal-bearing	NA	48	All to Italy.
Sulfur: Elemental, colloidal, precipitated, sublimed	2	NA	
MINERAL FUELS AND RELATED MATERIALS			
Coal: Lignite including briquets	25	NA	
Petroleum:			
Crude 42-gallon barrels	1,178,109	221,232	All to Italy.
Refinery products:			
Liquefied petroleum gas do.	12,853	NA	
Gasoline, motor do.	1,209,550	481,611	West Germany 331,543; Sweden 150,068.
Kerosene and jet fuel do.	221	NA	
Distillate fuel oil do.	82,060	NA	
Asphalt do.	17,465	NA	

[p]Preliminary. NA Not available.

[1]Table prepared by H. D. Willis. Owing to a lack of official trade data published by Cuba, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries. The United States reported no trade in mineral commodities with Cuba in 1984 or 1985.

[2]Anuario Estadistico de Cuba, 1985.

[3]Includes contained cobalt.

Table 5.—Cuba: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985
METALS			
Aluminum:			
Oxides and hydroxides	252	1,149	All from Japan.
Metal including alloys:			
Unwrought	35	29	All from United Kingdom.
Semimanufactures	1,004	94	Belgium-Luxembourg 30; West Germany 26; Japan 17.
Chromium, oxides and hydroxides	15	59	Japan 48; United Kingdom 11.
Cobalt: Oxides and hydroxides value	NA	$5,000	All from Japan.
Copper:			
Oxides and hydroxides	46	NA	
Metal including alloys, semimanufactures	2,575	5,080	Japan 3,256; Canada 1,761; West Germany 27.
Gold: Metal including alloys, unwrought and partly wrought troy ounces	611	2,572	All from Switzerland.
Iron and steel:			
Iron ore and concentrate excluding roasted pyrite	395	186	All from United Kingdom.
Metal:			
Scrap	96,515	99,185	All from U.S.S.R.
Pig iron, cast iron, related materials	134	17	All from West Germany.
Ferromanganese	NA	1,399	All from Japan.
Steel, primary forms	947	269	All from Austria.
Semimanufactures:			
Bars, rods, angles, shapes, sections	52,880	11,176	Belgium-Luxembourg 5,410; West Germany 4,764; Austria 848.
Universals, plates, sheets[2]	782,225	835,382	U.S.S.R. 586,733; Bulgaria 53,345; Belgium-Luxembourg 44,543.
Hoop and strip	1,001	1,239	Belgium-Luxembourg 690; West Germany 385; Japan 156.
Rails and accessories	155	NA	
Wire	8,280	3,561	United Kingdom 2,222; Belgium-Luxembourg 770; Austria 299.
Tubes, pipes, fittings[2]	95,062	99,608	U.S.S.R. 46,136; Japan 10,810; Bulgaria 9,677.
Castings and forgings, rough	[2]222,611	[2]238,254	Austria 47; Japan 1.
Unspecified	NA	21,000	All from Czechoslovakia.
Lead:			
Oxides	1	3	All from United Kingdom.
Metal including alloys:			
Unwrought	1,040	NA	
Semimanufactures	1,428	631	Belgium-Luxembourg 630; Japan 1.
Magnesium: Metal including alloys, unwrought	NA	21	All from Italy.
Manganese:			
Ore and concentrate	456	NA	
Oxides	796	236	All from Japan.
Metal including alloys, all forms	15	16	All from Italy.
Mercury 76-pound flasks	58	NA	
Nickel: Metal including alloys:			
Unwrought	4	1	All from West Germany.
Semimanufactures	7	13	West Germany 7; Japan 4; Canada 2.
Unspecified	4	NA	
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$37	$35	West Germany $31; Japan $4.
Silicon, metal	370	NA	
Silver: Metal including alloys, unwrought and partly wrought value, thousands	$556	$82	Japan $79; United Kingdom $3.
Tin: Metal including alloys:			
Unwrought	40	351	United Kingdom 331; Denmark 20.
Semimanufactures value, thousands	NA	$6	All from Japan.
Titanium: Oxides	101	107	West Germany 105; United Kingdom 2.
Tungsten: Metal including alloys, all forms value, thousands	NA	$18	All from Japan.
Zinc:			
Oxides	109	449	United Kingdom 237; Japan 212.
Metal including alloys:			
Unwrought	750	99	All from Japan.
Semimanufactures	64	104	Do.
Other:			
Ores and concentrates	NA	3	All from Canada.
Oxides and hydroxides	NA	32	Belgium-Luxembourg 29; United Kingdom 3.
Base metals including alloys, all forms	18	4	Belgium-Luxembourg 2; Canada 1; West Germany 1.

See footnotes at end of table.

Table 5.—Cuba: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985
INDUSTRIAL MINERALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc.	7	50	Italy 47; West Germany 3.
Artificial:			
Corundum	7	76	All from West Germany.
Silicon carbide	150	NA	
Dust and powder of precious and semiprecious stones, value, thousands	NA	$5	All from Japan.
Grinding and polishing wheels and stones	112	205	Yugoslavia 129; Austria 73; Italy 2.
Asbestos, crude	1,428	1,658	All from Canada.
Barite and witherite	2,190	NA	
Boron materials: Oxides and acids	345	2	All from Japan.
Cement	4,202	48,932	U.S.S.R. 39,000; Denmark 9,510; Japan 422.
Clays, crude:			
Bentonite	25	NA	
Chamotte earth	492	NA	
Kaolin	1,928	121	All from United Kingdom.
Unspecified	100	NA	
Diatomite and other infusorial earth	36	4	United Kingdom 3; West Germany 1.
Feldspar, fluorspar, related materials	232	80	All from West Germany.
Fertilizer materials: Manufactured:			
Ammonia	[2]16,283	[2]39,407	United Kingdom 2.
Nitrogenous	[2]626,786	[2]626,150	U.S.S.R. 395,800; West Germany 17.
Phosphatic (total)	310,336	295,466	U.S.S.R. 270,000.
Of which:			
Superphosphate, simple[2]	262,100	255,466	NA.
Superphosphate, triple[2]	48,236	40,000	NA.
Potassic (total)	353,406	414,874	U.S.S.R. 229,500; West Germany 21.
Of which:			
Potassium chloride[2]	333,733	390,593	NA.
Potassium sulfate[2]	19,673	24,281	NA.
Unspecified and mixed	1,084	534	All from United Kingdom.
Fluorspar	NA	64	Do.
Graphite, natural	586	512	All from Japan.
Gypsum and plaster	158	147	All from United Kingdom.
Iodine	2	NA	
Magnesium compounds: Oxides and hydroxides	NA	52	All from Japan.
Mica:			
Crude including splittings and waste	39	NA	
Worked including agglomerated splittings	4	NA	
Phosphates, crude	10,200	10,000	All from Algeria.
Pigments, mineral: Iron oxides and hydroxides, processed	377	183	Japan 97; West Germany 86.
Precious and semiprecious stones other than diamond:			
Natural, value, thousands	$14	NA	
Synthetic, do.	$22	$16	Switzerland $9; Japan $7.
Salt and brine	185	66	West Germany 60; Canada 6.
Sodium compounds, n.e.s.: Carbonate, manufactured	6	5,819	Bulgaria 5,805; West Germany 14.
Stone, sand and gravel:			
Gravel and crushed rock	20	NA	
Quartz and quartzite	38	47	All from Sweden.
Sand other than metal-bearing	NA	2	All from West Germany.
Sulfur:			
Elemental, all forms	[2]142,427	[2]157,061	Canada 115,062; Belgium-Luxembourg 5.
Sulfuric acid	1,834	35	All from West Germany.
Talc, steatite, soapstone, pyrophyllite	42	57	All from Japan.
Other: Crude	138	450	United Kingdom 250; Japan 200.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	598	3,121	U.S.S.R. 2,054; West Germany 716; Japan 267.
Coal:			
Anthracite[2]	85,271	89,718	NA.
All grades including briquets	364	1,300	All from Japan.
Coke and semicoke	[2]54,590	[2]63,849	Japan 7,700.
Peat including briquets and litter	98	138	West Germany 133; Canada 5.
Petroleum:			
Crude, thousand 42-gallon barrels	[2]52,816	NA	

See footnotes at end of table.

Table 5.—Cuba: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Sources, 1985
MINERAL FUELS AND RELATED MATERIALS —Continued			
Petroleum —Continued			
Refinery products:			
Gasoline, motor thousand 42-gallon barrels	[2]1,906	143	Mainly from Canada.
Mineral jelly and wax do	19	4	West Germany 3; Japan 1.
Kerosene and jet fuel do	14	85	All from United Kingdom.
Distillate fuel oil do	[2]25,624	72	Mainly from Canada.
Lubricants do	[2]805	121	Italy 60; West Germany 59; United Kingdom 1.
Residual fuel oil do	[2]8,196	NA	
Bitumen and other residues 42-gallon barrels	1,006	127	All from West Germany.
Bituminous mixtures do	648	30	Japan 24; Italy 6.
Petroleum coke do	NA	110	All from West Germany.

[p]Preliminary. NA Not available.

[1]Table prepared by H. D. Willis. Owing to a lack of official trade data published by Cuba, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the partner trade countries. The United States reported no trade in mineral commodities with Cuba in 1984 or 1985.

[2]Anuario Estadistico de Cuba, 1985.

DOMINICAN REPUBLIC

Mineral exploration studies undertaken with technical assistance from foreign governments continued to be encouraging, but new mining projects from these studies were not expected in the near future. Concerns about possible ecological damage interrupted financing arrangements under way for the Pueblo Viejo gold sulfide mining project. Limestone and salt production and sales increased and may result in an expansion of these small mining operations and could involve the entry of foreign investors into limestone and salt mining.

The gross domestic product (GDP) reached an estimated $5.5 billion,[3] and real economic growth was about 2%, compared with that of 1985. Reportedly, in 1987, the Dominican Republic may take steps to liberalize its mining policy and allow the private sector access to some areas now restricted to Government exploitation. Only four "fiscal reserve" areas were expected to be retained for Government development, but these areas were not identified. Private companies have been reluctant to invest money in the exploration of fiscal reserve areas when they had no reasonable assurance of being allowed to participate in exploitation.

The cooperative geological investigation project by the Dirección General de Minería and geologists from the Federal Republic of Germany began phase 2 of a mapping and metallic minerals exploration program. Phase 1 involved mapping and sediment sampling in the Northern Cordillera. Phase 2 was to provide more detailed mapping and geochemical sampling in selected target areas.

In December, an investigative team from the Republic of Korea began discussions with the Government on possible areas for technical cooperation. The Republic of Korea was represented by officials from the Mining Development Corp. of Korea and Kyung Book Mineral Co. Discussions reportedly concerned mostly industrial minerals, such as clays, gypsum, marble, and salt.

The Government of Sweden's prospecting agency, Swedish Geological Co. AB, was cooperating in exploration on the eastern flank of the Cordillera Central, and also assisting in the development of a geological survey department. The latter stressed personnel training in Sweden. This cooperative program also involved West German and Japanese technical missions.

East of Pico Duarte in the Las Canitas area west of Bonao, an interesting porphyry copper mineralization was located by Government and Japanese geologists. The discovery was made during an ongoing joint cooperative exploration program in Cordillera Central. The mineralization was estimated to cover a surface area as large as 300 by 500 meters and may extend to a depth of 150 meters. Sampling indicated the deposit may contain 1.03% copper, 10 grams per ton of silver, and 0.52 gram per ton of gold.

Mining of the Pueblo Viejo gold oxide ore

at Cotui by Rosario Dominicana S.A. is expected to cease in 1990. In 1986, Fluor Corp. of the United States completed a feasibility study on the exploitation of complex gold, silver, and copper sulfide deposits underlying the oxide ore. The conversion to sulfide ore extraction could extend the productive mine life at Pueblo Viejo another 25 to 30 years. An annual production of 400,000 troy ounces of gold and 1 million troy ounces of silver was projected. The disposal system proposed for about 900,000 tons of sulfuric acid byproduct per year drew criticism from some environmentalists and eventually caused an official withdrawal of a loan request from the Inter-American Development Bank (IDB) pending further study. The Government estimated more than a $400 million investment, with most of the financing from the IDB. Rosario proposed building a 90-kilometer pipeline to transport the sulfuric acid to a northern coastal port for export. However, the pipeline would pass through the agriculturally important Cibao Valley, and fears of contamination were strongly expressed. Another factor that may affect the eventual development of the sulfide deposits was the concern by some Government officials that this amount of money could bring a better rate of return if invested in other endeavors.

Cía. Minera Dominicana El Yujo C.A., the copper-zinc-gold project established in 1985 between the Government and Huellera-Vasco-Leonesa S.A., continued an exploratory drilling program in the El Yujo area of the Jarabacoa District. The Government also continued its gold mineralization exploration in the Restauración area near the Haitian border, in the Miches area in the northeast, around the Haina River near Villa Altagracia in the central-southwest, and in the Mao River Basin in the north-central region.

Labor problems resulted in a 36-day strike at the Falconbridge Dominicana C. por A. (Falcondo) ferronickel plant at Bonao. Lost nickel production was estimated at about 2,500 tons. Surplus electricity normally sold by Falcondo to the national electric company was not available during the strike, and power shortages resulted.

HAITI

Although there appeared to be some positive indicators in Haiti's minerals sector, no projects were reported as firmly scheduled for development.

A sudden change in Government leadership occurred early in February 1986, and a certain amount of caution was evidenced by investors despite the new regime's proclaimed prodevelopment and proforeign-investment policy. By midyear, confidence in Haiti's stability was growing, bouyed by an investment code that included tax exemptions, tax reductions, import duty exemptions, and accelerated depreciation allowances.

In October, the U.S. Agency for International Development funded the creation of the Direction Promotion des Investissements (Prominex), a joint public-private sector entity that would function to attract and facilitate foreign investment by identifying and publicizing business opportunities. In addition to trade advantages, the expected new business developments were to create as many as 50,000 new job opportunities. Unemployment in 1986 was estimated at 60%.

One of Prominex's active projects was to assist in finding joint venture partners to develop a sea salt refinery at the mouth of the Artibonite River in the coastal area between Gonaïves and Saint Marc. The $200,000 project would refine salt through carbonization, filtration, and crystallization. Haiti has been importing about 320 tons of salt per year.

The Government continued to do exploratory drilling in several mineralized areas of northeastern Haiti, around Terrier Rouge, Cap Haïtien, Grand Bois, Limbe, Milot, and Mount Organize, where deposits containing copper, gold, and silver have been found. Reportedly, talks were held between state-owned La Géominérale d'Haiti S.A. and private mining companies regarding development in these mineral-bearing areas.

Because the Maïssade lignite deposits were evaluated as having only a 17-year productive life, other reserves in the Central Plateau area may need to be evaluated to establish a viable mining operation whose output could be used either to generate electricity or manufacture briquets.

JAMAICA

In 1986, the Government failed to persuade the Alumina Partners of Jamaica (Alpart) to reopen its alumina plant, and the Aluminum Co. of Canada Ltd. (Alcan) was reluctant to increase its alumina production. Jamaica expected these events to take place in 1987.

After 3 years of decline, Jamaica's real economic growth reached an estimated 2% in 1986, and the GDP was about $2.3 billion.[4] Foreign exchange earnings from the bauxite production levy, royalties, and local cash inflows increased to $163 million, more than the $139 million (revised) received in 1985, but significantly short of the $220 million received in 1984. Bauxite exports were at an increased level, while the total volume of alumina exported decreased slightly from the 1985 level.

Despite earlier expectations that Jamaica might suspend or decrease the bauxite production levy as an inducement to increase output, at yearend, reportedly, the levy would remain based on the average realized price for primary aluminum ingots. For 1986, this projected price was $0.55 per pound, and the bauxite production level was set at $15.35 per ton of ore mined. The levy is subject to adjustments as market conditions change. New tax reforms were scheduled to be reviewed and enacted in 1987 by the Jamaican Parliament as part of the Government's program to attract investors and increase exports. These reforms included a 15% reduction in the corporate tax rate, as well as a drop in the rate of the withholding tax on dividends paid to investors. Tariffs on imports were expected to be progressively reduced. In another effort to attract foreign investors, Jamaica National Promotion Ltd. was designated as the Government agency that would exclusively process new foreign investment projects.

In July, after several months of testing, Kaiser Jamaica Bauxite Co. opened a new facility to recycle bauxite ore that had been rejected during normal processing. The facility is at the Port Rhoades plant on the north coast at Discovery Bay. Kaiser Jamaica had an estimated 4.5-million-ton stockpile of rejected ore that can now be processed at the rate of 250,000 tons per year at a cost of $75,000.

Clarendon Alumina Production Ltd., the Government-owned company that in 1985 leased for 2 years the closed Aluminum Co. of America (Alcoa) plant at Nain, reportedly planned to initially invest $25 million to improve the plant's red mud disposal system. Throughout 1986, there were reports that the Government and Alcoa were negotiating a resumption of Alcoa as an active partner in the Clarendon plant, with the Government's share increasing from 6% to 51%. The present lease agreement expires in mid-1987, and the Government wants the plant to be operated at its full 800,000-ton-per-year capacity, as well as have the joint venture produce bauxite ore for export.

At yearend, the Government was negotiating with Alcan to produce at the full capacity of their jointly owned alumina refineries at Kirkvine and Ewarton. Combined capacity at these two plants is 1.1 million tons per year, but Alcan, with a 93% interest in the venture, has been producing at less than 800,000 tons per year. The Government wanted to purchase any alumina above Alcan's reduced production level and full capacity operation. A dispute arose over pricing, and the two parties failed to reach an agreement by yearend. In view of the continued weakness in the market price for alumina, Alcan announced at midyear that it was further reducing employment at the two plants in an effort to improve productivity and reduce costs.

It was widely reported that Alpart would reopen the 1.2-million-ton-per-year alumina plant that it closed in August 1985. The plant remained closed throughout 1986, but the Government was hopeful it would reopen in early 1987. Considerably reduced oil prices were expected to lower operating costs at the plant and make reopening attractive to Alpart.

Several industrial minerals projects were under study during 1986. Marketing surveys were under way for dolomite, limestone, and marble-chip terrazzo tile. An investor was also being sought to manufacture chalk whiting for export. Cement manufacture has been about one-half of capacity, and Caribbean Cement Co. was undergoing a modernization program to increase market competitiveness. The renovation included boiler conversions from oil-fired to coal-fired units.

The proposal to mine domestic peat resources to fuel a proposed power station near Negril lost support in 1986 because of environmental concerns and because the fall in world oil prices reduced its import drain on available foreign exchange. However, a powerplant to burn imported coal for use at the Clarendon alumina plant and by the Jamaica Public Service Co. remained under active planning.

Table 6.—Jamaica: Exports and reexports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate thousand tons	4,559	2,325	1,522	U.S.S.R. 803.
Oxides and hydroxides do.	1,721	1,620	349	Canada 649; United Kingdom 259.
Metal including alloys:				
Scrap	375	526	456	United Kingdom 54; Netherlands 16.
Unwrought	--	14	14	
Semimanufactures	321	354	78	Trinidad and Tobago 175; Dominica 41.
Copper: Metal including alloys, scrap	264	354	212	Netherlands 46; East Germany 34.
Gold: Waste and sweepings value, thousands	$8	--		
Iron and steel: Metal:				
Scrap	94	1,544	17	Canada 1,464; West Germany 44.
Semimanufactures:				
Bars, rods, angles, shapes, sections	--	20	--	Cayman Islands 15.
Universals, plates, sheets	5,077	1,250	--	St. Lucia 394; Grenada 222; Trinidad and Tobago 221.
Hoop and strip	6	--		
Rails and accessories	10	--		
Wire	--	13	--	NA.
Tubes, pipes, fittings	126	155	20	Trinidad and Tobago 95; Haiti 33.
Castings and forgings, rough	1	--		
Nickel: Metal including alloys, semimanufactures	4	--		
Silver: Waste and sweepings value	$1,343	--		
Tin: Metal including alloys:				
Scrap	474	608	608	
Semimanufactures	24	22	22	
Zinc: Metal including alloys, scrap	6	16	15	Canada 1.
INDUSTRIAL MINERALS				
Asbestos, crude	3	--		
Cement	--	3,021	--	All to Leeward and Windward Islands.
Chalk	494	1	--	All to Trinidad and Tobago.
Fertilizer materials:				
Crude, n.e.s	--	38	38	
Manufactured, ammonia	--	2	(2)	NA.
Gypsum and plaster	170,553	160,548	36,391	Colombia 65,119; Haiti 13,538.
Lime	1,776	89	54	St. Vincent and the Grenadines 35.
Pigments, mineral: Iron oxides and hydroxides, processed kilograms	231	--		
Salt and brine	3,260	1,925	(2)	Trinidad and Tobago 1,245; Barbados 327; St. Lucia 224.
Sodium compounds, n.e.s.: Carbonate, manufactured kilograms	--	113	113	
Stone, sand and gravel:				
Dimension stone, crude and partly worked	23	5	--	All to St. Lucia.
Gravel and crushed rock	--	33	--	Barbados 18.
Limestone other than dimension	61,305	18	--	All to Barbados.
Sand other than metal-bearing	--	10	--	NA.
Sulfur: Sulfuric acid	57	38	--	All to Haiti.
Talc, steatite, soapstone, pyrophyllite value	$6,216	$705	--	All to Belize.
Other: Slag and dross, not metal-bearing	34	--		
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	104	75	--	All to Cayman Islands.
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	--	1,052	--	NA.
Gasoline do.	(3)	52,488	--	Bahamas 26,078; Honduras 21,492; Netherlands Antilles 1,560.
Mineral jelly and wax do.	1	8	--	All to Haiti.
Kerosene and jet fuel do.	(4)	78,384	--	All to Bahamas.
Distillate fuel oil do.	r504,675	126,897	21,838	Bahamas 47,098; Honduras 20,794.
Lubricants do.	100,611	92,715	1,262	Guyana 21,941; El Salvador 13,911; Guatemala 12,618.
Residual fuel oil do.	2,522	245,919	182,140	Bahamas 55,306.
Bitumen and other residues do.	2,297	376	--	All to Cayman Islands.

rRevised. NA Not available.
[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.
[3]Unreported quantity valued at $105.
[4]Revised to zero.

Table 7.—Jamaica: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate ____ value	--	$468	$416	Canada $52.
Oxides and hydroxides	4	10	9	United Kingdom 1.
Metal including alloys:				
Scrap	177	--	--	
Unwrought	804	860	--	All from Canada.
Semimanufactures	2,236	1,377	365	United Kingdom 518; Canada 207.
Chromium: Ore and concentrate	4	--		
Copper:				
Sulfate	2	6	6	
Metal including alloys:				
Unwrought	--	1	1	
Semimanufactures	542	618	196	United Kingdom 259; Australia 104.
Gold:				
Waste and sweepings ____ value	$209	$678	$678	
Metal including alloys, unwrought and partly wrought ____ troy ounces	450	1,029	322	United Kingdom 547; Canada 129.
Iron and steel:				
Ore and concentrate including roasted pyrite	--	19	19	
Metal:				
Scrap ____ value	$4,085	$894	$894	
Pig iron, cast iron, related materials	16	283	282	Canada 1.
Ferroalloys:				
Ferromanganese	39	--		
Ferrosilicon	22	24	24	
Steel, primary forms	14,199	5,666	45	Trinidad and Tobago 5,179; United Kingdom 340; Japan 102.
Semimanufactures:				
Bars, rods, angles, shapes, sections	13,257	10,645	913	Trinidad and Tobago 6,668; United Kingdom 1,714.
Universals, plates, sheets	17,398	13,643	816	Japan 8,896; United Kingdom 1,058; Republic of Korea 955.
Hoop and strip	525	286	135	United Kingdom 102; Japan 49.
Rails and accessories	271	331	331	
Wire	2,991	2,773	374	Belgium-Luxembourg 886; United Kingdom 616.
Tubes, pipes, fittings	4,223	3,021	1,548	Italy 927; United Kingdom 357.
Castings and forgings, rough	186	30	9	United Kingdom 15; Canada 5.
Lead:				
Oxides	158	251	235	United Kingdom 11; West Germany 4.
Metal including alloys:				
Scrap	3	2	2	
Unwrought	21	6	6	
Semimanufactures	31	26	9	United Kingdom 17.
Magnesium: Metal including alloys:				
Unwrought ____ value	--	$36	--	All from United Kingdom.
Semimanufactures ____ do	r$7,706	$910	$910	
Manganese: Ore and concentrate	71	193	--	Japan 140; United Kingdom 38; Belgium-Luxembourg 15.
Molybdenum: Metal including alloys:				
Unwrought ____ kilograms	(2)	443	443	
Semimanufactures ____ do	r3	--		
Nickel: Metal including alloys, semimanufactures	r11	2	(3)	Mainly from West Germany.
Platinum-group metals: Metals including alloys, unwrought and partly wrought ____ troy ounces	161	322	129	Canada 161; United Kingdom 32.
Silver:				
Waste and sweepings ____ value	$1,207	$172	--	All from Canada.
Metal including alloys, unwrought and partly wrought ____ troy ounces	26,010	32,215	9,034	United Kingdom 12,378; West Germany 6,623.
Tin: Metal including alloys:				
Unwrought	2	--		
Semimanufactures	9,882	8,228	24	United Kingdom 5,452; Netherlands 1,951; Japan 799.
Titanium: Oxides	509	605	342	United Kingdom 234; Norway 18.
Tungsten:				
Ore and concentrate ____ value	--	$517	$517	
Metal including alloys, semimanufactures	(2)	--		

See footnotes at end of table.

Table 7.—Jamaica: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Uranium and/or thorium: Metal including alloys, all forms kilograms	1,191	578	578	
Zinc:				
Ore and concentrate	7	--		
Oxides	275	95	64	United Kingdom 21; West Germany 10.
Blue powder	3	16	--	Mainly from Netherlands.
Metal including alloys:				
Unwrought	1,043	548	199	Canada 199; East Germany 100.
Semimanufactures	19	15	(3)	Mainly from United Kingdom.
Other:				
Ores and concentrates value	$89	$5,415	--	All from United Kingdom.
Oxides and hydroxides	85	122	34	Japan 60; United Kingdom 27.
Base metals including alloys, all forms kilograms	21	6	6	
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	19	24	24	
Grinding and polishing wheels and stones	12	26	4	Italy 7; Canada 4.
Asbestos, crude	29	3	3	
Barite and witherite	--	4	1	United Kingdom 3.
Boron materials: Crude natural borates value	$1,522	$286	$48	West Germany $238.
Cement	1,339	2,374	97	Yugoslavia 1,500; Denmark 325; West Germany 218.
Chalk	74	6	(3)	Mainly from United Kingdom.
Clays, crude	257	332	327	United Kingdom 5.
Diamond: Industrial stones value	$361	--		
Diatomite and other infusorial earth	202	27	27	
Feldspar, fluorspar, related materials	24	9	9	
Fertilizer materials:				
Crude, n.e.s	318	65	65	
Manufactured:				
Ammonia	173	157	78	Japan 67; United Kingdom 10.
Nitrogenous	30,379	17,023	269	Canada 16,700; Austria 50.
Phosphatic	2,310	890	74	Netherlands 816.
Potassic	15,048	183	183	
Unspecified and mixed	9,211	6,393	132	Canada 5,959; Dominican Republic 200.
Graphite, natural value	$3,782	$2	$2	
Gypsum and plaster	210	51	48	United Kingdom 3.
Lime value	$598	$138	$138	
Magnesium compounds:				
Magnesite, crude do	$30	$10	--	All from United Kingdom.
Oxides and hydroxides	2	--		
Mica:				
Crude including splittings and waste	59	119	4	Netherlands 62; Norway 53.
Worked including agglomerated splittings kilograms	1,959	9,501	9,497	United Kingdom 3; Canada 1.
Nitrates, crude	--	14	14	
Phosphates, crude	367	114	114	
Pigments, mineral:				
Natural, crude	3	21	(3)	West Germany 20; United Kingdom 1.
Iron oxides and hydroxides, processed	102	53	2	West Germany 36; United Kingdom 12; Canada 3.
Potassium salts, crude value	$45,695	--		
Precious and semiprecious stones other than diamond:				
Natural do	$15,355	--		
Synthetic do	--	$246	$246	
Salt and brine	46,495	25,058	24,891	Canada 110; United Kingdom 55.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	4,644	4,244	3,936	France 188; West Germany 64.
Sulfate, manufactured	1,789	1,091	310	Mexico 750; West Germany 20.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	8	116	115	Italy 1.
Worked	22	11	2	Italy 6; Guatemala 3.
Dolomite, chiefly refractory-grade	--	14	14	
Gravel and crushed rock	50	435	137	United Kingdom 255; Netherlands 43.

See footnotes at end of table.

Table 7.—Jamaica: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel —Continued				
Limestone other than dimension value	$152	$148	$148	
Quartz and quartzite do	$258	$4,523	$2,729	Japan $1,317; United Kingdom $477.
Sand other than metal-bearing	897	910	464	United Kingdom 315; Netherlands 131.
Sulfur:				
Elemental:				
Crude including native and byproduct	34	28	12	Belgium-Luxembourg 15; United Kingdom 1.
Colloidal, precipitated, sublimed	3,002	2,947	2,946	United Kingdom 1.
Dioxide	1	1	1	
Sulfuric acid	16	1,592	1,592	
Talc, steatite, soapstone, pyrophyllite	390	463	341	Norway 104; United Kingdom 12.
Other:				
Crude	71	26	26	
Slag and dross, not metal-bearing	--	2	--	All from United Kingdom.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,903	18	16	United Kingdom 2.
Carbon black	1,060	952	139	Venezuela 617; Mexico 162.
Coal: Anthracite value	--	$776	--	All from Taiwan.
Coke and semicoke	142	84	42	West Germany 25; United Kingdom 17.
Peat including briquets and litter	--	45	45	
Petroleum:				
Crude 42-gallon barrels	182	63	63	
Refinery products:				
Liquefied petroleum gas thousand 42-gallon barrels	245	522	482	Netherlands Antilles 24; Venezuela 16.
Gasoline do	417	587	(3)	Trinidad and Tobago 280; Netherlands Antilles 183; Panama 88.
Mineral jelly and wax do	17	10	2	United Kingdom 4; West Germany 3.
Kerosene and jet fuel do	313	328	(3)	Trinidad and Tobago 204; Netherlands Antilles 82; Venezuela 37.
Distillate fuel oil do	r268	286	1	Trinidad and Tobago 98; Netherlands Antilles 95; Panama 91.
Lubricants do	66	55	24	Netherlands Antilles 30.
Residual fuel oil do	10,316	11,347	779	Venezuela 4,803; Netherlands Antilles 3,029; Mexico 1,710.
Bitumen and other residues do	r(3)	1	1	
Bituminous mixtures do	1	1	1	
Petroleum coke value	--	$261	$261	

rRevised.
[1]Table prepared by H. D. Willis.
[2]Revised to zero.
[3]Less than 1/2 unit.

NETHERLANDS ANTILLES

Refinería Isla Curazao S.A., a subsidiary of Petróleos de Venezuela S.A. (PDVSA), reopened the former Royal Dutch/Shell Group's 320,000-barrel-per-day crude oil refinery on Curaçao in early 1986. Throughput averaged about 160,000 barrels per day. Refined products were exported to Latin America, 37%; the United States, 34%; Europe, 15%; and other destinations and local consumption, 14%.

In mid-1986, it was reported that Petróleo Brasileiro S.A. (PETROBRÁS) was negotiating with PDVSA for the storage and processing of 6 million barrels of Brazilian crude oil to provide special products destined for its West African markets. Also reportedly under negotiation was an agreement with Empresa Colombiana de Petróleos (Ecopetrol) for the processing of Colombia's Caño Limón crude oil at the Curaçao refinery. Neither the PETROBRÁS nor the Ecopetrol negotiations were reported as successfully concluded by the end of the year. PDVSA planned to spend as much as

$150 million[5] on maintenance and modernization at the Refinería Isla facility, which was leased for 5 years from the Government of the Netherlands Antilles at the rate of $11 million per year.

Aruba separated from the Netherlands Antilles on January 1, 1986, and is scheduled to attain full independence from the Netherlands in 1996. The 420,000-barrel-per-day crude oil refinery owned by Exxon Corp.'s Lago Oil and Transport Co. remained closed. Despite reported Government negotiations with other operators interested in reopening the refinery, no agreement was concluded in 1986.

Aruba's GDP dropped from an estimated $546 million in 1985, to $378 million in 1986. Because of Exxon's refinery closure, an estimated $158 million in annual foreign exchange earnings was lost. Also, about 1,300 jobs were eliminated at the refinery itself, and the impact was much greater if indirect employment is taken into account. The Government appeared to have adjusted to this loss of income by increasing some taxes, cutting expenditures, and receiving a special $50 million grant from the Netherlands. In 1987, the Aruban Parliament was expected to enact legislation regulating the exploitation of suspected offshore petroleum deposits. This legislation could stimulate exploration activity and bring Aruba associated economic benefits.

Table 8.—Netherlands Antilles: Exports and reexports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	Destinations, 1984	
		United States	Other (principal)
Fertilizer materials: Manufactured, ammonia	12	10	Venezuela 2.
Iron and steel: Metal:			
Scrap	248	--	Netherlands 198; Dominican Republic 20; Taiwan 18.
Semimanufactures: Bars, rods, angles, shapes, sections	19	--	All to West Germany.
Lead: Metal including alloys, all forms	39	39	
Other metals:			
Ores and concentrates	58	58	
Ashes and residues	1,090	155	Netherlands 636; West Germany 296.
Base metals including alloys, all forms	81	--	All to Netherlands.
Petroleum:			
Crude thousand 42-gallon barrels	3,348	960	Netherlands 2,073; Dominican Republic 315.
Refinery products:			
Liquefied petroleum gas do	650	209	Panama 220; Dominican Republic 81.
Gasoline do	17,910	7,064	Colombia 3,043; Bahamas 1,241.
Kerosene and jet fuel do	10,232	4,384	United Kingdom 2,504; Bahamas 496.
Distillate fuel oil do	13,204	2,029	Chile 1,395; Canada 1,276.
Lubricants do	3,111	434	Chile 707; Ecuador 308.
Residual fuel oil do	77,216	51,482	Jamaica 5,002; Netherlands 3,030.
Bitumen and other residues do	2,642	1,782	Netherlands 612; Guadeloupe 91.
Bituminous mixtures do	18	--	All to Honduras.
Phosphates, crude	20,219	2,754	Guyana 17,465.
Pyrite, unroasted	69,476	899	Colombia 25,562; Brazil 16,049; Netherlands 9,852.
Salt and brine	357,019	232,525	Suriname 58,741; New Zealand 37,800.
Stone, sand and gravel: Dimension stone, crude and partly worked	17,684	5,603	Trinidad and Tobago 6,764; Guyana 4,897.

[1]Data for 1983 were not available at the time of publication. Table prepared by H. D. Willis.

Table 9.—Netherlands Antilles: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	Sources, 1984	
		United States	Other (principal)
METALS			
Aluminum: Metal including alloys, all forms	978	243	Venezuela 165; Netherlands 156.
Copper: Metal including alloys, all forms	241	29	Netherlands 143; Italy 21.
Iron and steel: Metal: Semimanufactures:			
Bars, rods, angles, shapes, sections	3,612	222	Netherlands 2,528; Belgium-Luxembourg 323; Venezuela 281.
Universals, plates, sheets	3,104	543	Netherlands 1,316; Japan 752.
Hoop and strip	6	1	Netherlands 2; unspecified 3.
Wire	114	6	Netherlands 47; unspecified 61.
Tubes, pipes, fittings	4,085	1,132	Netherlands 2,340; Japan 163.
Castings and forgings, rough	1,032	(2)	Mainly from Netherlands.
Lead: Metal including alloys, all forms	49	20	Netherlands 21; West Germany 4.
Silver: Metal including alloys, unwrought and partly wrought—value	$41,111	$36,667	Netherlands $3,889; United Kingdom $555.
Tin: Metal including alloys, all forms	2	--	United Kingdom 1; Venezuela 1.
Zinc: Metal including alloys, all forms	356	1	Netherlands 172; Venezuela 109; Belgium-Luxembourg 52.
Other: Base metals including alloys, all forms	6	2	United Kingdom 2; Netherlands 1.
INDUSTRIAL MINERALS			
Abrasives, n.e.s.: Grinding and polishing wheels and stones	13	1	Netherlands 7; Venezuela 4.
Cement	71,718	488	Venezuela 49,026; Colombia 18,505; Netherlands 1,079.
Clays, crude	132	119	Netherlands 12; Venezuela 1.
Diamond: Gem, not set or strung—carats	620	250	Israel 370.
Fertilizer materials:			
Crude, n.e.s	234	13	Venezuela 213; Netherlands 8.
Manufactured:			
Ammonia	224	87	Netherlands 117; Venezuela 20.
Nitrogenous	39	39	
Phosphatic	1	--	All from Netherlands.
Unspecified and mixed	106	54	Venezuela 24; Netherlands 23.
Gypsum and plaster	28	5	Venezuela 20; Netherlands 3.
Lime	8	--	Venezuela 5; Netherlands 3.
Precious and semiprecious stones other than diamond: Natural and synthetic—grams	368	106	Netherlands 132; Israel 74.
Salt and brine	643	567	Netherlands 46; Venezuela 20.
Sodium compounds, n.e.s.: Carbonate, manufactured	28	8	Netherlands 20.
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	75	3	Venezuela 54; Netherlands 18.
Worked	118	36	Taiwan 37; Venezuela 23.
Gravel and crushed rock	1,268	25	Netherlands 919; Venezuela 324.
Sand other than metal-bearing	10,297	10	Suriname 9,333; Netherlands 916; Guyana 25.
Sulfur: Sulfuric acid	8,428	5,378	Spain 3,050.
Other: Crude	6,163	110	Netherlands 6,016; Venezuela 35.
MINERAL FUELS AND RELATED MATERIALS			
Petroleum:			
Crude—thousand 42-gallon barrels	135,579	527	Venezuela 109,460; Mexico 17,582; Libya 2,444.
Refinery products:			
Liquefied petroleum gas—42-gallon barrels	23,200	--	All from Venezuela.
Gasoline—do	42,534	25,500	Venezuela 17,000; West Germany 34.
Mineral jelly and wax—do	6,847	858	Spain 4,557; Japan 1,330.
Kerosene and jet fuel—do	336	320	Venezuela 16.
Distillate fuel oil—do	1,201,537	790,909	Venezuela 201,748; Bahamas 89,520.
Lubricants—do	26,145	9,611	Venezuela 679; unspecified 15,855.
Nonlubricating oils—do	224	175	Venezuela 42; Belgium-Luxembourg 7.
Residual fuel oil—do	1,951,380	392,940	San Salvador 539,460; Ecuador 299,700.
Bitumen and other residues—do	18,180	--	All from Venezuela.
Bituminous mixtures—do	9,641	2,721	Venezuela 6,102; Netherlands 612.
Unspecified—do	1,253	84	Venezuela 1,022; Norway 126.

[1]Data for 1983 were not available at the time of publication. Table prepared by H. D. Willis.
[2]Less than 1/2 unit.

TRINIDAD AND TOBAGO

Economic recovery plans suffered a severe blow in 1986 as petroleum prices unexpectedly dropped sharply at the beginning of the year. Although crude oil production declined by an estimated 4% from that of 1985, revenue earnings from the oil sector fell from an already depressed level of $1 billion[e] in 1985 to $444 million in 1986.

The economy continued to sharply decline, and in 1986 fell by an estimated 6% below that of 1985 in real terms. International reserves stood at about $933 million at the end of 1985 but were estimated at only $171 million in mid-December 1986. In December, a new Government was elected and one of its stated objectives involved the possible divestiture of Government interests in some industrial enterprises, among which were mentioned fertilizer and iron and steel. The Government anticipated instituting policies to encourage increased private, domestic, and foreign investment. At the same time, it was expected that the Government would impose strict budgetary, tax, and other financial measures to correct the lagging economy. A slight recovery in oil prices during the last quarter of 1986 somewhat improved the economic prospects for 1987.

Instability in world methanol prices caused Imperial Chemical Industries Ltd. to withdraw its proposal to join the Government in the construction of a 500,000-ton-per-year plant. It was later reported that Union Carbide Corp. was considering joining Trinidad and Tobago Oil Co. (Trintoc) in a similar joint venture. The $110 million methanol facility under discussion with Union Carbide would be constructed at Point Fortin, and Trintoc would provide the infrastructure for its share of equity. Trinidad and Tobago Nitrogen Co. obtained financing for the expansion project planned at the Point Lisas ammonia facility owned jointly by the Government and W. R. Grace & Co. The expansion cost was estimated at $230 million. The International Finance Corp. (IFC) assisted in arranging $150 million in financing from a group of international banks that included the Morgan Guaranty and Trust Co. IFC was to provide an additional $40 million, and the Overseas Private Investment Corp. agreed to guarantee another $40 million loan by international investors.

New discoveries of crude oil have not been able to keep pace with extraction, and yearend reserves were estimated at 610 million barrels, or about 9 years of production if no significant new fields are found. However, the Government expected that total reserves would stabilize at the present level.

The sharp decline in oil prices that began in early 1986 tended to discourage crude oil exploration investment. Offshore production costs were estimated to be about two-thirds that of onshore costs because of the more costly waterflooding, gas lift, and enhanced oil recovery techniques employed onshore.

New natural gas reserves have been more easily found, and 1986 yearend probable reserves were estimated at about 22 trillion cubic feet. In addition to promoting new industrial uses of natural gas, the Government initiated a pilot project into its use as a fuel for motor vehicles. Natural gas can be used at just over one-half the cost of gasoline and reportedly has the added benefits of lower vehicle maintenance costs, less carbon formation in engines, and reduced emission of pollutants. The pilot project will extend for 5 years and involve 250 Government-owned vehicles. Other countries engaged in natural gas-powered vehicle projects include Canada, New Zealand, the U.S.S.R., and the United States. Italy has used this fueling method since the 1920's. Trinidad expected the 5-year project to allow a $27 million increase in foreign exchange earnings because of the availability of more petroleum products for exports.

Development drilling and workovers gradually enabled Amoco Trinidad Oil Co. Ltd. to end the year with an average crude oil production of 87,800 barrels per day, accounting for about 52% of total production.

A compressor station fire caused production to decline at Trinidad Marine Ltd.'s (Trinmar) North Soldado and Main Fields, and the Southwest Soldado Field did not perform as well as expected. Trinmar averaged about 37,100 barrels per day in 1986 compared with nearly 39,000 barrels per day in 1985.

A high level of development drilling in the Barrackpore and Palo Seco Fields and increased workovers in all areas allowed Trintoc an overall increase in production. In 1986, Trintoc averaged about 20,200 barrels per day, or almost 7% more than in 1985.

Trinidad and Tobago Petroleum Co. (Trintopec) produced about 23,000 barrels per day during 1986, only slightly less than in 1985. Premier Consolidated Oilfields Ltd. averaged about 800 barrels per day during 1986, compared with about 600 barrels per day in 1985.

Trintoc and Trintopec planned to spend $117 million over the next 3 years to develop the 750 billion cubic feet of proven natural gas reserves in the Pelican Field off the southeast coast. Probable reserves in this field were estimated at 2.5 trillion cubic feet. The reserves are part of state-owned Southeast Coast Consortium holdings, which also owns the Keskidee Gasfield. The Government expected to eventually invest a total of $281 million to develop both fields.

Throughput at the two refineries averaged about 82,500 barrels per day, which was slightly above the level for 1985. The Government was reportedly negotiating with Colombia and Venezuela for an agreement to process feedstock from those countries.

[1]Physical scientist, Division of International Minerals.

[2]Where necessary, values have been converted from Cuban pesos (CP$) to U.S. dollars at the rate of CP$0.88=US$1.00.

[3]Where necessary, values have been converted from Dominican Republic pesos (RD$) to U.S. dollars at the rate of RD$2.80=US$1.00.

[4]Where necessary, values have been converted from Jamaican dollars (J$) to U.S. dollars at the rate of J$5.50=US$1.00.

[5]Where necessary, values have been converted from Aruban florins (AFl$) to U.S. dollars at the rate of AFl$1.79=US$1.00.

[6]Where necessary, values have been converted from Trinidad and Tobago dollars (TT$) to U.S. dollars at the rate of TT$3.60=US$1.00.

Table 10.—Trinidad and Tobago: Exports and reexports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Oxide kilograms	20	400	400	
Metal including alloys:				
Scrap	--	72	72	
Semimanufactures	38	180	1	Guyana 128; bunkers 51.
Chromium: Oxides and hydroxides kilograms	--	400	--	All to Barbados.
Copper: Metal including alloys:				
Scrap	491	875	104	United Kingdom 428; West Germany 305.
Unwrought	19	8	--	All to United Kingdom.
Semimanufactures	1	1	--	All to Barbados.
Iron and steel: Metal:				
Scrap	20	120	44	St. Lucia 40; United Kingdom 36.
Pig iron, cast iron, related materials	64,482	61,326	--	Brazil 22,664; Venezuela 21,322; Panama 11,597.
Ferroalloys	--	28	13	Grenada 15.
Steel, primary forms	1,231	1,271	--	Jamaica 1,251; Colombia 20.
Semimanufactures:				
Bars, rods, angles, shapes, sections	137,424	104,781	57,202	Jamaica 12,107; Switzerland 10,094.
Universals, plates, sheets	12,433	63	--	St. Vincent 26; Guyana 21; Grenada 4.
Hoop and strip	1	--		
Wire	73	58	--	St. Vincent 57; United Kingdom 1.
Tubes, pipes, fittings	376	464	127	United Kingdom 281; Guyana 18.
Lead: Metal including alloys:				
Unwrought	803	153	--	Barbados 55; Brazil 54; Honduras 44.
Semimanufactures	125	(2)	--	All to Guyana.
Silver: Waste and sweepings kilograms	6,307	73	--	All to Canada.
Tin: Metal including alloys, all forms	75	--		
Titanium: Oxides	5	--		
Zinc:				
Oxides	2	--		
Metal including alloys, semimanufactures	(2)	--		
Other:				
Oxides and hydroxides kilograms	130	645	--	Suriname 635; Guyana 10.
Base metals including alloys, all forms do	--	110	--	Mainly to Grenada.

See footnotes at end of table.

Table 10.—Trinidad and Tobago: Exports and reexports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones ____ kilograms	2,131	606	--	Guyana 590; St. Vincent 8; Grenada 7.
Cement	43	6	--	Guyana 2; bunkers 4.
Chalk	--	4	--	All to Barbados.
Clays, crude	--	18	(2)	Mainly to Barbados.
Fertilizer materials: Manufactured:				
Ammonia	1,173,923	1,157,485	616,798	France 116,630; Belgium-Luxembourg 77,483.
Nitrogenous	61,904	361,627	56,695	India 96,790; China 41,144.
Phosphatic	--	5	--	All to Guyana.
Unspecified and mixed	398	--	--	
Lime ____ value	$400	$440	--	St. Lucia $196; Dominica $127; Grenada $117.
Mica:				
Crude including splittings and waste	--	3	--	All to Barbados.
Worked including agglomerated splittings ____ kilograms	--	10	--	All to Grenada.
Salt and brine	253	193	(2)	Barbados 165; Grenada 15; St. Lucia 13.
Sodium compounds, n.e.s.:				
Carbonate, manufactured kilograms	1,950	545	--	St. Christopher and Nevis 500; Venezuela 20; bunkers 25.
Sulfate, manufactured ____ do	r194	140	--	All to Venezuela.
Stone, sand and gravel:				
Dimension stone: Worked	26	--		
Gravel and crushed rock	3	2	(2)	Mainly to Grenada.
Sand other than metal-bearing	17	20	--	Grenada 14; Anguilla 4; bunkers 2.
Sulfur:				
Dioxide ____ kilograms	392	--		
Sulfuric acid	3	--		
Talc, steatite, soapstone, pyrophyllite	--	4	--	Mainly to Barbados.
Other, crude	40	--		
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	23,215	31,786	1,419	West Germany 13,483; United Kingdom 6,693; Guadeloupe 4,204.
Carbon black ____ kilograms	113	--		
Petroleum:				
Crude thousand 42-gallon barrels	32,180	35,300	35,300	
Refinery products:				
Liquefied petroleum gas ____ do	174	262	(2)	Guyana 63; French Guiana 61; Barbados 44.
Gasoline ____ do	3,465	3,084	353	Guyana 432; Suriname 416.
Mineral jelly and wax ____ do	(2)	(2)	--	Mainly to Barbados.
Kerosene and jet fuel ____ do	2,885	2,493	122	Barbados 926; Antigua and Barbuda 399; Guadeloupe 224.
Distillate fuel oil ____ do	5,126	4,090	740	Guyana 683; Suriname 509.
Lubricants ____ do	r53	18	13	Suriname 1; bunkers 2.
Residual fuel oil ____ do	14,511	15,056	4,596	Italy 3,326; United Kingdom 1,893.
Bitumen and other residues ____ do	--	(2)	--	Mainly to Guyana.
Bituminous mixtures ____ do	3	20	--	Belize 10; Guyana 4; Grenada 2.
Unspecified ____ do	65	(2)	--	Mainly to Suriname.

rRevised.
[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.

Table 11.—Trinidad and Tobago: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	180	315	315	
Oxides and hydroxides	43	43	43	
Metal including alloys:				
Unwrought	--	14	(2)	Mainly from Hong Kong.
Semimanufactures	19,781	11,160	9,281	Sweden 956; United Kingdom 441.
Chromium: Ore and concentrate	--	4	--	All from Netherlands.
Copper:				
Sulfate	11	15	(2)	Mainly from United Kingdom.
Metal including alloys:				
Scrap	7	1	--	All from Grenada.
Semimanufactures	1,499	1,058	196	United Kingdom 601; Canada 195.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	199,755	318,284	--	All from Brazil.
Metal:				
Scrap	2,316	5,261	2,421	Guyana 2,001; Netherlands Antilles 839.
Pig iron, cast iron, related materials	431	66	1	Japan 60; West Germany 3; United Kingdom 2.
Ferroalloys:				
Ferromanganese	820	399	--	All from Norway.
Ferrosilicon	202	454	318	Norway 136.
Unspecified	1,891	1,602	883	United Kingdom 713; West Germany 6.
Steel, primary forms	30,362	2,664	3	Japan 953; Guyana 870; Belgium-Luxembourg 775.
Semimanufactures:				
Bars, rods, angles, shapes, sections	13,003	13,639	1,108	Belgium-Luxembourg 7,565; United Kingdom 2,231; West Germany 2,004.
Universals, plates, sheets	34,202	26,962	602	United Kingdom 5,798; Belgium-Luxembourg 4,988; Japan 4,403.
Hoop and strip	288	815	41	West Germany 500; Japan 149; United Kingdom 124.
Rails and accessories	2	71	50	United Kingdom 17; France 4.
Wire	11,510	3,226	160	Belgium-Luxembourg 1,096; Venezuela 945; United Kingdom 492.
Tubes, pipes, fittings	42,170	36,340	16,442	Japan 3,969; Argentina 3,401.
Castings and forgings, rough	52	(2)	--	Mainly from United Kingdom.
Lead:				
Oxides	5	5	1	India 2; United Kingdom 1.
Metal including alloys:				
Scrap	1,489	719	582	Barbados 118; Dominican Republic 19.
Unwrought	14	22	22	
Semimanufactures	162	7	1	United Kingdom 6.
Magnesium: Metal including alloys, all forms	1	3	2	United Kingdom 1.
Manganese: Ore and concentrate	--	1	1	
Molybdenum: Metal including alloys, semimanufactures, kilograms	--	2	--	All from West Germany.
Nickel:				
Matte and speiss, value	--	$970	$970	
Metal including alloys, semimanufactures	26	6	(2)	Spain 3; United Kingdom 2; Canada 1.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, troy ounces	1,093	1,190	965	Canada 193; United Kingdom 32.
Silver:				
Waste and sweepings, kilograms	1	132	--	All from India.
Metal including alloys, unwrought and partly wrought, troy ounces	79,251	12,571	3,890	Canada 8,681.
Tin: Metal including alloys:				
Scrap	3	--		
Unwrought	5	1	--	All from United Kingdom.
Semimanufactures	2,633	15	(2)	Canada 12; United Kingdom 3.
Titanium: Oxides	1,233	1,315	310	United Kingdom 786; Finland 180.
Tungsten: Metal including alloys:				
Unwrought, kilograms	200	--		
Semimanufactures, do	72	10	--	Brazil 8; West Germany 2.

See footnotes at end of table.

Table 11.—Trinidad and Tobago: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Zinc:				
Oxides	148	212	82	United Kingdom 104; Belgium-Luxembourg 20.
Blue powder	31	69	58	United Kingdom 6; Canada 5.
Metal including alloys:				
Scrap	--	43	--	All from Canada.
Unwrought	152	605	--	Canada 563; Hong Kong 40; United Kingdom 2.
Semimanufactures	71	73	(2)	Belgium-Luxembourg 63; Canada 9; West Germany 1.
Other:				
Ores and concentrates	24	13	13	
Oxides and hydroxides	10	15	11	United Kingdom 2; Canada 1.
Base metals including alloys, all forms	20	9	9	
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	40	562	555	United Kingdom 7.
Artificial: Silicon carbide	38	4	(2)	United Kingdom 3; Norway 1.
Dust and powder of precious and semiprecious stones, value	$22,456	$122	--	All from St. Vincent.
Grinding and polishing wheels and stones	1,548	1,104	1,051	Venezuela 23; China 6.
Asbestos, crude, value	$16,948	$153	--	All from Canada.
Barite and witherite	12,147	19,809	--	Morocco 19,727; West Germany 82.
Boron materials: Crude natural borates	1	4	1	United Kingdom 2; Venezuela 1.
Cement	115,343	64,549	508	Barbados 58,875; West Germany 3,438; Venezuela 554.
Chalk	690	698	189	France 263; United Kingdom 246.
Clays, crude	2,504	2,402	2,287	United Kingdom 114; Netherlands 1.
Diamond:				
Gem, not set or strung, carats	7,874	10,342	215	United Kingdom 8,968; India 645; Belgium-Luxembourg 388.
Industrial stones, do	25,000	5,000	5,000	
Diatomite and other infusorial earth	56	9,082	27	Netherlands 9,047; United Kingdom 8.
Feldspar, fluorspar, related materials	59	106	2	Netherlands 70; United Kingdom 25; Canada 9.
Fertilizer materials:				
Crude, n.e.s	17	5	5	
Manufactured:				
Ammonia	28	5	4	Netherlands 1.
Nitrogenous	2,678	2,990	54	Dominican Republic 2,000; Belgium-Luxembourg 600; West Germany 236.
Phosphatic	1,380	6,338	135	Dominican Republic 6,050; Netherlands Antilles 152.
Potassic	8,230	669	27	Martinique 300; West Germany 194; Dominican Republic 60.
Unspecified and mixed	8,621	5,310	1,080	West Germany 2,360; Dominican Republic 1,308.
Graphite, natural, value	$1,013	$1,780	$1,140	United Kingdom $554; Netherlands $86.
Gypsum and plaster	2,048	3,410	93	Venezuela 1,975; Jamaica 1,242.
Lime	2,518	4,200	--	United Kingdom 3,911; Barbados 154; France 135.
Magnesite, crude, value	$18,593	$937	--	All from United Kingdom.
Mica:				
Crude including splittings and waste	176	117	--	Norway 115; United Kingdom 2.
Worked including agglomerated splittings, kilograms	386	11	6	United Kingdom 5.
Phosphates, crude	205	236	151	France 45; United Kingdom 40.
Pigments, mineral: Iron oxides and hydroxides, processed	89	119	1	Canada 38; United Kingdom 28; West Germany 26.
Potassium salts, crude	197	--		
Precious and semiprecious stones other than diamond:				
Natural, value, thousands	$2,429	$882	$46	Canada $629; Colombia $121; Belgium-Luxembourg $67.
Synthetic, do	$20	$16	$1	France $7; Canada $5; Austria $2.
Salt and brine	55,632	15,351	84	Netherlands Antilles 9,830; United Kingdom 1,572; Jamaica 1,430.

See footnotes at end of table.

Table 11.—Trinidad and Tobago: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Sodium compounds, n.e.s.:				
Carbonate, manufactured	4,438	5,232	1	West Germany 2,912; Belgium-Luxembourg 1,662; United Kingdom 656.
Sulfate, manufactured	r1,859	2,604	28	Belgium-Luxembourg 2,471; Netherlands 79.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	79	179	--	China 155; Brazil 14; United Kingdom 10.
Worked	676	205	7	United Kingdom 80; Italy 73; West Germany 20.
Dolomite, chiefly refractory-grade	47	34	34	
Gravel and crushed rock	1,409	11,353	9,975	China 704; Netherlands 342.
Limestone other than dimension	r66,294	14,779	1,628	Barbados 6,480; Netherlands Antilles 5,809.
Quartz and quartzite	9	2	--	All from Netherlands.
Sand other than metal-bearing	898	7,256	7,248	United Kingdom 7; Canada 1.
Sulfur:				
Elemental:				
Crude including native and byproduct	56	37	--	All from United Kingdom.
Colloidal, precipitated, sublimed	3	2	(2)	Mainly from Netherlands.
Dioxide kilograms	392	183	170	United Kingdom 13.
Sulfuric acid	5,956	5,126	90	Spain 4,741; West Germany 149; Netherlands 101.
Talc, steatite, soapstone, pyrophyllite	1,172	621	424	Norway 138; Canada 51.
Other:				
Crude	29	72	72	
Slag and dross, not metal-bearing	--	55	55	
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	12	5	--	All from United Kingdom.
Carbon black	766	1,077	2	Venezuela 1,073; United Kingdom 1.
Coal: All grades including briquets	258	1,441	1,192	Canada 228; United Kingdom 21.
Coke and semicoke	20	49	19	West Germany 30.
Peat including briquets and litter	417	11,672	36	Canada 11,342; Ireland 212; United Kingdom 47.
Petroleum:				
Crude thousand 42-gallon barrels	(2)	1,286	365	Ecuador 680; Algeria 241.
Refinery products:				
Liquefied petroleum gas 42-gallon barrels	r110,980	709	235	West Germany 230; United Kingdom 198.
Gasoline do	629	13	13	
Mineral jelly and wax do	2,920	3,533	355	United Kingdom 2,775.
Kerosene and jet fuel do	--	13	--	All from United Kingdom.
Distillate fuel oil do	r107	160,755	220	Venezuela 160,535.
Lubricants including nonlubricating oils do	r56,466	63,038	10,911	Netherlands Antilles 39,654; United Kingdom 6,670.
Residual fuel oil do	8,850	57,873	5,592	Netherlands Antilles 52,268; United Kingdom 13.
Bitumen and other residues do	r13,047	109	12	United Kingdom 91; West Germany 6.
Bituminous mixtures do	2,109	8,242	127	United Kingdom 7,811; Canada 109.
Petroleum coke do	--	671	671	

rRevised.
[1]Table prepared by H. D. Willis.
[2]Less than 1/2 unit.

The Mineral Industry of Central American Countries

By Doris M. Hyde[1]

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BELIZE

The economy of Belize continued to show a very slight but still positive growth during 1986. The gross domestic product (GDP) was estimated to have been about $164 million,[2] almost the same as those of 1984 and 1985. Foreign investors looked favorably on Belize because it had remained isolated from the sometimes turbulent political and social strife elsewhere in Central America. Reportedly, in late 1986, Guatemala had decided not to pursue its claim to Belizean territory and to give full recognition to that country. Discussions were to be held regarding any matters of mutual concern.

New investment possibilities were oriented toward agriculture or manufacturing endeavors. Except for some interest in petroleum exploration, the minerals sector remained limited to the quarrying of construction-related materials.

For many years, Belize had encouraged foreign oil companies to invest in exploration activity. Although test drilling had found shows of petroleum, no commercial deposits were located. In late 1986, Exeter Oil and Gas Corp. acquired concession rights to Blocks 6 and 8, and an option on additional acreage.

Table 1.—Central American Countries: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Country and commodity	1982	1983	1984	1985[p]	1986[e]
BELIZE					
Stone, sand and gravel:					
Limestone	356,130	608,860	[e]600,000	[e]600,000	600,000
Marl	503,930	--	--	--	--
Sand and gravel	521,030	554,370	[e]500,000	[e]500,000	500,000
COSTA RICA					
Cement	423,700	385,300	[2]468,600	460,000	450,000
Clays: Kaolin	522	[e]500	[e]500	([3])	--
Diatomite	470	[e]450	[e]450	([3])	--
Gold[e] troy ounces	27,000	30,000	35,000	[2 4]15,997	[2 4]11,600
Lime[e]	9,000	10,000	10,000	10,000	10,000
Petroleum refinery products thousand 42-gallon barrels	[e]3,700	2,298	2,200	3,045	3,000
Pumice[e]	1,500	1,500	1,500	1,500	1,500
Salt, marine[e]	110,200	110,000	110,000	[2]29,484	30,000
Silver[e] troy ounces	2,000	2,000	2,000	2,000	2,000
Stone, sand and gravel:					
Crushed rock and rough stone[e] cubic meters	534,600	525,000	500,000	500,000	500,000
Limestone and other calcareous materials[e]	109,100	110,000	100,000	100,000	100,000
Sand and gravel[e] cubic meters	276,700	280,000	250,000	250,000	250,000
EL SALVADOR					
Aluminum metal including alloys, semimanufactures	1,143	1,344	1,154	1,266	[2]1,295
Cement	417,796	431,552	407,482	466,625	[2]442,625
Gold troy ounces	3,300	650	285	--	--
Gypsum[e]	5,000	4,500	4,500	4,000	4,000
Iron and steel: Metal:					
Steel, crude	7,265	15,281	11,197	11,845	11,000
Semimanufactures	16,166	15,799	27,985	23,472	[2]35,460
Limestone	800,000	850,000	870,000	890,000	900,000
Petroleum refinery products thousand 42-gallon barrels	4,002	[e]4,000	4,450	4,831	4,800
Salt, marine[e]	1,800	2,000	2,500	2,700	[2]2,950
Silver, fine troy ounces	85,713	21,988	21,750	--	--
GUATEMALA					
Antimony, mine output, Sb content	--	--	90	1,057	1,100
Barite	2,000	[e]300	[e]300	1,300	1,000
Cement	506,369	451,913	785,327	988,291	1,000,000
Clays:					
Bentonite	2,500	[e]8,000	8,500	3,000	3,000
Other	160,000	137,672	[e]144,000	175,364	175,000
Copper, Cu content of concentrates	[e]700	--	--	--	--
Feldspar	[e]12,000	[e]6,000	5,000	5,582	6,000
Gas, natural, gross million cubic feet	1,097	1,118	1,200	1,000	1,100
Gypsum, crude:					
For cement manufacture	[e]17,000	16,588	14,635	16,868	20,000
Other	[e]11,000	[e]22,000	11,017	--	--
Iron and steel:					
Iron ore, gross weight	4,000	860	365	705	700
Steel, crude	25,000	28,000	26,600	10,277	10,300
Semimanufactures	27,600	34,892	34,500	19,200	19,000
Lead, metal including secondary	40	60	64	70	70
Lime	[e]24,500	27,091	50,534	61,761	62,000
Petroleum:					
Crude thousand 42-gallon barrels	2,292	2,549	1,759	1,068	1,570
Refinery products do.	4,508	4,306	4,760	4,926	5,000
Pumice and related materials:					
Pumice[e]	12,000	15,000	13,200	[r]12,000	12,000
Volcanic ash	[e]4,000	[e]100	200	--	--
Salt[e]	14,000	15,100	16,000	17,300	18,000
Silver, mine output, Ag content[e] troy ounces	3,000	--	--	--	--
Stone, sand and gravel:					
Limestone thousand tons	950	[e]1,215	1,200	990	1,000
Marble cubic meters	1,200	[e]1,000	1,200	380	400
Silica sand	35,000	[e]18,400	18,000	22,355	22,400
Sand and gravel cubic meters	476,000	[e]525,000	370,000	315,737	320,000
Tungsten, mine output, W content of concentrate	40	--	--	6	20

See footnotes at end of table.

Table 1.—Central American Countries: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country and commodity	1982	1983	1984	1985[p]	1986[e]
HONDURAS					
Antimony, mine output, Sb content	--	--	111	87	100
Cadmium, mine output, Cd content	270	386	415	598	350
Cement	277,440	485,435	534,183	347,500	500,000
Copper, Cu content of lead and zinc concentrates	450	[e]650	770	5,051	5,000
Gold, troy ounces	1,711	2,151	2,784	5,023	5,000
Gypsum[e]	20,000	22,000	22,000	22,000	22,000
Iron and steel: Metal, semimanufactures[e]	20,000	20,000	22,000	[2]11,850	12,000
Lead, mine output, Pb content	15,120	19,291	20,544	21,250	19,000
Petroleum refinery products, thousand 42-gallon barrels	685	3,938	3,303	2,386	[2]1,472
Salt[e]	30,000	30,000	30,000	30,000	30,000
Silver, thousand troy ounces	2,100	2,587	2,697	2,765	2,700
Stone:[e]					
Limestone	500,000	500,000	500,000	500,000	500,000
Marble	40,000	40,000	40,000	40,000	40,000
Zinc, mine output, Zn content	24,554	37,980	41,483	44,026	40,000
NICARAGUA					
Cement[e]	100,000	100,000	100,000	100,000	100,000
Gold, mine output, Au content, troy ounces	54,384	46,428	[e]35,000	[2]24,491	24,000
Gypsum and anhydrite, crude	20,290	11,350	[e]10,000	8,310	8,000
Lime	5,000	4,700	[e]3,000	3,702	3,500
Petroleum refinery products, thousand 42-gallon barrels	4,244	3,914	3,277	3,715	3,700
Salt, marine[e]	18,000	18,000	15,000	15,000	15,000
Sand and gravel, cubic meters	502,812	481,743	[e]490,000	[e]450,000	450,000
Silver, mine output, Ag content, troy ounces	75,552	63,417	[e]50,000	29,665	25,000
PANAMA					
Cement	349,991	326,170	303,950	305,200	[2]336,000
Clays and clay products:					
Crude	84,261	58,284	71,104	98,382	[2]111,335
Products, cubic meters	60,606	18,255	32,649	37,343	[2]29,598
Manganese ore	--	--	--	--	[2]6,000
Petroleum refinery products, thousand 42-gallon barrels	11,845	11,755	10,622	8,864	9,000
Salt, marine[5]	24,300	85,491	18,585	16,024	[2]9,816
Stone, sand and gravel:					
Limestone[6]	439,952	448,145	212,205	293,726	[2]462,414
Sand and gravel, thousand cubic meters	894	802	712	674	[2]669
Sand, silica	27,289	26,779	[e]20,000	13,882	[2]16,290

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

[1]Includes data available through July 15, 1987.

[2]Reported figure.

[3]Revised to zero.

[4]Gold from placer deposits and mines purchased by Banco Central. Actual production estimated to be at least twice that amount.

[5]Represents sales. Figures for 1982 and 1983 reflect crude salt production.

[6]Excludes approximately 8,000 cubic meters per year, apparently dimension stone.

COSTA RICA

Although Costa Rica's priority target for mineral development remained gold, other minerals were not neglected. Costa Rica had attempted to interest mining companies in known bauxite, copper, and coal deposits, but the low world market prices that had prevailed since the early 1980's had not helped to attract exploration and development capital.

Like Belize and Panama, Costa Rica had managed to remain relatively unaffected by the destabilizing violence or civil strife found elsewhere in Central America. In 1986, the GDP reached an estimated $3.7 billion,[3] and the economy grew by about 3% in real terms. The economy remained fragile as the Government attempted to accommodate necessary budgetary restraints and still increase revenue earnings and reduce trade imbalances. A restructuring of public debt obligations and the creation of mechanisms to facilitate the entry of export-oriented investments were part of the Government's program that received support from international lending banks, multilateral agencies, and the domestic private sector. Lower interest rates and more moderate petroleum costs were expected to help keep the economy in a modest but positive growth cycle.

In 1986, state-owned Minera Nacional S.A. was created to promote investment in the minerals sector by preparing exploration claims for public tender. The bidding was to be open to both foreign and domestic investors. The Dirección General de Geología, Minas e Hidrocarburos in the Ministerio de Industria, Energía y Minas provides information to interested investors on past, present, and pending mining licenses in particular areas, as well as on any ongoing mining activity or mine feasibility prospects. This information greatly reduces the prospect for investment loss because of faulty assumptions concerning legal rights.

In 1986, the Ministerio de Industria, Energía y Minas began a small open pit mine to test the recovery of subbituminous coal near Puerto Limón in the southeast. In 1987, the Ministry expected to invite bids for commercial recovery. The U.S. Geological Survey provided exploratory assistance for Costa Rica's coal deposit investigations.

The Government of Sweden, through its Government prospecting company Sveriges Geologiska AB (SGAB), was assisting in a project to recover very fine-sized alluvial gold. SGAB designed and installed a special concentrator to evaluate the recovery prospects for this deposit. Alluvial gold is mostly recovered in the Osa region of southeastern Costa Rica.

A trench-sampling program and newly discovered stock mineralization at the Bellavista-Montezuma gold deposits increased proven and possible gold reserves for open pit and underground mining to 3 million tons. Proven open pit reserves were reported as 160,000 tons at 0.19 troy ounce per ton. Probable open pit reserves were estimated at 120,000 tons at 0.19 troy ounce per ton, and 450,000 tons at 0.13 troy ounce per ton. Possible open pit reserves were 275,000 tons averaging 0.13 troy ounce per ton. Proven underground reserves were reported as 173,600 tons averaging 0.23 troy ounce per ton, and probable underground reserves as 53,000 tons at 0.35 troy ounce per ton, with another 50,000 tons of possible reserves at 0.2 troy ounce per ton. The concession was owned by two Canadian companies: Midland Energy Corp., 60%, and Westlake Resources Inc., 40%. Another Canadian company, Rayrock Yellowknife Resources Inc., gained an option to obtain one-half of Midland's interest in the concession through the expenditure of $1.5 million on exploration and feasibility studies. Rayrock planned to initiate work to upgrade the probable and possible open pit reserves to the proven category. A $600,000 exploration program was to start in January 1987.

The Santa Clara open pit gold mine deposits near Esparta in western Costa Rica, owned by Minera Macacona S.A., remained the primary producer of precious metals. Up to 500 tons of ore per day went into the heap-leaching facility. Proven reserves were estimated at about 5 million tons averaging 0.05 troy ounce of gold per ton. The Government estimated that as much as 70% of Costa Rica's total gold production is secreted across the border to Panama and sold illegally.

The development of the low-grade El General lateritic bauxite deposits southeast of San Isidro remained subject to construction of the long-discussed 760-megawatt Boruca hydroelectric project. Without the inexpensive electricity the power facility would provide, international aluminum companies had not been willing to invest

the necessary capital for mining and smelting. This had been especially true in view of low aluminum market prices and underutilization of present world production capacities. Copper deposits have likewise been explored by foreign companies, but no development has taken place.

Petro-Canada International Assistance Corp. signed a $2.1 million agreement with Refinadora Costarricense de Petróleo S.A. (Recope) to provide technical assistance, seismic equipment, and personnel training in seismic and computer technology. Recope expected to conduct seismic surveys in areas that have been identified as having promising sedimentary structures for hydrocarbon accumulation.

EL SALVADOR

The mining sector remained a casualty of the continued civil strife as the Government and political dissidents failed to find a compromise solution to their differences.

Gold production continued to be minimal. The Commerce Group Corp. and San Sebastián Gold Mines Inc. expected to receive concession rights to exploit the San Sebastián Mine near Santa Rosa de Lima in central La Unión Department in early 1987. Mineral activity centered on cement, limestone, and salt.

The Government continued its program of nationalizing electric power companies as concessions expired. The action was taken originally under the authority of Decree 236 of December 19, 1985. On November 13, 1986, another decree law permitted nationalization of Compañía de Alumbrado Eléctrico de San Salvador S.A. when its concession expired on the day following the decree law. The nationalization decrees have allowed for compensation, and negotiations on this were expected to begin in the near future.

Early in 1986, the Government began an economic stabilization program that affected interest rates, credit expansion, and wage increases, subjected a wider range of commodities to price controls and, most notably, devalued the official rate of exchange.[4] International financial assistance, much in the form of grants from the U.S. Economic Support Fund, continued to buoy the economy and were especially supportive of the balance of payments. The United Nations, the European Economic Community, and Canada have also provided export financing and concessionary loans. Nevertheless, in 1986, the economy was estimated to have declined by about 1%. The Government struggled not only with a destructive guerrilla war that disrupted the productive sectors, but also with the effects of such natural disasters as drought and a severe earthquake that added more burdens to the strained budget.

GUATEMALA

The Ministerio de Industria, Energía y Minas continued its efforts to encourage the reactivation of the mining sector, despite the detracting influences of continued civil violence, a lack of advanced technology, low world metal prices, and a reluctance on the part of private investors to commit substantial capital. As some of the mining community's conception of physical security became less threatened, the reactivations begun in 1985 continued to grow in 1986. Small antimony, lead, and tungsten mines were reportedly reopened, and Government scientists initiated exploratory drilling on precious metal-bearing deposits in Chiquimula Department.

The GDP was estimated at slightly more than $9 billion[5] in 1986, and the overall economy decreased by less than 1% in real terms. The various economic sectors contended with low industrial capacity utilization, a depressed construction sector, and a failure to increase agricultural output. The combination of reduced world oil prices and less oil consumption because of the commissioning of the Chixoy hydroelectric facility were major factors in reducing import costs. A three-tiered exchange rate was adopted in June 1986, with the ultimate future objective of unification into a single market-related rate. The official rate of parity with the U.S. dollar remained effective for previously contracted foreign debt. During 1986, there was a simplification of the

three-tiered exchange rate, and the year ended with a $23 million balance of payments surplus, the first in 3 years.

It was reported that the Government intended to abandon its claim to Belizean territory and grant full recognition of Belize's independence. Future discussions between the two countries were expected to include provisions for some access to the Caribbean Sea for Guatemala.

Minas de Guatemala S.A. continued to increase production from the Annabella and Los Lirios antimony-tungsten mines in Ixtahuacán in Huehuetenango Department. Mine tunnels and incline shafts required frequent repairs, limiting mill output to about 40% of its 140-ton-per-day capacity of 62% antimony concentrate. Lump ore grading 45% antimony continued to be shipped to Anzon America Inc. in the United States and also to a Belgian company. Additional antimony exports were expected in 1987 as a result of the activities of a mining cooperative working in Chiquimula Department.

Cía. Minas de Oriente S.A. continued to develop its Ballena, Montenegro, and Penasco lead-zinc-silver mines in Chiquimula Department. The company expected ore production of about 500 tons per day. Reserves were estimated at 2.2 million tons averaging 0.58% lead, 4.28% zinc, and 2.76 troy ounces of silver per ton.

The Government continued with exploratory drilling in the gold and silver deposits near El Paso and Poxte in Chiquimula Department.

The project for a trans-Guatemalan oil pipeline resurfaced in 1986 and appeared somewhat closer to approval as representatives of a West German-U.S. engineering consortium were expected to submit their proposal to the Government in 1987. The project envisioned a pipeline with a minimum flow of 300,000 barrels per day to be operational by 1990. In the past, similar proposals were rejected by the Government, partly because of environmental objections, but the consortium was confident that approval would be forthcoming and that construction would start in 1988.

In 1986, attacks and threats by guerrillas forced Esso Central America S.A. and Amoco Exploration Guatemala S.A. to suspend their petroleum exploration activities in their respective contract areas, 3-85 and 4-85. The Esso concession was in Pectén Department; Amoco's concession was in Quiché and Huehuetenango Departments.

Hispánica de Petróleos S.A. and Basic Resources International (Bahamas) Ltd. brought in two successful wells during 1986. One well in the Rubelsanto Field tested at 5,023 barrels per day of 27° API gravity crude oil. The other well, in the central Pectén area, tested at 2,000 barrels per day of 22° API gravity crude oil.

Petroleum exploration in Guatemala has proved expensive because of the complicated geologic conditions and the rugged terrain. Deep drilling to possible reef or stratigraphic traps has proven to be not only costly but very time consuming. A 10,000-foot well in Guatemala requires over 3 months of work, whereas a well of the same depth in Venezuela would take about 3 weeks to drill.

Petroleum companies would like the Government to extend Decree Law 61-85, which allowed direct negotiations between the Ministerio de Industria, Energía y Minas and investors, bypassing the lengthy process of competitive bidding. Physical security and a poor return on investment have been cited as reasons for low exploration levels.

HONDURAS

The El Mochito lead-silver-zinc mine continued to dominate the minerals sector. Limited quantities of antimony, copper, gold, silver, and industrial minerals were also produced from small, private mining operations.

The minerals sector accounted for about 5% of the estimated $875 million[e] foreign exchange earnings. Real economic growth was estimated at less than 3%. Growth was supported by increased public and private investments, a decline in world oil prices that reduced import costs by nearly $43 million, and increased export earnings for agricultural products. The Government proposed a denationalization of state-owned enterprises. Inflation, at 4%, remained low, partly because of austere monetary restrictions and a fixed exchange rate. Although not subjected to domestic civil strife, peripheral repercussions from neighboring countries have had a profound effect on reducing the level of new private foreign investment and increasing dependence on international loans and grants for development projects. Agriculture, forestry, and fishing were expected to remain the primary growth sectors in the near future.

The El Mochito Mine continued to be a deficit operation as Rosario Resources Corp., an AMAX Inc. subsidiary, contended with low metal market prices, high production costs, a declining quality of ore, and an aggressive workers' union. In midyear, the company endured a 31-day strike over wage increases, and 1986 production fell below expected levels. Rosario resumed operations of a cyanide circuit in the processing plant to recover silver from oxide ore. A copper flotation pilot plant with about a 250-ton-per-day capacity was under installation.

The United Nations Fund of Natural Resources Exploration (UNFNRE) and the Honduran Government proceeded with the 14-month mineral exploration program agreed to in 1985. The $1.39 million project was investigating base and precious metals mineralization in Quitagana, Santa Bárbara Department, and deposits in Chantón, La Paz Department, and Yuscarán, El Paraíso Department. If warranted, UNFNRE would invest an additional $1 million to further define individual deposits. Private companies were to have an opportunity to bid on data gathered during the investigation after presentation to the Government by UNFNRE.

Metalco S.A. sought technical and financial assistance for a possible joint venture partner for a graphite mining project. A high-grade calcium carbonate project was also under investigation by private investors during 1986.

Madeleine Mines Ltd. and Milner Consolidated Silver Mines Ltd., each owners of a 25.5% interest in Cía. Minerales de Copán S.A. de C.V., expected that exploration would prove the underground mining concession to contain over 20 million tons of ore grading 0.09 troy ounce of gold per ton. In 1986, the mine was upgraded from a 60-ton-per-day modified heap-leaching operation to 125 tons per day by partial mechanization and drifting on one level of the mine. The Canadian companies invested about $183,000 in the exploration and feasibility program before exercising their 3-year option for each company to acquire an additional 20% interest.

Petroleum is imported under Government contract. Crude oil is refined by Refinería Texaco de Honduras S.A. and sold to distributors at Government-controlled prices. For the most part, in 1986, official domestic petroleum prices remained constant, and the Government's general budget benefited from the cost savings resulting from lower market prices for the crude oil refinery feedstock.

The El Cajón hydroelectric plant completed its first full year of operation. Surplus electricity was sold to Nicaragua and Costa Rica, and the Government entered into a contract to sell electricity to Panama.

The Los Alamos National Laboratory was to have drilled a geothermal test well in December at Plantanares, Copán Department. Results of this initial test were to be used to determine the continuation of the geothermal project. Although the envisioned 25-megawatt powerplant would not have a significant impact on total Honduran electric capacity, it would provide power to potential users lacking access to the national power grid.

Several U.S. firms held petroleum exploration concessions, but there was little, if any, exploration activity, probably because of the fall in crude oil market prices. Hond-Tex Corp. held a 98,270-hectare, 4-year exploration concession in the Lamitique and Olancho Valleys southwest of Tela in northwestern Honduras. Cambridge Resources Corp. and Bonavista Oil and Mining Co. obtained adjoining concessions in the northern La Mosquita area of Gracias a Dios Department.

NICARAGUA

The Nicaraguan economy was estimated to have declined by 3.5% in 1986, continuing the downtrend of recent years. The Government had to contend with an acute shortage of foreign exchange and the U.S. trade embargo, and both of these factors contributed to product shortages. This, in turn, caused industrial slowdowns and reduced the variety and quantity of goods available to domestic consumers and export markets. Industrial slowdowns aggravated the unemployment level to exceed the 22% estimated for 1985. An inflation rate of 760% far outpaced the 1986 increase in the minimum wage that was set at the equivalent of $152[7] per month at the official exchange rate, but only $3.60 at the Exchange Bureau or parallel rate. The highest monthly salary allowable to both Government and private sector workers for most of 1986 was equal to about $40 at the Exchange Bureau, or parallel, exchange rate.

The value of total exports declined to about $250 million, and despite reduced imports, still resulted in a balance of trade deficit estimated at $590 million. As much as 40% to 50% of the Nicaraguan budget was reportedly consumed by military expenditures. Counterrevolutionary disruptions have directly and indirectly damaged agriculture, infrastructural installations, and industry. New investment in Nicaragua had been scant and was not expected to show much improvement, even with the expected passage of a new foreign investment law in 1987 to guarantee repatriation of profits if the operation generated foreign exchange or substituted for imports.

The ASARCO Incorporated claim for $8 million compensation for Nicaragua's 1979 nationalization of Neptune Mining Co. assets was under arbitration during 1986. The Government counter-claimed that Neptune owed at least $10 million in back taxes. Arbitration between the Government and Rosario was also under way. Negotiations appeared deadlocked on the claim of Noranda Ltd. of Toronto, Canada, for $8.1 in compensation for the nationalized El Limón Mine of Empresa Minera de El Setentrión. The Government claimed El Setentrión still owed back taxes and debts to workers. The negotiation was expected to eventually reach arbitration.

Despite international assistance to develop the mining sector, it has failed to recover pre-1980 production levels of gold and silver. Construction material production has not declined substantially because of new military building and reconstruction of damaged infrastructure.

The Small Mines Div. of the Instituto Nicaraguense de la Minería promotes, regulates, and collects gold produced by individual and cooperative, or collective, mining groups working alluvial or small quartz vein deposits. The nationalized gold mines formerly owned by foreign investors have reportedly been detrimentally affected by a lack of ground and air transportation, flooding, a lack of supplies and spare parts, and electric power shortages. The mines are, unfortunately, within areas where they are directly and indirectly subject to the violence of counterrevolutionary forces. Nevertheless, there was some progress in mine exploration and exploitation. SGAB was assisted with development work at two gold mines, El Limón and La Libertad. During 1986, the El Limón beneficiation plant capacity increased from 300 tons per day to 500 tons per day; and at La Libertad, plant capacity increased from 30 tons per day to 150 tons per day. In 1986, a new 2-year assistance agreement was signed by SGAB and the Government.

The Government of Bulgaria had agreed to invest $3.2 million in the El Vesubio lead-zinc mine. Low international mineral prices and Bulgaria's own domestic economic problems caused that country to temporarily halt further work at El Vesubio. Bulgaria had committed itself to financing the project by providing technical assistance and purchasing the lead-zinc concentrates. Despite of losing Bulgaria's assistance, Nicaragua planned to continue the mine project and sought other export markets for an expected production of 1,500 tons of lead concentrate and 7,000 tons of zinc concentrate in 1990.

PANAMA

Mineral industry growth was minimal during 1986, with manganese ore production and export representing the only deviation from past years. New petroleum legislation moved closer to final passage by the national assembly.

Panama's GDP was about $5 billion[e] in 1986, indicating a real economic growth of less than 3% compared with a revised growth of 4% in 1985. Agriculture and the reexport of Alaska North Slope crude oil through the transisthmian pipeline were the two economic sectors that registered declining activity. The Government maintained tight controls on expenditures, and inflation remained at 1%.

The Government was preparing a new hydrocarbons law for submittal to the legislative assembly. The last change to petroleum legislation was in 1964. The new proposed law offered incentives for companies to explore in Panama. A model contract was to be drawn that would be basically a production-sharing agreement offering tax exemptions during the first 5 years of production to allow initial investment recovery. Also, during the first 5 years, the State would receive a minimum of 20% as its share of production, after which time this would change to a 50-50 split between the Government and the producing company. Finally, companies would not be required

to make royalty payments to the Government but would have to pay the Panamanian corporate tax.

Manganese ore was produced and exported to the United States in 1986. Although the mine source of the ore was not reported in 1985, a company was evaluating a manganese deposit in Colón Province.

The development of gold and silver deposits discovered in Darién Province were complicated because they occured on reserve land belonging to the indigenous Embera people. Nine companies were reported as planning to invest about $2.3 million in further exploration, but needed some Government guarantee that mineral rights could be granted to them.

Sossa Petroleum Co., a U.S. and Panamanian consortium, performed offshore petroleum exploration and was expected to drill a wildcat offshore of Darién Province in the Golfo de San Miguel on the eastern side of the Gulf of Panama.

[1]Physical scientist, Division of International Minerals.
[2]Where necessary, values have been converted from Belizean dollars ($B) to U.S. dollars at the rate of $B2.00=US$1.00.
[3]Where necessary, values have been converted from Costa Rican colones (c) to U.S. dollars at the average exchange rate of c57.60=US$1.00.
[4]Where necessary, values have been converted from Salvadoran colones (c) to U.S. dollars at the rate of c5.00=US$1.00.
[5]Where necessary, values have been converted from Guatemalan quetzals (Q) to U.S. dollars at the commercial or market rate of Q2.5=US$1.00. The official exchange rate remained at Q1.00=US$1.00 for previously contracted foreign debt. The interbank rate of Q2.90=US$1.00 was established for remittances, tourism, and miscellaneous transactions.
[6]Where necessary, values have been converted from Honduran lempiras (L) to U.S. dollars at the rate of L2.00=US$1.00.
[7]Where necessary, values have been converted from Nicaraguan cordobas (C$) to U.S. dollars at the official exchange rate of C$70=US$1.00. The Exchange Bureau or parallel rate was C$2,958=US$1.00.
[8]Where necessary, values have been converted from Panamanian balboas (B) to U.S. dollars at the rate of B1.00=US$1.00.

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

(Metric tons unless otherwise specified)

Commodity	1983	1984	Destinations, 1984	
			United States	Other (principal)
Aluminum: Metal including alloys:				
Unwrought	18	23	23	
Semimanufactures	118	163	NA	Costa Rica 121; Brazil 5; unspecified 37.
Iron and steel: Metal:				
Scrap	--	4,040	NA	Colombia 3,900; unspecified 140.
Steel, primary forms	30	16	--	All to Costa Rica.
Semimanufactures:				
Bars, rods, angles, shapes, sections	88	--		
Universals, plates, sheets	11	--		
Hoop and strip	2	--		
Lead: Metal including alloys, unwrought	174	--		
Petroleum refinery products thousand 42-gallon barrels	[r]1,361	207	200	Costa Rica 7.
Silver: Metal including alloys, unwrought and partly wrought troy ounces	107,801	18,261	NA	NA.
Zinc: Metal including alloys, semimanufactures	--	11	--	Mainly to Nicaragua.
Other: Base metals including alloys, scrap	1,970	2,856	2,478	Japan 307; unspecified 71.

[r]Revised. NA Not available.
[1]Table prepared by H. D. Willis.

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

(Metric tons unless otherwise specified)

Commodity	1983	1984	Sources, 1984	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys:				
Unwrought	500	934	786	West Germany 107; Peru 40.
Semimanufactures	833	983	475	Brazil 119; El Salvador 98.
Copper: Metal including alloys:				
Unwrought	9	--		
Semimanufactures	782	678	170	Chile 328; Belgium-Luxembourg 100.
Iron and steel: Metal:				
Scrap	1,026	--		
Pig iron, cast iron, related materials	(2)	--		
Ferroalloys	2	--		
Steel, primary forms	r13,330	10,288	77	Venezuela 6,083; Brazil 3,887; Japan 165.
Semimanufactures:				
Bars, rods, angles, shapes, sections	12,052	12,087	1,077	Taiwan 5,458; Belgium-Luxembourg 2,107; Republic of Korea 1,384.
Universals, plates, sheets	30,843	33,201	1,338	Japan 13,888; Republic of Korea 5,034; France 4,285.
Hoop and strip	1,050	670	40	Japan 604; unspecified 26.
Rails and accessories	3	--		
Wire	5,412	7,175	288	Brazil 3,958; Belgium-Luxembourg 947; Republic of Korea 655.
Tubes, pipes, fittings	4,177	9,155	900	Venezuela 2,925; Costa Rica 2,602; Taiwan 1,452.
Castings and forgings, rough	54	--		
Lead: Metal including alloys:				
Unwrought	320	--		
Semimanufactures	34	--		
Nickel: Metal including alloys, all forms	1	--		
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$5	--		
Silver: Metal including alloys, unwrought and partly wrought troy ounces	33,276	95,198	18,487	Colombia 33,147; Guatemala 17,876.
Tin: Metal including alloys:				
Unwrought	10	--		
Semimanufactures	1	--		
Zinc:				
Oxides	36	--		
Metal including alloys:				
Unwrought	478	399	9	Peru 327; Canada 60.
Semimanufactures	21	--		
Other:				
Ores and concentrates	1	--		
Base metals including alloys, all forms	30	6	3	France 2.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	3	--		
Grinding and polishing wheels and stones	70	119	18	Italy 56; Brazil 32.
Asbestos, crude	450	--		
Cement	9,512	5,229	--	Mexico 1,552; Republic of Korea 1,501; Taiwan 1,500.
Clays, crude	664	713	357	El Salvador 325; unspecified 31.
Diamond: Industrial stones value, thousands	$5	--		
Diatomite and other infusorial earth	221	307	216	Mexico 61; Canada 30.
Feldspar, fluorspar, related materials	1,100	865	80	Guatemala 785.
Fertilizer materials:				
Crude, n.e.s	4	--		
Manufactured:				
Ammonia	164	157	47	Japan 30; West Germany 28.
Nitrogenous	21,987	24,693	5,562	Venezuela 5,284; Costa Rica 3,413.
Phosphatic	1,299	2,978	2,956	West Germany 20.
Potassic	3,517	8,600	2,835	West Germany 5,750.
Unspecified and mixed	24,709	16,147	5,859	Costa Rica 7,775; Netherlands 2,463.
Graphite, natural	2	--		

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1983	1984	Sources, 1984	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Gypsum and plaster	191	149	39	Spain 100; Jamaica 10.
Lime	3,074	695	454	Belgium-Luxembourg 30; unspecified 211.
Mica:				
Crude including splittings and waste	18	--		
Worked including agglomerated splittings	6	--		
Pigments, mineral: Natural, crude	3	--		
Precious and semiprecious stones other than diamond kilograms	72	135	26	Colombia 9; West Germany 8.
Salt and brine	949	1,294	709	United Kingdom 415; Canada 128.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	1,976	1,941	1,557	France 208; West Germany 110.
Sulfate, manufactured	3,103	3,075	215	Mexico 2,860.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	856	905	--	Italy 721; Brazil 109; Guatemala 38.
Worked	239	211	NA	Brazil 101; Mexico 21; unspecified 89.
Gravel and crushed rock	51	--		
Limestone other than dimension	2,742	--		
Sand other than metal-bearing	9,712	3,568	3,560	NA.
Sulfur:				
Elemental, colloidal, precipitated, sublimed	32	--		
Sulfuric acid	1,752	1,537	1,494	NA.
Talc, steatite, soapstone, pyrophyllite	233	--		
MINERAL FUELS AND RELATED MATERIALS				
Coal: All grades including briquets	37	8,726	81	Colombia 8,645.
Coke and semicoke	94	--		
Petroleum:				
Crude thousand 42-gallon barrels	11,929	10,317	--	Mexico 4,037; Venezuela 3,303; Ecuador 2,897.
Refinery products:				
Liquefied petroleum gas do	334	434	153	Netherlands Antilles 234; Spain 21.
Gasoline do	1,128	1,163	200	Netherlands Antilles 533; Trinidad and Tobago 227; Venezuela 203.
Mineral jelly and wax do	10	8	2	Japan 5; Taiwan 1.
Kerosene and jet fuel do	8	8	4	NA.
Lubricants do	18	15	14	Netherlands Antilles 1.
Residual fuel oil do	11	41	41	

[r]Revised. NA Not available.
[1]Table prepared by H. D. Willis.
[2]Revised to zero.

The Mineral Industry of Other Areas of the Far East and South Asia

By E. Chin, Gordon L. Kinney, Travis Q. Lyday, and John C. Wu

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BANGLADESH[1]

The domination of Bangladesh's mineral industry by natural gas was in for some possibly significant changes. A modest flow of crude oil was struck in a gas development well in the northeastern corner of the country. This was the first commercial flow of crude oil in Bangladesh. All crude oil was being imported, which cost a significant proportion of the nation's foreign exchange earnings. The development of an oilfield producing only a few thousand barrels per day would be a welcome help to the economy.

Additional exploration at a 1985 coal discovery in the northwest indicated a considerable reserve of good-quality coal at a depth suitable for mining. If the coal is mined, it would be a boon to the local economy because natural gas was not available in the area.

Exploration and delineation work has been under way for several other minerals and in several areas in an effort to broaden the country's base of mineral production. The heavy mineral beach sand deposits along the Cox's Bazaar coastal area in the southeast were being studied for possible commercial production. Exploitable reserves were apparently sufficient for a modest-sized production operation. A small pilot plant operation in the early 1980's proved the feasibility of separating the ilmenite, monazite, zircon, and other placer minerals. A feasibility study was under way, with Asian Development Bank assistance, for development of limestone quarries in the northeast.

Industrial production registered a growth of 3% for fiscal year[2] 1985 in constant prices and accounted for nearly 16% of the gross national product. Mining and quarrying, excluding gas, accounted for an insignificant proportion of the industrial sector. Natural gas production, which also included electric power and sanitary services in the Bangladesh accounting system, comprised 4.2% of the industrial component.

Crude minerals and fuels were not ex-

ported during the year. Imports of petroleum were a major item, but their value declined from that of 1985 because of lower world oil prices. Imports of coal, crude fertilizer, crude industrial minerals, base-metal ore, and some metal semimanufactures increased. Most fertilizer imports other than crude fertilizer decreased.

COMMODITY REVIEW

Industrial Minerals.—*Fertilizer Materials.*—Bangladesh was in the middle of an ambitious expansion program for its nitrogen fertilizer industry. Four nitrogen plants and one triple superphosphate plant were operating during the year. With the recently completed Polash Urea Fertilizer Factory near Ghorasal, the operating capacity of urea was 1.1 million tons per year. Domestic demand has been increasing steadily in the 1980's and stood at 1.2 to 1.3 million tons per year at yearend 1986.

The Government was striving to get ahead of the demand by authorizing three new 561,000-ton-per-year plants, two at Chittagong and one near Jamalpur in Mymensingh District. The Chittagong Urea Fertilizer Ltd. plant was under construction with planned completion rescheduled for 1988. Construction was nearly 2 years behind schedule, and increased costs required the Asian Development Bank to supply a supplemental loan of $26 million late in 1986. Karnaphuli Fertilizer Co. Ltd. expected to sign contracts for construction of the second Chittagong plant in early 1987. Total production from this plant was to be exported in order to earn foreign exchange. The Government, however, would retain the option of buying the fertilizer for hard currency if required. The third plant was still in the planning stage. It consisted of a 1,000-ton-per-day ammonia unit and a 1,700-ton-per-day urea plant along the Jamuna River, possibly in the town of Tarakandi or Jagannathganj.

Mineral Fuels.—*Coal.*—The April 1985 discovery of significant bituminous coal deposits at depths between 130 and 366 meters was the first known occurrence of good-quality coal at a depth that was realistically minable under Bangladesh's current state of technology and finances. Since the discovery, five additional exploratory holes have been drilled in a 3-square-kilometer area in Barapukuria, Dinajpur District, northwestern Bangladesh. All five holes hit coal, and the Geological Survey of Bangladesh (GSB) was continuing its survey work at the site and expected to drill an additional four holes early in 1987. By yearend 1986, GSB estimated the deposit contained 254 million tons of coal.

The discovery of coal in northwestern Bangladesh was particularly significant for several reasons: (1) The only previous coal discoveries were in Jamalganj, Bogra District, but were too deep to be economically mined; (2) northwestern Bangladesh was entirely dependent for commercial energy supplies from other parts of the country; and (3) the GSB has described the coal as of exceptional quality, with heating values of 11,000 to 14,400 British thermal units per pound. The Government anticipated that the new coal deposit could be used for local power generation. In view of the high cost of mineral exploration, planning, and development and the Government's shortage of capital, the Ministry of Finance was accepting and reviewing technical assistance proposals from foreign consulting firms. The Government would like a detailed engineering report as soon as possible. Bangladesh Oil, Gas and Mineral Corp. (BOGMC) officials were confident that the coal deposit could be mined and hoped that production could start as early as 1988. Infrastructure in the area was reportedly good, including railroads and highways.

Natural Gas.—Proved reserves of more than 12 trillion cubic feet could provide the key component for a major improvement in the country's economy. Exploration and development work, largely financed by international loans, has moved slowly, however, considering the vast resource, relatively low cost, and urgent need to save foreign exchange. Plans called for a large increase in gas production by the end of the decade. Development was under way to increase gas production capacity to 600 million cubic feet per day, and plans were to increase that figure to 1 billion cubic feet per day by the end of the decade. By 1990, the end of the third 5-year plan, gas development was being programmed to meet 70% of the country's fuel needs, against only 37% in 1980 and 56% in 1986. In order to meet these broad goals, the Second Natural Gas Development project was under way. Its main components were drilling 11 new development wells at 6 gasfields and extending the pipeline network serving the fields. The $220 million cost was being met by a number of sources including loans from the Asian Development Bank, the International Development Association (IDA), the Overseas Development Administration, and the Government of Canada. Gas and condensate

treatment facilities were also to be installed at three of the fields. Long-term plans called for the expansion of the pipeline network across the Brahmaputra and Ganges Rivers. There were no pipeline crossings of either river because the deep, wide channels and swift currents during high water presented formidable engineering problems and considerable expense.

Most of Bangladesh's gas was used for generating electricity, manufacturing nitrogenous fertilizer, or for domestic fuel. Plans to absorb the additional output during the coming years included the expansion of the liquefied petroleum gas (LPG) processing facilities of Eastern Refinery Ltd. (ERL) at Chittagong and the start of production and marketing of compressed natural gas as a transportation fuel.

The pipeline link to the western half of the country, or better still, a gas discovery in the region, could rekindle interest in a plan to export gas to Calcutta, India. Energy shortages in that part of India could ensure a ready market for the gas if political and financial obstacles could be overcome.[3]

Petroleum.—Shell Nederland BV affiliate Bangladesh Shell Petroleum Development Co. signed a production-sharing contract with BOGMC in April covering 13,500 square kilometers of Rangpur and Divajpur regions in the extreme northwestern corner of the country. The area was only 32 kilometers from another Shell Nederland affiliate's production-sharing contract in southern Nepal. Seismic work was due to start before yearend, and exploration drilling, by the third year of the 4-year contract.

BOGMC's urgent hunt for crude oil deposits was rewarded, at least to a modest extent, by the discovery of crude oil in a gas development well in Sylhet, in the northeastern corner of the country. On December 25, the seventh well at the Haripur Gasfield tested 600 barrels per day of heavy, high-wax crude oil, the first commercial crude oil produced in the country. BOGMC repaired a nearby 5,000-barrel storage tank and began collecting oil there and transporting it by truck, then railroad, to ERL's refinery in Chittagong. Additional drilling was to be undertaken as soon as possible to increase the output and to assess the limits of the oil zone. The heavy crude oil was being combined with lighter imported crudes for which the ERL refinery was designed. Government officials believed that the refinery could continue to handle the Haripur oil, even with a modest increase in flow, without having to modify the refining equipment. However, if oil production substantially increased, it was likely that a dioxidizing unit would have to be added to improve the refining capability for this type of crude oil.[4]

The oil discovery at No. 7 Haripur came as BOGMC was finishing a package of onshore geophysical data it would present in 1987 to the international oil companies. The data included seismic surveys from the country's delta region, from areas around earlier gas discoveries, and from the so-called geologic hinge zone trending southwest-northeast across the center of the country. The area lay roughly between the new Bangladesh Shell concession and Dhaka. The geophysical work was part of a hydrocarbon habitat study funded by the IDA, the Federal Republic of Germany, and the United Kingdom.

The IDA has approved a $47 million loan to allow ERL to perform a major revamp of its facilities. The project would change the proportions of the refinery output to be more in line with the consumption pattern of the population and industry. The plan would also allow substitution of LPG for more expensive imported kerosene. In a significant policy change, the Government was to allow the private sector to handle the distribution of LPG in the Khulna area. At first, all of the LPG would come from ERL, but part of the natural gas expansion program included an LPG recovery plant, increasing the availability and ease of distribution of the LPG. Both production facilities would remain in the public sector.

Table 1.—Other Areas of the Far East and South Asia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Area and commodity	1982	1983	1984	1985[p]	1986[e]
BANGLADESH[2]					
Cement, hydraulic[3]	326,247	306,688	272,619	240,176	292,000
Clays: Kaolin[3]	5,862	2,269	2,613	4,178	[4]2,695
Gas, natural, marketed[3 5] million cubic feet	63,717	70,133	80,257	90,958	[4]101,138
Iron and steel: Metal:[3]					
Steel, crude (ingot only)	108,624	47,401	73,387	101,419	[4]95,514
Steel products	172,080	54,552	100,741	126,582	[4]111,593
Nitrogen: N content of ammonia and ammonium sulfate	182,252	178,695	352,888	358,480	352,000
Petroleum refinery products thousand 42-gallon barrels	8,853	7,168	7,958	7,357	[4]7,405
Salt, marine[3]	574,790	243,091	671,832	489,000	500,000
Stone: Limestone, industrial[3]	44,592	32,101	24,564	40,392	[4]22,082
BRUNEI[2]					
Gas, natural:					
Gross million cubic feet	343,000	352,000	[e]330,000	[e]330,000	320,000
Marketed do.	306,459	[e]315,000	[e]300,000	307,645	290,000
Natural gas liquids:					
Condensate thousand 42-gallon barrels	5,570	[e]5,910	[e]5,460	[e]5,500	5,400
Natural gasoline do.	289	[e]305	[e]280	[e]300	290
Liquefied petroleum gas do.	166	[e]125	[e]115	[e]110	100
Total do.	6,025	[e]6,340	[e]5,855	[e]5,910	5,790
Petroleum:					
Crude do.	60,225	63,875	58,560	54,300	54,000
Refinery products:					
Gasoline do.	697	553	605	600	600
Distillate fuel oil do.	321	358	395	400	400
Residual fuel oil do.	7	7	8	8	10
Other including refinery fuel and losses do.	200	250	272	300	300
Total do.	1,225	1,168	1,280	1,308	1,310
CAMBODIA[e 2]					
Salt	[4]38,100	40,000	40,000	40,000	40,000
CHRISTMAS ISLAND[2]					
Phosphate rock, marketable:					
Gross weight thousand tons	1,328	1,094	1,259	1,200	[4]880
P_2O_5 content do.	466	385	443	418	309
HONG KONG[2]					
Cement, hydraulic do.	1,436	1,717	1,847	1,835	[4]2,236
Clays:					
Kaolin	286	834	70	9,602	[4]850
Other	31,114	51,272	92,293	82,446	[4]35,208
Feldspar	1,744	5,275	23,101	26,777	[4]68,737
Iron and steel: Metal: Steel, crude[e]	120,000	120,000	120,000	120,000	120,000
Quartz	--	--	34	116	[4]33
NORTH KOREA[e 2]					
Aluminum metal ingot, primary	10,000	10,000	10,000	10,000	10,000
Cadmium, smelter	100	100	100	100	100
Cement, hydraulic thousand tons	8,000	8,000	8,000	8,000	8,000
Coal: Anthracite do.	36,000	36,000	36,000	36,000	36,000
Coke do.	3,000	3,000	3,000	3,000	3,000
Copper:					
Mine output, Cu content	15,000	15,000	15,000	15,000	15,000
Metal:					
Smelter, primary and secondary	18,000	18,000	18,000	18,000	18,000
Refined, primary and secondary	22,000	22,000	22,000	22,000	22,000
Fluorspar	40,000	40,000	40,000	40,000	40,000
Gold, mine output, Au content troy ounces	160,000	160,000	160,000	160,000	160,000
Graphite	25,000	25,000	25,000	25,000	25,000
Iron and steel:					
Iron ore and concentrate, marketable:					
Gross weight thousand tons	8,000	8,000	8,000	8,000	8,000
Fe content do.	3,200	3,200	3,200	3,200	3,200
Metal:					
Pig iron do.	5,250	5,500	5,750	5,750	5,750
Ferroalloys, furnace type unspecified do.	120	120	120	120	120
Steel, crude do.	5,800	6,100	6,500	6,500	6,500
Lead:					
Mine output, Pb content	95,000	75,000	110,000	110,000	110,000
Metal, primary and secondary	60,000	60,000	95,000	95,000	95,000

See footnotes at end of table.

Table 1.—Other Areas of the Far East and South Asia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Area and commodity	1982	1983	1984	1985[p]	1986[e]
NORTH KOREA[e 2] —Continued					
Magnesite, crude thousand tons	1,900	1,900	1,900	1,900	1,900
Nitrogen: N content of ammonia do.	450	450	450	450	450
Phosphate rock	500,000	500,000	500,000	500,000	500,000
Salt, all types	570,000	570,000	570,000	570,000	570,000
Silver, mine output, Ag content thousand troy ounces	1,600	1,600	1,600	1,600	1,600
Sulfur thousand tons	230	230	230	230	230
Talc, soapstone, pyrophyllite	170,000	170,000	170,000	170,000	170,000
Tungsten, mine output, W content	2,200	500	1,000	1,000	1,000
Zinc:					
Mine output, Zn content	140,000	140,000	140,000	[r]180,000	180,000
Metal, primary	120,000	120,000	120,000	[r]180,000	180,000
LAOS[e 2]					
Cement (from imported clinker)	--	--	--	[4]2,500	4,000
Gypsum	[4]60,000	70,000	[4]82,000	[r]110,000	130,000
Salt, rock	[4]8,949	10,000	[4]8,000	10,000	30,000
Tin, mine output, Sn content	302	359	430	[4]540	550
MONGOLIA[2]					
Cement, hydraulic thousand tons	[r]179	[r]165	141	151	200
Coal:					
Anthracite and bituminous do.	401	408	458	480	500
Lignite and brown do.	4,520	4,566	4,973	6,038	6,200
Total do.	4,921	4,974	5,431	6,518	6,700
Copper, mine output, Cu content	90,000	104,000	[e]118,000	[e]128,000	136,000
Fluorspar, all grades thousand tons	[r]667	[r]708	747	787	790
Gypsum[e] do.	32	32	32	32	32
Lime, hydrated and quicklime[e] do.	[r]90	[r]93	[r]95	[r]95	95
Molybdenum, mine output, Mo content[e]	830	960	1,000	1,000	1,100
Petroleum refinery products:[e]					
Kerosene thousand 42-gallon barrels	23	23	23	23	23
Residual fuel oil do.	20	20	20	20	20
Salt[e]	15,000	16,000	16,000	16,000	16,000
Tin, mine output, Sn content[e]	--	1,000	1,000	1,000	1,000
Tungsten, mine output, W content[e]	1,500	1,500	1,500	1,500	1,500
NEPAL[6]					
Cement, hydraulic	[e]25,000	45,587	39,225	31,479	[4]92,853
Clays for cement manufacture[e]	2,000	2,000	2,000	4,242	[4]6,798
Coal: Lignite	[e]8,000	8,244	7,595	6,808	[4]4,536
Copper ore:					
Gross weight	6	11	[e]9	6	6
Cu content	2	4	[e]3	[4]2	2
Gem stones:					
Garnet kilograms	[e]30,000	[e]23,000	[e]20,000	27,300	25,000
Tourmaline do.	[e]10	[e]10	[e]12	60	50
Lime, agricultural	[e]10,000	[e]10,000	7,000	7,000	[4]584
Magnesite, crude	[e]20,000	15,016	14,603	19,851	[4]63,190
Salt	[e]10	6	700	7,500	7,000
Stone:					
Limestone	[e]80,000	50,422	[e]45,000	55,953	[4]174,798
Marble:					
Chips	[e]400	482	609	700	700
Cut square meters	[e]4,000	3,208	[e]3,000	7,641	[4]10,442
Craggy cubic meters	[e]1,000	3,530	708	691	[4]3,590
Talc	[e]3,000	15,263	7,595	6,015	7,000
SINGAPORE[2]					
Cement, hydraulic thousand tons	2,695	3,153	2,821	1,992	1,805
Iron and steel: Metal: Steel, crude[e] do.	350	350	350	350	350
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	14,562	19,738	17,731	[e]18,000	18,000
Jet fuel do.	28,922	30,690	43,578	[e]44,000	44,000
Kerosene do.	29,144	31,377	14,338	[e]14,000	13,000
Distillate fuel oil do.	91,992	88,258	76,677	[e]77,000	75,000
Residual fuel oil do.	80,902	81,906	87,418	[e]87,000	85,000
Lubricants do.	3,152	3,852	3,959	[e]4,000	4,000
Other do.	44,966	41,663	45,560	[e]46,000	45,000
Refinery fuel and losses do.	11,391	8,536	4,024	[e]4,000	3,000
Total do.	305,031	306,020	293,285	[e]294,000	287,000

See footnotes at end of table.

Table 1.—Other Areas of the Far East and South Asia: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Area and commodity	1982	1983	1984	1985[p]	1986[e]
SINGAPORE[2] —Continued					
Stone: Granite, broken thousand cubic meters	5,947	7,569	7,422	6,743	5,565
Sulfur, byproduct of petroleum	15,188	3,666	5,557	[e]6,000	5,000
SRI LANKA					
Cement, hydraulic thousand tons	[e]650	506	[e]500	[e]600	600
Clays:					
Ball clay	9,291	11,980	16,500	23,825	[4]20,470
Kaolin	8,206	7,976	11,100	5,405	[4]6,260
Brick and tile clay[e]	60,000	60,000	70,000	70,000	[4]40,000
Clays for cement manufacture	62,591	51,931	[e]50,000	39,123	[4]36,322
Feldspar, crude and ground	2,922	2,609	5,200	9,789	[4]7,270
Gem stones, precious and semiprecious, other than diamond value, thousands	[e]$10,000	$39,814	$20,569	[e]$20,000	[4]$23,304
Graphite, all grades	8,803	5,528	5,623	7,413	[4]7,453
Iron and steel: Metal: Semimanufactures	--	24,546	15,990	9,310	[4]10,872
Mica, scrap	291	171	[e]200	[e]200	200
Nitrogen: N content of ammonia	103,600	62,700	[e]70,000	[e]30,000	--
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	968	806	[e]1,100	[e]1,100	1,100
Jet fuel do.	908	517	[e]700	[e]700	700
Kerosene do.	1,226	1,047	[e]1,400	[e]1,400	1,400
Distillate fuel oil do.	4,783	3,703	[e]5,000	[e]5,000	5,000
Residual fuel oil do.	4,833	3,235	[e]4,350	[e]4,350	4,500
Other do.	[e]1,000	1,252	[e]1,650	[e]1,650	1,500
Refinery fuel and losses[e] do.	600	600	800	800	800
Total do.	14,318	11,160	[e]15,000	[e]15,000	15,000
Phosphate rock	[e]20,000	[e]16,000	13,685	[e]14,000	[4]14,977
Rare-earth metals: Monazite concentrate, gross weight	304	[e]300	147	[e]200	200
Salt	176,437	129 222	107,000	76,858	[4]104,278
Stone:					
Limestone thousand tons	1,616	947	[e]1,000	[e]1,000	[4]649
Quartz, massive	794	764	1,100	1,566	[4]1,090
Titanium concentrate, gross weight:					
Ilmenite	68,282	81,778	102,048	114,854	[4]129,907
Rutile	7,212	8,093	6,467	8,558	[4]8,443
Zirconium: Zircon concentrate, gross weight	5,789	5,721	3,708	4,061	4,000
VIETNAM[7]					
Bauxite: Gross weight[e]	1,000	3,000	5,000	6,000	6,000
Cement, hydraulic thousand tons	[e]800	928	[e]1,100	[e]1,300	1,540
Chromium: Chromite[e]	16,000	16,000	16,000	15,000	15,000
Clays: Kaolin[e]	1,000	1,200	1,000	1,000	1,000
Coal: Anthracite thousand tons	5,700	6,019	5,840	6,200	6,007
Gypsum[e]	25,000	25,000	25,000	25,000	25,000
Iron and steel: Metal:[e]					
Steel, ingot thousand tons	120	100	100	110	110
Steel, rolled do.	40	40	40	50	50
Nitrogen: N content of ammonia	([8])	([8])	([8])	([8])	([8])
Phosphate rock:[e]					
Gross weight thousand tons	110	200	200	[4]516	530
P_2O_5 content do.	36	66	66	[r e]170	175
Salt do.	650	890	[e]800	379	450
Tin:					
Mine output, Sn content[e]	500	550	500	600	650
Metal, smelter	475	[e]520	[e]475	[e]570	620
Zinc:[e]					
Mine output, Zn content	6,000	7,000	7,000	5,000	5,000
Metal, smelter, primary	5,000	6,000	6,000	4,200	4,200

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

[1]Table includes data available through Aug. 27, 1987.

[2]In addition to the commodities listed, other crude construction materials such as sand and gravel and other varieties of stone presumably are produced, but available information is inadequate to make reliable estimates of output levels.

[3]Data are for years ending June 30 of that stated.

[4]Reported figure.

[5]Gross production is not reported; the quantity vented, flared, or reinjected is believed to be negligible.

[6]Data are for the Nepalese fiscal year ending mid-July of that stated.

[7]In addition to the commodities listed, iron ore was mined in the past and pig iron was produced at industrial facilities, but the status of these industries under prevailing conditions is not sufficiently clear to allow formulation of reliable estimates of output levels. Similarly, data on output of crude construction materials and natural gas are not available, and no basis is available to make reliable estimates of output levels.

[8]Nitrogen (N content of ammonia) production capacity of the country's only known plant is 54,000 tons per year; it is not known at what output level the plant is operating.

BRUNEI[5]

Brunei, officially State of Brunei Darussalam, is an oil-rich Muslim sultanate on the northeastern coast of Kalimantan Island, formerly Borneo. A population of only 224,000 persons live in the 5,765-square-kilometer country. Brunei is surrounded and divided into two parts, by the Malaysian State of Sarawak.

The people of Brunei live comfortably in an economy based overwhelmingly on revenue from the production of crude oil and natural gas. The trade surplus was down to $2.5 billion in 1986[6] after being much higher in previous years before a gradual planned cutback of oil production and lower world oil prices. Real gross domestic product (GDP) declined about 0.3% to $3.4 billion in 1985 and was believed to have declined again in 1986, directly reflecting the strong dependence of the economy on the petroleum sector. Overall real growth of the nonoil sector has been strong, averaging 7.3% since 1981.

The Government's expenditures were believed to have exceeded its revenues in 1986. This was a somewhat sobering event in a country that has generally run a large surplus from the huge oil industry-generated taxes, royalties, and profits.

The fifth national development plan (1986-90) took the first steps toward a more diversified economy. The main thrust of the plan was the establishment of import substitution industries and infrastructural projects. Public utility spending more than doubled the fourth plan's expenditure, but public buildings and security expenditures declined somewhat. Public building construction was unusually high prior to Brunei attaining independence in 1984. The allocation for social services, which included Government housing and town and country planning, was 29% of the development expenditures plan. A definitive list of construction projects was expected to be publicized in a forthcoming 20-year master plan being prepared by British consultants.

An important aspect of the fifth plan was the emphasis placed on creating the right conditions for the growth of a tertiary sector in the economy (after oil and civil service) and the encouragement of private enterprise. The Government planned to establish a monetary authority and a development bank to help fund private investment. The monetary authority was prerequisite to the Government's plan to make the capital into a regional financial center. The bank was essential for industrial diversification because there was an acute shortage of private investment capital.

The National Development Committee recommended several industrial projects, those which were mineral related included a cement plant, a precast concrete products plant, and a tile and pottery factory. The Government had a strong incentive to foster growth in the private sector. The civil service was close to saturation, accounting for over 46% of all employment in the country. The oil industry employed about 15% of the labor force.

Production and trade were completely dominated by the petroleum sector. Production of natural gas was controlled by the long-term contract with Japan, to buy liquefied natural gas (LNG) at a rate of 5 million tons per year, about $1.6 billion in 1985. Standby capacity built into the LNG plant has allowed all contracts to be fulfilled since the facility opened in 1972.

Oil production has fallen in the last few years. Brunei Shell Petroleum Co. attributed the decrease to a combination of technical factors, a Government resources conservation policy, and the depressed international market. Production varied considerably from month to month in 1985 and averaged about 164,000 barrels per day. Production in 1986 was more steady and at about the same rate.

Nearly 90% of Government revenue was derived from taxes or profit sharing directly from oil and gas. There has been a large positive balance of trade for the last decade. Export of hydrocarbons had accounted for 99% of Bruneian exports during the last 5 years. Foreign exchange reserves were estimated at over $20 billion, much of it invested in overseas assets earning a further substantial return.[7]

The main development during the year was an ownership change in the LNG processing, marketing, and transportation companies. The Government of Brunei increased its stake in Brunei LNG Sdn. Bhd. (the gas-processing company) and Brunei Cold Gas Trading Sdn. Bhd. (the marketing company) from 33.3% to 50%. Brunei Shell Petroleum and Mitsubishi Corp., the other partners, will each retain a 25% interest. In addition, the Government took a 50% share in a newly created shipping venture with Brunei Shell Petroleum. The new company,

Brunei Shell Tankers Sdn. Bhd., was formed to operate the fleet of seven 75,000-cubic-meter LNG tankers shuttling between Brunei and Japan. The tankers had been owned and operated exclusively by Shell Tankers (U.K.) Ltd. It was believed that the Government's increased ownership in Brunei LNG and Brunei Cold Gas and its new equity in Brunei Shell Tankers was agreed to by Brunei Shell Petroleum and Mitsubishi Corp. on condition that the Government of Brunei would renew the long-term supply contract with Japan when it expires in 1992.

Exploration activity has slacked off because of the low world oil prices. The semisubmersible drilling rig, Sedco Echo, operated for Brunei Shell Petroleum in the offshore Gannet Field late in the year. It was drilling primarily for gas in line with Brunei Shell Petroleum's desire to increase its unassociated gas reserves. Total exploration wells were believed to be two offshore and one onshore for the year, a decrease of one compared with that of 1985. Several development wells were also drilled.

Elf Aquitaine Offshore BV Asia, a subsidiary of Elf Aquitaine S.A. of France, acquired a part interest in a 1,570-square-kilometer concession area offshore. Elf Aquitaine Offshore was taking over one-half of the concession that Jackson Exploration Inc. of the United States relinquished late in the year. Elf Aquitaine Offshore's other partners were Bruneian companies, Jasra International Petroleum Sdn. Bhd. and Pengiran Dato Paduka Haji Abdul Rahman. Planned exploration activity for 1987-88 envisioned seismic surveying followed by a minimum of two wells.

CAMBODIA[8]

The mineral industry of Cambodia was of little significance to the economy. Construction materials, gem stones, phosphate rock, and salt were produced in limited amounts, generally for consumption in the immediate area of production. There were no known exports of mineral commodities. The economy of the country was based almost entirely on small-farm agriculture.

The Government-controlled press claimed that industrial production made a remarkable recovery since early 1979 when there was a change in administration. At that time, there was virtually no operating industry or electric power in the country. Restoration of electric power was gradual, but by 1984, five cities had power restored and a total capacity of 35,000 kilowatts was operating throughout the country. Reconstruction continued, and by yearend 1986, 90% of the old factories were claimed to have been restored to operation after years of inactivity. Only unsophisticated light industrial plants for manufacturing such commodities as cigarettes, processed foods, paper, textiles, and tires operated in the country. There was also some light fabrication using imported semimanufactures, but there was no primary metal production.

Military clashes between Vietnamese troops and anti-Government guerrilla forces continued to be frequent throughout the rural countryside. Because of this and the chaotic political situation, it was unlikely that additional mineral-based industries could be developed in the immediate future. However, Vietnamese and Cambodian Government personnel met during 1986 and agreed that Vietnam was to help restore or develop Cambodia's basic mineral industry.

Mineral trade was limited mainly to imports of chemical fertilizers, coal, metal semimanufactures, and petroleum products, which were believed to have been supplied primarily by the U.S.S.R.

CHRISTMAS ISLAND[9]

The Territory of Christmas Island is a 135-square-kilometer volcanic island overlain by coral limestone, roughly 360 kilometers south of Java Head, Indonesia, and 2,600 kilometers northwest of Perth, Australia, in the Indian Ocean. The island has been a territory of Australia since October 1, 1958.

Presumably, crude construction materials such as sand and gravel and other varieties of stone were produced during 1986 for local consumption, but the island's sole organized mineral industry continued to be the phosphate rock operation owned and operated by Phosphate Mining Co. of Christmas Island Ltd. (PMCI), a wholly Australian Government-owned firm headquartered in Perth. PMCI employs about 550

people, about one-quarter of the island's population.

Although the island's limited phosphate deposits remained among the richest in the world, production continued to decline owing to the island's poor competitive position relative to other producing countries and to labor unrest owing to a dispute over compensation for winding down an uneconomic operation for which the Government of Australia was unwilling to increase its subsidies because of imminent depletion of the phosphate rock, probably within 5 years. Production of phosphate rock decreased more than 27% on a gross-weight basis from that of 1985.

Although Australia has continued to import phosphate rock at approximately the same levels since 1984, imports by New Zealand declined sharply in 1986, and thus these two traditional markets for Christmas Island phosphate continued to account for a progressively smaller share of exports, which had been almost 90% of shipments as recently as 1982.

Table 2.—Christmas Island: Exports of phosphate rock, by destination

(Thousand metric tons)

Destination	1984	1985	1986
Australia	493	499	490
China	55	--	--
Indonesia	--	38	18
Japan	40	39	41
Korea, Republic of	35	45	22
Malaysia	208	231	196
New Zealand	387	327	107
Philippines	--	2	--
Sri Lanka	--	--	1
Taiwan	16	6	4
Other	--	--	1
Total	1,234	1,187	880

Source: Phosphate Rock Statistics 1986, International Fertilizer Industry Association Ltd.

HONG KONG[10]

Mine output in Hong Kong was limited to feldspar, kaolin, and quartz by small operations in the New Territories. At the end of 1986, there were one mining lease and two mining licenses for the extraction of feldspar and kaolin. The Mines Division of the Labour Department enforces legislation and safety regulations relating to mining and explosives. It also controls the possession, conveyance, storage, manufacture, and use of explosives in Hong Kong. Tunneling for the Mass Transit Railway Island Line was completed early in 1986, resulting in a sharp reduction in the overall consumption of explosives. Transit storage facilities were provided for explosives imported from France and the United States for use by offshore oil-well-drilling companies operating in the South China Sea. The Geochemical Control Office of the Civil Engineering Services Department manages two Government quarries, supervises six private quarries, and supervises two private rock-crushing plants, which are operated under Government contract. In 1986, total production of aggregates was about 11 million tons. The consumption of aggregates, crushed rock fines, and sand was about 16 million tons. About 5 million tons of material was imported primarily from China.

Table 3.—Hong Kong: Exports and reexports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	17,748	16,566	--	Taiwan 11,230; Indonesia 2,858.
Oxides and hydroxides	613	64,161	--	China 61,572; Indonesia 2,100.
Metal including alloys:				
Scrap	19,447	18,423	--	Japan 17,448; China 384.
Unwrought	22,648	48,903	--	Taiwan 21,580; China 12,463; Thailand 6,762.
Semimanufactures	13,397	46,145	1,591	China 36,220; Taiwan 2,643.
Arsenic: Oxides and acids	34	81	--	Taiwan 44; Indonesia 35.
Chromium:				
Ore and concentrate	99	--	--	
Oxides and hydroxides	33	76	--	Indonesia 27; Netherlands 20.
Cobalt: Oxides and hydroxides	19	29	--	Taiwan 16; Singapore 6.
Copper: Metal including alloys:				
Scrap	22,802	24,444	17	Japan 13,075; China 5,187; Taiwan 2,735.
Unwrought	3,059	4,001	--	China 2,755; North Korea 858; Taiwan 293.
Semimanufactures	4,365	5,594	135	China 3,037; Taiwan 865.
Gold:				
Waste and sweepings value, thousands	$2,739	$3,665	$114	Switzerland $3,154.
Metal including alloys, unwrought and partly wrought thousand troy ounces	48	68	(2)	Macau 41; China 11.
Iron and steel: Metal:				
Scrap	300,067	319,137	61	Japan 112,168; Taiwan 108,373.
Pig iron, cast iron, related materials	127	2,156	--	China 2,116.
Ferroalloys:				
Ferromanganese	5,430	500	--	All to North Korea.
Unspecified	114	563	--	Netherlands 274; Switzerland 100.
Steel, primary forms	41,574	41,920	--	China 40,939.
Semimanufactures	597,458	963,232	120	China 898,695; Macau 37,652.
Lead:				
Oxides	55	33	--	Indonesia 30.
Metal including alloys:				
Scrap	3,097	1,883	--	China 1,227; Taiwan 653.
Unwrought	729	345	--	China 329.
Semimanufactures	45	56	--	China 26; Malaysia 12.
Magnesium: Metal including alloys, all forms	73	44	--	Japan 18; Netherlands 12.
Manganese:				
Ore and concentrate, metallurgical-grade	102	120	--	All to Republic of Korea.
Oxides	504	618	--	Indonesia 306; Republic of Korea 222.
Mercury 76-pound flasks	169	1,237	--	Indonesia 782; Philippines 245; China 118.
Nickel:				
Oxides and hydroxides	189	244	--	Taiwan 212.
Metal including alloys:				
Scrap	293	118	--	Japan 73; India 36.
Unwrought	3,020	3,242	--	Taiwan 1,800; North Korea 660; Republic of Korea 457.
Semimanufactures	933	1,081	--	Taiwan 497; Republic of Korea 341.
Platinum-group metals:				
Waste and sweepings value, thousands	$1,985	$451	--	West Germany $225; United Kingdom $153.
Metals including alloys, unwrought and partly wrought troy ounces	13,876	26,645	--	Taiwan 18,033; Republic of Korea 3,296.
Silver:				
Waste and sweepings value, thousands	$97,844	$71,890	$5	United Kingdom $38,972; West Germany $17,158; France $14,546.
Metal including alloys, unwrought and partly wrought thousand troy ounces	1,211	611	--	Japan 328; China 125; Taiwan 105.
Tin:				
Ore and concentrate	--	4,768	--	Netherlands 2,018; Singapore 891; Republic of Korea 780.
Metal including alloys:				
Scrap	59	90	--	Japan 56; United Kingdom 19.
Unwrought	766	5,570	234	Japan 4,483.
Titanium: Oxides	1,926	2,743	--	China 1,417; Indonesia 472; Taiwan 278.

See footnotes at end of table.

Table 3.—Hong Kong: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Tungsten:				
Ore and concentrate	--	1,717	--	U.S.S.R. 606; Singapore 397; West Germany 391.
Metal including alloys, all forms	5	2	--	Mainly to Netherlands.
Uranium and/or thorium: Oxides and other compounds ---- kilograms	226	4,340	--	China 4,000; Indonesia 200.
Zinc:				
Oxides	344	393	--	Indonesia 171; Singapore 101; China 47.
Metal including alloys:				
Scrap	94	78	--	All to China.
Unwrought	3,437	4,496	--	Macau 2,894; China 1,552.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	1,894	1,409	--	China 509; Macau 328; Republic of South Africa 178.
Artificial:				
Corundum	7,768	9,011	78	Republic of Korea 4,388; Taiwan 3,144; Japan 810.
Silicon carbide	1,391	1,210	29	Taiwan 509; Republic of Korea 374; Japan 115.
Dust and powder of precious and semi-precious stones including diamond value, thousands	$53	$87	--	Republic of Korea $67; Japan $16.
Grinding and polishing wheels and stones	2,108	3,099	146	Indonesia 1,922; Republic of Korea 454.
Asbestos, crude	19	155	--	Indonesia 100; China 55.
Barite and witherite	262	16	--	All to Republic of Korea.
Boron materials: Oxides and acids	92	306	--	Taiwan 135; Republic of Korea 66; North Korea 63.
Cement	726,884	738,876	--	China 425,716; Macau 312,359.
Clays, crude	112,148	97,898	--	Taiwan 76,531; Republic of Korea 13,823.
Diamond:				
Gem, not set or strung ---- carats	397,542	540,141	182,972	Belgium-Luxembourg 136,845; Japan 63,870; Israel 51,860.
Industrial stones ---- do	7,967	157,507	--	China 122,282; Netherlands 31,159.
Diatomite and other infusorial earth	22	254	--	China 239.
Feldspar, fluorspar, related materials	36,957	38,571	--	Taiwan 32,718; Indonesia 5,533.
Fertilizer materials:				
Crude, n.e.s	1,856	393	--	China 164; United Arab Emirates 152.
Manufactured:				
Ammonia	68	12	--	China 8.
Nitrogenous	136,644	51,079	--	China 50,900.
Potassic	306	1,904	--	Malaysia 1,604.
Unspecified and mixed	8,409	1,574	6	China 1,551.
Graphite, natural	856	508	--	Republic of Korea 386; Taiwan 60.
Gypsum and plaster	1,677	7,307	--	Macau 5,500; China 1,314.
Iodine	2	1	--	Mainly to China.
Lime	64	114	--	All to China.
Magnesium compounds:				
Magnesite, crude including calcined	18,399	15,444	--	Taiwan 13,980; Indonesia 1,096.
Oxides and hydroxides	--	12	--	All to Philippines.
Mica:				
Crude including splittings and waste	20	8	--	Mainly to China.
Worked including agglomerated splittings	48	83	--	Taiwan 34; China 27; Republic of South Africa 12.
Pigments, mineral:				
Natural, crude	273	517	--	Japan 193; Indonesia 140; Taiwan 100.
Iron oxides and hydroxides, processed	1,674	2,138	--	China 956; Indonesia 559.
Precious and semiprecious stones other than diamond:				
Natural ---- value, thousands	$82,499	$78,806	$26,196	Japan $21,686; China $7,636; Thailand $4,546.
Synthetic ---- do	$1,296	$659	$347	Taiwan $67; Japan $66; China $61.
Salt and brine	1,519	1,039	--	China 673; Macau 150; Papua New Guinea 126.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	106,854	585,296	--	China 583,470.
Sulfate, manufactured	1,339	5,366	--	Vietnam 3,839; Indonesia 800; China 315.

See footnotes at end of table.

Table 3.—Hong Kong: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	5,915	4,413	--	Indonesia 1,108; Japan 1,021; Taiwan 861.
Worked	5,414	11,366	94	China 10,443.
Dolomite, chiefly refractory-grade	72	36	--	All to China.
Gravel and crushed rock	2,205	4,842	1,288	Taiwan 1,300; China 958.
Limestone other than dimension	806	19,284	--	Republic of Korea 17,250; China 2,034.
Quartz and quartzite	387	1,491	--	Taiwan 1,218.
Sand other than metal-bearing	4,110	1,833	--	China 1,402; Macau 213.
Sulfur:				
Elemental:				
Crude including native and byproduct	12	31	--	Macau 18; Philippines 13.
Colloidal, precipitated, sublimed	36	25	--	China 17; Philippines 7.
Sulfuric acid	66	228	--	China 208.
Talc, steatite, soapstone, pyrophyllite	13,881	13,471	--	Indonesia 8,080; Taiwan 4,151.
Other:				
Crude	1,081	1,015	36	Taiwan 797; Nigeria 150.
Slag and dross, not metal-bearing	1,230	5,957	--	Macau 5,000; Taiwan 351; Indonesia 200.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	24	18	--	All to China.
Carbon black	2,892	8,586	--	China 7,883; Indonesia 686.
Coke and semicoke	436	337	--	Nigeria 237; Indonesia 100.
Petroleum refinery products thousand 42-gallon barrels	2,058	1,854	(2)	Macau 1,111; China 501.

[1]Table prepared by Audrey D. Wilkes.
[2]Less than 1/2 unit.

Table 4.—Hong Kong: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	23,630	18,773	--	All from China.
Oxides and hydroxides	351	32,818	--	Australia 31,022; China 1,750.
Metal including alloys:				
Scrap	1,107	888	15	Macau 460; China 166; Taiwan 94.
Unwrought	35,565	76,071	4,957	Canada 20,042; Australia 13,390; Republic of South Africa 11,902.
Arsenic: Oxides and acids	242	99	--	All from China.
Chromium: Oxides and hydroxides	479	513	33	West Germany 277; China 125.
Cobalt: Oxides and hydroxides	22	19	--	United Kingdom 12; China 7.
Copper:				
Oxides and hydroxides	236	156	--	West Germany 113; Norway 36.
Sulfate	193	271	38	France 78; United Kingdom 60; China 55.
Metal including alloys:				
Scrap	7,394	9,148	3,568	Vietnam 3,581; China 1,000.
Unwrought	5,788	5,391	811	North Korea 1,098; Chile 800; Japan 522.
Gold:				
Waste and sweepings value, thousands	$366	$383	$5	Malaysia $378.
Metal including alloys, unwrought and partly wrought thousand troy ounces	5,319	5,229	110	Switzerland 2,294; United Kingdom 1,206; Australia 620.

See footnotes at end of table.

Table 4.—Hong Kong: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Iron and steel: Metal:				
Scrap	27,748	20,093	4,306	China 5,231; Japan 4,256; Taiwan 2,234.
Pig iron, cast iron, related materials	5,779	4,891	11	Republic of South Africa 1,955; Brazil 1,927.
Ferroalloys:				
Ferromanganese	6,326	1,848	--	Republic of South Africa 1,740.
Ferrosilicon	1,067	1,690	--	Philippines 1,026; Republic of South Africa 643.
Unspecified	1,547	1,670	72	Republic of South Africa 797; China 649.
Steel, primary forms	147,722	128,827	--	Spain 29,824; West Germany 25,345.
Semimanufactures thousand tons	1,943	2,300	4	Japan 834; Taiwan 279; China 150.
Lead:				
Oxides	155	143	1	China 60; West Germany 33.
Metal including alloys:				
Scrap	287	458	8	China 108; Kuwait 108; Singapore 82.
Unwrought	1,893	2,321	--	China 1,009; Taiwan 620.
Semimanufactures	218	244	1	Japan 82; Republic of South Africa 71; Belgium-Luxembourg 30.
Magnesium: Metal including alloys, all forms	--	44	10	Norway 28.
Manganese:				
Ore and concentrate, metallurgical-grade	135	243	--	All from China.
Oxides	1,977	885	--	China 612; Japan 214.
Mercury 76-pound flasks	446	2,834	--	China 2,821.
Nickel:				
Oxides and hydroxides	142	273	--	Canada 249.
Metal including alloys:				
Unwrought	4,494	3,812	6	Canada 1,312; Norway 1,246; Australia 603.
Semimanufactures	1,426	1,460	22	Norway 622; Canada 263; West Germany 138.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	39,411	43,964	8,424	United Kingdom 29,879; U.S.S.R. 2,589.
Silver:				
Waste and sweepings[2] value, thousands	$79	$112	--	Taiwan $97.
Metal including alloys, unwrought and partly wrought thousand troy ounces	1,729	1,390	48	Japan 548; Australia 281; United Kingdom 194.
Tin: Metal including alloys:				
Scrap	7	61	--	Singapore 23; China 20.
Unwrought	1,908	3,982	12	China 3,445; Japan 379.
Titanium: Oxides	6,633	7,492	871	Australia 1,273; United Kingdom 1,120; Japan 1,109.
Tungsten: Ore and concentrate	47	3,799	--	China 3,781.
Uranium and/or thorium: Oxides and other compounds	26	27	--	China 13; France 11.
Zinc:				
Oxides	929	699	9	China 394; West Germany 143; France 103.
Blue powder	184	84	11	West Germany 37; Norway 35.
Metal including alloys, unwrought	31,803	32,713	410	Australia 15,772; Canada 5,108; Belgium-Luxembourg 4,854.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	8,464	10,321	358	Japan 4,658; China 2,526; Indonesia 2,424.
Artificial:				
Corundum	6,788	10,777	31	China 10,183.
Silicon carbide	1,564	1,279	--	China 1,253.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$194	$28	$10	Belgium-Luxembourg $10.
Asbestos, crude	28	168	17	China 150.
Barite and witherite	378	227	--	China 101; Thailand 81.

See footnotes at end of table.

Table 4.—Hong Kong: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Boron materials: Oxides and acids	303	544	208	U.S.S.R. 234; China 101.
Cement thousand tons	2,876	3,460	--	Japan 2,047; Taiwan 883.
Clays, crude:				
Kaolin	42,503	38,827	2	China 38,185.
Unspecified	90,457	74,265	1,264	China 45,988; Macau 22,050.
Diamond:				
Gem, not set or strung thousand carats	1,336	1,434	66	India 591; Israel 359; Belgium-Luxembourg 236.
Industrial stones do	149	234	25	Netherlands 128; China 38; United Kingdom 33.
Diatomite and other infusorial earth	562	602	587	West Germany 8.
Feldspar, fluorspar, related materials	21,842	23,989	--	China 23,375; Macau 400.
Fertilizer materials:				
Crude, n.e.s	2,919	715	--	Netherlands 406; United Kingdom 125; China 111.
Manufactured:				
Ammonia	1,855	1,611	33	China 1,446.
Nitrogenous	124,127	66,515	5	China 50,583; United Arab Emirates 11,058.
Potassic	4,525	15,000	--	All from North Korea.
Unspecified and mixed	17,734	9,509	77	West Germany 6,192; Netherlands 1,984.
Graphite, natural	1,545	1,499	--	China 1,494.
Gypsum and plaster	89,364	103,210	--	Thailand 53,500; Japan 45,481.
Lime	49,062	42,715	--	China 42,545.
Magnesium compounds:				
Magnesite, crude including calcined	22,593	19,798	--	China 19,645.
Oxides and hydroxides	1,089	1,533	2	Japan 1,081; China 410.
Mica:				
Crude including splittings and waste	48	32	--	Mainly from United Kingdom.
Worked including agglomerated splittings	910	819	1	Belgium-Luxembourg 298; Japan 286; France 199.
Pigments, mineral:				
Natural, crude	496	461	--	China 458.
Iron oxides and hydroxides, processed	2,990	3,618	288	China 1,368; West Germany 1,031; Japan 665.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$60,271	$61,378	$9,942	Thailand $16,823; Burma $4,860; India $4,713.
Synthetic do	$2,814	$2,014	$285	West Germany $548; Switzerland $344; Republic of South Africa $331.
Salt and brine	92,620	106,599	5	China 96,554.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	148,902	594,463	560,978	East Germany 18,603.
Sulfate, manufactured	15,551	29,140	14	China 27,499.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	8,236	6,423	--	China 6,113.
Worked	21,340	27,439	19	Italy 21,557.
Dolomite, chiefly refractory-grade	253	356	--	All from United Kingdom.
Gravel and crushed rock thousand tons	2,565	3,401	1	China 3,062.
Limestone other than dimension	876,487	26,042	--	China 25,808.
Quartz and quartzite	1,797	2,924	--	China 2,794.
Sand other than metal-bearing thousand tons	1,152	1,108	(3)	China 1,100.
Sulfur:				
Elemental:				
Crude including native and by-product	644	530	8	West Germany 450.
Colloidal, precipitated, sublimed	308	58	17	West Germany 23; Netherlands 18.
Sulfuric acid	4,827	5,858	168	China 5,139; Japan 333.
Talc, steatite, soapstone, pyrophyllite	15,258	15,972	394	China 14,793; Republic of Korea 270.
Other:				
Crude	3,606	3,043	374	China 2,185; Republic of South Africa 270.
Slag and dross, not metal-bearing	683	649	--	China 457; Thailand 126.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	182	108	20	Spain 54; Trinidad and Tobago 18.

See footnotes at end of table.

Table 4.—Hong Kong: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Carbon black	3,429	9,181	93	Republic of Korea 6,428; Taiwan 1,716; China 688.
Coal: Anthracite and bituminous thousand tons	4,463	5,523	--	Republic of South Africa 2,242; Australia 1,986; China 710.
Coke and semicoke	2,925	4,288	--	China 2,573; Japan 1,120.
Petroleum refinery products thousand 42-gallon barrels	38,942	37,724	1,283	Singapore 24,822; China 7,549.

[1]Table prepared by Audrey D. Wilkes.
[2]Includes waste and sweepings of platinum-group metals.
[3]Less than 1/2 unit.

NORTH KOREA[11]

North Korea's external debt was in excess of $3 billion, and it was even in arrears on interest payments to creditor nations, especially Japan.[12] In September 1984, the Government promulgated a joint venture law inviting foreign participation to help vitalize the country's economy. In 1985, the Government promulgated the regulations of the joint venture law, followed by the income tax law and its regulations and finally the foreigner's income tax law and its regulations. The first was a Japanese joint venture for a general merchandise department store, and the second, a French venture for the construction of a hotel. However, North Korea remained very much a closed society to the outside world. Lacking tourism, both ventures were experiencing financial difficulties.

The next joint venture was with Korean business executives living in Japan to rehabilitate a gold mine at Unsan, 100 kilometers north of Pyongyang. Production was expected to begin in 1989 with an initial annual output of 2,000 kilograms of gold. The gold was to be used to help retire North Korea's debt to Japan. In the meantime, the Government offered to pay its Japanese creditors with fish instead of cash.

Under the second 7-year plan (1978-84), the country's output target for coal was to reach 70 to 80 million tons; cement, 10 to 13 million tons; steel, 7.4 to 8 million tons; chemical fertilizers, 5 million tons; and nonferrous metals, 1 million tons. The Central Statistical Board claimed that the targets for the production of cement, coal, and chemical fertilizers were attained and that the output of steel was three times that of 1977. However, Japanese and Western analysts agreed that the output targets were not met.

After a 2-year adjustment period (1985-86), the Government unveiled its third 7-year plan (1987-93) with even more ambitious targets. The country's industry output by 1993 was to increase by 90% and that for agriculture, by 40%. The final-year target for coal was 120 million tons; cement, 22 million tons; steel, 10 million tons; nonferrous metals, 1.7 million tons; and electricity, 100 billion kilowatt hours.

The country's largest mining product is anthracite, which is its only indigenous energy source aside from hydropower. North Korea imports crude oil from China and the U.S.S.R. Government officials attended the Sixth Offshore South East Asia Conference and Exhibition in Singapore in early 1986. This signaled North Korea's intention for oil exploration activities. The maximum prospects for finding oil lay in the offshore area east of Bohai, waters North Korea calls the Western Sea.

The largest metallurgical sector is steel with a current annual output capacity of 7.5 million tons. The nonferrous sector is dominated by lead-zinc mines at Komtok and Tanchon. The flagships of the industrial minerals sector is cement and one of the world's largest magnesite mines at Yongyang.

In 1986, about 150,000 members of the Korean Peoples' Army were detailed for industrial construction. The soldiers were to assist in projects, which included mines, salt evaporite ponds, powerplants, and chemical plants.

Table 5.—North Korea: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Principal destinations, 1985
METALS			
Aluminum: Metal including alloys, all forms	328	8,715	Japan 7,688; Hong Kong 675.
Copper: Metal including alloys, all forms	2,947	[2]1,107	Hong Kong 1,098.
Gold: Metal including alloys, unwrought and partly wrought, troy ounces	347,179	133,715	All to West Germany.
Iron and steel: Metal:			
Scrap	NA	2,520	All to Japan.
Pig iron, cast iron, related materials	68	74,127	Japan 69,002; Egypt 4,600.
Ferroalloys	748	3,765	U.S.S.R. 3,408; Japan 357.
Steel, primary forms	37,491	115,864	Japan 69,995; Thailand 30,354; United Kingdom 8,797.
Semimanufactures:			
Bars, rods, angles, shapes, sections	4,175	10,645	Egypt 10,033; Indonesia 421.
Universals, plates, sheets	48,348	33,127	Hong Kong 13,239; Japan 12,634; Cuba 5,002.
Hoop and strip	20	--	
Rails and accessories	--	16	All to Indonesia.
Wire	100	--	
Tubes, pipes, fittings	168	515	All to Indonesia.
Castings and forgings, rough	26	2	Mainly to Indonesia.
Lead: Metal including alloys, all forms	15,837	8,769	Japan 7,868; Singapore 455.
Nickel: Metal including alloys, all forms	160	--	
Silver: Metal including alloys, unwrought and partly wrought, value, thousands	$12,789	$96	All to Japan.
Tungsten: Ore and concentrate	4	--	
Zinc:			
Ore and concentrate	19,150	11,843	All to Japan.
Oxides and hydroxides	--	10	Do.
Metal including alloys, all forms	18,674	33,631	Japan 28,718; Hong Kong 2,685.
Other:			
Ashes and residues	3,343	[3]	All to Japan.
Base metals including alloys, all forms	--	29	All to Singapore.
INDUSTRIAL MINERALS			
Barite and witherite	220	--	
Cement	NA	263,000	All to U.S.S.R.
Clays, crude	NA	10,579	All to Japan.
Feldspar	957	--	
Fertilizer materials: Manufactured:			
Nitrogenous	6,461	3,096	All to Japan.
Potassic	--	15,000	All to Hong Kong.
Unspecified	1,005	13,937	All to Thailand.
Graphite, natural	11,026	5,798	Japan 5,410; Poland 388.
Kyanite and related materials	99	--	
Magnesium compounds	145,303	[4]158,564	Poland 99,806; West Germany 41,563; France 10,622.
Precious and semiprecious stones other than diamond, value, thousands	$1	$11	All to Italy.
Stone, sand and gravel:			
Dimension stone	9,665	6,662	Japan 6,612.
Gravel and crushed rock	488	299	All to Japan.
Quartz and quartzite	1,678	[5]	Do.
Sulfur: Elemental, all forms, kilograms	100	--	
Talc, steatite, soapstone, pyrophyllite	27,171	20,430	Japan 13,263; Poland 7,167.
Other: Crude, value, thousands	NA	$45	All to Japan.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	190	100	Indonesia 70; Thailand 30.
Coal: Anthracite and bituminous	93,470	259,138	All to Japan.
Petroleum refinery products: Residual fuel oil, 42-gallon barrels	122,131	94,938	All to Hong Kong.

[p]Preliminary. NA Not available.

[1]Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by North Korea, this table should not be taken as a complete presentation of this country's mineral trade. These data have been compiled from United Nations information and data published by the trading partner countries. The United States did not report any imports of mineral commodities from North Korea in 1985.

[2]Excludes unreported quantity valued at $942,000 exported to Japan.

[3]Unreported quantity valued at $397,000.

[4]Excludes unreported quantity valued at $6,770,000 exported to Japan.

[5]Unreported quantity valued at $148,000.

Table 6.—North Korea: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Principal sources, 1985
METALS			
Alkali and alkaline-earth metals	(2)	31	All from West Germany.
Aluminum:			
Oxides and hydroxides	24,101	28,208	Japan 23,100; Singapore 5,108.
Metal including alloys:			
Unwrought	631	6,456	Australia 6,454.
Semimanufactures	1,105	1,035	Japan 715; Australia 227.
Beryllium: Metal including alloys, all forms	2	--	
Chromium:			
Ore and concentrate	NA	16,000	All from U.S.S.R.
Oxides and hydroxides	75	66	All from Japan.
Cobalt: Oxides and hydroxides	1	2	Do.
Columbium and tantalum: Metal including alloys, all forms, tantalum kilograms	260	4,000	Do.
Copper:			
Ore and concentrate	8,448	4,443	All from Philippines.
Metal including alloys:			
Scrap	18	18	All from Canada.
Unwrought	1,000	1,198	Hong Kong 858; Japan 340.
Semimanufactures	285	226	Japan 192; Australia 25.
Gold:			
Contained in copper ores and concentrates value, thousands	$638	$239	All from Philippines.
Metal including alloys, unwrought and partly wrought do	$2	--	
Iron and steel: Metal:			
Ferroalloys:			
Ferromanganese	13,310	7,506	Japan 7,006; Hong Kong 500.
Unspecified	2,487	681	Japan 310; Singapore 301.
Steel, primary forms	9,858	--	
Semimanufactures:			
Bars, rods, angles, shapes, sections	2,340	513	Japan 511.
Universals, plates, sheets	6,430	5,071	Japan 3,847; West Germany 963.
Hoop and strip	370	117	Japan 103; France 13.
Rails and accessories	2,578	6,758	All from Japan.
Wire	1,065	2,070	Hong Kong 980; Japan 622; Singapore 450.
Tubes, pipes, fittings	7,524	8,326	Japan 7,159; West Germany 713; Italy 388.
Castings and forgings, rough	16	--	
Lead:			
Ore and concentrate	1,363	2,169	All from Japan.
Metal including alloys:			
Unwrought	3,048	3,047	Do.
Semimanufactures	205	--	
Magnesium: Metal including alloys, all forms	441	193	Japan 168; Singapore 20.
Manganese:			
Ore and concentrate	NA	21,320	U.S.S.R. 21,000.
Oxides	365	54	All from Japan.
Mercury 76-pound flasks	290	290	All from Singapore.
Molybdenum: Metal including alloys, all forms kilograms	304	1,000	All from Japan.
Nickel: Metal including alloys:			
Unwrought	517	660	All from Hong Kong.
Semimanufactures	217	261	Cuba 257.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$265	$169	Japan $137; West Germany $32.
Silver: Metal including alloys, unwrought and partly wrought do	$6	--	
Tin:			
Ore and concentrate	--	3	All from Singapore.
Oxides	19	--	
Metal including alloys:			
Unwrought	143	194	Singapore 172.
Semimanufactures	2	3	All from Austria.
Titanium:			
Oxides	39	56	Japan 47.
Metal including alloys, all forms	4	--	
Tungsten:			
Ore and concentrate	170	149	All from Singapore.
Metal including alloys, all forms	31	4	All from Japan.
Zinc: Metal including alloys, all forms	1,197	50	Do.
Other:			
Ores and concentrates	--	103	All from Australia.
Oxides and hydroxides	--	132	All from West Germany.
Ashes and residues	1,590	--	
Base metals including alloys, all forms	109	264	Hong Kong 140; Singapore 66; Japan 58.

See footnotes at end of table.

Table 6.—North Korea: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Principal sources, 1985
INDUSTRIAL MINERALS			
Abrasives, n.e.s.:			
Artificial: Corundum	96	--	
Dust and powder of precious and semiprecious stones excluding diamond value, thousands	--	$9	Japan $5; West Germany $4.
Grinding and polishing wheels and stones	[4]28	([2])	All from Switzerland.
Asbestos, crude	27	--	
Boron materials: Oxides and acids	54	66	Hong Kong 63.
Cement	--	1	All from Italy.
Diamond:			
Gem, not set or strung -- value, thousands	$4	--	
Industrial stones do	$5	$134	Japan $75; Belgium-Luxembourg $59.
Fertilizer materials: Manufactured:			
Potassic	--	99,100	All from U.S.S.R.
Unspecified	9	--	
Graphite, natural	6	--	
Gypsum and plaster	--	23,312	All from Canada.
Mica, all forms	20	--	
Phosphates, crude	--	21,250	All from Egypt.
Pigments, mineral: Iron oxides and hydroxides, processed	11	([2])	All from Singapore.
Potassium salts, crude	--	11,000	All from Jordan.
Precious and semiprecious stones other than diamond: Synthetic value, thousands	$30	$34	Mainly from Switzerland.
Salt and brine	147	329	Japan 299; Italy 30.
Sodium compounds, n.e.s	20	613	All from Japan.
Stone, sand and gravel: Dimension stone, all types	481	1,355	Italy 1,310.
Sulfur:			
Elemental, all forms	62	23,200	Poland 23,000; Singapore 200.
Sulfuric acid	26	2	All from Japan.
Talc, steatite, soapstone, pyrophyllite	10	--	
Other: Crude	17	4	All from Japan.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	5	14	Do.
Coal, all grades	36,487	103,416	Do.
Coke and semicoke	66,033	38,660	Do.
Peat including briquets and litter	--	221	Do.
Petroleum refinery products:			
Liquefied petroleum gas 42-gallon barrels	[5]81	--	
Gasoline do	97,478	3,485	Mainly from Singapore.
Mineral jelly and wax do	4,022	3,566	Hong Kong 1,897; Singapore 866; Japan 685.
Kerosene and jet fuel do	352	496	All from Japan.
Distillate fuel oil do	NA	455	All from Ivory Coast.
Lubricants do	2,820	2,001	Singapore 931; Japan 692; Hong Kong 301.
Residual fuel oil do	50	33	All from Japan.
Bitumen and other residues do	12	--	
Petroleum coke do	8,244	8,283	All from Japan.

[p]Preliminary. NA Not available.

[1]Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by North Korea, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the trading partner countries. The United States did not report any exports of mineral commodities to North Korea during 1985.

[2]Less than 1/2 unit.

[3]Excludes unreported quantity valued at $3,000 imported from Japan.

[4]Excludes unreported quantity valued at $24,000 imported from Switzerland.

[5]Excludes unreported quantity valued at $2,400 imported from Japan.

LAOS[13]

The landlocked nation of 3.9 million people had known deposits of coal, gypsum, iron ore, potash, salt, and tin. Although the country was poorly explored, the limited exploration indicated a strong potential for commercial occurrences of most common metals and some industrial minerals. Production was limited to common construction minerals, gypsum, salt, and tin. Cement was ground from imported clinker, and a small amount of steel and its products were produced from imported ingot and semimanufactures. Only tin and gypsum were produced in important amounts, and both were exported to earn foreign exchange.

Electricity from the Nam Ngum hydroelectric powerplant was by far the country's leading foreign exchange earner. The power was exported to Thailand from the 150,000-kilowatt plant and earned over $25 million[14] in 1985. Negotiations were under way during 1986 between officials of the two countries for an increase in the price paid for the power. Laos was asking for a 40% increase to $0.04376 per kilowatt hour.

The best potential for future mineral development probably lay in the large shallow magnetite deposits in Xieng Khouang Province. These deposits have been described as massive, having 70% to 72% iron and very low sulfur content. Another possibility was the development of potash deposits that underlie the Lao-Thai border near the Lao capital. In both cases, the high capital cost of development and the lack of infrastructure were strong deterrents to exploitation under present economic conditions. Regarding the land transportation system, 20% of the administrative districts had no roads suitable for motor vehicles and as many had no all-weather roads.

COMMODITY REVIEW

Metals.—*Steel.*—Equipment was manufactured in Ho Chi Minh City, Vietnam, for a 600-ton-per-year steel-rolling mill and installed in Vientiane. The Ministry of Industries and Forestry operated a sheet metal plant that was to produce 1.7 million sheets of steel roofing in 1986. The plant had apparently used imported hot-rolled coil as its raw material in the past. Presumably, the new steel-rolling equipment will produce raw sheet from imported ingot. Laos was not known to have primary steel production facilities in 1986.

Tin.—The Lao press reported an extensive appraisal by the Government of tin resources of the Pathen Basin in Khammouan Province conducted with Soviet aid during 1980-85.[15] Three new deposits were mentioned in addition to the active mining areas of Phon Tieu, Bo Neng, and Nong Seun. The new deposits (unlocated) were called Tham Seua, Ban Pha Lem, and Ban Sao. Lao's reserves were placed at 30 million tons of ore containing 71,000 tons of tin. Stated in a different way later in the text, the Pathen Basin possessed 67,000 tons of tin at a grade cutoff of 0.20% tin. The survey also included gold resources in the area, but the results were not reported.

The fiscal year[16] 1985 tin ore production of 209,000 tons, published during 1986, agreed reasonably well with the previously published figure of 540 tons of tin-in-concentrate.

Industrial Minerals.—*Construction Materials.*—A cooperative agreement was signed in August between Laos and Vietnam to expand the Dong Hen gypsum mine in Savannakhet Province. The 100,000-ton-per-year mine was to be increased in stages to a capacity of 200,000 tons per year in 1990. The mining company has worked with Rural Area Electrification Project officials to bring a 22-kilovolt, 82-kilometer power transmission line into Dong Hen to furnish a reliable power supply for the mine. The Lao press has also referred to the mine as the Outhoumphone gypsum mine.

The Tong Pong cement plant apparently operated smoothly during its first full year of operation after startup problems in 1985. Cement clinker was imported from Vietnam's Bim Son cement plant in Thanh Hoa Province.

Vietnam has also supplied six new tile-making machines to the Lao-Vietnamese Friendship tile plant. Each of the machines can produce 260 clay roofing tiles per 8-hour shift.

Table 7.—Laos: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Destinations, 1985	
			United States	Other (principal)
Copper: Metal including alloys, scrap	NA	5	--	All to Netherlands.
Diamond: Gem, not set or strung value, thousands	$71	--		
Iron and steel: Metal:				
Scrap	69	--		
Steel, primary forms	5,514	--		
Semimanufactures	--	158	158	
Zinc: Metal including alloys, scrap	--	6	--	All to Netherlands.

[p]Preliminary. NA Not available.

[1]Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by Laos, this table should not be taken as a complete presentation of this country's mineral trade. These data have been compiled from United Nations information and data published by the trading partner countries.

Table 8.—Laos: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Principal sources, 1985
METALS			
Aluminum: Metal including alloys, all forms	--	1	All from Thailand.
Copper: Metal including alloys, all forms	99	20	Mainly from Japan.
Iron and steel: Metal: Semimanufactures:			
Bars, rods, angles, shapes, sections	214	2,094	Thailand 1,956; Japan 138.
Universals, plates, sheets	2,892	4,807	Japan 4,795.
Wire	5	56	All from Thailand.
Tubes, pipes, fittings	377	201	Thailand 129; Japan 51; Netherlands 20.
Castings and forgings, rough	--	1	All from Japan.
Lead: Metal including alloys, all forms	358	2	All from Thailand.
Silicon, elemental kilograms	--	130	Do.
Tin: Metal including alloys, all forms	2	1	Do.
Uranium and thorium: Ore and concentrate kilograms	36	--	
Zinc: Metal including alloys, all forms	193	189	All from Thailand.
INDUSTRIAL MINERALS			
Abrasives, n.e.s.: Grinding and polishing wheels and stones	1	1	Do.
Cement	6,768	6,176	Do.
Chalk	3	(2)	Do.
Clays, crude	1	6	Do.
Fertilizer materials: Manufactured:			
Ammonia	(2)	2	Do.
Nitrogenous	NA	3,950	Jordan 3,150; U.S.S.R. 700.
Unspecified and mixed	--	150	All from Japan.
Gypsum and plaster	250	--	
Precious and semiprecious stones other than diamond: Natural kilograms	--	62	All from Thailand.
Salt and brine	95	158	Do.
Sodium compounds, n.e.s.: Sulfate, natural and manufactured	232	386	Do.
Stone, sand and gravel:			
Dimension stone: Worked	(2)	30	Do.
Limestone other than dimension	3	68	Do.
Sulfur: Sulfuric acid	1	1	Do.
MINERAL FUELS AND RELATED MATERIALS			
Carbon black	4	(2)	Do.
Petroleum refinery products:			
Liquefied petroleum gas 42-gallon barrels	--	2	Mainly from Thailand.
Gasoline do	55,828	84,269	All from Singapore.
Kerosene and jet fuel do	32,599	62,132	Do.
Distillate fuel oil do	84,686	122,568	Do.
Lubricants do	4,956	8,717	Singapore 8,680; Japan 19.
Bitumen and other residues do	--	12,490	Singapore 12,375.
Unspecified do	12	--	

[p]Preliminary. NA Not available.

[1]Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by Laos, this table should not be taken as a complete presentation of this country's mineral trade. These data have been compiled from United Nations information and data published by the trading partner countries. The United States did not report any exports of mineral commodities to Laos during 1985.

[2]Less than 1/2 unit.

MONGOLIA[17]

In 1986, Mongolia began implementing its eighth 5-year plan (1986-90). According to the guideline of economic and social development, formulated by the Central Committee, the Mongolian economy was projected to grow at between 26% and 29%, which is slower than growth during the previous 5-year plan. The guideline continued to emphasize expansion of the material and technical base of the Mongolian economy. A capital investment of $7.4 billion[18] was planned for the material and technical base including agricultural and industrial sectors. Of this planned capital investment, $2.5 billion was allocated to the industrial sector.

In the industrial sector, higher priority was given to further development of the fuel and power industry, continuing expansion and modernization of production capacity in the mining industry, and expansion of the metal works and repair industry. In the fuel and power industry, coal production was projected to increase 40% mainly by expanding capacity of small-size coal mines. In the mining industry, the capacity of the Erdenet copper-molybdenum complex and other mining operations of the Mongol-

sovtsvetmet, a Mongolian-Soviet joint venture enterprise, would be increased with capital investments of $536 million. Prospecting for coal, construction materials, nonferrous minerals, and phosphorites would be extended. In the metal work and repair industry, the production capacity was projected to increase between 22% and 26% with a broader range of metal products and a higher volume of repair works.[19]

In 1986, the Mongolian economy, as measured by the change in national income, grew 5.6%, and the country's labor force reportedly had increased 3.2% with a 5.8% rise in labor productivity. Industrial production for the first 9 months of 1986 rose by 8.6% as a result of a substantial increase in labor productivity. The most significant increase among output of the industrial sector was that of cement due to additional cement production from the Hotol area in north-central Mongolia.[20]

As a result of the joint geological expedition between Mongolia and the U.S.S.R. during the seventh 5-year plan (1980-85), the metallogenic maps for copper, fluorspar, gold, molybdenum, and other minerals in Mongolia reportedly were completed in 1985. During the current 5-year plan, the joint expedition was expected to conduct research on the Mongolian geological formations and structures as well as compilations of general metallogenic maps for other important minerals.

COMMODITY REVIEW

Metals.—Copper ore production at the Erdenet copper-molybdenum mine in northern Mongolia reportedly reached 17 million tons in 1986. Expansion of the Erdenet Mine to produce 20 million tons of ore per year by 1990 had been planned. During the current 5-year plan, Mongolia planned to export copper, fluorspar concentrates, molybdenum, tin, and tungsten to Czechoslovakia, the German Democratic Republic, Hungary, Poland, Romania, and the U.S.S.R. In 1986, exports of copper and molybdenum concentrate alone accounted for about 40% of Mongolian exports.

Two joint venture companies, called Mongolbulgarmetal in cooperation with Bulgaria and Mongolczechoslovakmetal in cooperation with Czechoslovakia, were established for mining tin in Mongolia. Development of a tungsten mine at Tsagaandavaa in central Mongolia in cooperation with Hungary was expected to be completed by 1988. The U.S.S.R. reportedly was assisting Mongolia to increase mining of precious metals in the Darhan area.

Industrial Minerals.—Production of fluorspar was estimated to remain at the same level as that of 1985. However, production of cement increased substantially owing to additional output produced from the newly commissioned cement plant in the Hotol area. In December, a construction agreement between Mongolia and the U.S.S.R. for expanding cement production capacity at Hotol to 600,000 tons per year from 250,000 tons per year was signed.[21]

A large phosphorite deposit reportedly was discovered near Lake Hovsgol in the Burenhaan Valley. Under a long-term Mongolian-Soviet program of economic, scientific, and technical cooperation, the outline on the prospects for developing the phosphorite deposit had been drawn, and the area along the western bank of the lake was declared by the Government as a state protection zone. Development of a phosphorite mine and dressing complex for production of 12 million tons of phosphorite per year was planned.

Table 9.—Mongolia: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Principal destinations, 1985
Aluminum: Metal including alloys, scrap	--	185	All to Yugoslavia.
Barite and witherite	--	10	Do.
Cement[2]	3,100	--	
Clays, crude	5	--	
Stone, sand and gravel: Sand excluding metal-bearing	--	20	All to United Kingdom.
Tin: Ore and concentrate	--	10	All to Yugoslavia.

[p]Preliminary.

[1]Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by Mongolia, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the trading partner countries. The United States did not report any imports of mineral commodities from Mongolia in 1985.

[2]Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

Table 10.—Mongolia: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Principal sources, 1985
Aluminum: Metal including alloys, all forms	17	--	
Cement[2]	87,000	107,000	NA.
Coal: Anthracite and bituminous[2]	11,500	100	NA.
Fertilizer materials: Manufactured:			
Nitrogenous[2]	11,700	13,800	NA.
Phosphatic (P_2O_5 content)[2]	18,400	22,100	NA.
Potassic	--	99,100	All from U.S.S.R.
Iron and steel: Metal: Semimanufactures:[2]			
Tubes, pipes, fittings	11,700	11,300	NA.
Unspecified	45,000	63,900	NA.
Petroleum refinery products[2] thousand 42-gallon barrels	5,352	5,898	NA.
Precious and semiprecious stones other than diamond, natural value, thousands	$11	--	
Salt and brine	--	2,729	All from U.S.S.R.
Sodium compounds, n.e.s.: Carbonate, natural and manufactured[2]	900	900	NA.
Stone: Dimension, all forms	60	53	All from Italy.
Sulfur: Sulfuric acid[2]	1,700	1,100	NA.

[p]Preliminary. NA Not available.

[1]Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by Mongolia, this table should not be taken as a complete presentation of this country's mineral trade. Unless otherwise specified, these data have been compiled from United Nations information and data published by the trading partner countries. The United States did not report any exports of mineral commodities to Mongolia during 1985.

[2]Statistical Yearbook of Members of the Council for Mutual Economic Assistance, Moscow, U.S.S.R.

NEPAL[22]

The contribution of the mineral industry toward the total economy was insignificant. Potential for greatly increased mineral production was considerable, however, as very little of the upland regions has been explored for mineral occurrences by any but the most primitive methods.

The Department of Mines and Geology (DMG) reported that basic geologic mapping on a scale of 1:63,000 had been completed for about two-thirds of the country up to the 3,048-meter elevation. Once the current mapping is completed, the DMG planned to extend the mapping from 3,048 meters up to the snowline elevation of 3,700 to 4,900 meters, probably by fiscal year 1989.[23]

The DMG, after years of finding traces of placer gold in western Nepal, was encouraged by the discovery of in-situ gold. Size and grade of the deposit was still under investigation.

Development of Nepal's first modern metal mining undertaking, a lead-zinc mine, continued at a slow pace near Ganesh Himal, north of Kathmandu. About 130 kilometers of new gravel road was nearly complete to the mining site. Some mining equipment had been flown in by helicopter or packed in on muleback. The concentration plant is to process 400 tons of ore per day when completed. Since the project was begun several years ago, the world price of lead and zinc has fallen, bringing into question the project's potential for profitability.

Elsewhere, a second lead-zinc deposit had been identified near Chainpur in western Nepal. Grade was reported at 11% zinc and 1.5% lead. Access to the area was limited because of rugged terrain, as in the Ganesh Himal deposit, but a planned hydroelectric plant near Arun would require road construction that would simplify access if the deposit was judged economically minable.

The country's first modern steel pipe and fabrication plant, owned by Himali Pipeco (Pvt.) Ltd., began operating in August at Simra in Bara District. The plant had an installed capacity of 18,000 tons of black and galvanized iron pipe, cold-rolled sections, angles, and other forms. The licensed capacity was restricted to 4,000 tons per year or about 80% of current demand for its type of products. All raw materials were to be imported. Long-term plans by the Government of Nepal called for the building of a small electric arc furnace and bar works.

The official inauguration of the Hetauda cement factory was held in December amid a celebration that included the King and Queen and the top members of the Government. The 260,000-ton-per-year (750-ton-per-day) plant was the largest industrial project to date in Nepal and was being operated by Nepalese technicians and workers. The plant output met about one-half of the

country's cement needs and reduced the considerable foreign exchange burden incurred by the previous cement imports. The plant employed 1,100 persons directly, and another 7,000 people would derive their livelihoods from the plant indirectly. The plant construction was completed late in 1985, and testing and shakedown trials were conducted during 1986.[24]

According to advertisements in the Nepalese press, Triveni Cement (Nepal) Pvt. Ltd. began selling cement in the Chitwan area from its miniplant at Bhoratpur.

Plans for a large new cement plant about 140 kilometers east of Kathmandu moved forward when Japan agreed to extend a low-interest loan to Nepal to help finance the project. The plant would have a capacity of 800 tons per day and reportedly be in Jaljali. It was not clear if this was to be a separate project from the Udayapur cement project, which has been under discussion with India for the last 10 years.

A consortium of Shell Exploration BV (Netherlands), Triton Nepal Inc. (United States), and Crusader Ltd. (Australia) signed the first production-sharing contract for oil exploration in Nepal in April 1986. The agreement covered the 4,969-square-kilometer Block No. 10 in the Biratnagar area of extreme southeastern Nepal. Seismic surveys were begun as soon as the weather permitted. In addition to the expatriate technical personnel, the surveying work employed 1,000 contract laborers. Very little was known of the geology of the area, and this was believed to be the first detailed oil survey work done in Nepal. The Shell Exploration consortium was obliged to perform some drilling but only after the survey work was completed in February 1988, according to current plans.

A separate agreement was signed with Petro-Canada International Assistance Corp. to update seismic studies conducted by the International Bank for Reconstruction and Development in 1984. The principal zones to be studied would be those along Nepal's southern border not covered by the Shell Exploration consortium agreement. The goal was to delineate further possible oil-bearing structures in order to interest new prospectors. In light of Nepal's present petroleum consumption of 5,000 to 7,000 barrels per day, it would not take a very large discovery to make Nepal self-sufficient.[25]

SINGAPORE[26]

The only mining operation in Singapore was granite quarrying for use as aggregate. In 1986, there were 18 quarrying establishments for granite, employing 710 persons. There were six operations using imported clinker to produce cement. This sector employed 423 persons. In the metals sector, there were 14 operations to produce iron and steel manufactures from imported metal. Nonferrous manufactures were likewise produced from imported metal. The output of ferrous products was valued at $170.5 million; nonferrous products, $83.3 million; granite, $58 million; and cement, $48 million.[27]

Singapore's largest mineral-related activity was oil bunkering and refining. During the year, imports of crude oil were valued at $3.8 billion, and for petroleum products, $1.3 billion. Exports from oil bunkers were valued at $1.0 billion, while that for petroleum products was $4.4 billion.

Singapore's largest industrial sector was electronic products with an output valued at $5.1 billion, followed by petroleum refining, $2.8 billion; food, $1.0 billion; and fabricated metal products, $0.9 billion.

Table 11.—Singapore: Exports and reexports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	150	37	--	All to China.
Oxides and hydroxides	1,277	17,665	--	China 10,722; North Korea 5,108.
Metal including alloys:				
Scrap	9,963	10,707	--	Japan 9,007; Pakistan 565; Malaysia 491.
Unwrought and semimanufactures	14,251	15,681	--	Malaysia 8,846; Hong Kong 1,428; Australia 950.
Chromium:				
Ore and concentrate	7	18	--	All to Malaysia.
Oxides and hydroxides	41	29	--	Malaysia 19; Philippines 10.
Cobalt: Oxides and hydroxides	24	4	--	Malaysia 3.
Columbium and tantalum:				
Ore and concentrate, tantalite	20	3	--	All to Netherlands.
Metal including alloys, all forms, tantalum kilograms	7	30	NA	NA.
Copper:				
Ore and concentrate	--	250	--	All to Malaysia.
Matte and speiss including cement copper	4	16	--	Malaysia 6.
Metal including alloys:				
Scrap	17,882	21,726	23	India 10,548; Japan 6,585; Belgium-Luxembourg 1,190.
Unwrought and semimanufactures	7,770	9,537	--	Malaysia 8,319.
Gold:				
Waste and sweepings kilograms	878	759	5	Japan 509; Hong Kong 214.
Metal including alloys, unwrought and partly wrought troy ounces	r99,474	63,691	161	Malaysia 37,713; Japan 15,014.
Iron and steel:				
Ore and concentrate excluding roasted pyrite	--	21	--	All to Malaysia.
Metal:				
Scrap	108,948	166,636	--	Thailand 70,186; Japan 59,104; Malaysia 32,105.
Pig iron, cast iron, related materials	r6,937	3,599	--	Malaysia 3,348.
Ferroalloys	r607	1,126	--	Malaysia 710; North Korea 301.
Steel, primary forms	r4,878	8,627	--	Malaysia 8,432.
Semimanufactures	307,658	353,001	50,802	Malaysia 146,738; Thailand 22,503; Brunei 21,244.
Lead:				
Ore and concentrate	10	21	--	India 18.
Oxides	1,806	2,147	--	Japan 1,836; Malaysia 299.
Metal including alloys:				
Scrap	3,597	7,057	--	Malaysia 4,910; Taiwan 1,338; India 535.
Unwrought and semimanufactures	r1,792	857	--	Malaysia 671; India 65.
Magnesium: Metal including alloys, all forms	r429	44	--	North Korea 20; Malaysia 7.
Manganese:				
Ore and concentrate, battery-grade	25,492	21,954	--	India 4,850; Republic of Korea 3,423; Pakistan 2,439.
Oxides	1,996	1,239	--	Mainly to Malaysia.
Mercury 76-pound flasks	194	290	--	Mainly to North Korea.
Nickel:				
Matte and speiss	846	1	--	All to Malaysia.
Metal including alloys:				
Scrap	160	1,072	7	India 874; Japan 113; United Kingdom 60.
Unwrought and semimanufactures	4,798	2,480	1	India 2,224.
Platinum-group metals: Metals including alloys, unwrought and partly wrought troy ounces	1,286	8,456	--	West Germany 5,916; Japan 2,025.
Silver:				
Ore and concentrate[2]	40	(3)	NA	NA.
Waste and sweepings[2] kilograms	4,679	18,452	16,702	France 643; Japan 566.
Metal including alloys, unwrought and partly wrought troy ounces	121,144	59,543	4,051	Malaysia 21,895; United Kingdom 20,898; France 7,877.

See footnotes at end of table.

Table 11.—Singapore: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS —Continued				
Tin:				
Ore and concentrate	11,253	9,728	435	Spain 3,794; U.S.S.R. 2,020; Republic of Korea 1,928.
Ash and residue containing tin	781	1,012	--	Netherlands 463; Taiwan 396; Japan 129.
Metal including alloys:				
Scrap	465	137	--	Taiwan 98; Japan 30.
Unwrought and semimanufactures	18,004	20,458	5,970	Japan 5,877; U.S.S.R. 3,741.
Titanium: Oxides	1,793	821	--	Malaysia 707; India 48.
Tungsten:				
Ore and concentrate	1,695	1,438	146	India 470; West Germany 384; North Korea 149.
Metal including alloys, all forms	105	68	53	Taiwan 2.
Zinc:				
Oxides	1,595	1,446	--	Japan 623; China 525; Cambodia 100.
Metal including alloys:				
Scrap	758	662	--	Japan 312; India 217; Taiwan 74.
Unwrought and semimanufactures	5,051	3,363	--	Malaysia 2,706.
Other:				
Ores and concentrates	176	245	--	Japan 183; Malaysia 40; India 20.
Ashes and residues	35,433	31,362	--	Malaysia 12,656; Brunei 11,440; Philippines 5,000.
Base metals including alloys, all forms	78	83	--	Japan 50; North Korea 29.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	39	110	--	Malaysia 78.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$19	$48	--	All to United Kingdom.
Grinding and polishing wheels and stones	327	370	--	Malaysia 286.
Asbestos, crude	6,715	7,117	--	Malaysia 6,243; Cambodia 540.
Barite and witherite	11,303	32,431	309	Papua New Guinea 8,903; Malaysia 7,741; United Arab Emirates 5,100.
Boron materials:				
Crude natural borates	939	18,986	--	All to Malaysia.
Oxides and acids	125	135	--	Malaysia 113.
Cement	557,699	307,287	--	Malaysia 279,409; Brunei 9,397.
Chalk	2,162	2,359	--	Brunei 1,471; Malaysia 665.
Clays, crude	33,342	22,668	--	Malaysia 11,164; Australia 2,030; Bangladesh 1,861.
Diamond:				
Gem, not set or strung value, thousands	$18,106	$15,151	$792	Malaysia $7,380; Switzerland $3,241; Belgium-Luxembourg $2,145.
Industrial stones ---do---	$1,256	$444	$24	United Arab Emirates $221; Sweden $110; Belgium-Luxembourg $73.
Diatomite and other infusorial earth	366	202	--	Thailand 134; Malaysia 41.
Feldspar	4,938	4,314	--	Malaysia 4,298.
Fertilizer materials:				
Crude, n.e.s	r40,389	40,069	--	Malaysia 40,052.
Manufactured:				
Ammonia	388	560	--	Malaysia 452; Thailand 60.
Nitrogenous	150,556	86,814	--	Tanzania 20,714; Sri Lanka 17,600; Thailand 16,000.
Phosphatic	r3,527	2,129	--	Malaysia 1,180; Philippines 650.
Potassic	168,828	174,015	--	Sri Lanka 92,336; Malaysia 47,782; India 9,265.
Unspecified and mixed	r79,482	57,964	--	Malaysia 55,545.
Graphite, natural	146	91	--	Malaysia 59.
Gypsum and plaster	r2,316	2,666	--	Malaysia 2,378.
Lime	3,912	5,081	--	Malaysia 3,437; Brunei 885.
Magnesium compounds: Magnesite, crude including magnesia	602	245	--	NA.
Mica, all forms	415	226	--	Netherlands 74; Malaysia 60; Papua New Guinea 35.
Nitrates, crude	5	74	--	Malaysia 59.
Phosphates, crude	5,095	3,499	--	Malaysia 2,061; Taiwan 1,008.
Pigments, mineral: Iron oxides and hydroxides, processed	755	1,289	--	Malaysia 1,006; Bangladesh 213.
Potassium salts, crude	12	330	--	Malaysia 325.

See footnotes at end of table.

Table 11.—Singapore: Exports and reexports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Precious and semiprecious stones other than diamond:				
Natural ____ value, thousands__	$11,844	$5,337	$415	Thailand $2,136; Switzerland $1,260.
Synthetic ____do____	$235	$209	--	Thailand $159.
Pyrite, unroasted____	--	4	NA	NA.
Salt and brine____	20,523	13,817	--	Malaysia 11,388; Brunei 1,991.
Sodium compounds, n.e.s.:				
Carbonate, manufactured____	3,626	4,688	--	Malaysia 3,488; Thailand 700.
Sulfate, manufactured[4] ____	4,922	6,120	--	Malaysia 5,371; Thailand 300.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked ____	336	217	--	Malaysia 166; Brunei 47.
Worked ____	4,685	6,046	--	Malaysia 4,326; Brunei 508.
Dolomite, chiefly refractory-grade __	293	22	--	Brunei 21.
Gravel and crushed rock ____	r15,937	717	--	Malaysia 660.
Limestone other than dimension ___	781	234	--	Malaysia 162; Brunei 71.
Sand other than metal-bearing ____	1,024	601	--	Malaysia 352; Brunei 196.
Sulfur:				
Elemental:				
Crude including native and by-product____	24,269	7,338	--	Thailand 4,019; Malaysia 3,304.
Colloidal, precipitated, sublimed_	14,743	7,051	--	Malaysia 5,174; Vietnam 1,000.
Sulfuric acid____	1,359	2,581	--	Malaysia 1,755; Sri Lanka 670.
Talc, steatite, soapstone, pyrophyllite __	536	832	--	Malaysia 761; Philippines 54.
Other:				
Crude____	15,341	17,220	--	Malaysia 14,090; Thailand 1,532.
Slag and dross, not metal-bearing ___	12,962	11,150	--	Japan 5,445; Brunei 3,824.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural ____	20,888	20,135	--	Burma 5,689; Malaysia 3,626; Sri Lanka 3,058.
Carbon black ____	1,295	3,274	112	India 1,050; Malaysia 458; Cambodia 366.
Coal, all grades including briquets ____	r353	478	--	Philippines 168; Australia 153.
Coke and semicoke____	r10,146	14,731	--	Malaysia 12,141; Bangladesh 2,015.
Petroleum:				
Crude_ thousand 42-gallon barrels__	2,415	622	--	Mainly to Japan.
Partly refined____do____	6	829	--	Japan 805.
Refinery products ____do____	180,441	193,971	17,496	Japan 42,163; Malaysia 32,414; Thailand 15,061.

rRevised. NA Not available.
[1]Table prepared by Audrey D. Wilkes.
[2]May include other precious metals.
[3]Less than 1/2 unit.
[4]Includes hydrogen sulfate and pyrosulfate.

Table 12.—Singapore: Imports of selected mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	153	410	--	China 200; Australia 122.
Oxides and hydroxides	9,339	48,702	184	Australia 41,961; Japan 5,100.
Metal including alloys:				
Scrap	796	771	--	Malaysia 591; Brunei 113.
Unwrought and semimanufactures	44,067	46,896	1,180	Australia 8,729; Japan 7,095; Malaysia 4,693.
Beryllium: Metal including alloys, all forms	2	--		
Chromium:				
Ore and concentrate	24	19	NA	NA.
Oxides and hydroxides	331	220	132	West Germany 42; Japan 23.
Cobalt: Oxides and hydroxides	3	5	--	Belgium-Luxembourg 2; Canada 2.
Columbium and tantalum:				
Ore and concentrate, tantalum	112	68	--	Malaysia 45; Thailand 20.
Metal including alloys, all forms, tantalum, kilograms	861	25	--	NA.
Copper:				
Matte and speiss including cement copper	51	12	--	Hong Kong 11.
Metal including alloys:				
Scrap	3,436	3,587	911	Malaysia 2,019; Brunei 175.
Unwrought	877	2,249	94	Chile 1,976.
Semimanufactures	41,269	34,161	609	Japan 16,296; Republic of Korea 8,425; Taiwan 4,126.
Gold:				
Waste and sweepings value, thousands	$318	$1,442	--	Malaysia $511; Taiwan $267; Philippines $237.
Metal including alloys, unwrought and partly wrought, troy ounces	142,524	105,937	6,784	Japan 57,003; West Germany 24,049.
Iron and steel:				
Iron ore and concentrate excluding roasted pyrite	7,441	12,581	--	Malaysia 12,237.
Metal:				
Scrap	78,646	65,402	553	Brazil 27,500; Mozambique 10,993; Australia 10,728.
Pig iron, cast iron, related materials	9,003	46,614	226	Australia 21,046; Mozambique 17,186; Malaysia 3,609.
Ferroalloys:				
Ferromanganese	1,101	6,186	--	Mozambique 3,927; Australia 2,027.
Ferrosilicon	1,319	1,940	38	Mozambique 1,457; Japan 190.
Unspecified	8,334	1,542	--	Mozambique 1,107.
Steel, primary forms	114,657	163,018	2	Australia 41,237; Spain 34,777; Netherlands 20,744.
Semimanufactures thousand tons	1,581	1,349	12	Japan 808; United Kingdom 134.
Lead:				
Ore and concentrate	3	20	--	All from Morocco.
Oxides	440	274	4	Australia 135; West Germany 47; China 20.
Metal including alloys:				
Scrap	426	104	NA	NA.
Unwrought	6,349	5,457	--	Japan 2,890; Australia 1,888.
Semimanufactures	1,292	1,322	13	Taiwan 332; Japan 273; Australia 221.
Magnesium: Metal including alloys, all forms	176	85	72	NA.
Manganese:				
Ore and concentrate	35,095	35,923	129	Mexico 5,702; unspecified Africa 29,505.
Oxides	2,361	2,440	--	Japan 1,870; Ireland 198.
Mercury, 76-pound flasks	411	735	349	West Germany 146; Algeria 145.
Nickel: Metal including alloys:				
Scrap	182	170	--	Malaysia 141.
Unwrought	917	2,638	--	New Caledonia 2,201; Norway 313.
Semimanufactures	284	774	285	Canada 168; United Kingdom 84.
Platinum-group metals: Metals including alloys, unwrought and partly wrought, troy ounces	1,800	34,240	--	Japan 24,595; West Germany 8,488.
Silver:				
Ore and concentrate	20	--		
Waste and sweepings[2] value, thousands	$258	$341	$4	Hong Kong $202; West Germany $63.

See footnotes at end of table.

Table 12.—Singapore: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS —Continued				
Silver —Continued				
Metal including alloys, unwrought and partly wrought thousand troy ounces	892	1,282	57	Australia 557; West Germany 286; Japan 231.
Tin:				
Ore and concentrate	6,504	8,315	--	Thailand 5,342; Burma 1,852.
Ash and residue containing tin	9,261	8,481	--	Malaysia 8,445.
Metal including alloys:				
Scrap	436	337	--	Malaysia 223; Thailand 105.
Unwrought and semimanufactures	3,199	1,371	17	Malaysia 470; Thailand 321.
Titanium: Oxides	9,236	6,854	698	Japan 2,722; United Kingdom 1,168; Australia 751.
Tungsten:				
Ore and concentrate	2,429	1,699	--	Burma 1,209; Hong Kong 298.
Metal including alloys, all forms	83	28	17	China 11.
Uranium and/or thorium:				
Oxides and other compounds value, thousands	$332	$111	$20	France $81.
Metals including alloys, all forms kilograms	--	58	NA	NA.
Zinc:				
Oxides	472	968	13	China 562; Belgium-Luxembourg 90; Malaysia 65.
Metal including alloys:				
Scrap	211	415	--	Malaysia 376.
Unwrought and semimanufactures	13,713	10,980	196	Australia 5,776; United Kingdom 821; Norway 518.
Other:				
Ores and concentrates	396	352	--	Australia 125; Burma 101; Japan 52.
Ashes and residues	151,550	114,576	--	Japan 110,259; Philippines 4,005.
Base metals including alloys, all forms	113	85	49	United Kingdom 19.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	625	437	244	Japan 72.
Artificial: Corundum	24	37	--	Japan 18.
Dust and powder of precious and semiprecious stones including diamond value, thousands	$115	$51	$31	Norway $12.
Grinding and polishing wheels and stones	2,541	1,704	45	Japan 564; China 275; Italy 237.
Asbestos, crude	9,951	6,078	--	Canada 3,684; Greece 786; Italy 486.
Barite and witherite	11,428	18,116	32	Thailand 9,058; Malaysia 7,990.
Boron materials:				
Crude natural borates	935	1,281	1,281	
Oxides and acids	557	573	67	Italy 360; China 52; Turkey 40.
Cement thousand tons	3,711	2,701	5	Japan 1,062; Taiwan 779; Republic of Korea 524.
Chalk	3,564	3,865	--	United Kingdom 1,381; Thailand 846; Taiwan 578.
Clays, crude	72,346	50,186	29,923	United Kingdom 5,572; Malaysia 4,905.
Diamond:				
Gem, not set or strung value, thousands	$45,113	$30,521	$2,750	Israel $7,699; India $7,280; Belgium-Luxembourg $7,160.
Industrial stones do.	$1,886	$1,522	$1,082	Belgium-Luxembourg $162; Ireland $90.
Diatomite and other infusorial earth	1,146	866	826	NA.
Feldspar	7,812	5,992	--	India 3,792; Thailand 970; China 827.
Fertilizer materials:				
Crude, n.e.s	2,867	3,703	--	Thailand 3,549.
Manufactured:				
Ammonia	611	772	--	Malaysia 377; Belgium-Luxembourg 191; Netherlands 85.
Nitrogenous	171,744	79,860	22	Qatar 32,500; Canada 20,722; United Arab Emirates 20,457.
Phosphatic	2,150	3,163	16	Israel 2,000; Iraq 658; China 200.
Potassic	172,688	189,366	--	Canada 108,756; Israel 35,312; U.S.S.R. 15,000.
Unspecified and mixed	50,080	62,036	135	West Germany 56,975; Belgium-Luxembourg 2,068.
Graphite, natural	1,125	427	--	Republic of Korea 136; Japan 76; West Germany 70.

See footnotes at end of table.

Table 12.—Singapore: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Gypsum and plaster	141,613	97,845	232	Australia 60,973; Thailand 34,081.
Lime	21,041	11,208	--	Malaysia 9,283; China 1,010.
Magnesium compounds: Magnesite, crude including magnesia	567	791	13	Japan 275; China 200; Norway 126.
Mica:				
Crude including splittings and waste	2,027	1,220	--	India 620; China 520.
Worked including agglomerated splittings	36	54	(3)	Maldives 30; Japan 13.
Nitrates, crude	7	--	--	
Phosphates, crude	9,528	5,219	--	Christmas Island 3,500; India 750; Malaysia 396.
Pigments, mineral: Iron oxides and hydroxides, processed	3,011	2,948	159	West Germany 1,164; Japan 771; China 338.
Precious and semiprecious stones other than diamond:				
Natural value, thousands	$9,269	$4,287	$231	Switzerland $887; Hong Kong $732; Thailand $512.
Synthetic do.	$238	$688	$300	U.S.S.R. $276; West Germany $70.
Salt and brine	43,161	36,102	350	Australia 13,178; Thailand 12,348; Israel 3,384.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	11,260	5,288	423	Kenya 4,000; Poland 567.
Sulfate, manufactured[4]	6,102	7,652	5	Taiwan 3,512; India 2,100; China 1,450.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	3,545	2,275	271	Italy 415; China 311; Mozambique 201.
Worked	60,600	56,675	353	Italy 38,354; Portugal 4,815.
Dolomite, chiefly refractory-grade	4,211	1,192	--	Thailand 1,026.
Gravel and crushed rock	798,738	779,438	--	Malaysia 777,339.
Limestone other than dimension	68,935	80,543	--	Malaysia 52,906; Japan 27,553.
Quartz and quartzite	1,193	126	--	France 53; United Kingdom 44.
Sand other than metal-bearing thousand tons	1,462	1,203	3	Malaysia 1,197.
Sulfur:				
Elemental:				
Crude including native and by-product	84	34	20	NA.
Colloidal, precipitated, sublimed	281	127	--	Poland 72.
Sulfuric acid	135	263	17	Malaysia 142; West Germany 69.
Talc, steatite, soapstone, pyrophyllite	8,382	3,986	122	China 2,446; Republic of Korea 589; Norway 308.
Other:				
Crude	36,372	39,753	--	West Germany 37,558; Malaysia 1,287.
Slag and dross, not metal-bearing	11,865	6,726	--	Japan 6,703.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2,710	2,643	388	Japan 1,472; Taiwan 235.
Carbon black	6,408	4,523	270	Malaysia 2,770; Taiwan 408; West Germany 360.
Coal, all grades including briquets	1,945	2,148	1,751	United Kingdom 194; Australia 105.
Coke and semicoke	17,120	31,727	--	Japan 16,084; Australia 14,925.
Peat including briquets and litter	702	166	--	West Germany 82.
Petroleum:				
Crude thousand 42-gallon barrels	238,420	218,831	--	China 60,160; Iran 42,536; Malaysia 32,919.
Partly refined do.	1,545	2,378	--	Malaysia 2,185.
Refinery products do.	57,116	71,278	10,059	Saudi Arabia 14,013; Kuwait 11,152; Malaysia 7,249.

NA Not available.
[1]Table prepared by Audrey D. Wilkes.
[2]May include other precious metals.
[3]Less than 1/2 unit.
[4]Includes hydrogen sulfate and pyrosulfate.

SRI LANKA[28]

The mining industry of Sri Lanka was not a major factor in the economy during 1985-86. It contributed about 2% of the GDP and made a real growth of 1.5% in 1985, the most recent complete data available. The major minerals and mineral-based commodities produced in 1986 were cement, clays, gem stones, graphite, petroleum products from imported crude oil, and titanium minerals.

The economic situation deteriorated during the year for several basic reasons. Unemployment was 16% in 1986, up from 10% in 1985. The debt-service proportion hit 30% of export earnings. Falling prices from primary export commodities, tea in particular, contributed to the poor economic results in 1986. Not the least of the Government's problems was the guerrilla war being waged by Tamil separatist groups in the northeastern part of the country. This has caused a large increase in expenditures for military equipment, a simultaneous drop in tourist spending, and a growing erosion in investor confidence, both domestic and foreign.

In a bid to alleviate horrendous losses made by many publicly owned corporations, the Government was drawing up measures to privatize several of these companies. Some of the mineral industry companies could be among those chosen. The privatization issue was politically sensitive and could take a long time to implement. The nitrogen fertilizer plant remained closed during the year and therefore didn't even contribute to interest payments on its large debt and losses.

The Government was studying a proposal from Australia's Pancontinental Mining Ltd. for exclusive rights to exploit mineral resources in collaboration with the State Mining and Mineral Development Corp. The proposal included copper, gold, lead, silver, and zinc occurrences. A committee evaluating the proposal has recommended further discussion regarding exploration and development rights, partnership agreements, environmental impact, and royalties. It also requested that Pancontinental Mining should first identify specific areas to be explored.[29]

A new gem topaz deposit was discovered and announced during the year. The rich topaz find was in central Sri Lanka at Polwatta near Matale. The State Gem Corp. assumed control of the deposit and announced plans for a topaz-marketing center to supply lapidaries with rough topaz.

The Government of Sri Lanka was considering processing the ilmenite produced at Pulmoddai into synthetic rutile. The International Bank for Reconstruction and Development has recommended the project and was offering a $16 million loan toward plant construction.[30] It was doubtful, however, that the plant would progress beyond the planning stage before the political stability can be assured along the northeastern coast.

Ceylon Petroleum Corp., the Government-owned oil company, let a turnkey contract to Nippon Kokan K.K. to install a single-point mooring buoy to receive oil imports. The $19 million job included laying a 91-centimeter pipeline 9.2 kilometers to shore at the port of Colombo. The buoy is to accommodate 180,000-deadweight-ton tankers. Onshore, Mitsui & Co. Ltd. and Mitsui Construction Ltd. are to build four storage tanks with a combined capacity of 1,157,000 barrels.

There was no seismic surveying or drilling activity for petroleum during the year. Only Phoenix Offshore Petroleum Corp. of Canada retained a concession in the offshore drilling areas.

Despite the revisions to the oil exploration rules in 1985, there has been no renewed interest by the international oil companies in exploring in Sri Lankan waters. Given the problems caused by the separatist strife and the depressed state of the international petroleum industry, there was small prospect of any revival in 1987.

VIETNAM[31]

Vietnam produced small amounts of several minerals during 1986. Those most significant to the overall economy were, in order of importance, coal, phosphate rock, cement, several clays, tin, chromite, and natural gas. By far, the most important new development was the commercial production of crude oil from the offshore Bach Ho Oilfield, which began in June.

The Vietnamese economy continued to suffer from problems at almost every turn. At the Seventh National Assembly, party

leaders detailed difficulties, which amounted to the breakdown of the economic structure and the management system. Mentioned prominently at various points in the assembly were the widespread problems of corruption, bribery, and speculation.

The Government launched an ambitious reform program at the end of 1985 to stimulate the economy by doing away with state subsidies and giving businesses a freer hand in management. In general, the program quickly became bogged down owing to bureaucratic difficulties, plunging the country into an unprecedented crisis. Inflation soared to a reported annual rate of 700%, as a result of higher prices and wages and domestic currency devaluation. A lack of competent managers able to cope with the changes cut production, which was already running at about 50% of capacity, still further.[32] This exacerbated shortages of already scarce consumer goods and increased black market operations. The result was a failure to meet most of its planned economic and production targets for 1986. Food production was 8% below target; exports, 30%; and industrial production, 40% below plan.

The mining sector was not immune to problems. Apparently, the only commodities fulfilling the state plan were coal, phosphate fertilizer, steel, and tin. The coal target was met only because of a drop in quality of the delivered coal.

Despite vigorous efforts to improve the performance of the infrastructure, electricity remained chronically in short supply. Several large new generating units were installed in 1985 and 1986, but their completion has failed to alleviate the shortages. It was hinted in National Assembly speeches that distribution lines may not have been constructed to utilize the new capacity, or were at least very far behind the construction schedule.

The largest hydroelectric powerplant under construction in South and East Asia was on the Da River west of Hanoi. The 128-meter-high dam is to form a 9-billion-cubic-meter reservoir and was to have a 1.92-million-kilowatt powerplant. The project was entirely under the assistance and funding of the Soviet Union. The first turbine was scheduled for installation at yearend 1987, but Vietnamese press reports indicated that the progress of construction was slowing down and the site for the No. 1 generator may not be ready when delivery is made.

COMMODITY REVIEW

Industrial Minerals.—*Cement.*—According to the Council of Ministers, the installed capacity was 3.4 million tons per year. However, the yearly plan was put at 1.61 million tons, not even 50% of capacity. A directive by the Council early in the year directed all coal production to go to cement plants and to maintain electric power output. Only if there was a surplus was it to be used for other purposes. All other supplies were to be furnished on a priority basis as well. An inadequacy of power transmission lines was also mentioned in regard to Hoang Thach and Bim Son cement plants and for the Trang Kinh limestone quarry. Transportation of finished cement was also going slowly, and work was under way to speed its movement.

The state allowed export of some cement every year to obtain foreign exchange. For the first time, the Ministry of Building was allowed to export the cement in the first quarter of the year, to earn currency to buy imported equipment and spare parts.

Several of the small cement miniplants, operated by town or district officials, reported improved output and smoother operations during the year. The improvements, reportedly, were due to increased authority given to the plant managers.

The large central Government-operated cement plants continued to suffer from long-term inadequacies, apparently derived from poor planning and management. For example, the 1.2-million-cubic-meter-per-year quarry to supply limestone to the Bim Son cement plant was still under construction 4 years after the first kiln began operating. A road leading from the quarry to the plant had not been built by yearend 1986. Overall, the cement production apparently increased over that of 1985 but missed the 1986 plan by 100,000 tons.

Fertilizer Materials.—Phosphate fertilizer production was one of the few mineral-based commodities to reach the planned production level in 1986. The Lam Thao single superphosphate plant in Vinh Phu Province ran satisfactorily during the year but not at its new 320,000-ton-per-year rated capacity. Several plants produced a roasted apatite product that was effective on perennial crops. This product was apparently included in the fertilizer statistics published by the Government. Since no grade is ever given for this product, the phosphorus pen-

toxide content of the fertilizer production cannot be determined.

It was reported that the heat exchanger in the ammonia synthesizer at the Ha Bac nitrogen fertilizer plant cracked in July 1985, shutting down the entire system. The sophisticated welding and X-ray inspection equipment necessary to properly inspect and repair the high-pressure equipment was not available in the country. Rather than incur the cost of importing the new equipment or contracting for the repairs to a foreign company, the heat exchanger from the An Hoa nitrogenous fertilizer plant was cannibalized, shipped to Ha Bac, and installed on a new foundation. The plant resumed production in October 1985 at a rate of 74 tons of ammonia per day. It was believed that the An Hoa referred to was an abandoned fertilizer plant in former South Vietnam, probably knocked out of service in the early 1970's and never repaired.[33]

Mineral Fuels.—*Coal and Peat.*—A 300,000-ton-per-year underground coal mine was opened in May at Tan Lap. The mine was designed and built by the Ministry of Mines and Coal and was situated south of Khe Hum adjacent to the Ha Tu open pit mine in Quang Ninh Province. The mine employed 300 miners underground and 375 workers on the surface. The reserves were placed at 10 million tons.[34]

Despite the fact that production goals were generally met during 1986, coal shortages caused electric power to be in short supply throughout the northern section of the country. In midyear, total power output was only 270 megawatts. The new 440-megawatt Pha Lai coal-fired powerplant was handling 80% of the load, although installed capacity countrywide was believed to total 1,800 megawatts.

The main causes of the extremely low productivity in the coal sector was a lack of efficiency and low morale among the miners, laborers, and management. One culprit was a recently introduced wage system, which was supposed to increase wages for the workers with higher productivity. According to the Hon Gai Coal Corp., the real purchasing power of the miners' salaries has fallen to only 35% of when the new wage system was first applied. Under the old system, a substantial part of the worker benefits consisted of food supplements of meat, fish, eggs, milk, and sugar. These supplements were eliminated as part of the new system.

Working conditions underground were at best described as unpleasant. Temperatures of 40° to 50° C limited work shifts to 4 hours. One article described the improvements since the French colonial period. Now "every 15 to 20 minutes, blasts of air are pumped in to stir up the air and clear away the dust."[35] Such conditions certainly contributed to the more publicized problems of poor maintenance, inadequate transportation facilities, and shortages of electric power, fuel, and spare parts.

Exploration for usable peat deposits was successful in Tay Ninh Province during 1985, and a small peat extraction enterprise has been set up in Ben Cau District. Reserves were reported at about 6 million tons at depths of from 0.3 to 3.0 meters. Firewood has become scarce and expensive in the area, and the peat is to be used as a fuel at plants for firing brick and tile, in sugar plant boilers, and for domestic needs. It is also to be used as an organic fertilizer in the intensive cultivation of peanuts, a major crop in Tay Ninh. A production goal of 20,000 tons per year has been set.

Geologic exploration teams also discovered peat deposits in the Central Highlands during 1985. Ten locations were discovered in the northern part of the Central Highlands. Five deposits in Dac Lac and Gia Lai-Cong Tum Provinces were evaluated as to reserves and quality. The recommendations to begin mining was submitted to Dac Lac Province authorities in April 1986. The first deposit to be mined was Cuoc Dang in Cu Ngar District. It was in a semiclosed marshy valley covering nearly 200 hectares. Reserves were estimated at 900,000 cubic meters and occurred with no overburden and an average thickness of 1 meter. Planned production was 60,000 to 70,000 cubic meters per year. The savings over shipping anthracite from the northeastern coalfields would be substantial.

Petroleum and Natural Gas.—The major mineral news of the year was the start of commercial crude oil production on June 26, 1986, at the Bach Ho offshore oilfield; production tests in late 1985 had been reported as commercial production. By yearend, production was about 1,000 barrels per day, but reports mentioned that the production platforms only operated in good weather. Five wells from two platforms were operating at yearend, a third platform was completed in November, and two more were under construction. Production was scheduled to increase to more than 5,000 barrels per day in 1987.

The Soviet Union, a partner in this oil venture, was supplying additional equip-

ment as fast as practical. Mobile rigs and exploration vessels operating out of Sakhalin ports are to be used off Vietnam during the long winter period in the Sea of Okhotsk when ice and weather conditions prevent their operating.

The highest priority was being placed on the construction of transport facilities for the oil. Piers for oil tankers were being rushed to completion. The platforms are to be connected by a network of oil pipelines to a floating storage unit (probably temporary) and to the proposed oil refinery southeast of Ho Chi Minh City. Negotiations were reportedly under way with Japanese firms for supply of the pipe. The refinery would have a 60,000-barrel-per-day capacity with provisions for doubling the output when production warranted the increase. Presently, all petroleum consumed is in the form of imported refined products.

The SRV Oil and Gas General Department reported that a new natural gas deposit had been discovered in Thai Binh Province at gas well No. 64. The well had an estimated capacity of 1.5 million cubic feet per day. Production at this level would increase current output by about 40%. The present flow of about 3.5 million cubic feet per day was dedicated to production of electric power in the Hanoi suburbs. If 64 wells were indeed needed to obtain such a modest flow, it would indicate a rather low rate of return on the effort expended in the onshore exploration work.

[1]By Gordon L. Kinney, physical scientist, Division of International Minerals.
[2]The Bangladesh fiscal year begins July 1 of the year stated.
[3]Petroleum Economist. V. 53, No. 11, Nov. 1986, p. 413.
[4]U.S. Embassy, Dhaka, Bangladesh. State Dep. Telegram Dhaka 02519, Dts. R 080810 Z, Apr. 1987, p. 1.
[5]By Gordon L. Kinney, physical scientist, Division of International Minerals.
[6]Expenditures supplied in U.S. dollars.
[7]U.S. Embassy, Bandar Seri Begawan. Annual Report on Brunei's Petroleum Industry. State Dep. Airgram 005, July 7, 1986, pp. 1-25.
[8]By Gordon L. Kinney, physical scientist, Division of International Minerals.
[9]By Travis Q. Lyday, physical scientist, Division of International Minerals.
[10]By E. Chin, physical scientist, Division of International Minerals.
[11]By E. Chin, physical scientist, Division of International Minerals.
[12]Where necessary, values have been converted from the Korean won (W) to U.S. dollars at the rate of W0.94=US$1.00 for 1986.
[13]By Gordon L. Kinney, physical scientist, Division of International Minerals.
[14]Receipts supplied in U.S. dollars.
[15]Vientiane PASASON in Lao. Jan. 9, 1986, p. 1.
[16]The Lao fiscal year begins July 1 of the year stated.
[17]By John C. Wu, economist, Division of International Minerals.
[18]Where necessary, values have been converted from Mongolian tugriks (Tug) at the rate of Tug3.3555=US$1.00.
[19]NOVOSTI MONGOLII (Ulaanbaatar). May 29, 1986, pp. 2-7.
[20]The British Broadcasting Corp. Summary of World Broadcasts Part 3. Far East Weekly Econ. Rep., FE/W 1412/A/19, Oct. 22, 1986, and FE/W 1424/A/20, Jan. 21, 1987.
[21]———. FE/W 1422/A/33, Jan. 7, 1987.
[22]By Gordon L. Kinney, physical scientist, Division of International Minerals.
[23]The Nepalese fiscal year runs from mid-July to mid-July.
[24]The Rising Nepal (Kathmandu). V. 21, No. 355, Dec. 12, 1986, p. 1.
[25]U.S. Embassy, Kathmandu, Nepal. State Dep. Telegram Kathmandu 03584, Dtd. T 131103 Z, May 1987.
[26]By E. Chin, physical scientist, Division of International Minerals.
[27]Where necessary, values have been converted from Singapore dollars (S$) to U.S. dollars at the rate of S$2.18=US$1.00 for 1986.
[28]By Gordon L. Kinney, physical scientist, Division of International Minerals.
[29]Mining Magazine (London). V. 155, No. 2, Aug. 1986, p. 77.
[30]Where necessary, values have been converted from Sri Lankan rupees (Rs) to U.S. dollars at the rate of Rs27.41=US$1.00 in 1985 and Rs28.52=US$1.00 in 1986.
[31]By Gordon L. Kinney, physical scientist, Division of International Minerals.
[32]Hong Kong AFP (in English). 0152 GMT, Jan. 1, 1987.
[33]Hanoi CONG NGHIEP HOA CHAT (in Vietnamese). Dec. 1985, p. 35.
[34]Hanoi NHAN DAN (in Vietnamese). May 3, 1986, p. 1.
[35]Ho Chi Minh City SAIGON GIAI PHONG (in Vietnamese). July 9, 1986, p. 2.

Table 13.—Vietnam: Apparent exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Principal destinations, 1985
Aluminum: Metal including alloys, all forms	374	94	All to Hong Kong.
Chromium: Ore and concentrate	6,277	1,664	All to Japan.
Coal: Anthracite and bituminous	204,387	198,800	Japan 153,462; Belgium-Luxembourg 25,293; France 12,237.
Copper: Metal including alloys, all forms	4,043	4,605	Hong Kong 3,981; Singapore 624.
Diamond: Industrial stones, value, thousands	--	$28	All to France.
Fertilizer materials: Manufactured, nitrogenous	16	--	
Iron and steel: Metal:			
Scrap	2,355	55,477	Japan 54,541; Hong Kong 936.
Semimanufactures	--	140	All to Indonesia.
Mica: Crude including splittings and waste	20	10	All to Japan.
Precious and semiprecious stones other than diamond: Natural, value, thousands	--	$14	All to France.

See footnotes at end of table.

Table 13.—Vietnam: Apparent exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Principal destinations, 1985
Salt and brine	3,524	1,674	Hong Kong 1,441; Singapore 233.
Stone, sand and gravel:			
Dimension stone, all forms	(2)	66	Italy 65.
Sand excluding metal-bearing	--	390	Japan 220; Hong Kong 170.
Tin: Metal including alloys, unwrought	--	13	All to Japan.

[p]Preliminary.

[1]Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by Vietnam, this table should not be taken as a complete presentation of this country's mineral trade. These data have been compiled from United Nations information and data published by the trading partner countries. The United States did not report any imports of mineral commodities from Vietnam during 1985.

[2]Unreported quantity valued at $2,000 exported to Singapore.

Table 14.—Vietnam: Apparent imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Principal sources, 1985
METALS			
Aluminum:			
Oxides and hydroxides	(2)	--	
Metal including alloys, all forms	1,048	321	Japan 319.
Chromium: Oxides and hydroxides	5	(3)	
Cobalt: Oxides and hydroxides	2	--	
Copper: Metal including alloys, semimanufactures	55	126	Sweden 55; Japan 34; Italy 33.
Gold: Metal including alloys, unwrought and partly wrought, troy ounces	31	--	
Iron and steel: Metal:			
Pig iron, cast iron, related materials	--	90	Italy 70; Sweden 20.
Ferroalloys	362	250	All from Japan.
Semimanufactures:			
Bars, rods, angles, shapes, sections	5,628	14,122	Japan 12,327; Sweden 654; Hong Kong 643.
Universals, plates, sheets	11,498	9,639	Japan 5,639; Poland 1,947; Singapore 1,612.
Rails and accessories	--	41	Mainly from Belgium-Luxembourg.
Hoop and strip	595	524	Japan 454; Singapore 40; Sweden 20.
Wire	1,408	1,515	Japan 1,246; Hong Kong 101; Singapore 101.
Tubes, pipes, fittings	461	356	Singapore 130; Japan 125; Sweden 97.
Lead:			
Oxides	103	7	All from Japan.
Metal including alloys, all forms	300	208	Mainly from Japan.
Magnesium: Metal including alloys, all forms	--	1	Mainly from France.
Manganese:			
Ore and concentrate	5	--	
Oxides	511	113	Japan 73; Hong Kong 40
Mercury, 76-pound flasks	40	290	All from Japan.
Molybdenum: Metal including alloys, all forms, kilograms	50	--	
Nickel: Metal including alloys, semimanufactures	15	5	Sweden 4.
Silver: Metal including alloys, unwrought and partly wrought, troy ounces	[4]7,726	(5)	
Titanium: Oxides	42	73	Japan 50; Hong Kong 17.
Tungsten: Metal including alloys, all forms, kilograms	364	--	
Zinc:			
Oxides	210	48	Singapore 43.
Metal including alloys:			
Unwrought	NA	190	Poland 100; Japan 90.
Semimanufactures	NA	1	All from Singapore.
Other:			
Ores and concentrates	--	25	Do.
Oxides and hydroxides	1	--	
Base metals including alloys, all forms	26	--	
INDUSTRIAL MINERALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc	1	--	
Artificial:			
Corundum	--	4	All from Italy.
Silicon carbide	--	4	Do.
Grinding and polishing wheels and stones	6	1	All from West Germany.
Asbestos, crude	--	5	All from Japan.
Cement	37,468	8,163	Japan 5,550; Singapore 1,850.
Diatomite and other infusorial earth, value, thousands	NA	$3	All from Japan.

See footnotes at end of table.

Table 14.—Vietnam: Apparent imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985[p]	Principal sources, 1985
INDUSTRIAL MINERALS —Continued			
Feldspar, fluorspar, related materials	80	--	
Fertilizer materials: Manufactured:			
Ammonia	115	72	Japan 67.
Nitrogenous	45,552	578,534	U.S.S.R. 537,700; Bulgaria 26,600.
Potassic	--	79,673	All from U.S.S.R.
Unspecified and mixed	28,675	1,531	Sweden 1,461.
Gypsum and plaster	2	--	
Magnesium compounds: Oxides and hydroxides	NA	20	All from Japan.
Mica: Worked including agglomerated splittings	([6])	--	
Pyrite, unroasted	NA	38,000	All from U.S.S.R.
Sodium compounds, n.e.s.:			
Carbonate, natural and manufactured	3,393	9,867	Japan 5,678; France 3,700.
Sulfate, natural and manufactured	1,608	3,839	All from Hong Kong.
Stone, sand and gravel: Dimension stone	11	480	All from Italy.
Sulfur:			
Elemental, all forms	9,515	13,058	Canada 9,048; Poland 3,000; Singapore 1,000.
Sulfuric acid	124	112	All from Japan.
Talc, steatite, soapstone, pyrophyllite	3	16	France 10; Singapore 6.
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	--	1,711	All from Singapore.
Carbon black	898	302	All from Japan.
Coal: Anthracite and bituminous	38,502	28,955	All from Australia.
Coke and semicoke	14,610	5,850	All from Japan.
Petroleum refinery products:			
Gasoline—42-gallon barrels	357	145	Singapore 85; Japan 60.
Mineral jelly and wax—do	7,893	3,502	Singapore 2,188; Japan 1,259.
Kerosene and jet fuel—do	2,480	81,321	Singapore 81,127.
Distillate fuel oil—do	323,309	1,612,143	All from Singapore.
Residual fuel oil—do	--	897,362	Do.
Lubricants—do	61,712	173,596	Italy 108,493; West Germany 36,729; Japan 18,329.
Bitumen and other residues—do	97,978	16,374	Singapore 16,362.
Bituminous mixtures—do	--	588	All from Singapore.

[p]Preliminary. NA Not available.

[1]Table prepared by Audrey D. Wilkes. Owing to a lack of official trade data published by Vietnam, this table should not be taken as a complete presentation of this country's mineral trade. These data have been compiled from United Nations information and data published by the trading partner countries. The United States did not report any exports of mineral commodities to Vietnam during 1985.

[2]Unreported quantity imported from France valued at $2,000.

[3]Unreported quantity imported from Japan valued at $1,000.

[4]Excludes unreported quantity imported from France valued at $38,000.

[5]Unreported quantity imported from Japan valued at $16,000.

[6]Less than 1/2 unit.

The Mineral Industry of Other Near East Countries

By Michael D. Fenton[1] and Charles L. Kimbell[2]

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AFGHANISTAN[3]

The modest mineral industry of Afghanistan continued to suffer adversely from internal disorders that were essentially the result of the continued presence of elements of the armed forces of the U.S.S.R. Despite press reports near yearend intimating that the Soviets might reduce troop strength in Afghanistan, there were no indications of any significant numeric reductions.

Indeed, there were clear demonstrations of heightened military actions along the Afghani-Pakistani border, including bombing raids on settlement sites for Afghanis within the territorial limits of Pakistan, actions hardly demonstrative of conditions indicative of Soviet withdrawal.

From the overall economic viewpoint, there was considerable evidence of a much closer integration of the Afghani economy with that of the Soviet Union and its partners within the Council for Mutual Economic Assistance (CMEA)—Bulgaria, Czechoslovakia, the German Democratic Republic, Hungary, Mongolia, Poland, and Romania. Reportedly, the U.S.S.R. and other CMEA countries accounted for 95% of the foreign aid directed to Afghanistan during the 5 years ending in March 1986, with the Soviet Union itself being the single largest source of assistance. Soviet-assisted projects produced 75% of the industrial output of public sector ventures during this same period.

During the 5-year period ending in March 1986, the Afghani Government claimed that there was an 11% increase in national income, which would indicate an annual growth rate at about 2.1% for the plan period. In reality, however, a uniform growth rate across this one-half decade seems unlikely, for there were some severe setbacks at times, with perhaps downturns at the outset. Thus, by the end of the period, an annual growth rate exceeding 2.1% may well have been achieved.

Over 170 Soviet-aided projects were reported either completed or under construction at the end of the 5-year period, including, perhaps most notably, the Ainak copper mine, beneficiation plant, and smelter (evidently completed), and a railline linking Kubul with the Soviet rail system (ap-

parently not yet finished). Mineral commodities constituted a significant component of planned payment for this Soviet assistance. Smelted copper from Ainak, natural gas from the Shibarghan area, nitrogen fertilizer produced using additional gas from this region, and cement from the Czech-built plant at Herat were among Afghanistan's exports and/or planned exports to the U.S.S.R. in partial repayment of debts incurred for Soviet assistance.

Soviet interest in the mineral deposits of Afghanistan was known to exist as far back as the early 1940's, and has continued right up to the present. Technical assistance in the development of coal and natural gas resources began in the 1960's; projects in other commodity areas increased rapidly following the massive Soviet military incursions. Examples of these projects, other than the Ainak copper operation, included the Hajigak iron ore deposit, which evidently was not yet complete at yearend 1986; exploitation of uranium deposits in the Lashkangah area; and exploration and investigations of deposits of a variety of other commodities such as asbestos, barite, bauxite, beryl, chromite, emeralds, fluorspar, gold, lead, lithium, mica, silver, sulfur, tantalum, and zinc.

The Ainak copper mine and beneficiation plant and the associated smelter at Kabul, although described as completed in late 1985, apparently did not go into operation, quite possibly because of insurgency problems. The production from the operation, which theoretically could range from 25,000 to 38,000 tons of smelter copper per year, was slated for export to the U.S.S.R., and the shipment of such a tonnage of copper would result in an increase in the value of total Soviet imports from Afghanistan, even if the Soviet trade statistics did not individually report copper shipments from that country. In actuality, however, total Soviet imports from Afghanistan in 1986 declined by almost 25% from the 1985 level rather than registering an increase such as would be expected if a major new product was included. Hence, it must be concluded that the copper smelter did not come on-stream in 1986, although the mine and beneficiation plant could have operated on a limited basis.

Afghanistan's energy requirements in 1986 presumably topped the 1985 estimated level of about 1 million tons of standard coal equivalent, as cement plants, the nitrogen fertilizer plant, and other industrial facilities increased usage of energy. A modest growth in energy use for transport also seemed likely, but there was insufficient data to estimate actual total energy needs. The single dominant component of Afghanistan's energy supply continued to be imported refined oil products, which accounted for almost half of the total energy supply in 1984. In that year, domestically produced natural gas accounted for about one-quarter of the total, domestically produced coal for about 17%, and hydropower for the remainder. Although total domestic energy production considerably exceeds demand, the country is not self-sufficient in energy because of the virtual absence of liquid fuels production, whereas this is the dominant fuel need, and because the bulk of domestic energy production is in the form of natural gas, for which the country has neither markets nor a distribution system of any significance. Thus, Afghanistan meets its limited needs for coal and hydropower, produces an exportable surplus of natural gas, and is almost wholly dependent on imports for its liquid fuels needs.

Table 1.—Other countries of the Near East: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Country and commodity	1982	1983	1984	1985[p]	1986[e]
AFGHANISTAN[2]					
Barite	[r]1,800	2,000	2,000	2,000	2,000
Cement, hydraulic[e]	87,000	[r]13,000	[r]112,000	77,000	100,000
Coal, bituminous	145,000	165,000	170,000	180,000	190,000
Copper:					
Mine output, Cu content[e]	--	--	--	10,000	20,000
Smelter[e]	--	--	--	--	10,000
Gas, natural:					
Gross[e] million cubic feet	95,000	100,000	106,000	111,000	116,000
Marketed do	85,744	90,016	95,879	[e]100,000	105,000
Gypsum[e]	[3]3,000	3,000	3,000	3,000	3,000
Natural gas liquids[e] thousand 42-gallon barrels	117	127	117	120	125
Nitrogen: N content of ammonia	8,000	8,000	[3]41,000	45,000	45,000
Salt, rock[e]	10,000	10,000	10,000	10,000	10,000

See footnotes at end of table.

Table 1.—Other countries of the Near East: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country and commodity	1982	1983	1984	1985[p]	1986[e]
BAHRAIN					
Aluminum metal: Primary, smelter	170,960	171,700	177,300	177,600	78,188
Gas, natural:					
Gross, million cubic feet	130,507	139,325	145,152	224,475	[3]256,230
Marketed, do.	91,373	96,321	130,000	177,755	[3]200,020
Natural gas liquids:					
Butane, thousand 42-gallon barrels	890	914	864	772	800
Propane, do.	986	996	1,010	976	1,000
Naphtha, do.	1,139	1,209	1,251	1,206	1,200
Petroleum:					
Crude, do.	16,067	15,164	15,289	15,301	15,484
Refinery products:					
Gasoline, do.	10,068	4,993	[e]6,100	6,892	9,000
Jet fuel, do.	8,341	9,984	[e]12,500	11,434	15,000
Kerosene, do.	2,676	1,096	[e]2,000	2,446	3,200
Distillate fuel oil, do.	19,515	16,848	[e]21,500	19,734	25,800
Residual fuel oil, do.	19,866	16,344	[e]17,000	15,378	20,200
Other, do.	9,975	10,881	[e]12,100	11,862	15,500
Total, do.	70,441	60,146	71,200	67,746	88,700
Sulfur, byproduct of petroleum, do.	34,060	49,275	[e]54,000	35,800	35,800
LEBANON[2]					
Cement, hydraulic, thousand tons	1,700	1,500	1,250	1,000	NA
Gypsum	[e]5,000	[e]5,000	5,000	3,000	NA
Iron and steel: Metal, semimanufactures, thousand tons	[e]150	[e]100	100	90	NA
Lime[e], do.	50	20	20	10	NA
Petroleum refinery products:[e]					
Gasoline, thousand 42-gallon barrels	2,400	2,300	935	3,200	2,566
Jet fuel, do.	400	300	107	NA	218
Kerosene, do.	50	50	50	600	129
Distillate fuel oil, do.	2,000	2,000	1,417	3,200	2,234
Residual fuel oil, do.	3,800	3,500	2,664	5,800	4,549
Liquefied petroleum gas, do.	200	175	NA	335	194
Other	150	125	NA	NA	153
Refinery fuel and losses, do.	500	400	NA	NA	735
Total, do.	9,500	8,850	5,173	13,135	10,778
Salt[e], thousand tons	10	5	5	5	NA
OMAN					
Cement, hydraulic	--	[e]2,200	477,000	648,501	600,000
Chromite, gross weight	--	[e]24,000	7,000	--	[3]3,800
Copper:					
Mine output, Cu content	--	11,300	16,200	17,200	[3]18,000
Smelter	--	7,600	21,300	18,800	[3]20,000
Refinery	--	3,800	15,100	14,300	[3]18,000
Gas, natural:					
Gross, million cubic feet	19,000	[r]52,000	98,000	114,000	NA
Marketed, do.	9,500	[r]23,500	44,300	51,400	NA
Natural gas liquids:[e]					
Butane and propane, thousand 42-gallon barrels	4,756	52,084	53,940	54,000	NA
Natural gasoline, do.	[r]730	[r]900	[r]1,500	1,500	NA
Petroleum:					
Crude, do.	122,598	145,000	150,000	181,000	[3]204,100
Refinery products:					
Gasoline, do.	--	2,550	2,975	NA	NA
Jet fuel, do.	--	880	1,200		
Kerosene, do.	--	78	78		
Distillate fuel oil, do.	--	2,312	2,611		
Residual fuel oil, do.	--	1,199	1,265		
Other, do.	--	200	234		
Total, do.	--	7,219	8,363	NA	NA
Sand and gravel, thousand tons	1,343	3,410	6,420	[e]6,642	[3]7,514
Stone:					
Marble, do.	50	33	37	[e]37	[3]44
Other, do.	6,200	[r]4,572	4,224	[e]4,000	[3]2,875
Sulfur, pyrites	--	[e]11,000	31,000	31,000	[3]31,000

See footnotes at end of table.

Table 1.—Other countries of the Near East: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country and commodity	1982	1983	1984	1985[p]	1986[e]
QATAR[2]					
Cement, hydraulic thousand tons	229	375	326	332	[3]321
Gas, natural:					
Gross million cubic feet	212,100	194,000	225,300	r e223,000	245,000
Marketed do	178,500	184,800	209,400	211,540	232,700
Iron and steel: Metal, semimanufactures thousand tons	495	469	488	510	[3]493,120
Natural gas liquids thousand 42-gallon barrels	r10,950	r9,125	10,220	10,950	12,000
Nitrogen: N content of ammonia	434,016	r480,800	518,000	524,800	[3]593,120
Petroleum:					
Crude thousand 42-gallon barrels	120,289	r107,675	138,400	109,865	[3]121,545
Refinery products:					
Gasoline do	1,022	1,097	1,700	2,169	[3]2,130
Jet fuel do	e504	e488	e640	723	[3]710
Kerosene do	r31	r e31	r e30	27	30
Distillate fuel oil do	1,095	1,387	2,100	3,070	[3]3,100
Residual fuel oil do	1,432	e1,465	e1,500	4,071	[3]4,200
Other do	73	73	72	558	[3]696
Total do	r4,157	r4,541	r6,042	10,618	10,866
Stone: Limestone thousand tons	2,185	e1,600	1,500	1,100	[3]900
Sulfur	12,000	19,000	33,264	36,500	40,000
SYRIA					
Asphalt, natural thousand tons	71	54	NA	NA	NA
Cement, hydraulic do	2,520	3,626	4,279	4,356	4,400
Gas, natural:[e]					
Gross million cubic feet	52,000	16,729	17,922	19,200	19,200
Marketed do	9,000	2,344	4,556	4,800	4,800
Gypsum	e80,000	169,000	200,000	e200,000	200,000
Iron and steel: Steel, crude thousand tons	99	80	69	e69	69
Nitrogen: N content of ammonia	64,900	113,400	120,000	e120,000	120,000
Petroleum:					
Crude thousand 42-gallon barrels	55,625	61,320	60,400	61,000	[3]68,000
Refinery products:					
Naphtha do	NA	4,672	5,329	NA	NA
Gasoline do	e5,255	6,242	7,190		
Kerosene and jet fuel do	e4,400	3,285	3,212		
Distillate fuel oil do	e32,000	46,757	52,889		
Residual fuel oil do	e17,700	NA	NA		
Liquefied petroleum gas do	e1,500	1,314	1,606		
Asphalt do	e2,250	2,336	2,409		
Other do	e1,800	1,533	1,716		
Total do	e64,905	66,139	74,351	NA	76,650
Phosphate rock thousand tons	1,455	1,229	1,514	1,270	[3]1,606
Salt do	102	87	87	e87	87
Stone, sand and gravel:					
Stone: Dimension, marble cubic meters	20,000	71,000	71,000	e71,000	71,000
Sand and gravel thousand tons	205	5,780	5,829	e6,000	6,000
Sulfur, byproduct of petroleum and natural gas do	22	e30	105	e105	[3]120
PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN					
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	r1,700	r2,000	2,000	e2,000	2,000
Jet fuel do	r1,600	r1,600	1,700	e1,700	1,700
Kerosene do	r1,200	r1,100	1,200	e1,200	1,200
Distillate fuel oil do	r6,200	r6,000	6,300	e6,300	6,300
Residual fuel oil do	r11,300	r11,000	11,000	e11,000	13,500
Other do	r200	r200	230	e230	900
Total do	r22,200	21,900	22,430	e22,430	25,600
Salt[e] thousand tons	75	75	75	75	75

See footnotes at end of table.

Table 1.—Other countries of the Near East: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Country and commodity	1982	1983	1984	1985[p]	1986[e]
YEMEN ARAB REPUBLIC[2]					
Cement ---- thousand tons	237	600	850	1,400	[3]1,160
Gypsum	21,923	23,138	24,295	25,000	[3]53,000
Petroleum:					
Crude ---- thousand 42-gallon barrels	--	--	--	--	[3]2,700
Refinery products:					
Gasoline ---- do	--	--	--	--	[3]811
Diesel fuel ---- do	--	--	--	--	[3]870
Fuel oil ---- do	--	--	--	--	[3]929
Total ---- do	--	--	--	--	[3]2,610
Salt	[e]57,000	[e]141,000	[e]148,000	150,000	[3]300,000

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

[1]Table includes data available through July 10, 1987.

[2]In addition to the commodities listed, asbestos, lapis lazuli, and uranium (in Afghanistan) and a variety of other crude construction materials (clays, sand and gravel, and stone) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3]Reported figure.

BAHRAIN[4]

Bahrain had one of the most diversified economies in the Persian Gulf region, but it was seriously affected by the fall in oil revenues and the effect of recession in neighboring states. The current account went into deficit in 1984 and was not expected to improve before 1988. Gross domestic product (GDP) fell by nearly 7% in 1985, and was projected to drop a further 14% by the end of 1986. The Government continued to decrease its dependence on oil revenues without complete success. Diversification efforts focused on aluminum production, but the industry had been hurt by a dramatic slump in world prices. Hydrocarbons still accounted for more than 60% of state income.

Hydrocarbons production increased in 1986 as a result of Bahrain National Oil Co.'s (Banoco) intensive $20 million development-drilling and well-maintenance program. Crude oil production was at an average of 42,423 barrels per day (bbl/d), compared with about 41,922 bbl/d in 1985. Twenty new wells were drilled, and the program of well overhauling was completed. Production from the Awali Oilfield had been declining steadily since 1978, and a low point was reached in 1984. The current goal of the Government's development program was to keep production at the 40,000- to 43,000-bbl/d level.

The production volume of associated and Khuff gas produced in 1986 was 702 million cubic feet per day (MMcfd), compared with 615 MMcfd in 1985. Local sales were 548 MMcfd, an increase over the 487 MMcfd sold in 1985. Banoco completed the first phase of development with the drilling of 10 Khuff wells. Deeper formations were also drilled, and they were being studied for possible additional drilling.

Progress continued under the offshore sharing agreement with the Kuwait Foreign Petroleum Exploration Co. The first wildcat, in the northwest of Banoco's concession area about 50 miles from the Abu Saafa Field, was scheduled for completion in early 1986. A second well was to be drilled shortly thereafter.

Bahrain Petroleum Co. Ltd.'s Sitra Island refinery returned to 97% capacity after operating at only 75% in 1985, and a feasibility study continued on the proposed $900 million expansion and modernization project. The study, expected to take 18 months by representatives of the Government and California Texas Petroleum Co. (Caltex) of the United States, was to evaluate processing techniques and product requirements. The three-stage, 6-year project would increase output of high-value products. The 50-year-old Sitra refinery produced 243,000 bbl/d during 1986, after running at only 75% of its 250,000 bbl/d capacity during 1985. It refined 39,000 bbl/d of locally produced oil, and the rest was from Saudi Arabia.

A $65 million expansion project to double the capacity of the Bahrain National Gas Co. (Banagas) liquefied petroleum gas (LPG) plant to 340 MMcfd was approved as a result of a feasibility study by the Japan Gasoline Corp. of Japan. Banagas also planned to construct a $2.5 million refrigerated LPG storage tank that would be one-half the size of the company's two existing 200,000-barrel units.

Aluminium Bahrain Ltd. (ALBA), owned by the Government, Saudi Arabia's Public Investment Fund, Kaiser Aluminum & Chemical Corp. of the United States, and Breton Investments of the Federal Republic of Germany, poured over 2 million tons of metal between May 1971 and September 1986. Record-high production levels were set during the past 3 years. Production in 1986 was 178,188 tons of hot metal and 178,194 tons of finished products, which were increases over 1985 production of 176,731 tons of hot metal and 174,825 tons of finished products. The importance of the facility had been increasing as a user of abundant, inexpensive natural gas and a provider of local employment. In 1986, 129,000 tons of metal was exported. The Gulf Cooperation Council states, the most important markets, took 67,000 tons, whereas local purchases more than doubled to 47,500 tons. The Gulf Aluminium Rolling Mill Co. (GARMCO) bought 25,191 tons since beginning operations in January 1986. Bahrain Atomisers and Midal Cables Co. took 15,355 tons of liquid metal, and Bahrain Aluminium Extrusion Co. bought 5,914 tons of extrusion billet. Saudi Arabia also increased its purchases to 17,100 tons from 5,500 tons in 1985. The Southeast Asian market was important, but purchases by the United States decreased.

Bahrain-Saudi Aluminium Marketing Co. (BALCO) was responsible for sales of Bahrain's and Saudi Arabia's share of ALBA production, and net profits of BALCO increased from $6.4 million in 1985 to $27.6 million in 1986. Total sales of 79,000 tons brought $213 million in revenue, up 52%. Sales included about 40,000 tons carried over from 1985 production.

ALBA announced a $158 million expansion program that would extend annual production capacity from 170,000 to 200,000 tons over the next 5 years. Pot rooms would be extended, and an additional 76 pots would be installed as reduction cells were rebuilt. A second phase of expansion, which would cost a similar amount and would be completed by 1991, would boost production by an additional 20,000 to 25,000 tons by increasing the efficiency of existing facilities. Production would be increased by almost 15% with no increase in gas consumption by installing a waste-heat recovery system on the newest gas turbines.

The 40,000-ton-per-year GARMCO aluminum rolling mill near the ALBA primary aluminum smelter produced 30,000 tons of rolled aluminum in 1986, its first year of production. This was more than the original goal of 20,000 tons. The mill did remelting, hot and cold rolling, annealing, and finishing. Products were sheet and coil aluminum from slabs weighing up to 10 tons. GARMCO planned to nearly triple annual production and sales over the next 2 years. This goal was expected with the help of the planned $35 million aluminum foil plant to be located next to the rolling mill. Tenders for this 6,000-ton-per-year plant were to be issued by the end of 1986.

The $400 million ammonia and methanol complex of Gulf Petrochemical Industry Co. (GPIC), which had the daily capacity of 1,000 tons for each product, operated at production rates of over 100% capacity. A total of over 640,000 tons of products was produced and exported during the first year since opening in July 1985. The company's methanol and ammonia output was in a sales pool along with output from the Saudi Arabian Basic Industries Corp. and Kuwait Petrochemical Industries Co., which, with Banoco, are equal shareholders in GPIC. GPIC was studying ways to restructure its outstanding debt. The company sold 70,000 tons of ammonia to India, 16,000 tons to Tunisia and 10,000 tons to Turkey.

The Arab Iron and Steel Co. (Aisco) reported a $31.6 million loss in 1986. This was $20 million more than was lost in 1985, the first full year of operation. Total revenue was $4.7 million; sales were $3.8 million. Sales costs were $16.1 million, and liabilities at the end of 1986 were $55.1 million, twice the company's assets. The 4-million-ton-per-year iron-pelletizing plant worth $160 million was shut down for several months during the summer for the second time in 2 years, apparently because of a combination of technical and export sales difficulties and problems with the quality of ore feedstock. Also, there has been a lack of demand for its product; the Iran-Iraq war has deprived it of 50% of its market. British Steel Corp. completed a study of Aisco's problems with pellet production, markets, and supplies.

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

(Metric tons unless otherwise specified)

Commodity	1982	1983	Destinations, 1983	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	120	25	--	All to United Arab Emirates.
Metal including alloys:				
Unwrought	166,014	191,741	--	Japan 103,588; China 14,499; Republic of Korea 12,471.
Semimanufactures	26,476	15,501	--	Saudi Arabia 7,861; West Germany 1,790; Japan 1,527.
Copper:				
Ore and concentrate	--	27	--	United Kingdom 17; Qatar 10.
Metal including alloys, all forms	44	15	--	All to Saudi Arabia.
Iron and steel: Metal:				
Scrap	2,816	6,443	--	India 5,205; Japan 413; United Arab Emirates 75.
Pig iron, cast iron, related materials	9	--		
Steel, primary forms	8,110	69	--	Saudi Arabia 65.
Semimanufactures:				
Universals, plates, sheets	2,624	149	--	United Arab Emirates 104; Saudi Arabia 38.
Wire	369	5	--	Saudi Arabia 4.
Tubes, pipes, fittings	6,328	3,975	--	Saudi Arabia 2,552; Netherlands 841.
Lead: Metal including alloys, all forms	39	--		
Zinc: Metal including alloys, all forms value, thousands	$12	$2	--	All to Saudi Arabia.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	8	--		
Cement	89,316	33,176	--	Iraq 2,584.
Lime	421	464	--	Saudi Arabia 241; United Arab Emirates 130.
Salt and brine	20	3	--	India 1; Qatar 1.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	43	--		
Sulfate, manufactured	25	--		
Stone, sand and gravel:				
Dimension stone, worked value, thousands	$24	$6	--	All to Saudi Arabia.
Gravel and crushed rock	19	--		
Sand other than metal-bearing	28	54	--	Qatar 40; Saudi Arabia 14.
Sulfur:				
Elemental: Colloidal, precipitated, sublimed	2,100	17,268	--	India 16,228.
Sulfuric acid	10	10	--	All to United Arab Emirates.
MINERAL FUELS AND RELATED MATERIALS				
Coal: Lignite including briquets	--	1	--	All to Qatar.
Petroleum:				
Crude thousand 42-gallon barrels	16,724	--		
Refinery products:				
Liquefied petroleum gas do	2,009	2	--	All for bunkers.
Gasoline, motor do	8,805	402	NA	NA.
Mineral jelly and wax do	(2)	(2)	--	All to Saudi Arabia.
Kerosene and jet fuel do	10,867	32	--	Saudi Arabia 20; United Arab Emirates 2.
Distillate fuel oil do	38,720	8	--	All to Qatar.
Lubricants do	393	3	--	Saudi Arabia 1; United Arab Emirates 1.
Nonlubricating oils do	(2)	--		
Residual fuel oil do	10	4	1	United Kingdom 2.

NA Not available.
[1]Table prepared by Virginia A. Woodson.
[2]Less than 1/2 unit.

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

(Metric tons unless otherwise specified)

Commodity	1982	1983	Sources, 1983	
			United States	Other (principal)
METALS				
Aluminum:				
Ore and concentrate	--	59	--	All from Saudi Arabia.
Oxides and hydroxides	1,030,719	298,263	(2)	Australia 298,233.
Metal including alloys:				
Unwrought	121	73	19	Belgium-Luxembourg 11; India 3.
Semimanufactures	6,478	1,983	40	Belgium-Luxembourg 564; Italy 376; United Kingdom 246.
Copper:				
Ore and concentrate	317	621	--	Netherlands 611.
Metal including alloys, all forms	1,400	3,411	79	Italy 2,195; United Kingdom 380; Australia 222.
Iron and steel: Metal:				
Scrap	4,253	2,950	1,562	Japan 731; Netherlands 207.
Pig iron, cast iron, related materials	59	252	--	Netherlands 250.
Steel, primary forms	50,756	58,475	8	Japan 40,424; Netherlands 11,852; Qatar 2,581.
Semimanufactures:				
Universals, plates, sheets	18,637	14,513	39	Japan 10,955; United Kingdom 1,646.
Wire	1,172	3,027	3	Netherlands 1,739; Japan 619; China 241.
Tubes, pipes, fittings	46,209	57,703	8,505	Japan 36,292; Italy 4,455; Netherlands 3,118.
Lead: Metal including alloys, all forms	57	27	--	United Kingdom 15; West Germany 1.
Mercury value, thousands	--	$1	NA	NA.
Nickel: Metal including alloys, all forms	1	--		
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	$6	--		
Silver:				
Ore and concentrate do	$17	--		
Metal including alloys, unwrought and partly wrought do	--	$9	--	United Kingdom $3; West Germany $2; India $2.
Tin: Metal including alloys, all forms	21	1	--	All from Netherlands.
Uranium and thorium: Metals including alloys, all forms value, thousands	$1	--		
Zinc: Metal including alloys, all forms	197	19	--	Denmark 12; Italy 4.
Other: Base metals including alloys, all forms	--	220	20	United Kingdom 96; Italy 60; Norway 40.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	36	64	4	Republic of Korea 35; Italy 4.
Asbestos, crude	24	114	--	India 91; Republic of Korea 17.
Cement	480,229	671,841	1,834	Republic of Korea 204,924; Japan 159,066; Australia 126,444.
Clays, crude	25	84	32	United Kingdom 34; Saudi Arabia 15.
Diamond: Gem, not set or strung value, thousands	$105	--		
Fertilizer materials:				
Crude, n.e.s	457	217	2	Belgium-Luxembourg 175; Netherlands 29.
Manufactured:				
Ammonia	143	36	2	United Kingdom 22; Belgium-Luxembourg 5.
Unspecified and mixed	708	1,451	32	Belgium-Luxembourg 525; West Germany 388; United Kingdom 153.
Graphite, natural	--	1	--	All from United Kindgom.
Gypsum and plaster	12,967	18,682	73	Spain 13,247; Republic of Korea 3,036.
Lime	59	4	--	All from Japan.
Magnesite, all forms value, thousands	--	$2	--	All from United Kingdom.
Mica: Worked including agglomerated splittings	4	4	--	Do.

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity	1982	1983	Sources, 1983	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Precious and semiprecious stones other than diamond:				
Natural ----- value, thousands--	$127	$92	$1	Thailand $28; West Germany $25.
Synthetic ----------do----	$42	$50	$3	Austria $12; Thailand $5; unspecified $25.
Salt and brine----------	1,618	1,998	184	Netherlands 1,202; China 221.
Sodium compounds, n.e.s.:				
Carbonate, manufactured--------	826	548	--	West Germany 468; Spain 20.
Sulfate, manufactured ---------	404	627	198	United Kingdom 146; United Arab Emirates 136.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked -----	1,829	2,345	--	Italy 2,234; India 100.
Worked ----------	3,320	4,163	(2)	Italy 3,349; Greece 151.
Gravel and crushed rock thousand tons--	815	1,295	--	United Arab Emirates 1,290.
Sand other than metal-bearing--	2,236	1,718	41	Netherlands 1,285; United Arab Emirates 241.
Sulfur:				
Elemental: Colloidal, precipitated, sublimed ----------	--	1	--	All from West Germany.
Sulfuric acid----------	763	1,268	--	Netherlands 528; Belgium-Luxembourg 522; West Germany 83.
Other: Slag and dross, not metal-bearing-	22	--		
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural -------	47	43	--	United Kingdom 18; China 16.
Carbon: Gas carbon value, thousands--	$1	$2	--	All from Japan.
Coal: All grades including briquets ----	11,331	212	93	Republic of South Africa 45; Malaysia 32.
Petroleum:				
Crude thousand 42-gallon barrels--	69,827	48,180	NA	NA.
Refinery products:				
Liquefied petroleum gas 42-gallon barrels--	593,096	774,184	699,342	Belgium-Luxembourg 72,883.
Gasoline, motor ------do----	72,752	269,501	--	Netherlands 183,600; Italy 85,000.
Mineral jelly and wax value, thousands--	$9	$3	$2	United Kingdom $1.
Kerosene and jet fuel 42-gallon barrels--	51,770	158,387	67,665	United Arab Emirates 65,875.
Distillate fuel oil ------do----	12,436	22,365	22,365	
Lubricants ----------do----	70,532	55,531	3,479	United Arab Emirates 22,925; United Kingdom 12,257.
Nonlubricating oil ----do----	1,036	3	2	Singapore 1.
Residual fuel oil------do----	122,704	19,967	NA	NA.

NA Not available.
[1]Table prepared by Virginia A. Woodson.
[2]Less than 1/2 unit.

LEBANON[5]

The Lebanese civil war continued through 1986, the economic condition of the country continued to decline, and economic hardship began to affect the middle classes as well as the urban poor. The Lebanese pound depreciated significantly during the year, and the annual inflation rate was well over 100%. In an effort to offset declining revenues, the Government borrowed heavily in the domestic market and increased prices of petroleum products by as much as 100%. The public paid even more than the new, higher official prices because of added unofficial militia taxes and the hoarding of scarce fuels. The unpopular removal of fuel subsidies and decreasing oil prices in the world markets brought about a decrease in the oil import bill by about 20% in 1986 from over $500 million to about $400 million.

The Lebanese petroleum and mineral industries continued to function in a war environment. The Mediterranean Refining Co. refinery at Zahrani, south Lebanon, had been having technical and operational difficulties since it experienced war damage in

1982, and in 1986, it was given to the Lebanese Government by its U.S. owners, Mobil Oil Corp. and Caltex, without compensation. The Government began to operate the 17,000-bbl/d refinery along with the Zahrani terminal that it had acquired in December 1983 when the Trans Arabian Pipeline Co. closed its Lebanon operations for economic and war-related reasons. The throughput at the refinery was recently no more than 12,500 bbl/d.

The Lebanese ceramics industry may have been a typical example of the mining and minerals processing industry as a whole. This ceramics industry, along with other industrial mineral operations, constituted 4.4% of the total industry. Of about 116 ceramic manufacturers in 1972, only 20 remain, and most of the current manufacturers were operating at 60% capacity in 1986. The total number of employees declined from about 2,500 to about 1,200. This decline in productive activity was a direct result of war-related problems: inaccessibility of good raw materials, high fuel cost, irregularity of power supply, declining availability of technical labor, increasing transport fees, poorly enforced export-import regulations, and governmental legislative-financial regulations.

OMAN[6]

The impact of falling oil prices on the economy of Oman in 1986 was significant, and it caught the Government by surprise. Oil prices of at least $25 per barrel had been assumed for budget purposes, whereas prices actually fell to nearly $8. The 1986 deficit, estimated at $1.8 billion, was more than three times greater than budgeted. The Government reacted to the plunging oil prices by devaluing its currency and by cutting all ministerial budgets by 10%. The 1987 budget called for a decrease in spending by 14%, and revenues were expected to be nearly 30% below the 1986 budget figure. The 1987 budget deficit was to be financed by aid from other Persian Gulf countries and money from the state general reserve fund.

In 1986, oil and associated oil products accounted for over 90% of Oman's foreign exchange earnings and about 85% of Government revenues. Although production and exports increased, annual GDP was projected to fall by as much as 33% between 1985 and 1986 because of reduced oil revenues. Because Oman could not increase production significantly to make up for lost revenue, it decided to coordinate its production and pricing strategies with the Organization of Petroleum Exporting Countries (OPEC), and a 50,000-bbl/d cut in output of 550,000 bbl/d was announced in September 1986 in support of the OPEC production agreement. A growth rate of 5% was anticipated for 1986-90 by continuing to diversify the economy, but because of Oman's limited resources, including personnel, diversification was not expected to be easy.

Oman's proven crude oil reserves were increased near the end of 1986 to 4.2 billion barrels. Crude oil production in 1986 was an average 559,178 bbl/d, a 12.3% increase over the 1985 output of 498,082 bbl/d. Oil production rose steadily to a peak of 600,000 bbl/d in August in an attempt to offset the fall in revenues caused by the price slump. Oil exports increased by 13.7%, from 451,507 bbl/d in 1985 to 513,425 bbl/d in 1986, but oil earnings were probably about $2.5 billion, a significant decline from 1985 earnings of $4.4 billion. Main buyers were Japan, the Republic of Korea, and Thailand, along with India, Singapore, and Taiwan.

Oilfield development continued by focusing on hooking up new wells to production stations along the north-south pipeline, rather than on experimental schemes to enhance production from existing fields. A complementary plan to expand the capacity of the main pipeline could raise output to 650,000 to 670,000 bbl/d by 1988. A rebid was called for the largest development scheme, at Lekhwair, to include detailed design of crude oil and gas separation plants, gas lift installations, and oil treatment plants, plus oilfield development—including oil, gas, and water injection wells. Several contractors had been employed to build gas-gathering facilities for the Marmul, Nimr, Rima, and Yibal Fields.

Seven oilfields were developed by Petroleum Development Oman during 1986. The southern Nimr Field opened in November at a total development cost of $165 million. Facilities included five gathering stations, a production station, pipelines linked to the main south Oman oil line, a residential camp, 200 kilometers of roads, an airfield, and electric power lines. Nimr was the third major field to be developed in south Oman. Production was expected to rise from an

initial 75,000 bbl/d to 88,000 bbl/d in 1988.

Test drilling by Occidental Petroleum of Oman Ltd., a subsidiary of Occidental Petroleum Corp. of the United States, suggested a potential output of 15,000 to 20,000 bbl/d from its Sunainah concession. Petroleum Development Oman made a discovery in its concession in south Oman at Zahra. Japex Oman decided to develop an oil discovery at Daleel in its Wadi Aswad concession where two wells flowed at rates of 800 bbl/d and 1,000 bbl/d.

Development of the known reserves of nearly 6.4 trillion cubic feet (Tcf) of natural gas continued to be a high-priority project in order to allow the export of oil that had been used for local power generation. A $30 million expansion project at the Yibal gas treatment plant was commissioned near the end of 1985. The capacity of the plant was increased to 194.2 MMcfd, and gas supplies were increased to the Muscat area, the Ghubrah desalination plant and powerplants and the smelter plant at Sohar.

Promising indications of gas condensate and dry gas from Bukha-2 well in the Bukha offshore field west of Oman were announced in mid-1986 by Consolidated International Petroleum Corp., and a second appraisal well was spudded in December. Bukha-2 tested at an effective rate of about 11,000 bbl/d. The field had a production potential of 50,000 bbl/d of condensate and 350 MMcfd of dry gas. Development wells and production facilities for the 40-million-barrel reserve of condensates were expected to cost $170 million.

Oman Refinery Co. Ltd. let a $25 million contract to Mitsui Engineering & Shipbuilding Co. Ltd. for the expansion to 80,000 bbl/d of its 50,000-bbl/d Mina al Fahal hydroskimming refinery. Mitsui was to complete basic design work, procurement, civil engineering, and installation of a sulfur recovery system by September 1987.

GCC postponed plans to build a new 250,000-bbl/d export refinery and to expand port facilities in Oman outside the Strait of Hormuz as an alternative to other facilities in the Persian Gulf region near the Iran-Iraq war. However, the decline in petroleum production by GCC states brought about a reevaluation of the proposal, and the current production could be handled by existing ports on the Red Sea that can be reached by a good road network.

Oman Lubricants Co.'s Mina al-Fahal lube-oil-blending complex was inaugurated in May 1986. The $7.8 million plant had a design capacity of 20,000 tons per year of about 30 varieties of lubricating oils that would satisfy local requirements and provide some surplus for export to nearby markets.

Copper mining and refining at Sohar, 250 kilometers north of Muscat, were an important part of Oman's diversified economy. The development, costing about $213 million, was one of the Government's largest investments. The Government-owned Oman Mining Co. (OMC) operated two underground mines, Bayda and Lasail, that produced ore of 1.7% copper. Reserves at these mines, with the undeveloped Aarja deposit, were about 12 million tons of 2.1% copper. The development of Aarja was postponed in 1986, and the smelter and refinery operated below their design capacity of 20,000 tons per year.

The Government had decided to increase chromite production in the Nakhl and Rajmi deposits by the OMC because of the depressed state of the world copper market. However, this investment depended on the availability of funds from the hydrocarbon sector of the economy, and the fall in the price of oil and the consequent decline in oil revenue caused the Government to temporarily postpone the project. Production of chromite for export had been about 6,000 tons per year, but mine capacity was about 20,000 tons per year. Exploration had resulted in the discovery of 320 chromium mineral deposits.

Gypsum deposits near Salahare were reported to be a potential source for the Rasyut cement plant at a rate of 2,000 tons per year. Gypsum resources were estimated at 2 billion tons. Oman also reported a potential for large-scale development of granite, marble, and sandstone. Iron, manganese, and nickel mineralization also were reported.

Table 4.—Oman: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	2	9	--	United Arab Emirates 8.
Copper: Metal including alloys:				
Unwrought	13,276	12,725	--	Netherlands 6,402; Italy 3,000; Japan 800.
Semimanufactures	3	--		
Iron and steel: Metal:				
Pig iron, cast iron, related materials	--	10	--	All to United Arab Emirates.
Semimanufactures:				
Bars, rods, angles, shapes, sections	746	2,220	--	United Arab Emirates 2,195.
Universals, plates, sheets	94	302	--	All to United Arab Emirates.
Wire	93	--		
Tubes, pipes, fittings	1,343	5,013	--	United Arab Emirates 5,009.
INDUSTRIAL MINERALS				
Cement	1,452	230	--	All to United Arab Emirates.
Diamond: Gem, not set or strung value, thousands	$52	--		
Fertilizer materials:				
Crude, n.e.s	30	--		
Manufactured:				
Nitrogenous	15	6	--	All to United Arab Emirates.
Unspecified and mixed value, thousands	--	$3	--	Do.
Lime	346	203	--	United Arab Emirates 123; Kuwait 80.
Salt and brine	2	--		
Stone, sand and gravel:				
Dimension stone, crude and partly worked	30	501	--	All to United Arab Emirates.
Gravel and crushed rock	22,437	15,295	--	United Arab Emirates 15,002.
Limestone other than dimension	--	260	--	All to Kuwait.
Sand other than metal-bearing	6,482	17,213	--	United Arab Emirates 17,198.
Other: Crude	5,042	1,040	--	All to United Kingdom.
MINERAL FUELS AND RELATED MATERIALS				
Petroleum:				
Crude thousand 42-gallon barrels	134,631	164,800	--	Japan 109,300; Republic of Korea 23,200; Thailand 11,000.
Refinery products:				
Liquefied petroleum gas 42-gallon barrels	35	116	--	Saudi Arabia 58; United Arab Emirates 58.
Gasoline do	60	145	--	United Kingdom 94; United Arab Emirates 51.
Distillate fuel oil do	--	2,385	--	All to United Arab Emirates.
Lubricants do	2,695	882	--	United Arab Emirates 833.

[1]Table prepared by Virginia A. Woodson.

Table 5.—Oman: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum: Metal including alloys, all forms	1,143	1,215	20	Belgium-Luxembourg 370; United Kingdom 211; Thailand 114.
Copper: Metal including alloys:				
Unwrought	1	1	--	All from United Arab Emirates.
Semimanufactures	395	370	8	United Kingdom 278; United Arab Emirates 21.
Iron and steel:				
Iron ore and concentrate including roasted pyrite	600	10,008	--	All to India.
Metal:				
Pig iron, cast iron, related materials	7,644	268	--	Japan 202; United Arab Emirates 65.
Steel, primary forms	565	28	--	Japan 26; United Arab Emirates 2.
Semimanufactures:				
Bars, rods, angles, shapes, sections	189,772	202,614	--	Qatar 72,370; Japan 47,477; United Arab Emirates 42,920.
Universals, plates, sheets	29,137	33,729	--	Japan 19,494; United Arab Emirates 6,667; Kuwait 2,444.
Hoop and strip	19	3	--	Mainly from United Arab Emirates.
Rails and accessories	5	43	--	United Kingdom 42.
Wire	1,536	466	2	Republic of Korea 119; United Kingdom 108; Japan 85.
Tubes, pipes, fittings	165,472	215,375	244	Japan 108,774; West Germany 38,773; Netherlands 30,755.
Castings and forgings, rough	86	270	--	United Arab Emirates 263.
Lead: Metal including alloys, all forms	14	285	(2)	Australia 242; United Kingdom 40.
Nickel: Metal including alloys, all forms value, thousands	$1	--		
Silver: Metal including alloys, unwrought and partly wrought[3] ---do---	$251	$1,134	--	France $1,015.
Tin: Metal including alloys, all forms ---do---	$1	--		
Zinc: Metal including alloys, all forms	60	54	--	All from Australia.
Zirconium: Metal including alloys, all forms	60	--		
Other: Base metals including alloys, all forms value, thousands	$12	--		
INDUSTRIAL MINERALS				
Abrasives, n.e.s.: Grinding and polishing wheels and stones	864	210	--	Italy 146; India 36.
Cement ---thousand tons---	1,009	1,090	--	United Arab Emirates 1,047.
Diamond: Gem, not set or strung value, thousands	$17	$18	--	India $12; France $5.
Fertilizer materials:				
Crude, n.e.s	2,760	4,757	--	Ireland 1,981; West Germany 780; United Kingdom 419.
Manufactured:				
Nitrogenous	6,997	8,043	10	United Arab Emirates 3,766; Saudi Arabia 1,950.
Phosphatic	469	607	--	West Germany 463; Belgium-Luxembourg 97.
Potassic	618	121	--	Belgium-Luxembourg 91; United Arab Emirates 10.
Unspecified and mixed	3,635	10,098	10	Belgium-Luxembourg 3,583; West Germany 3,323.
Gypsum and plaster	10,788	20,922	--	United Arab Emirates 20,443.
Lime	3,786	4,608	--	United Arab Emirates 4,547; India 52.
Salt and brine	11,724	10,259	150	Netherlands 4,848; United Arab Emirates 2,395; West Germany 1,564.

See footnotes at end of table.

Table 5.—Oman: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
INDUSTRIAL MINERALS —Continued				
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	2,162	2,137	1	Italy 1,438; India 341; United Arab Emirates 200.
Worked	7,701	11,638	--	Italy 7,531; United Arab Emirates 1,865.
Gravel and crushed rock	973	8,879	--	United Arab Emirates 6,771; India 1,847.
Limestone other than dimension	111	3,326	--	India 3,300.
Sand other than metal-bearing	357	10,955	--	India 7,420; Kenya 2,564.
Other: Crude	18,041	9,170	3	India 6,686; United Arab Emirates 1,366.
MINERAL FUELS AND RELATED MATERIALS				
Coal: All grades including briquets	345	235	38	Sri Lanka 120; United Arab Emirates 34.
Petroleum refinery products:				
Liquefied petroleum gas 42-gallon barrels	85,492	81,525	--	United Arab Emirates 80,539.
Gasoline, motor do	4,998	1,632	43	United Arab Emirates 825; Italy 764.
Mineral jelly and wax do	--	197	8	West Germany 79; Japan 79.
Kerosene and jet fuel do	1,604	1,054	--	Netherlands 310; United Arab Emirates 271; West Germany 233.
Distillate fuel oil do	132,482	379,199	--	United Arab Emirates 379,080.
Lubricants do	171,864	180,096	1,442	United Arab Emirates 58,401; Singapore 53,116; United Kingdom 37,345.
Residual fuel oil do	47	147	--	United Arab Emirates 140.

[1]Table prepared by Virginia A. Woodson.
[2]Unreported quantity valued at $2,000.
[3]May include platinum-group metals.

QATAR[7]

Qatar's oil reserve of about 3.3 billion barrels was the smallest among member countries of OPEC, whereas its natural gas reserve of 148 Tcf was the fourth largest in the world behind that of the U.S.S.R., Iran, and the United States. Despite efforts to increase the importance of other sectors, oil still accounted for more than one-half of the GDP and 90% of revenue, and because of the steep decline in oil prices that began in late 1985 and weak demand for OPEC oil, the economy was much weaker in 1986. Qatar's oil revenues in 1986 were projected to be about one-half of the 1985 level, and because of oil market uncertainties, no budget was announced for fiscal year 1986 (April 1-March 31). Government agencies were directed to operate within their 1985 levels of actual expenditure, domestic development was put on hold, and payments to contractors were postponed. The GDP was expected to decline 10% and 15% in 1985 and 1986, respectively, after an average decline of 5.2% during 1981-84. Since 1984, even the nonoil sector declined.

Because the Qatari oil reserve was expected to last for only 30 years at a production rate of 300,000 bbl/d, Qatar's energy policy was focused mainly on the development of its natural gas resource, especially in the giant North Field of nonassociated gas, which contained an estimated 380 Tcf that is second in size to the world's largest Urengoi Field in western Siberia.

As a member of OPEC, Qatar agreed in August 1986 to return to its October 1984 quota of 280,000 bbl/d. Shortly thereafter, two Japanese term customers, Mitsubishi Corp. and Marubeni Corp., were told that their contract volumes would be cut about 48% after September 1. During late 1986, Qatar General Petroleum Corp. (QGPC) reset prices for onshore and offshore crude oil. Prior to February 1, 1987, prices would be related to those of Omani oil, and afterward would be fixed at $17.67 per barrel for offshore oil and $17.82 per barrel for onshore oil. Three companies terminated their agreements in 1986: Neste Oy of Finland, and Satoil and Africa Middle East of Swit-

zerland. Three others agreed to buy in 1987: Mitsubishi and Marubeni of Japan and Carey Group of the United States.

Qatar's power, desalination, natural gas liguids (NGL), steel, cement, fertilizer, and petrochemical plants continued to require about 600 MMcfd of associated gas, and the rate of increase of demand continued to be such that it was estimated that another 500 MMcfd would need to be found by 1990. However, with crude oil output and nonassociated gas reserves in the Khuff formation below the Dukhan Oilfield declining, development of North Field continued to be a high-priority project. The basic development concept of the North Field was submitted to QGPC in 1984, but the submission of other proposals resulted in its reappraisal by Bechtel Corp. of the United States and Technip of France. Their revised conceptual study called for production of 800 MMcfd that would be piped ashore at Ras Laffan and fed to a processing plant at Umm Said. Dry gas from this unit would be distributed to local industries and power stations; NGL would be exported. With several alternative plans to consider and a decline in the world price of gas, QGPC continued to delay development to the detriment of several downstream industries. Production at two NGL plants at Umm Said was down nearly 23%, and LPG exports were reduced nearly 28%. Qatar Fertilizer Co. (QAFCO) was totally dependent on secure feedstock. Feed to the Qatar Petrochemical Co. (QAPCO) ethylene plant decreased 26% in 1985, but in 1986, a turbo-expander was brought on-stream to strip a further 500 tons of ethane each day. India expressed a need for more fertilizer made with Qatari gas, but the required increase in production would require development of the North Field.

Amoco Qatar Petroleum Co., a wholly owned subsidiary of the Amoco Oil Co. of the United States, was created to operate in a concession defined by a new 25-year production-sharing agreement with the Government. The 8,000-square-kilometer onshore concession covered the whole country, except the west coast Dukhan Field and a small section of land in the northeast. Amoco was to fund seven exploration wells; three appraisal wells, if necessary; and 4,000 kilometers of seismic survey lines during the first 6 years of the agreement. Forty percent of the concession would then be relinquished. A further 20% would be returned after 8 years, with all nonproducing areas relinquished when 11 years had elapsed. Production sharing would be 80-20 in favor of Qatar on production of 20,000 bbl/d; 82.5-17.5 on 40,000 bbl/d; 85-15 on 60,000 bbl/d; 87.5-12.5 on 80,000 bbl/d; and 90-10 on production in excess of 80,000 bbl/d. The second of four concessions offered was awarded to Standard Oil Co. of Ohio in 1985 that had completed offshore seismic work in the area's northern sector and expected to begin drilling March 1987. Seismic work in the southern sector was expected to begin in December 1986. The Government was awaiting bids for the remaining two offshore concessions in November 1986. Apparently, interest by exploration companies declined as a result in the downturn in oil prices.

QGPC awarded Technip Geoproduction of France a $2.5 million detailed-design contract for the Bul Hanine offshore gas-lift program. The goal would be to maintain oil production at 120,000 to 140,000 bbl/d.

Qatar canceled, in June 1985, an exploration-production contract with a group led by Wintershall AG of the Federal Republic of Germany for lack of agreement on development of gas reserves discovered by the group in 1980. The group then sought compensation of about $600 million by an international arbitration panel.

The National Oil Distribution Co. operated two oil refineries at Umm Said for QGPC and was more than self-sufficient in all major product categories. QGPC reported a profit of $50.2 million in 1986 after working at about 76% capacity. The new jetty and a depot for distributing oil products locally were expected to be completed in 1987. Qatar had the capability of exporting as much as 1.5 million tons (30,000 bbl/d) of petroleum products, roughly one-half being residual fuel oil, which was roughly 10% of 1985 net oil exports.

Qatar Steel Co. (QASCO) produced a record high 493,120 tons of steel in 1986, but was expected to report a loss for the year as it had in 1985. Accumulated losses were $109 million through 1985 since opening in 1978, because QASCO had been getting low prices for its products. Local demand accounted for 40,000 tons of steel in 1986. Saudi Arabia remained the biggest market, 43% of sales, followed by the United Arab Emirates and Kuwait, which took about 20% each.

After 2 years of construction work, the new $55 million turboexpander became operational at the QAPCO Umm Said ethylene plant. The unit would enable the com-

pany to overcome the shortages of associated gas feedstock that were caused by the fall in oil output in recent years. In 1984, ethylene production reached 204,000 tons, 73% of its 280,000-ton-per-year capacity, but the October 1984 reduction in the country's OPEC-imposed oil quota, to 280,000 bbl/d, further reduced output. The unit would supply daily, from about 150 million cubic feet of gas, 500 tons of ethane, 210 tons of propane, and 120 cubic feet of methane-rich gases for feedstock to QAFCO. Additional design capacities are 140,000 tons per year of low-density polyethylene and 46,000 tons per year of sulfur products.

QAPCO reported a $43 million loss for 1985, double the 1984 loss and the worst in its 5-year history as a result of the fall in product prices and below-capacity production. For much of 1986, production averaged 90% of capacity, although QAPCO operated at capacity since mid-May, and losses were only $15.7 million. The Umm Said plant produced, in 1986, record-high amounts of ethylene, 258,000 tons, and polyethylene, 176,000 tons.

Production by QAFCO increased from 530,000 tons of ammonia and from 660,000 tons of urea in 1982 to 640,000 tons of ammonia and 744,000 tons of urea in 1985. Ammonia output was 658,000 tons (565,880 tons of nitrogen) during 1986, and urea production was 747,000 tons (343,620 tons of nitrogen). Qatar was the largest exporter of ammonia in the Arab Gulf region and was equal to Saudi Arabia in urea sales. Urea exports reached 799,000 tons in 1986, up 14% from those of 1985. Exports of ammonia increased by about 12% to 219,000 tons. The main markets for urea were Australia, China, India, and the United States, and ammonia went mainly to India (70%) and the Republic of Korea. However, sales income fell by more than 30% in 1986, from $123.6 million to $85.7 million, as a result of low world prices. QAFCO continued to plan the construction of a 1,500-ton-per-day ammonia plant costing $200 million to add to its two operating 900-ton-per-day ammonia units and two 2,000-ton-per-day urea plants.

Qatar's industrial minerals sector continued to focus on construction-based minerals such as clays, gypsum, and limestone, for cement manufacture, recrystallised limestone for building aggregates, and silica sand for construction purposes. The Qatar National Cement Co. increased profits by 49% between 1984 and 1985, despite an 8.5% fall in cement sales. Clinker production was up 2% to 319,470 tons, which was 1% above design capacity. During the first half of 1986, clinker production was down by 6% to 146,359 tons, and cement sales fell by 18.5%. While determining the total limestone reserves for the Qatar cement industry, celestite deposits were found exposed on the southwestern coast of Qatar within rocks of Early to Middle Eocene age. Total reserves were estimated at 64,000 tons of celestite ore averaging 75% to 85% strontium sulfate. Gypsum reserves within the same region were estimated at about 10 million tons.

SYRIA[8]

The fall in world oil prices had a serious, negative impact on the economy of Syria, because its own oil-generated revenues declined and Arab Gulf States were less prepared to give Syria aid as their own revenues continued to decline. The depression in the Persian Gulf region also had a negative effect on the remittances from Syrians working abroad.

Syria had a well-established oil industry that accounted for about 10% of gross national product and for about 50% of overall exports. Production rose to nearly 200,000 bbl/d in 1986 as a result of new production from the Tayyim Field. Output at refineries averaged about 210,000 bbl/d, by using a blend of one-third Syrian heavy oil and two-thirds imported lighter oils. Syria exported about 100,000 bbl/d of its heavy oil, plus about 20,000 bbl/d of refined products. Domestic petroleum consumption averaged about 190,000 bbl/d. In January 1986, Syria's proved oil reserves were estimated at 1,541 million barrels, and gas reserves were 4,378 billion cubic feet. Recent discoveries still in the evaluation stage were not included in these estimates.

Pecten Syria Petroleum Co. awarded a contract to Metric Corp. of the United States for the design and fabrication of a skid-mounted metering and proving station. Capacity of the 80,000-bbl/d unit for crude production from the Dier-ez-Zor Field would be increased to 120,000 bbl/d in the future.

The Syrian Petroleum announced a significant discovery of light crude oil in the northeastern part of the country that may have been in a 3,200-meter-deep horizon in

the al-Hall Field, about 10 kilometers from the Iraqi border. Initial flow was about 2,000 bbl/d. Production from shallower levels of the field were about 10,000 to 15,000 bbl/d.

Al-Furat Petroleum Co., a joint venture between Syrian Petroleum and a subsidiary of Shell Oil Co. of the United States, began operating the Thayyem Oilfield in the Deir-ez-Zor concession in northeastern Syria in October at an initial rate of 50,000 bbl/d. Two new discoveries were also made north of the Tayyim Field; one tested at a rate of 7,200 bbl/d of 42° API gravity crude. The Dubai-based Brown & Root Engineering and Construction Co. installed the $4.5 million, 60,000-bbl/d production facility that would send oil to the Baniyas and Homs refineries through the old 30- to 32-inch Iraq-Mediterranean pipeline that was closed by Syria in early 1982. A 92-kilometer, 30-inch spur line linking the field to the pipeline was built by Technoexport of Czechoslovakia. Plans were then made to offer a $60 million to $70 million contract for production facilities that would double output capacity to 120,000 bbl/d. Reserves of the light (36.5° API gravity) low-sulfur (less than 1%) oil were estimated at about 250 million barrels. The bulk of the 170,000 bbl/d produced from fields elsewhere in Syria was heavy, with a high sulfur content. About 200,000 bbl/d had been routinely imported to mix with local oil for refining at Baniyas and Homs. By 1988, the field would help to increase total Syrian output by more than 50%, thereby cutting the oil import bill. In late 1986, the U.S. Government announced economic sanctions against Syria, and in response, Pecten made arrangements to sell its share in the concession to the Royal Dutch/Shell Group. American personnel were to be transferred to Royal Dutch/Shell to continue employment in Syria.

The Homs Petroleum Refinery Co. studied bids from international groups for a contract to build an estimated $180 million, 700,000-barrel-per-year lube-oil complex that would bring the total annual throughput capacity of the Homs refinery to 46 million barrels.

Technoexport of Czechoslovakia received a $10 million contract to construct a 100-kilometer gasline linking the T4 pumping station on the unused Iraqi-Mediterranean pipeline to the nitrogenous fertilizers plant near Homs. The line would complete the link between the gas treatment plant at Jubaisah in northeastern Syria and Homs. The gas treatment plant and the first 277-kilometer part of the line linking the plant to the T3 station on the pipeline were also being built by Technoexport. Gas producing fields were being developed in the Jubaisah area (Ghuna, Jabaisah, Kubaibah, and Tishrin among others) and a gas-gathering pipeline network was being built by Bulgargeomin of Bulgaria.

An oil supply agreement was made with Iran that would renew until March 1987 a 4-year-old arrangement that ended in May. Since 1982, when the Government closed the oil pipeline from Iraq, Iran had been delivering to Syria 100,000 bbl/d of oil at about 10% below prevailing official prices and a free 20,000 bbl/d. Supplies were interrupted in late 1985 because of disagreements about payments in arrears and price, and Syria was forced to buy oil on the Mediterranean spot market and from Algeria. Some free oil was donated by Kuwait.

Agriculture provided employment for nearly one-half the total Syrian labor force, and part of Syria's strategy of agricultural development continued to be the development of a self-sufficient, indigenous fertilizer industry. Production facilities at Homs included a 165,000-ton-per-year (phosphorus pentoxide) phosphoric acid plant, a 211,000-ton-per-year (phosphorus pentoxide) triple superphosphate unit, and a 159,000-ton-per-year (nitrogen) urea unit. Syria's phosphate rock industry that fed the phosphoric acid plant had an annual nominal installed capacity of 1.6 million tons per year. A small amount of Syrian sulfur from refineries was used in the Homs complex, but most of the industry's requirements were imported from Saudi Arabia and Kuwait. Total sulfur recovery was about 120,000 tons per year. Ammonium nitrate fertilizer was no longer imported, and only small quantities of potash were imported.

Phosphate production by the General Co. for Phosphates and Mines was 1.6 million tons in 1986, compared with about 1.3 million tons in 1985 and 1.5 million tons in 1984, and was expected to rise to 2 million tons in 1987. Exports increased by about 50% in 1986 from 872,000 tons to 1,302,000 tons as a result of increased production, the opening of new markets in Western Europe, increased sales to Eastern Europe resulting from fewer deliveries from the U.S.S.R., and the doubling of annual phosphate throughput capacity at Tartous port to 2,600,000 tons. The industry's expansion plans were

to include upgrading rail links between the phosphate mines and Tartous port. The phosphate industry was set up with technical assistance from Eastern Europe, and that region remained Syria's largest market. For the first time, Syria shipped 10,000 tons of phosphate rock to India. Important new markets were opened in Austria, 36,000 tons; Finland, 21,000 tons; the Netherlands, 19,000 tons; and Spain, 48,000 tons. Exports to France (122,000 tons), Italy (197,000 tons), the Federal Republic of Germany (189,000 tons), and the U.S.S.R. (39,000 tons) increased significantly. Phosphate rock continued to be distributed through barter and countertrade deals rather than for cash because of its relatively low quality (72% of production was 65% bone phosphate lime). A French-British consortium was awarded a $5 million contract to convert the Homs ammonia plant to run on natural gas instead of naphtha. The conversion would include the addition of a feed gas compressor and modifications to the feed preheat furnace, the desulfurisers, and the primary reformer's burners. The gas would be piped 370 kilometers from the Jubaisa treatment plant.

A discovery of a diamond deposit near Homs was announced in early November, and a South African company, Van Eck & Lurie, was said to be interested in building a $1.5 million pilot plant to exploit the kimberlite.

The production of minerals other than phosphate rock was relatively limited and confined mainly to the construction materials such as clays, gypsum, and limestone.

Table 6.—Syria: Exports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	Destinations (principal), 1983
METALS			
Aluminum: Metal including alloys, all forms	1	--	
Chromium: Oxides and hydroxides	--	13	All to Jordan.
Copper: Metal including alloys:			
Unwrought	--	581	All to West Germany.
Semimanufactures	6	2	All to Saudi Arabia.
Iron and steel: Metal:			
Pig iron, cast iron, related materials	--	33	All to West Germany.
Steel, primary forms	1	--	
Semimanufactures:			
Universals, plates, sheets value, thousands	NA	$1	All to Saudi Arabia.
Rails and accessories	13	2	Saudi Arabia 1; Yemen (Sanaa) 1.
Wire	9	14	Kuwait 13.
Tubes, pipes, fittings	4	15	Jordan 10; Saudi Arabia 5.
Castings and forgings, rough	379	148	Saudi Arabia 105; Jordan 23.
Lead: Metal including alloys, semimanufactures	--	2	All to Saudi Arabia.
Magnesium: Metal including alloys, unwrought	--	6	All to Jordan.
Other: Ashes and residues	--	432	Do.
INDUSTRIAL MINERALS			
Abrasives, n.e.s.:			
Natural: Corundum, emery, pumice, etc	5	2	All to Saudi Arabia.
Grinding and polishing wheels and stones	4	1	All to Qatar.
Barite and witherite	988	273	All to Turkey.
Chalk	17	--	
Clays, crude	441	407	Saudi Arabia 274; Kuwait 103.
Fertilizer materials: Manufactured:			
Ammonia	357	65	All to Jordan.
Nitrogenous	230	5,548	Do.
Phosphatic	100	15,700	Iran 15,500.
Gypsum and plaster	22,390	30,565	Lebanon 29,862.
Phosphates, crude thousand tons	705	1,002	Romania 408; U.S.S.R. 233; Republic of Korea 132.
Pigments, mineral: Iron oxides and hydroxides, processed	5	--	
Stone, sand and gravel:			
Dimension stone:			
Crude and partly worked	7,717	143	Jordan 113; Saudi Arabia 22.
Worked	25	49	United Arab Emirates 17; Lebanon 15.
Gravel and crushed rock	60,658	41,818	Kuwait 23,926; Saudi Arabia 8,390; Lebanon 6,663.
Sand other than metal-bearing	201	97	Jordan 40; Saudi Arabia 25.
Talc, steatite, soapstone, pyrophyllite, etc	NA	2	All to Saudi Arabia.
Other: Crude	182	73	NA.

See footnotes at end of table.

Table 6.—Syria: Exports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	Destinations (principal), 1983
MINERAL FUELS AND RELATED MATERIALS			
Asphalt and bitumen, natural	1,142	NA	
Coke and semicoke	--	5	All to Saudi Arabia.
Petroleum:			
Crude thousand 42-gallon barrels	38,282	42,226	Romania 23,139; Italy 5,763.
Refinery products:			
Liquefied petroleum gas do	--	16	All to Lebanon.
Gasoline, motor do	1,662	715	Lebanon 393; Nigeria 322.
Kerosene and jet fuel do	470	116	All to France.
Residual fuel oil do	16,284	9,801	Italy 5,092; France 1,692.
Bituminous mixtures do	12	44	Lebanon 23; Kuwait 6.
Petroleum coke do	463	514	Mainly to Turkey.

NA Not available.

[1]Table prepared by Virginia A. Woodson. There were no reported exports of mineral commodities by Syria to the United States during 1983.

Table 7.—Syria: Imports of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1982	1983	Sources, 1983	
			United States	Other (principal)
METALS				
Alkali and alkaline-earth metals value, thousands	$1	$18	--	All from Belgium-Luxembourg.
Aluminum:				
Oxides and hydroxides	51	3,196	--	West Germany 3,160.
Metal including alloys:				
Unwrought	653	5,746	--	France 5,494.
Semimanufactures	6,434	11,841	--	West Germany 2,350; Norway 1,624; Italy 1,060.
Chromium: Oxides and hydroxides	16	21	--	Hungary 20.
Cobalt: Oxides and hydroxides	--	1	--	All from U.S.S.R.
Copper: Metal including alloys:				
Unwrought	100	57	--	Saudi Arabia 21; Jordan 18.
Semimanufactures	8,562	9,391	20	Spain 2,907; United Kingdom 1,553.
Iron and steel: Metal:				
Scrap	24,856	6,451	16	Lebanon 2,158; United Kingdom 1,910.
Pig iron, cast iron, related materials	7,839	4,521	--	China 2,287; Bulgaria 955.
Ferroalloys: Ferromanganese	60	776	--	Belgium-Luxembourg 730.
Steel, primary forms	28,262	54,097	142	Zimbabwe 19,847; U.S.S.R. 16,001.
Semimanufactures:				
Bars, rods, angles, shapes, sections	485,840	123,267	--	Brazil 29,435; U.S.S.R. 25,572; East Germany 16,648.
Universals, plates, sheets	129,203	74,525	--	Republic of Korea 14,932; North Korea 9,847; U.S.S.R. 7,671.
Hoop and strip	19,995	28,639	--	Greece 12,941; Austria 8,109.
Rails and accessories	(2)	9,293	--	U.S.S.R. 8,506.
Wire	23,518	19,594	1	China 7,098; Romania 5,317; U.S.S.R. 2,013.
Tubes, pipes, fittings value, thousands	$51,669	$84,611	$9,126	Italy $13,027; Romania $11,242; West Germany $9,224.
Castings and forgings, rough	2,182	6,540	524	United Kingdom 1,941; Italy 1,827; Czechoslovakia 1,231.
Lead:				
Oxides	--	375	--	France 374.
Metal including alloys:				
Unwrought	1,638	2,680	--	Italy 750; Saudi Arabia 660; Denmark 500.
Semimanufactures	5	211	--	France 175; United Kingdom 20.
Manganese: Oxides	40	--		
Nickel: Metal including alloys:				
Unwrought	20	15	--	France 11; United Kingdom 4.
Semimanufactures	4	3	--	Hungary 2.
Platinum-group metals: Metals including alloys, unwrought and partly wrought value, thousands	--	$13	--	All from West Germany.
Silver: Metal including alloys, unwrought and partly wrought do	$5	--		

See footnotes at end of table.

Table 7.—Syria: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	Sources, 1983	
			United States	Other (principal)
METALS —Continued				
Tin: Metal including alloys:				
Unwrought	21	68	1	China 47; Denmark 18.
Semimanufactures	13	18	--	Denmark 15.
Titanium: Oxides	588	336	--	Turkey 238; France 94.
Zinc:				
Oxides	70	779	--	United Kingdom 506; West Germany 127.
Metal including alloys:				
Unwrought	610	1,717	--	Finland 750; Hungary 638.
Semimanufactures	771	46	--	France 30; Romania 12.
Other: Oxides and hydroxides	31	417	5	Italy 239; Turkey 100.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	91	315	--	Italy 300; U.S.S.R. 15.
Artificial: Corundum	1	410	1	West Germany 409.
Grinding and polishing wheels and stones	714	61	NA	Italy 24; Czechoslovakia 19.
Asbestos, crude	3,885	4,849	--	Republic of South Africa 4,397.
Barite and witherite	9,155	3,918	--	Turkey 2,500; Italy 998.
Boron materials: Oxides and acids	25	31	--	France 20; China 10.
Cement	611,235	49,206	--	U.S.S.R. 27,340; Lebanon 13,645.
Chalk	2,643	2,658	--	Belgium-Luxembourg 1,469; France 1,188.
Clays, crude	3,945	7,571	25	United Kingdom 3,036; France 2,227.
Diamond: Gem, not set or strung value, thousands	$6	--		
Diatomite and other infusorial earths	299	1	--	All from United Kingdom.
Feldspar, fluorspar, related materials	200	1,027	--	Hungary 400; West Germany 353; India 250.
Fertilizer materials: Manufactured:				
Ammonia	9	6	--	Netherlands 4; West Germany 2.
Nitrogenous	67,008	145,516	--	Romania 74,427; Bulgaria 60,072.
Phosphatic	8,260	13,271	2,602	Romania 10,617.
Potassic	12,917	11,673	--	Italy 6,150; France 5,523.
Unspecified and mixed	10	32	--	United Kingdom 10; France 9.
Graphite, natural	65	420	--	All from China.
Gypsum and plaster	4	12	9	NA.
Lime	7,396	962	--	Italy 482; Lebanon 405.
Magnesite, all forms	60	10	--	All from France.
Mica:				
Crude including splittings and waste	10	--		
Worked including agglomerated splittings	--	1	--	NA.
Pigments, mineral: Iron oxides and hydroxides, processed	633	508	--	China 390; United Kingdom 60.
Precious and semiprecious stones other than diamond: Natural value, thousands	$145	$20	--	Thailand $11; Belgium-Luxembourg $9.
Salt and brine	22	11	--	West Germany 10.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	5,908	17,087	--	Turkey 12,299; Bulgaria 3,533.
Sulfate, manufactured	19,664	10,954	--	Italy 4,230; West Germany 2,965; Netherlands 994.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	1,733	112	--	All from Lebanon.
Worked	476	691	--	Italy 449; Greece 239.
Gravel and crushed rock	(3)	11,973	15	Italy 7,435; Turkey 3,508.
Quartz and quartzite	697	483	--	West Germany 386; Turkey 56.
Sand other than metal-bearing	100	100	--	United Kingdom 79; Greece 15.
Sulfur:				
Elemental:				
Crude including native and by-product	41	46,427	--	Mexico 31,692; Saudi Arabia 14,313.
Colloidal, precipitated, sublimed	40	220	--	All from West Germany.
Sulfuric acid	1,311	386	--	Greece 380.
Talc, steatite, soapstone, pyrophyllite	1,119	3,130	--	China 2,798.
Other: Crude	211	829	--	West Germany 778.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	2	30	5	United Kingdom 20.
Carbon black	2,261	3,605	--	United Kingdom 3,592.

See footnotes at end of table.

Table 7.—Syria: Imports of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1982	1983	Sources, 1983	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Coal: Briquets of anthracite and bituminous coal	250	522	--	West Germany 320; Belgium-Luxembourg 200.
Coke and semicoke	4,582	4,929	--	Italy 4,686.
Peat including briquets and litter	30	--		
Petroleum:				
Crude thousand 42-gallon barrels	37,614	43,750	--	All from Iran.
Refinery products:				
Liquefied petroleum gas do	1,126	345	--	Libya 98; Greece 87.
Gasoline, motor do	2,541	213	--	Romania 211.
Mineral jelly and wax do	5	4	--	China 1; Japan 1.
Kerosene and jet fuel do	4,103	994	--	Italy 700; Greece 148.
Distillate fuel oil do	--	376	--	U.S.S.R. 191.
Lubricants do	52	823	49	France 260; West Germany 234; Italy 219.
Residual fuel oil do	918	1,324	--	U.S.S.R. 796.
Bituminous mixtures do	--	14	2	Lebanon 4; Turkey 4.

NA Not available.
[1]Table prepared by Virginia A. Woodson.
[2]Unreported quantity valued at $6,109,000.
[3]Unreported quantity valued at $591,000.

PEOPLE'S DEMOCRATIC REPUBLIC OF YEMEN[9]

The violent change in Government in January brought a decline in economic activity during 1986, and development expenditure was cut. Actual spending was about $432.1 million,[10] compared with a planned $510.4 million. About 70% was financed from foreign sources, and this aid appeared to have been maintained despite fears about the country's political stability. The 1986 current-account deficit was estimated at $250 million, down from $310 million for 1985 as a result of a reduction of imports following the introduction of restrictions. Merchandise exports increased, especially fish and cotton. Interest in People's Democratic Republic of Yemen (PDRY) oil prospects increased following the discovery of oil in the Yemen Arab Republic (YAR). Soviet, French, and Canadian companies signed production agreements; preliminary exploration results were encouraging.

Elf Aquitaine Petroleum (EAP), an affiliate of Société Nationale Elf Aquitaine (SNEA) of France, completed a dry hole, Balhaf No. 1, 350 kilometers east of Aden, after a delay of nearly 6 months following the civil disturbances in PDRY. The Balhaf concession had an area of 18,500 square kilometers that was partly offshore. EAP was also negotiating for a 19,300-square-kilometer onshore-offshore concession at the Aden-Abyan area in the western plateau region of southwestern PDRY. EAP's onshore production split would range from 27.5% on output under 25,000 bbl/d, to 20% on production over 50,000 bbl/d. Offshore, the split would go from 30% to 25%. Cost recovery would be 40%.

In mid-1986, Occidental Petroleum of Canada and Consolidated Contractors Co. of Lebanon initialed a production-sharing agreement with the Petroleum Exploration Department (PED) for a 36,000-square-kilometer area at al-Masilah al-Barriyyah in eastern PDRY. PED was also negotiating with Geneva-based Consolidated International Petroleum for an onshore-offshore concession at Qamar Bay in eastern PDRY near Oman.

The international operations subsidiary of the Brazilian state-owned company Petróleo Brasileiro S.A. began drilling a second well in its concession in the Hurin-Ghayda bloc in eastern PDRY. The first 4,000-meter wildcat did not find oil.

Azienda Generali Italiana Petroli S.p.A. of Italy ended its exploration activities in PDRY after appraisal work followed the discovery of 3,000-bbl/d, 34° API gravity oil at offshore Sharmah, about 600 kilometers east of Aden.

The Soviet Union agreed in late 1986 to finance oil exploration until 1990 with a $190 million loan, and to conduct geological and geophysical exploration at Shabwa, 300 kilometers northeast of Aden. Earlier, in November 1985, Technoexport of the Soviet

Union drilled and found a very light, low-sulfur oil in the Shabwa area near the Ma'rib-Jawf concession in YAR where oil was discovered in commercial quantities in 1984 by Yemen Hunt Oil Co. (YHOC). The Soviet Union also agreed to supply an annual 50,000 tons of free fuel oil for 3 years as part of the 600,000 tons (12,000 bbl/d) that were to be processed annually at the Aden refinery, and to exchange fish, cotton, and other products for Soviet minerals, heavy machinery, and electrical goods.

Technipetrol of Italy finished the $25 million modernization program of the 170,000-bbl/d Aden refinery, which included a 10,000-bbl/d vacuum distillation unit to process fuel oil into asphalt and gas-oil, a 100,000-ton-per-year asphalt plant, a new LPG unit that would increase production from 20,000 tons per year to 60,000 tons per year, and LPG storage tanks. Other projects included repair of all of the port's piers, enlargement of Pier No. 4 to enable it to receive tankers having a load capacity of 110,000 tons, repair of tanks that had a storage capacity of 750,000 tons of oil and products, and modernization of the powerplant. The refinery, which suffered damage worth $9.3 million during the civil unrest in January, was reported at midyear to be running at a little more than one-half capacity, and in late 1986 at about 30% capacity. It supplied the domestic market with 10,000 bbl/d, Kuwait with 10,000 bbl/d, and Iran with 50,000 bbl/d.

Batais Cement Co. postponed construction of its 350,000-ton-per-year cement plant, which was to be built by Creusot Loire Entreprise Groupe Technip of France for $83 million, because of a cash shortage.

Progress by Soviet technicians continued on the Wadi Madin gold mine, 95 kilometers from Mukalla on the Hadhramaut coast, which was expected to be operational by 1989. The deposit, in a mineralized zone 44 kilometers long and 7 kilometers wide, was vein mineralization associated with dikes within a 5-square-kilometer area.

YEMEN ARAB REPUBLIC[11]

YAR became the latest oil producing country in the Peninsula when the Alif Field in the Ma'rib-Jawf concession, 150 miles northeast of Sanaa, began producing. The concession was held by YHOC and a consortium of South Korean companies. The country's development had traditionally been hampered by the Government's lack of foreign exchange, and recently, there had been a steady fall in remittances from Yemenis working abroad that amounted to 30% of the male labor force. A swift development of YAR's hydrocarbons program was desirable and was implemented by the exemption of those connected with this industry from the licensing system that had halted much of the country's imports. Access to domestically generated foreign exchange would strengthen the authority of the traditionally weak central Government, and would reduce dependency on remittances and foreign aid for general economic development, thereby changing relations with Saudi Arabia, the principal source of these funds. In an effort to offset declining remittances during 1986, the Government devalued the local currency, restricted import licensing, and tried to decrease smuggling from Saudi Arabia. As a result of these efforts and increased foreign aid, the current account showed a $45 million surplus for the first 9 months of 1986 compared with a deficit of $240 million in 1985.

Oil from Alif Field fueled a topping plant (a 10,000-bbl/d topping unit and a 2,500-bbl/d reformer) built near Ma'rib by Petrofac Inc. of the United States. The unit, started in April, supplied about 40% of YAR's demand for gasoline (3,100 bbl/d), diesel fuel (3,600 bbl/d), and fuel oil (3,600 bbl/d). Volume production, 200,000 bbl/d, was expected to begin by 1988 when a major export oil pipeline system was to be ready. The cost of development was expected to be about $500 million, including $350 million for the pipeline. The Petroleum and Mineral Resources Ministry announced plans to build a second refinery, either near Sanaa or on the coast at Al Salif.

Estimates of the Ma'rib-Jawf concession oil and gas reserves were tentative, because the area was still under exploration. Proven reserves of 39° to 40° oil were conservatively estimated to be at least 500 million barrels in the Alif Field. Other significant oil-bearing structures were discovered. Associated and nonassociated gas was found in large quantities, and all output was reinjected.

In late 1985, Foster Wheeler U.S.A. Corp. was awarded a contract to supervise exploitation of YAR's only commercial oil reserves in the 19,600-square-kilometer Ma'rib-Jawf concession for Yemen Explora-

tion and Production Co. (YEPCO), a joint venture of YHOC and Exxon Corp. In mid-1986, Gulf Interstate Engineering Corp. replaced Foster Wheeler and continued the project that was to include engineering, procurement, and construction management for a crude-oil-gathering system in Alif Field, a central processing plant, a 440-kilometer, 24- to 26-inch pipeline from Ma'rib to the Red Sea, and a new terminal near Salif on the Red Sea coast. YEPCO awarded a $90 million contract to an Italian-West German-Lebanese consortium of Saipem S.p.A., Mannesmann AG, and Consolidated Contractors International Co. Ltd. for the construction of the central production unit, gathering system and terminal, main pipeline, three pump and two letdown stations, 5-1/2 miles of offshore pipeline, and an offshore storage and buoy system. Four compressors and three generators for use in secondary oil recovery were to be supplied by Cooper-Rolls of the United States. Mitsubishi Corp. of Japan was to provide the steel pipe for the line that was surveyed by Hunting Surveys of the United Kingdom. Ingersoll Rand of the United Kingdom was to supply seven gas- and diesel-fired units, each capable of pumping 4,132 U.S. gallons per minute, for pumping stations on the oil export pipeline. Sofic Mooring Systems of the United States was to supply a $5.9 million, single-buoy mooring system, and YEPCO purchased from Exxon a tanker of 400,000 deadweight tons (dwt) to be used as a floating storage vessel moored 8 kilometers off Al Salif.

The state-owned Yemen Oil and Minerals Corp. (YOMC) signed a $92-million contract with Sumitomo Corp. and Niigata Engineering Co. Ltd. of Japan and Spie Capag of France for the construction and management of an oil products distribution system and a strategic products reserve. The system would be unrelated to the project to develop the Alif Oilfield, and would distribute imported products only. The project consisted of a floating berth at Ras Isa south of Al Salif capable of receiving vessels of up to 80,000 dwt, a 70-kilometer, single-direction products line between Al Salif and Hodeidah, and products tanks at Al Salif, Hodeidah, and Sanaa having a total capacity of 280,000 tons.

YHOC gave a 50% interest in its 12,000-square-kilometer concession, which lies off Hudaydah in the Red Sea, to SNEA in return for the drilling of two wells, the first of which was spudded in December.

The Economy & Industry Ministry was reported to have given a letter of intent to Ishikawa-jima-Harima Heavy Industries Co. of Japan for a contract to build a 500,000-ton-per-year cement plant at Mafraq. Talks were held with the Soviet Union to discuss the possible expansion of the cement plant at Bajel from 350,000 tons per year to 500,000 tons per year. The capacity of the Amran cement works may also be expanded to 1 million tons per year.

A $20 million project to mine and process gypsum from a deposit near Ma'rib was expected to be retendered in early 1987. The project would consist of an annual extraction and processing of 70,000 tons of plaster and up to 30,000 tons of gypsum to be used as a fertilizer base.

An agreement was signed by the Yemeni Salt Refining and Packaging Co. in Sanaa and Traub Co. of the Federal Republic of Germany for the construction of a new salt refining and packaging plant to be built in al-Hudaydah. Annual production of 30,000 tons of high-quality, refined cooking salt for local use and export would be derived from local raw material.

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[3]Prepared by Charles L. Kimbell.
[4]Prepared by Michael D. Fenton.
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[7]Prepared by Michael D. Fenton.
[8]Prepared by Michael D. Fenton.
[9]Prepared by Michael D. Fenton.
[10]Where necessary, values have been converted from People's Democratic Republic of Yemen dinars (SYD) to U.S. dollars at the rate of SYD0.345=US$1.00.
[11]Prepared by Michael D. Fenton.

The Mineral Industry of Other Areas of South America

By H. Robert Ensminger, Charles D. Hoyt, and Orlando Martino

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ECUADOR[1]

As a result of the new mining law implemented in August 1985 and the programs conducted by the Instituto Ecuatoriano de Minería (INEMIN), which was created by this legislation, there was considerably greater activity in the nonfuels mineral sector during 1986. Over the next 2 years, INEMIN will be developing a national mining plan that will guide Ecuadorean mineral development for the balance of this century. As stage one of INEMIN's mineral study, historical records were reviewed and 300 abandoned mines and 1,200 unexplored mineral deposits were available for further investigation. In 1986, INEMIN established 5 branch offices and negotiated 250 new mining contracts with foreign companies valued at $16 million. Despite all this activity, INEMIN officials estimate that 100,000 square kilometers remain available for claim staking.

Technical assistance contracts were signed with Belgium, the Federal Republic of Germany, Italy, Spain, and the United Kingdom, to assist in a variety of assignments ranging from helping prepare the national mining plan to the development of industrial mineral deposits.

In late 1986, a group of U.S. investors, sponsored by the Overseas Private Investment Corp., visited Ecuador to consider a wide range of investment projects. Reportedly, a group of 60 potential investment projects were under consideration. Among these investments were a number of mining projects, of which several may be funded in the short term.

The Ecuadorean economy was impacted severely by the sharply falling oil prices, which declined 50% from slightly under $26 per barrel to about $13 per barrel. This caused an almost $1 billion shortfall in export earnings compared with those of 1985. Such losses were an extremely serious situation since in 1985 petroleum export earnings provided over 14% of the gross domestic product (GDP), almost 63% of merchandise exports, and over 60% of central Government revenue. Growth in the GDP was estimated at 1% and inflation at 25%. Starting in February and then again in August and September, the Government instituted strong countermeasures to meet this financial crisis caused by the sharp petroleum price decline. The Ecuadorean currency (sucre) was allowed to float, and tariffs were reduced from 10% to 70%. The overall result was that Ecuador's trade balance in 1986 was a positive $611 million.

Petroleum production continues to domi-

nate the economy of Ecuador. In 1985, the petroleum-mining sector provided nearly 15% of the GDP; however, this declined considerably in 1986. For the first 7 months of 1986, petroleum output averaged over 301,000 barrels per day (bbl/d), of which two-thirds was exported. Output declined in the final months of the year because of the Organization of Petroleum Exporting Countries (OPEC) quotas. In a report issued at yearend, Ecuador's total oil reserves were stated to have declined from 1.50 billion barrels in 1972 to 1.15 billion in 1986.

The dominant petroleum producer, with over 80% of total output, continued to be the Corporación Estatál Petrolera Ecuatoriana (CEPE)-Texaco Inc. operations in the northern part of the Oriente region oilfields, whose reported output in 1986 was 234,000 bbl/d. The largest producing field in the Oriente, the eastern jungle region, was Shushufindi, discovered in 1959, whose output from 46 wells in the first half of 1986 slightly exceeded 108,500 bbl/d. Texaco, which operates the CEPE-Texaco jointly owned operations in the Oriente, also reported a new discovery well, Guanta-1, which flowed from two intervals at a combined rate of 5,600 bbl/d. Texaco also reported completing an extensive seismic and geologic exploration program in the 500,000-acre Manabi block in the Pacific coast area. Three wildcat wells are to be drilled in this tract.

Ecuador's total petroleum refining capacity from three refineries remained at 87,600 bbl/d. The largest refinery, at Esmeraldas, has a capacity of 55,600 bbl/d and is owned by CEPE. CEPE announced plans to begin an expansion in 1987 of this refinery by 90,000 bbl/d at a cost of over $200 million.

In late 1986, CEPE accepted five petroleum exploration bids from foreign consortia who agreed to spend $115 million on four onshore and one offshore tract. The successful bidders were Block 3 (offshore southwest of Guayaquil), Fred Parks Inc.; Block 9, Petro-Canada International Assistance Corp.; Block 12, a group led by Tenneco Oil Exploration and Production Co.; Block 14, consortium of Société Nationale Elf Aquitaine (SNEA) of France; Petróleo Brasileiro S.A. (PETROBRÁS) and Yacimientos Petrolíferos Fiscales S.A. (YPF) of Argentina; and Block 17, PETROBRÁS, SNEA, and Britoil Ltd.

Over the past few years, there has been a considerable increase in gold output, primarily from small mining operations, both hard rock and placer. The director of INEMIN reportedly expressed optimism that Ecuador had the potential to further increase its gold output to become one of the leading producers in the world. INEMIN reported total output in 1986 at almost 320,000 troy ounces. The three main gold mining centers are Nambija, Ponce Enriquez, and the old mining district, Portovelo. The Nambija Mine reportedly produced over 60% of the total output with about 1,200 miners using primitive methods and working in dangerous conditions. To improve safety and efficiency, INEMIN formed a joint mining company with the miners. The Central Bank of Ecuador also opened a branch at Nambija to buy gold directly from the miners. An article in a trade journal[2] summarizes Ecuador's mineral resource potential and included a map showing potential gold zones and comments in detailed fashion on several deposits being appraised or under development, including the historic Portovelo Mine (copper and gold), the Nambija deposit (gold), the Chaucha project (copper and molybdenum), and the San Bartolome silver mine, which is being developed by Compañía Armeno Resources Inc. of Vancouver, British Columbia, Canada, at a $4 million cost. The article also describes the considerable potential in gold placers in riverbeds throughout Ecuador. Five gold mining districts were described in the article, primarily in the western half of Ecuador. Values in these various occurrences have shown gold values ranging from about 3.75 to 11.65 grams per cubic meter.

In 1986, the Government of Ecuador contracted with a West German firm, Preussag AG, to conduct comprehensive investigations for offshore marine mineral resources. In addition to these offshore investigations, extensive aeromagnetic surveys were being conducted over 8,000 square kilometers in south Ecuador in the areas of Puyango and Zamora. Earlier, geochemical and radiometric investigations encountered a number of high-level anomalies that are to be further investigated in 1987 by drilling. In Puyango, the occurrences are uranium and vanadium, and in Zamora, the occurrences extend over dozens of kilometers and are associated with copper, lead, and zinc.

Since 1980, the output of cement from the country's four producers has more than doubled, increasing from slightly over 1 million tons to 2.1 million tons in 1986. The largest producer is La Cemento Nacional C.E.M., which operates two plants near

Guayaquil. In the late 1970's and through 1981, Ecuador was a substantial importer of cement with peak imports occurring in 1980 when almost 1 million tons was imported. Since that time, imports have remained well below 100,000 tons per year. All of the cement producers have their own quarries to provide limestone as raw material for the kilns. The country reportedly produced 6.5 million tons of limestone in 1986, of which an estimated 4.2 million tons was consumed in making cement.

Table 1.—Other Areas of South America: Production of mineral commodities[1]

Country and commodity	1982	1983	1984	1985[p]	1986[e]
ECUADOR[2]					
Cadmium, mine output, Cd content[e] kilograms	300	350	300	300	300
Cement, hydraulic thousand metric tons	1,585	[r]1,420	1,733	1,966	2,105
Clays, kaolin metric tons	4,104	1,000	1,000	2,000	NA
Copper, mine output, Cu content do.	25	8	180	100	100
Gas, natural:					
Gross million cubic feet	13,816	17,008	18,111	21,495	22,000
Marketable do.	1,158	2,568	4,769	4,583	2,600
Gold, mine output, Au content troy ounces	1,601	608	280,000	300,000	319,000
Gypsum (for cement) metric tons	2,000	2,000	2,000	2,000	2,000
Iron and steel:					
Steel, crude do.	27,768	22,768	18,143	17,500	16,400
Semimanufactures do.	146,026	150,755	138,611	130,500	174,500
Lead concentrate, Pb content do.	235	225	200	200	200
Natural gas liquids:					
Natural gasoline thousand 42-gallon barrels	45	108	178	229	NA
Liquefied petroleum gas do.	763	643	1,077	591	NA
Total do.	808	751	1,255	820	NA
Petroleum:					
Crude do.	77,106	86,341	94,915	102,415	105,000
Refinery products:					
Gasoline do.	8,232	6,109	7,850	7,630	NA
Jet fuel do.	1,065	907	1,045	1,124	NA
Kerosene do.	2,531	2,059	2,279	2,127	NA
Distillate fuel oil do.	5,221	5,792	10,077	13,646	NA
Residual fuel oil do.	14,491	11,067	9,295	4,111	NA
Lubricants do.	320	228	283	291	NA
Liquefied petroleum gas do.	646	382	580	703	NA
Unspecified do.	460	430	575	718	NA
Refinery fuel and losses do.	1,043	548	514	1,089	NA
Total do.	34,009	27,522	32,498	31,439	NA
Silica metric tons	12,919	7,000	21,437	22,441	29,875
Silver, mine output, Ag content troy ounces	10,076	3,138	[e]2,400	2,000	NA
Stone, sand and gravel:					
Limestone (for cement manufacture) thousand metric tons	1,200	1,500	1,600	3,000	4,200
Marble metric tons	23	6,200	6,679	11,435	15,195
Sulfur:[e]					
Native do.	4,500	5,000	5,000	4,000	4,000
Byproduct:					
From petroleum do.	5,000	5,000	5,000	5,000	5,000
From natural gas do.	5,000	5,000	5,000	5,000	5,000
Total do.	14,500	15,000	15,000	14,000	14,000
Zinc, mine output, Zn content do.	47	15	100	100	100
FRENCH GUIANA					
Gold, mine output, Au content[e] troy ounces	5,231	8,038	[3]10,127	12,000	9,000
Stone, sand and gravel[e] metric tons	400,000	400,000	400,000	400,000	400,000
GUYANA[2]					
Aluminum:					
Bauxite, dry equivalent, gross weight thousand metric tons	1,783	1,087	1,333	1,675	[3]1,466
Alumina do.	73	--	--	--	--

See footnotes at end of table.

Table 1.—Other Areas of South America: Production of mineral commodities[1] —Continued

Country and commodity	1982	1983	1984	1985[p]	1986[e]
GUYANA[2] —Continued					
Diamond:[e]					
Gem thousand carats	4	5	6	4	NA
Industrial stones do	7	5	8	7	NA
Total do	11	[3]10	14	11	[3]9
Gold, mine output, Au content troy ounces	7,347	4,607	11,131	10,323	[3]14,030
PARAGUAY					
Cement, hydraulic thousand metric tons	111	153	109	46	[3]179
Clays:					
Kaolin metric tons	55,000	45,000	50,000	60,000	[3]60,000
Other thousand metric tons	2,100	1,600	1,700	1,750	[3]1,650
Gypsum metric tons	6,500	4,000	6,000	2,500	[3]2,800
Lime do	53,700	73,891	85,000	80,270	[3]88,290
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	698	434	327	506	382
Jet fuel do	69	88	18	115	162
Kerosene do	88	201	88	58	21
Distillate fuel oil do	698	705	512	623	640
Residual fuel oil do	277	202	149	223	254
Liquefied petroleum gas do	35	81	35	47	40
Refinery fuel and losses do	404	339	167	229	22
Total do	2,269	2,050	1,296	1,801	1,521
Pigments, mineral: Natural, ocher metric tons	120	180	250	260	[3]250
Sand including glass sand thousand metric tons	2,300	1,602	1,654	1,741	[3]1,659
Stone:					
Dimension do	108	71	62	65	65
Crushed and broken:					
Limestone (for cement and lime) do	270	350	175	180	200
Other do	2,500	1,500	1,730	1,850	1,800
Marble metric tons	250	250	300	400	450
Talc, soapstone, pyrophyllite do	150	120	150	120	[3]130
SURINAME					
Aluminum:					
Bauxite, gross weight thousand metric tons	4,205	3,400	3,454	3,000	[3]3,847
Alumina do	1,055	1,129	1,208	1,000	[3]1,471
Metal, primary[4] do	43	34	23	23	[3]29
Cement, hydraulic do	72	74	50	50	50
Clays: Common metric tons	100,000	100,000	100,000	100,000	110,000
Gold, mine output, Au content troy ounces	599	482	322	500	600
Sand and gravel:[e]					
Sand, common thousand metric tons	150	150	150	160	160
Gravel do	70	20	20	25	25
Stone, crushed and broken do	50	50	46	50	50
URUGUAY					
Aluminum, secondary metric tons	21	24	31	20	[3]51
Barite do	80	3	10	15	[3]15
Cement, hydraulic thousand metric tons	659	401	334	314	[3]340
Clays, unspecified metric tons	278,821	152,155	70,936	150,000	150,000
Coke, gashouse[e] do	12,000	10,000	10,000	8,000	8,000
Corundum[e] do	45	50	50	40	40
Feldspar do	838	1,129	1,950	1,000	1,000
Gem stones, semiprecious:					
Agate do	94	53	108	90	90
Amethyst do	21	24	21	20	20
Gypsum do	122,284	151,832	74,091	100,000	100,000
Iron and steel:					
Ferroalloys: Electric-furnace ferrosilicon crust do	--	250	162	250	250
Steel, crude do	28,019	45,674	40,763	38,964	[3]39,626
Semimanufactures do	37,553	33,602	47,221	41,367	[3]40,775
Lime thousand metric tons	14	10	8	9	[3]10
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	1,901	1,570	1,643	1,649	[3]1,660
Jet fuel do	231	191	152	184	[3]182
Kerosene do	804	642	572	452	[3]415
Distillate fuel oil do	3,600	3,181	3,348	2,992	[3]2,324
Residual fuel oil do	4,732	2,975	2,725	2,301	[3]2,434
Lubricants do	50	41	46	--	--
Liquefied petroleum gas do	445	415	482	498	[3]459
Unspecified do	318	206	251	189	[3]225
Refinery fuel and losses do	401	-288	-151	-386	[3]22
Total do	12,482	8,933	9,068	7,879	7,721

See footnotes at end of table.

Table 1.—Other Areas of South America: Production of mineral commodities[1] —Continued

Country and commodity	1982	1983	1984	1985[p]	1986[e]
URUGUAY —Continued					
Sand and gravel:					
Sand, common thousand metric tons	2,042	1,598	1,391	1,500	1,500
Gravel do	506	439	237	500	500
Stone:					
Dimension do	9	9	10	8	8
Crushed and broken:					
Alum schist metric tons	6,320	3,234	9,977	8,000	8,000
Dolomite thousand metric tons	[4]14	3	4	3	3
Limestone do	1,098	757	666	700	700
Marble do	[e]5	4	4	4	4
Marl metric tons	11,480	7,269	4,257	7,000	7,000
Quartz do	627	481	150	300	300
Other including ballast thousand metric tons	2,171	1,908	1,969	1,900	1,900
Sulfur, elemental, byproduct[e] metric tons	2,000	2,000	2,000	2,000	2,000
Talc, soapstone, pyrophyllite do	1,145	685	1,658	1,500	1,500
Tuff: Tufa do	--	2,444	4,347	3,500	3,500

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available.
[1]Includes data available through mid-June 1986.
[2]In addition to the commodities listed, a variety of crude construction materials (common clays, sand and gravel, and stone) undoubtedly were also produced, but output was not reported, and available information was inadequate to make reliable estimates of output levels.
[3]Reported figure.
[4]Data represent exports.

FRENCH GUIANA[3]

French Guiana's mineral industry comprised a small segment of the overall industry in 1986. The few minerals produced consisted of gold, stone, and sand and gravel. The gold was mined at a number of remote placer sites in the interior. Stone products were quarried in small quantities in the central coastal region for domestic consumption only. Sand and gravel were produced along the major rivers near the coast and along the coastline.

Very small quantities of mineral commodities were traded with the United States. Included were imports of precious and semiprecious stones other than aluminum, diamonds, fertilizer material, refined petroleum products, and steel. The United States received approximately 55% of the total exports, and contributed about 10% of the total imports. The mining industry did not have a noticeable effect on the overall economy in 1986. As an Overseas Department of France, French Guiana is almost totally supported by the Government of France.

French Guiana's electric power generating capacity in 1985 was 31 megawatts. Total electric energy produced was 138 million kilowatt hours, which translated to 1,625 kilowatt hours per capita.

Table 2.—French Guiana: Exports and reexports of selected mineral commodities[1]

Commodity	1984	1985	Destinations, 1985	
			United States	Other (principal)
Abrasives, n.e.s.: Natural: Corundum, emery, pumice, etc. value, thousands	--	$8	--	All to Suriname.
Copper: Metal including alloys, scrap	52	26	--	All to France.
Fertilizer materials: Manufactured, unspecified	844	--		
Tantalum: Metal including alloys, all forms	--	1	1	

[1]Table prepared by H. D. Willis.

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

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
METALS				
Aluminum:				
Oxides and hydroxides	2	--		
Metal including alloys:				
Unwrought, value, thousands	--	$1	--	All from France.
Semimanufactures	104	98	5	France 88; West Germany 5.
Copper: Metal including alloys, semimanufactures	39	49	--	France 39; Austria 5; Finland 4.
Iron and steel: Metal:				
Scrap	4	--		
Semimanufactures:				
Bars, rods, angles, shapes, sections	2,570	2,195	--	France 1,515; Belgium-Luxembourg 582; West Germany 95.
Universals, plates, sheets	2,472	2,986	--	France 2,878; Belgium-Luxembourg 79; Martinique 21.
Hoop and strip	11	8	--	All from France.
Rails and accessories	8	42	--	Do.
Wire	39	36	--	Do.
Tubes, pipes, fittings	482	1,047	--	France 939; Spain 62; Belgium-Luxembourg 40.
Castings and forgings, rough	27	41	4	France 37.
Lead: Oxides	2	1	--	All from France.
Mercury value, thousands	$6	$8	--	Do.
Zinc: Metal including alloys, semimanufactures	1	--		
Other:				
Ores and concentrates	20	--		
Ashes and residues	20	39	--	Do.
Base metals including alloys, all forms value, thousands	$6	$1	--	Do.
INDUSTRIAL MINERALS				
Abrasives, n.e.s.:				
Natural: Corundum, emery, pumice, etc	--	23	--	Do.
Grinding and polishing wheels and stones	6	9	--	France 8; Netherlands 1.
Cement	36,692	39,771	--	Martinique 19,020; France 14,791; Cuba 4,000.
Clays, crude	--	7	--	All from France.
Diamond: Gem, not set or strung value, thousands	$5	$3	--	Do.
Fertilizer materials:				
Crude, n.e.s	41	1	--	Do.
Manufactured:				
Ammonia	2	8	--	France 5; Guadeloupe 2; Martinique 1.
Nitrogenous	350	375	--	France 373; Martinique 2.
Phosphatic	--	20	--	All from Belgium-Luxembourg.
Potassic	2	31	20	France 11.
Unspecified and mixed	1,300	2,019	60	France 1,859; Belgium-Luxembourg 100.
Lime	1,105	300	--	France 202; Martinique 98.
Precious and semiprecious stones other than diamond: Natural value, thousands	$35	$53	--	Brazil $41; France $12.
Salt and brine	396	504	--	France 273; West Germany 170; Spain 54.
Sodium compounds, n.e.s.:				
Carbonate, manufactured	1	1	--	All from France.
Sulfate, manufactured	174	245	--	Do.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked	2	20	--	All from Martinique.
Worked	79	75	--	Brazil 37; Spain 24; France 14.
Dolomite, chiefly refractory-grade	120	60	--	All from France.
Gravel and crushed rock	--	6	--	Do.
Sand other than metal-bearing	--	80	22	France 58.
Sulfur: Sulfuric acid	15	19	--	All from France.
Other: Crude	12	88	--	Do.
MINERAL FUELS AND RELATED MATERIALS				
Asphalt and bitumen, natural	--	25	--	United Kingdom 20; France 5.

See footnote at end of table.

Table 3.—French Guiana: Imports of selected mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Commodity	1984	1985	Sources, 1985	
			United States	Other (principal)
MINERAL FUELS AND RELATED MATERIALS —Continued				
Petroleum refinery products:				
Liquefied petroleum gas, 42-gallon barrels	13,340	24,453	--	Trinidad and Tobago 19,511; Venezuela 2,575; Netherlands Antilles 2,169.
Gasoline, do	145,104	187,757	--	Trinidad and Tobago 185,955; France 1,794; Martinique 8.
Mineral jelly and wax, do	8	8	--	All from France.
Kerosene and jet fuel, do	113,840	99,921	--	Trinidad and Tobago 99,758; France 163.
Distillate fuel oil, do	364,563	358,647	--	All from Trinidad and Tobago.
Lubricants, do	12,187	6,790	28	France 5,943; Jamaica 595; Netherlands 98.
Residual fuel oil, do	163,909	143,983	--	All from Trinidad and Tobago.
Bitumen and other residues, do	2,248	5,963	--	Netherlands Antilles 5,890; France 73.
Bituminous mixtures, do	242	97	--	All from France.

[1]Table prepared by H. D. Willis.

GUYANA[4]

In 1986, Guyana had approximately 60% of the world calcined bauxite market. Plans were laid to increase production from 500,000 tons per year to 700,000 tons per year over the succeeding 3 years. In 1986, production of all grades of bauxite declined 200,000 tons from that of 1985.

A drastic shortage of foreign exchange hampered the recovery of the bauxite industry. The immediate prospects remain heavily dependent on increased outside financial assistance. Increased production of all grades of bauxite have been funded by the European Economic Community (EEC). At yearend, the International Bank for Reconstruction and Development (World Bank) was also considering financial assistance to bolster the bauxite industry.

During 1986, a number of measures were announced that reflected the Government's desire to boost gold production. In an attempt to reduce losses owing to smuggling, the Government more than doubled the price paid to miners in September. Gold miners and Government representatives developed a 5-year plan aimed at encouraging the discovery and development of new gold resources, providing aid and services, and ultimately elevating gold production to the country's second largest foreign exchange earner. Reported gold production in 1986 increased 36% over that of 1985. This was the highest annual gold production by Guyana since 1981. Paranapanema S.A. Mineração, Indústria e Construção, Brazil's largest tin producer, announced that it may begin developing a gold deposit in early 1987 if initial favorable results are confirmed. Encouraging results were reported by Golden Star Resources Ltd. of Canada at its Amai gold prospect, situated approximately 190 kilometers south of Georgetown. An additional gold ore zone was identified about 1 kilometer south of the original deposit. The company is also exploring other potential gold sites at Arakaka, Baramita, and Million Mountain.

PARAGUAY[5]

The mineral industry of Paraguay was limited to the production of a small variety of industrial minerals such as gypsum, limestone, sand, and stone primarily related to construction activity. This output was mostly for domestic consumption. Although not currently under exploitation, other minerals known to occur in Paraguay include barite, copper, lateritic iron ore, manganese, and mica. Peat deposits were estimated to be extensive near Pilas along Río Paraguay where large resources of limestone also occur. The limestone deposits have been exploited for the country's growing cement industry.

State-owned Industria Nacional de Cemento S.A. started operations in 1986 of its new cement plant at Puerto Vallemi. The 730,000-ton-per-year plant incorporates an F. L. Smidth precalciner kiln, raw mill, and cement mill.

The energy sector had a dominant position in Paraguay's economy because of two large hydroelectric power projects: Itaipú, a joint venture with Brazil, and Yacyretá, a joint venture with Argentina, both on Río Paraná at the respective country borders. The 12,600-megawatt Itaipú plant was fully constructed but operating at partial capacity since the equipment installation was still in process. Initial generation was in October 1984. By yearend 1986, four generating turbines were in operation giving Itaipú an installed capacity of 3,800 megawatts. The civil works of the 2,700-megawatt Yacyretá powerplant continued under construction. This plant was designed to have 20 generating units of 135 megawatts each. Paraguay's surplus share of Itaipú's electrical output was sold to Brazil as an important source of foreign exchange. Within the next decade, Paraguay may become the world's largest exporter of hydroelectric energy.

In 1986, Paraguay completed construction of its first steelworks at Villa Hayes on Río Paraguay, 20 kilometers north of Asunción, the capital. In July, the rolling mill was inaugurated with a capacity to produce 150,000 tons per year of steel products, including steel wire, reinforcing bars, angles, and light sections. The two blast furnaces, based on charcoal and iron ore imported from Brazil, were scheduled for startup in November, about 3 years behind schedule. Eighty percent of output was destined for the domestic market. The main objectives of the new plant are to promote Paraguay's industrial development and to meet the demand for steel products created by the construction of the canal for Itaipú and the Yacyretá hydroelectric projects.

The steelworks will be operated by Aceros del Paraguay S.A. founded in 1975, a Brazil-Paraguay joint venture composed of Siderúrgica Paraguaya, a state enterprise administered by the Defense Ministry, 60% of equity; FLM, Comercio e Participaçoes Ltda., 39%; and Técnica Nacional de Engenharía S.A., 1%. The last of the two Brazilian firms was responsible for the engineering and construction of the steel mill. The design provides for future expansion to 400,000 tons per year of steel products. In 1985, Paraguay's apparent consumption of rolled steel products was 31,400 tons composed mostly of bars, tubes, and light sections, all imported mostly from Brazil and Argentina, in order of importance.

Paraguay's iron ore resources occur as lateritic deposits estimated at 250 to 300 million tons with an average grade of 35% iron, situated near Encarnación on Río Paraná, but these deposits are too remote and of relatively low grade compared with Brazilian imports to be commercially feasible for use by the new steelworks at Villa Hayes. Rich new deposits of hematite-magnetite occur southeast of Asunción, chiefly in Precambrian rocks, but are small and also not commercially feasible.

Paraguay is considered by petroleum geologists to have potential for oil and gas discoveries because of its proximity to oil and gas producing areas in southeastern Bolivia and northwestern Argentina near the Pilcomayo River. The Government is cognizant of the risks and costs involved in hydrocarbon exploration in Paraguay and has developed relatively liberal laws and offered large tracts of land to attract foreign interest. Exploration by several foreign oil companies since 1944 has not given promising results other than the drilling by Piper Oil Co. that led to a sizable oil and gas discovery in the Curupayty Basin in the northern part of Chaco Boreal. Occidental Petroleum Corp. resumed its interest in exploring for oil in Paraguay through its subsidiary Occidental of Paraguay Inc. and in its 1986 annual report stated that it was holding interests varying from 45% to 65% in about 6.9 million hectares.

Paraguay's only oil refinery, at Villa Elisa, with a capacity of 10,000 bbl/d of a limited number of petroleum products, was operated by Refinaría Paraguaya S.A.

Mineral trade is not an important factor in Paraguay's economy, especially with regard to exports. As for mineral-related imports, the dominant commodities in 1986 were crude oil and petroleum products not produced by the local refinery or in insufficient quantity to meet domestic demand. Petroleum product imports were down about 17% in 1985 and further reductions were estimated for 1986. Because of fixed contracts held by the state petroleum importing monopoly, it was determined that the full savings from lower world oil prices would not be realized before 1987. Paraguay imported its crude oil from Algeria and its petroleum products from Brazil and Argentina.

SURINAME[6]

The mining and processing of bauxite accounted for 15% of the GDP and 80% of exports in 1986. Despite large reserves of bauxite, about 400 million tons, exports have declined every year since 1980 with a consequent drop in revenue and a resultant widening fiscal debt. Figures for the first half of 1986 showed an increase in alumina and aluminum exports over those of 1985. Bauxite exports were down slightly during the same period. The social and political disturbances later in the year resulted in considerable disruption to the output and exports of alumina, aluminum, and bauxite. In 1986, Suriname exported 216,070 tons of alumina and 111,611 tons of bauxite to the United States.

The Government of Suriname suspended the bauxite production levy in late 1986 following an agreement by the aluminum companies, NV Billiton Maatschappij Suriname (BMS) and Suriname Aluminum Co. (SURALCO), to invest $150 million in mine and facility development over the next 5 years. Operating losses incurred by BMS and SURALCO over the past few years have also been reduced by the establishment of joint ventures. This association is expected to increase integration and the modernizing of existing facilities.

A portion of the lost revenue from the bauxite levy suspension will be offset by increased alumina shipments to Brazil. The agreement currently calls for 130,000 tons per year to be contracted to 1990. Suriname also has a countertrade agreement with Czechoslovakia for the supply of alumina, aluminum, and bauxite.

The state oil company, NV Staatsolie Maatschappij Suriname, continued to develop the Tambaredjo and Borneo Fields. Proven reserves were in excess of 1 million barrels with daily production that exceeded 1,600 barrels.

Approximately 600 troy ounces of gold was recovered from alluvial deposits in the Lawa and Tapanahony areas. Czechoslovakia has a countertrade agreement with Suriname over the processing of gold mined in the country.

URUGUAY[7]

As a country poorly endowed with mineral resources, Uruguay's very limited mineral industry played a minor role in the national economy and in the Latin American region. Uruguay's mineral or mineral-related output continued to be limited to corundum, steel products, industrial minerals mostly related to construction, and petroleum products processed from imported crude oil. All mineral fuels were imported.

Although a relatively small producer, Uruguay was among a small group of countries in the world, including India, the Republic of South Africa, the U.S.S.R., and Zimbabwe, that produce corundum as a natural abrasive. Corundum has been very largely replaced by synthetic abrasives. It is still used by a few glassmakers for grinding optical lenses. Demand for corundum tends to be volatile as well as declining.

Uruguay's production of crude steel has more than doubled since 1981 while output of semimanufactures, primarily reinforcing rods for concrete, has declined. This situation reflected the sharp contraction in the construction industry that in 1985 was 50% below the level of 1981. Construction activity continued to decline in 1986, while the manufacturing and commercial sectors improved. In addition to rods, Uruguay also produced smaller amounts of wire and light sections. A minor amount of ferroalloys produced was comprised only of ferrosilicon with 75% silicon. The economic recession

since 1980 has caused a reduction in the imports of steel products, which in 1985 amounted to 25,500 tons compared with the 80,800 tons imported in 1980. Most of the imported steel products in 1985 were supplied by Brazil and Argentina, in order of importance. Uruguay ceased importing ingot steel from Brazil in 1985 because its own output of crude steel had increased to meet local demand. Steel exports in 1985 amounted to only 1,200 tons, consisting mostly of rods and seamless tubes.

The cement industry operated at one-half of its productive capacity because of lower Government spending and reduced commercial building in 1986. Uruguay's cement production had reached a record-high level in 1981 in meeting the demand created by the construction of the Salto Grande and Palmar hydroelectric projects completed in 1979 and 1982, respectively. However, cement output was expected to expand again to meet the needs of the Montevideo sewerage modernization project under way and two construction projects under consideration: a bridge to Buenos Aires as a link in the Pan American highway and an irrigation project on the Yaguarón River bordering southeast Brazil.

During 1986, the World Bank was evaluating a proposed loan to Uruguay's only oil refinery for a modernization program estimated to cost $32 million. The La Teja oil refinery was operated by state-owned Administración Nacional de Combustibles, Alcohol y Portland (ANCAP). The modernization program involves increasing capacity from 5,500 to 8,400 bbl/d of petroleum products by revamping the process units. Technical assistance was also included to improve operations planning and control. One of the main objectives was to reduce the overall cost of producing the oil derivatives and thus reduce the quantity of crude oil, all imported. Another important objective was to increase the flexibility of the refinery to handle the different types of crude oil that have been imported from Africa, Mexico, the Middle East, the U.S.S.R., and Venezuela.

Uruguay imports all of its petroleum energy, which represented about one-half of the country's primary energy supply in 1985. The other half was provided by hydroelectric energy, which was already almost completely developed. The major development of alternate energy sources such as fuelwood, coal, wind, and solar appeared unlikely in the medium term.

ANCAP had the monopoly on the importation and refining of crude oil. Refined products were distributed through ANCAP's own sales network or sold through private sales outlets. Prices of imported refined products were maintained at the same level as the local equivalent. Fuel prices in retail outlets were the same throughout Uruguay. In 1986, regular gasoline cost $1.92[8] per U.S. gallon, and light fuel oil, $0.70 per gallon.

In the recent past, imports of crude oil and refined products have amounted to about one-third of total imports. Average crude oil prices for Uruguay's imports during 1985 and 1986 were $28 per barrel and $13.83 per barrel, respectively. Because of this considerable price decrease and despite the fact that Uruguay purchased 25% more crude oil in 1986 than in 1985, the share of total imports decreased to 17%, representing a saving of more than $100 million.

Under a geological and mineral cooperation agreement signed between Uruguay and Argentina, the state oil company of the latter, YPF, began a series of exploratory drillings in northeast Uruguay.

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[1]Prepared by Charles D. Hoyt, Chief, Branch of Latin America and Canada, Division of International Minerals.
[2]Engineering and Mining Journal. Feb. 1987, pp. 14-15.
[3]Prepared by H. Robert Ensminger, physical scientist, Division of International Minerals.
[4]Prepared by H. Robert Ensminger, physical scientist, Division of International Minerals.
[5]Prepared by Orlando Martino, physical scientist, Division of International Minerals.
[6]Prepared by H. Robert Ensminger, physical scientist, Division of International Minerals.
[7]Prepared by Orlando Martino, physical scientist, Division of International Minerals.
[8]Where necessary, values have been converted from the Uruguayan peso (Ur$) to U.S. dollars at the rate of Ur$185=US$1.00.

The Mineral Industry of Other South Pacific Islands

By Travis Q. Lyday[1]

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INTRODUCTION

The other South Pacific islands included in this chapter extend from Papua New Guinea, east of the Indonesian Province of Irian Jaya on the island of New Guinea, to Fiji, straddling the 180° meridian. A number of islands have been omitted from this chapter owing to the fact that their only mineral production remained insignificant to the economy of the respective country or territory. These islands include the French overseas territories of French Polynesia and Wallis and Futuna Islands; the independent states of Kiribati, Tonga, Tuvalu, and Vanuatu; the New Zealand freely associated state of the Cook Islands; and the New Zealand dependency of Niue. The mineral production that did exist in these islands was limited to construction materials such as coral reef limestone, crushed stone, and sand and gravel in minor quantities used solely for domestic consumption.

FIJI

Fiji, an archipelago in Melanesia consisting of 300 islands ranging from tiny coral atolls, cays, and rugged coral limestone islets to the larger mountainous, volcanic islands of Kadavu, Taveuni, Vanua Levu, and Viti Levu, straddles the 180° meridian about 1,800 kilometers south of the Equator. Fiji has been an independent member of the British Commonwealth of Nations since October 10, 1970.

Although Fiji's economy is basically agrarian, depending mainly on the sugar industry and a large subsistence sector, the exportation of unrefined gold and silver produced from the Vatukoula Mine in the north of the main island of Viti Levu ranked second in value among the country's exports in 1986. The Vatukoula Mine was managed and operated by Western Mining Corp. (Fiji) Ltd. (WMCF), a wholly owned subsidiary of Western Mining Corp. Holdings Ltd. of Australia, in a joint venture with Emperor Gold Mining Co. Ltd. (EGM). WMCF held a 20% interest in the Vatukoula joint venture. The Vatukoula operation continued as Fiji's only metallic min-

eral producer in 1986. Other active mining in Fiji remained limited to industrial mineral materials—quarries for stone and crushed gravel, limestone for cement and lime production, and coral and river sand mining—all exclusively for domestic use.

As a result of a 3-year exploration and development program conducted by WMCF, along with the reinterpretation of the geological structure controls and a reassessment of previous sampling results, proven ore reserves at the Vatukoula deposit were increased to 2 million tons grading 8 grams (0.23 troy ounce per short ton) of gold per ton, an increase from the previous figure of 1.1 million tons of ore at the same grade.

Since taking over as manager in 1983, WMCF has revised and improved mining methods, reduced operating costs, and rehabilitated and reequipped the mill at the Vatukoula operations, thereby increasing throughput to the mill from about 450,000 tons of ore per year to 800,000 tons per year. By yearend 1986, gold recovery had been enhanced from 77% to 85% during this period.

The 380-meter exploration Philip shaft was completed by midyear at WMCF's and EGM's 50-50 Tavua joint venture at the Prince William Prospect at Nasomo, about 2.5 kilometers south of the main mine at Vatukoula, to gain access to deeper mineralization. If the underground drilling and exploration program, as well as the metallurgical testing of bulk samples, proved successful, the joint venture expected to bring a new mine and mill into operation, possibly as early as 1988. An estimated 300,000 tons of recoverable ore containing 14 grams (0.41 troy ounce per short ton) of gold per ton was estimated for the Nasomo deposit.

Australian-based Climax Mining Ltd. reported that the results from a preliminary shallow percussion drilling program at its Faddy gold prospect on Veti Levu, 16 kilometers south of Nadi, confirmed the existence of a large gold-sulfide mineral deposit. Results of a later diamond core drilling program conducted at the prospect had not been released by yearend.

At midyear, Range Resources Ltd. announced the start of a diamond drilling program at the Mount Kasi gold prospect in southwestern Vanua Levu for the definition of reserves for a proposed 50,000-ton-per-year plant using open pit material averaging 5 grams (0.14 troy ounce per short ton) of gold per ton. Range Resources (35% interest) managed the program in a joint venture with Newmont Pty. Ltd. (65%).

The Government placed the importation of cement, including clinker, under license early in the year in order to protect Fiji's only cement manufacturer, Fiji Industries Ltd. of Lami, near the capital city of Suva. The duty on imported cement had been previously raised from 10% to 57.5%, but cement was still being successfully imported and distributed in Fiji at competitive prices. In addition to the licensing and import duty measures, the Government announced that no concessions or Government assistance would be given to any other firm entering the domestic cement industry.

Three petroleum exploration licenses, granted in 1978 and renewed in 1983, were held during 1986, but results of any exploration activity were unknown at yearend.

Table 1.—Other South Pacific Islands: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Area and commodity	1982	1983	1984	1985[p]	1986[e]
FIJI					
Cement, hydraulic	88,089	109,900	97,900	93,200	[2]92,278
Gold, mine output, Au content troy ounces	45,750	40,124	48,515	60,707	[2]94,902
Lime[3]	3,811	[e]2,500	[e]2,500	3,261	[2]2,305
Silver, mine output, Ag content troy ounces	18,519	13,021	15,207	14,198	[2]17,062
Stone, sand and gravel:					
Coral sand for cement manufacture	99,895	[e]95,000	[e]95,000	[e]126,500	160,900
River sand for cement manufacture	29,773	[e]28,000	[e]25,000	[e]40,000	39,500
River sand and gravel, n.e.s.[e] cubic meters	380,000	375,000	350,000	1,200,000	577,500
Quarried stone[e] do.	230,000	225,000	225,000	105,030	160,000
NAURU[4]					
Phosphate rock thousand tons	1,359	1,684	1,358	1,508	[2]1,494

See footnotes at end of table.

Table 1.—Other South Pacific Islands: Production of mineral commodities[1] —Continued

(Metric tons unless otherwise specified)

Area and commodity	1982	1983	1984	1985[p]	1986[e]
NEW CALEDONIA					
Cement	53,191	[e]60,000	[e]60,000	[e]60,000	[2]40,000
Chromite, gross weight	49,825	91,380	84,152	78,820	[2]72,219
Cobalt, mine output:					
Content by analysis[5]	2,133	1,540	2,006	2,541	2,191
Recovered[6]	271	161	103	124	105
Nickel:					
Ore:					
Gross weight thousand tons	3,050	2,200	2,886	3,600	[2]3,130
Ni content	60,101	46,162	[r]58,326	72,400	[2]81,380
Metallurgical products:					
Ferronickel:					
Gross weight	108,606	[e]84,700	[e]113,700	[r e]140,800	[2]130,500
Metal content (nickel plus cobalt)	28,006	21,717	29,158	36,103	[2]33,001
Nickel matte:					
Gross weight	9,700	[e]6,200	[e]7,600	[r e]12,100	[e]12,260
Metal content (nickel plus cobalt)	7,144	4,578	5,462	8,905	[2]9,160
Stone, sand and gravel:					
Stone:					
Crude (unspecified) cubic meters	19,600	[e]19,000	[e]20,000	[e]20,000	20,000
Crushed do	91,000	[e]90,000	[e]90,000	[e]90,000	100,000
Sand[e] do	59,000	60,000	60,000	60,000	75,000
Silica (for metallurgical use) do	15,240	[e]15,000	[e]15,000	[e]15,000	15,000
PAPUA NEW GUINEA[3]					
Copper, mine output, Cu content	170,004	201,876	164,447	175,048	[2]173,903
Gold, mine output, Au content troy ounces	589,258	579,407	[e]835,000	1,186,618	1,157,400
Silver, mine output, Ag content do	1,387,399	1,524,360	1,427,491	1,482,533	1,500,000
SOLOMON ISLANDS[4]					
Gold, mine output, Au content do	1,318	[e]1,100	2,572	2,090	4,000
Silver, mine output, Ag content do	169	[e]250	--	--	--

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

[1]Table includes data available through July 15, 1987.

[2]Reported figure.

[3]Produced from an unreported amount of domestically quarried limestone.

[4]In addition to the commodities listed, crude construction materials (common clays, sand and gravel, and stone) are produced, but output is not reported quantitatively, and available general information is inadequate to make reliable estimates of output levels.

[5]Cobalt content of nickel ores computed assuming average cobalt content to be 0.07% since 1975.

[6]Cobalt actually recovered for use as cobalt; excludes cobalt content of nickel-cobalt alloys and/or included in ferronickel.

NAURU

The Republic of Nauru, in Micronesia, consists of a single uplifted coral island of 21 square kilometers, 42 kilometers south of the Equator, in the southern Pacific Ocean. Except for a few artificial channels allowing the passage of small boats, a coral reef completely surrounds the island. Nauru has been an associate member of the British Commonwealth of Nations since it became an independent republic on January 31, 1968.

The affluent Nauruan economy, one of the world's richest per capita, continued to be based on extensive high-grade phosphate deposits on the central plateau of the island. These deposits had an 84% bone phosphate of lime (BPL), or tricalcium phosphate (35.8% phosphorous pentoxide, P_2O_5), guaranteed, the world's highest grade phosphate rock available to industry.

Nauru's sole export remained phosphate, mined and marketed by the Nauru Phosphate Corp. (NPC). NPC, an agency of the Government of Nauru, was incorporated in 1969 and assumed full control of the industry in 1970 from the British Phosphate Commissioners, headed by representatives of Australia, New Zealand, and the United Kingdom.

Production of phosphate rock in 1986, mined from between dolomitized coral limestone pinnacles using clamshell buckets, remained about the same as that of 1985. All production was exported to Australia, 58.2%; the Philippines, 31.4%; New Zealand, 8.9%; and the Republic of Korea, 1.5%.

During the year, a cursory feasibility study continued into developing new technology to rework the estimated 6% to 8% of the phosphate rock left behind from previous mining, especially in the areas that were mined using only picks and shovels.

NEW CALEDONIA

The group of South Pacific islands in Melanesia that comprise the French Territory of New Caledonia and Dependencies consists of the main island of New Caledonia, one of the largest islands in the South Pacific; the Isle of Pines and Walpole Island off the southeast coast of the main island; the Loyalty Islands to the east; the Huon Islands on the north; and the Chesterfield Islands to the northwest. The islands of the territory, about 1,600 kilometers east of Australia's Queensland coast, extend about 1,000 kilometers from west to east and about 900 kilometers north to south.

The economy of New Caledonia remained centered around the mining of nickel from lateritic ore and the subsequent production of ferronickel of various grades and of nickel matte. The mineral sector also produced chromite from extensive ultramafic rock, cobalt recovered externally from exported nickel matte, and certain pit and quarry construction materials. LeNickel-SLN, a wholly owned subsidiary formed from domestic nickel mining and smelting operations of France's Société Métallurgique le Nickel, operated mines at Kouaoua (Meaba Mine) and at Thio (Camp des Sapins and Le Plateau Mines) on the east coast of New Caledonia and a smelter at Noumea (Doniambo smelter). Two other LeNickel-SLN properties, the Poro Mine on the east coast and the Kouaoua Mine on the west coast, remained closed during the year. In addition to smelting most of the company's own nickel material into ferronickel and nickel matte, the 52,000-ton-per-year Doniambo smelter also processed material produced from smaller, independently owned mines. Some of the company's ore continued to be shipped to Japan for processing and smelting, and in April, the first shipment of ore containing 294 tons of nickel was shipped to Australia's Metals Exploration Ltd.'s Yabulu smelter at Townsville, Queensland. Minor amounts of cobalt were recovered from exports of nickel matte from refining operations in Le Havre, northern France.

New Caledonia was the world's third largest nickel producer in 1986 after Canada and the U.S.S.R. New Caledonia's rich nickel laterite ore reserves, with an average grade in excess of 2.4% nickel, were estimated to be 20% to 25% of world nickel reserves, second only to those of Cuba.

Cromical S.A. continued to produce refractory-grade (low-silica, high-grade fines) chromite ore in addition to high-grade lumpy ore and high-grade fines from its 90,000-ton-per-year capacity underground Tiebaghi Mine in the northern part of the island of New Caledonia. Proven yearend reserves were 600,000 tons of chromite ore grading 35% to 37% chromic oxide (Cr_2O_3).

Resources other than chromite and nickel had been known to exist in the territory for several years, including significant deposits of antimony, copper, gold, iron ore, lead-zinc, manganese, and phosphate, but none has been mined commercially.

PAPUA NEW GUINEA

About 85% of Papua New Guinea, an independent state within the British Commonwealth of Nations since achieving independence on September 16, 1975, occupies the eastern portion of the island of New Guinea, with Irian Jaya, an Indonesian Province, occupying the western portion. The remainder of the country is comprised of about 600 islands, including those of the Bismarck Archipelago (the largest of which are New Britain, New Ireland, and Manus), the northernmost Solomon Islands (Bougainville and Buka), and the D'Entrecasteaux, Louisiade, Trobriand, and Woodlark Island groups.

The economy of Papua New Guinea remained predominantly agricultural, accounting for about one-third of both the gross domestic product (GDP), estimated to be $2.4 billion,[2] and foreign exchange earnings from exports. However, the mineral industry of the country continued to increase in importance and accounted for an estimated 20% of the GDP and more than one-half of total export receipts in 1986.

The exploration for nonfuel minerals in Papua New Guinea was dominated by the search for porphyry copper deposits during the late 1960's to mid-1970's. These deposits are characterized by low-grade disseminated copper mineralization and usually minor, but recoverable, gold and silver. Bougainville Copper Ltd.'s (BCL) copper-gold-silver mine at Panguna on Bougainville Island in the North Solomons Province was brought into production in 1972 and represented a classic exploration success for this type of deposit. BCL was owned by CRA Ltd., 53.6%; the Papua New Guinea Government, 20%; and by public shares, 26.4%.

Other porphyry deposits have been discovered in the country as a result of the efforts expended for this type of mineralization, but only one, Ok Tedi, has proceeded beyond the exploration stage.

The Ok Tedi copper-gold-silver mine on Mount Fubilan in the Star Mountains, 25 kilometers from the Irian Jaya border in Western Province, began production in May 1984. Ok Tedi was owned by The Broken Hill Pty. Co. Ltd. and Amoco Minerals Co. (Standard Oil Co., Indiana), each with a 30% share; Kupferexplorationsgesellschaft mbH, 20%; a consortium of Metallgesellschaft AG and Degussa AG, 7.5% each; the state-owned West German Development Co., 5.0%; and the Papua New Guinean Government, 20%. This deposit, primarily a low-grade porphyry copper with some gold and silver values, also contained significantly increased gold mineralization along the surface of the ore body—the gold capping formed from secondary enrichment—in which the first stage of mining was being concentrated.

For the past several years in Papua New Guinea, and throughout the southwest Pacific region generally, the primary target for mineral exploration had been that of the epithermal deposit formed essentially in the same type of volcanic system as that of the porphyry coppers, but nearer the surface and thus at lower temperatures. Several of these deposits, typically containing significant gold and silver values, were at advanced stages of evaluation at yearend 1986. The project at the most advanced stage at yearend was Placer Pacific Ltd.'s Misima deposit, on the eastern half of Misima Island off the southeastern coast of the mainland, about 600 kilometers from Port Moresby. Estimated reserves at Misima were 62.1 million tons of ore grading 1.35 grams per ton (0.04 troy ounce per short ton) of gold and 20 grams per ton (0.58 troy ounce per short ton) of silver.

Probably the most significant epithermal gold project in Papua New Guinea during the year was the Porgera gold and silver deposit in Enga Province of the western highlands region of the main island, about 130 kilometers by air and 230 kilometers by road to the west of the town of Mount Hagen. The property had been under investigation since 1979 by the Porgera joint venture in which Placer Pty. Ltd., Renison Goldfields Consolidated Ltd., and Mount Isa Mines Ltd. each held a one-third interest. Placer was the manager of the project, and the Government held an option to acquire up to a 10% interest. In situ reserves were reported to be 4.5 million tons of ore grading 21.9 grams per ton (0.64 troy ounce per short ton) of gold and 23.1 grams per ton (0.67 troy ounce per short ton) of silver in the high-grade Zone VII ore body, and 78 million tons grading 3.7 grams per ton (0.11 troy ounce per short ton) of gold and 11.3 grams per ton (0.33 troy ounce per short ton) of silver in the remainder of the deposit. Because the ore is refractory (gold in close association with sulfide minerals), only about 40% of the contained gold-silver is readily recoverable by simple cyanide leaching. However, metallurgical tests have demonstrated that an acceptable level of gold-silver recovery can be obtained by flotation and pressure oxidation of a bulk sulfide concentrate prior to conventional cyanide leaching. Contingent upon the completion in 1987 of a satisfactory final feasibility study and successful negotiations with the Government for a Special Mining Lease, the joint venture anticipated the beginning of a 3-year mine construction program commencing by mid-1988.

A third major gold project at an advanced stage of evaluation in 1986 was the Lihir Island Prospect off New Ireland in the Bismarck Archipelago, a joint venture comprised of Kennecott Explorations (Australia) Ltd., 88% (acting as manager), and Niugini Mining Ltd. of Australia, 12%. Published reserves were 137 million tons grading 2.7 grams of gold per ton (0.08 troy ounce per short ton). The discovery of a higher grade mineralized zone about 700 meters away from the original ore body was reported at yearend. This zone was estimated to contain a resource of 15 to 30 million tons grading about 5 grams of gold per ton (0.14 troy ounce per short ton), with a potential for further tonnage at lower grades.

As a result of the apparent eventual success of efforts to satisfactorily bring into operation gold deposits like Misima, Porgera, and Lihir, precious metal exploration efforts by both large and small mining companies have accelerated in Papua New Guinea during the past several years. At the end of 1986, there were a record 159 active Prospecting Authorities in force compared with 140 in 1985. Some of the prospects that were being investigated in 1986 for possible development were the Mount Victor Prospect near Kainantu in Chimbu Province on the mainland, with estimated

reserves of 314,000 tons grading 4.6 grams of gold per ton (0.13 troy ounce per short ton) for an expected mine life of about 4 years (Niugini Mining); the Kerimenge deposit to the east of the Mount Victor Prospect near the old alluvial districts of Wau and Bulolo in Morobe Province (Renison Goldfields); the Olipai River alluvial area at the Lakekamu Prospect in Gulf Province, 120 kilometers northeast of Port Moresby (City and Suburban Properties Ltd.); and the Wild Dog Prospect at Uramit near Rabaul on eastern New Britain Island, with estimated resources of 250,000 tons grading 5 grams of gold per ton (0.14 troy ounce per short ton) (City and Suburban).

The Government continued to actively encourage foreign mining companies to explore for and mine mineral resources in Papua New Guinea during the year. The Government also reserved the right to take a maximum 30% participating interest in any significant mining enterprise, although it had not fully exercised this option. Its maximum involvement in any mining endeavor at yearend was a 20% stake, plus dividend payments, in both the Panguna Mine on Bougainville and the Ok Tedi Mine. In addition, both Bougainville and Ok Tedi were paying royalties to the Government, together with normal corporation taxes. Under the terms of the Porgera joint venture, dating from 1979, the Government had the option to acquire a maximum 10% participation in the project, but had not taken any share by yearend 1986.

Table 2.—Papua New Guinea: Exports of copper in concentrates, by destination

(Metric tons of copper content)

Destination	1985	1986
China	9,153	9,207
Germany, Federal Republic of	49,078	62,513
Japan	74,597	77,373
Korea, Republic of	17,656	18,367
Spain	18,228	11,314
Total	168,712	178,774

Source: World Metal Statistics, June 1987.

SOLOMON ISLANDS

Named for the legendary gold mines of King Solomon, the Melanesian state of the Solomon Islands, which became an independent member of the British Commonwealth of Nations on June 7, 1978, consists of a double chain of ruggedly mountainous volcanic islands and low-lying coral atolls in the South Pacific Ocean. The major island of the archipelago is Guadalcanal, which lies about 1,600 kilometers east of Port Moresby, Papua New Guinea. Choiseul, Malaita, New Georgia, San Cristobal, and Santa Isabel comprise the other larger islands in the group.

Alluvial gold, including minor amounts of silver, has been mined in the Solomon Islands since its discovery in the mid-16th century by Spanish explorers. However, it was not until 1985 that a modern, large-scale gold mine began operations under the first mining lease granted in the Solomons since it became independent. The mine was officially opened on November 9, 1985, at Mavu on the island of Guadalcanal, 30 kilometers southeast of the capital city of Honiara, by Australia's Zanex Ltd. (70%), and the domestic firm Mavu Gold Development Ltd. (30%), under a joint venture named Zanex Mavu. The mine plant commenced operating early in 1986, but production was suspended later in the year owing to the destruction of the plant by a tropical cyclone.

Cyprus Minerals Australia Co., a subsidiary of Amoco Minerals Australia Co., continued its assessment for developing the potentially much larger bedrock and eluvium gold deposits at Gold Ridge, immediately upstream from and the source material for the Mavu alluvial gold deposit. Actually, the bulk of all the gold recovered in the Solomon Islands has been produced from alluvial and colluvial deposits derived from Gold Ridge primary gold source material.

Late in the year, United Gold (Solomon Islands) Ltd., a subsidiary of City Resources of Australia, obtained a prospecting license for gold and other minerals—mainly phosphate, coal, and diamond—in the Duff Islands Group and the Luasalemba area of Santa Cruz Island, Temotu Province.

The mineral sector of the Solomon Is-

lands historically has had an insignificant role in the Nation's economy, producing only small quantities of clays, crushed stone, and sand and gravel for domestic use. However, recent exploration programs by large multinational companies—especially for gold, but also for bauxite, copper, nickel, and phosphate rock—may change the role of minerals in the economy in the future. Recent prospecting efforts, aside from gold, have concentrated on bauxite deposits on Rennell and Vaghena Islands, where reserves were estimated at 25 million tons with an alumina content of 48%, and 30 million tons with a 47% alumina content, respectively. Phosphate rock deposits have been identified on Bellona Island containing 10 million tons of phosphate-bearing material. Both copper and nickel laterite deposits have been identified on several of the islands. Other potential mineral resources included asbestos, cobalt, lead, and zinc.

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[2]Where necessary, values have been converted from the Papua New Guinean kina (K) to U.S. dollars at the rate of K0.95=US$1.00, the average for 1986.